

Examining Factors for Self-Harm in LGBTQIA+ and Cisgender/Heterosexual People Using the Online Card Sort Task for Self-Harm (CaTS-Digital; CaTS-D)

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Abstract

Self-harm is recognised as a global health concern and is the most significant predictor of death by suicide. Rates among LGBTQIA+ individuals are particularly high. Many factors which precede self-harm have been identified (e.g., depression, anxiety). However, the temporal pathway is poorly understood, because factors were examined in isolation. Previous models (e.g., the Four Function Model) sought to explain why people self-harm; however, these were reductionist and did not consider the various antecedents identified in the literature. Consequently, researchers recommended research measures capable of examining multiple antecedents simultaneously to better understand the self-harm pathway.

This thesis aims to identify salient risk and protective factors and examine their timing across diverse groups (LGBTQIA+ and cisgender/heterosexual people). Central to this work is the development and initial application of the Card Sort Task for Self-Harm-Digital (called CaTS-D), a novel web-application developed during this PhD to capture temporal self-harm pathways from large datasets that can be captured quickly and more conveniently than during in-person research.

This thesis comprises first empirical studies. The first study investigates implicit and explicit attitudes towards self-harm and suicide-related constructs using secondary data from Project Implicit-Health, revealing stronger associations in both constructs in Transgender and Gender-Diverse (TGD) individuals, compared to cisgender individuals. The second study is a systematic review of 78 studies examining risk and protective factors in TGD populations, and identified key risk (e.g., gender-minority stressors; physical/sexual abuse) and protective (e.g., social support, connectedness) factors. The third and fourth studies co-developed amendments and additions to CaTS and CaTS-D with individuals with lived experience, enhancing the tools usability and inclusiveness.

The final study was the first application of CaTS-D to examine self-harm pathways in LGBTQIA+ and cisgender/heterosexual populations. The findings of studies are considered within the Integrated Motivational-Volitional (IMV) model. Findings from the

final study suggest self-harm pathways are largely similar across LGBTQIA+ and cisgender/heterosexual populations, with LGBTQIA+ individuals experiencing distinct proximal factors (e.g., acquired capability).

This thesis contributes novel insights into the features and timing of self-harm antecedents, support for the IMV and the use of digital applications in research settings, and offers practical recommendations for clinical practice, and support for the IMV. Finally, possible refinements to the IMV are discussed which may strengthen the model's ability to explain self-harm pathways.

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For my sweet Stella Boo, everything I do is always for you.

“The darker the night, the brighter the stars, the deeper the grief, the closer is God” – Fyodor Dostoevsky ‘Crime and Punishment’

“You can never be overdressed or overeducated” – Oscar Wilde

“Now I know I’m more than all of my scars” – Black Veil Brides

To my mum, I’m sorry this is too late for you to read. I hope I’ve finally made you proud.

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Peer-review publications from this thesis

1. Chapter 2

The research presented in **Chapter 2** is published in:

Bird, K., Arcelus, J., Matsagoura, L., O'Shea, B., & Townsend, E. (2024). Risk and protective factors for self-harm thoughts and behaviours in transgender and gender diverse people: A systematic review. *Heliyon*, *10*(5), e26074. 10.1016/j.heliyon.2024.e26074

2. Chapter 4

The research presented in **Chapter 4** is published in:

Bird, K., Greentree, I., O'Shea, B., & Townsend, E. (in press). Co-developing the CaTS-D: a pilot study and thematic analysis of content updates for the Card Sort Task for Self-Harm (CaTS) with people with lived experience. This has been accepted and is currently in production, but the preprint can be read at JMIR Preprints. Doi.10.2196/preprints.71296 http://preprints.jmir.org/preprint/71296

3. Chapter 6

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Bird, K., Greentree, I., O'Shea, B., & Townsend, E. (in press). Co-developing the CaTS-D: a pilot study and thematic analysis of content updates for the Card Sort Task for Self-Harm (CaTS) with people with lived experience. This has been accepted and is currently in production, but the preprint can be read at JMIR Preprints. Doi.10.2196/preprints.71296. Doi.10.2196/preprints.71296 http://preprints.jmir.org/preprint/71296

4. Other publications during this PhD

Experiences during my PhD enabled me to publish research related to, but beyond the chapters of this thesis. These are:

Lockwood, J., Babbage, C., **Bird, K.**, Thynne, I., Barsky, A., Clarke, D. D., & Townsend, E. (2023). A comparison of temporal pathways to self-harm in young people compared to adults: A pilot test of the Card Sort Task for Self-harm online using Indicator Wave Analysis. *Frontiers in psychiatry*, *13*, 938003. Doi: 10.3389/fpsyt.2002.938003.

French, B., Babbage, C., **Bird, K**., Marsh, L., Pelton, M., Patel, S., … & Rennick-Egglestone, S. (2024). Data integrity issues with web-based studies: an institutional example of a widespread challenge. *JMIR Mental Health*, *11*(1), e58432. Doi: 10.2196/58432

Presentations related to this thesis

1. **Mental Health Research UK Conference – 22nd April 2021.**

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4. **Mental Health Research UK Conference – 21st April 2022.**

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6. **From Harm to Hope: The 8th National Self-Harm and Suicide Prevention Conference, Harmless – 1st March 2023.**

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7. **Mental Health Research UK Conference – 27th April 2023.**

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8. **From Harm to Hope: The 9th National Self-Harm and Suicide Prevention Conference, Harmless – 1st March 2024.**

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9. **Mental Health Research UK Conference – 25th April 2024.**

Bird, K., O'Shea, B., Arcelus, J., & Townsend, K. "Understanding pathways to self-harm and suicide ideation in high-risk young people" (Oral presentation)

10. **8th Suicide and Self-Harm Early-Mid Career Researchers Forum, Glasgow – June 2024.**

Bird, K., O'Shea, B., & Townsend, E. "Updates to the Card Sort Task for Self-Harm (CaTS): A qualitative study with people with lived experience" (Oral Presentation)

11. **School of Psychology, University of Nottingham PostGraduate Conference – 16th October 2024.**

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Chapter 1. General Introduction

1.1 Introduction and Overview of Thesis Structure

This thesis aims to develop and pilot test a digital version of the card sort task for self-harm (CaTS) and utilise the digital task (called CaTS-D) to examine self-harm pathways of Lesbian, Gay, Bisexual, Transgender, Queer/Questioning, Intersex, Asexual, and other gender identities/sexualities (LGBTQIA+; Lewis & Reynolds, 2021) and cisgender/heterosexual people. An overview of terminology used throughout this PhD thesis is presented in Table 1. This introduction chapter provides an overview of key literature on which this new research is based. Gaps in literature are highlighted, and rationale is provided for the research objectives and aims of the PhD research. Each subsequent chapter includes rationale for the chosen methodology used in that study. This thesis presents five studies (Chapters 2-4, 6, 7) each written in the format of a standalone research paper. Chapters 3, 4, and 6 have been published during the PhD programme (Bird et al., 2024; Bird et al., 2025).

Table 1.
Overview of key terminology used within this thesis and their definitions

Terminology	Definition

Self-harm	Intentional self-harm or self-poisoning, regardless of intent (NICE, 2022; Norman et al., 2020)
Suicidality/STB's (suicidal thought and behaviours)	Suicidal ideation, self-injurious behaviour (self-harm), suicide attempts, and completed suicide (Meyer et al., 2010)
Suicide	Defined as death caused by self-directed injurious behavior with intent to die as a result of the behavior (excluding assisted suicide/ euthanasia) (Ladikli et al., 2024; National Institution of Mental Health, 2021)
Attempted suicide/Suicide attempt/s	Any non-fatal, self-directed, potentially injurious behaviour with intent to die as a result of the behaviour. A suicide attempt might not result in injury. (Ladikli et a., 2024; National Institution of Mental Health, 2021)
LGBTQIA+	Lesbian, Gay, Bisexual, Transgender, Queer/Questioning, Intersex, Asexual, and other gender identities/sexualities (Lewis & Reynolds, 2021)
TGD (Transgender and Gender-Diverse)	People who are transgender and gender-diverse
Cisgender	People whose gender identity aligns with their birth-assigned gender and body (Zhang et al., 2021)
Heterosexual	Either a cisgender man or woman whose sexual and romantic preference is a person of the opposite sex
Suicidal/suicide ideation	Thinking about, considering, or planning suicide (National Institution of Mental Health, 2021)
CaTS	Card Sort Task for Self-Harm (Townsend et al., 2016)
CaTS-D	Card-Sort Task for Self-Harm-Digital

Within the wider LGBTQIA+ umbrella, Transgender and Gender-Diverse (TGD) people are at increased risk of self-harm and suicidality. Despite their increased risk, there is a dearth of

research on TGD self-harm and preceding factors, and TGD individuals' unique self-harm pathway is poorly understood. To address this, the first two studies consider whether implicit and explicit attitudes and/or specific risk and/or protective factors increase self-harm risk in TGD people (Chapters 2 & 3; Bird et al., 2024). Chapter 2. examines whether TGD people have positive implicit/explicit attitudes to self-harm, suicide, and death-related stimuli compared to cisgender people. Chapter 3 reviews extant evidence of factors preceding TGD self-harm to present a systematic review. Risk and protective factors for TGD self-harm were reviewed, with both general and TGD-specific factors identified, and implications for clinical practice and policy are discussed.

The card sort task for self-harm (CaTS) was developed in 2013 as a self-harm research tool. CaTS allows people to build their self-harm pathway using concepts pertinent to their self-harm along a timeline. Since CaTS' development, our understanding of self-harm has changed. Consequently, updating CaTS/CaTS-D is important for it to remain a useful, meaningful research tool. Furthermore, we are increasingly aware of the elevated risk of self-harm LGBTQIA+ people experience. Identifying LGBTQIA+ amendments and/or additions is essential to increase its inclusivity and relevance in this high-risk group. To address this, Chapter 4 explores amendments and additions to CaTS/CaTS-D using semi-structured interviews with LGBTQIA+ and cisgender/heterosexual people with lived self-harm experience. A coding-reliability thematic analysis presents amendments to wording on existing cards and additional cards.

CaTS was initially developed to utilise during in-person research (e.g., Townsend et al., 2016). However, this limits participants' ability to take part. Further, capturing large data sets is challenging, costly, and time-consuming. To address these challenges, during the PhD I developed a digital web-app version of CaTS (called CaTS-Digital or CaTS-D) to widen and increase study recruitment and capture large data sets. Development of CaTS-D is presented in Chapter 5. An important next step required prior to utilising CaTS-D in research is to ensure the web-app is appropriate and functional. Chapter 6 assessed the feasibility and usability of CaTS in a pilot study utilising the System Usability

Scale. Qualitative data were also captured regarding possible amendments or additions to CaTS/CaTS-D.

Findings from chapters 4 and 6 informed key amendments and additions to CaTS which were built into CaTS-D for the final empirical study (Chapter 7). This study utilised CaTS-D to examine self-harm pathways in LGBTQIA+ and cisgender/heterosexual populations. Indicator Wave Analysis was employed to identify key antecedents in each group, or key co-occurring antecedents, which may be important intervenable targets.

The final discussion chapter presents overarching findings from this thesis (Chapter 8). To demonstrate how these studies have contributed to, and extended, our understanding of self-harm. Findings are reviewed with extant literature and theoretical models, and practical implications and directions for future research are also discussed. Finally, I discuss the strengths and limitations of the research undertaken in this PhD and my own research practices.

1.1.1. A Note on the Definition of Self-Harm

Debate surrounds the definition of self-harm, with arguments for and against including acts with suicidal intent (Abdelraheem et al., 2019). Historically, terms included 'self-mutilation', 'self-cutting', and 'deliberate self-injury', however, as understanding of self-harm has developed, we have moved away from such terms as they are considered stigmatising (Lurigio et al., 2023). Currently, there is no globally accepted definition of self-harm (Jakobsen et al., 2023). Instead, various terms are currently used to describe the act of self-harm within research and clinical settings. For example, nonsuicidal self-injury (NSSI) is defined as a "direct, deliberate, destruction of one's own body tissue in the absence of suicidal intent" (Lengel et al., 2022; Nock & Favazza, 2009; Wang et al., 2022) for purposes "not socially sanctioned" (Cipriano et al., 2017) (e.g., body piercing and tattooing (Wilkinson & Goodyer, 2011)). Nonsuicidal self-injury (NSSI) is commonly used within research settings, and its definition is underpinned by the notion that, while related to suicidal behaviours, NSSI aetiology will be different because the motive to die is absent (Mangnall & Yurkovich, 2008; Wilkinson, 2013; Wilkinson & Goodyer, 2011). Indeed, for most, there is no desire to die (Wilkinson, 2013).

However, intent can be difficult to determine (Millard & Ougrin, 2017; Rogers et al., 2022), may change over time (Townsend et al., 2016), and patient and clinician views regarding intent may differ (Gao et al., 2014; Hawton et al., 2012).

To account for these issues, in the UK, the National Institute for Health and Care Excellence (NICE) define self-harm as any self-injury or -poisoning regardless of intent (Aggarwal et al., 2017; Curtis & Thorne, 2018; Millard & Ougrin, 2017; NICE, 2022), thus including acts with definite and ambiguous intent. Research utilising taxometric methods found suicidal and nonsuicidal self-harm did not represent distinct typologies, rather they represented ranges across a single dimension (Orlando et al., 2015). In short, while ascertaining suicidal intent is important in clinical settings, suicidal and nonsuicidal self-harm occur along a spectrum and should not be considered distinct behaviours with distinct aetiology. Because of this, and because the self-harm definition is used by NICE, and more widely by researchers in the UK and Europe (Kapur et al., 2013), throughout this thesis, I will use the term 'self-harm' and its associated NICE definition: **any self-injury or –poisoning regardless of intent.**

1.2. Self-Harm: An Epidemiological Overview

Self-harm can be used to express or respond to emotional distress (Lurigio et al., 2024), and prevalence has increased since the 1980's (Lurigio et al., 2024). This rise is concerning considering the range of negative health and wellbeing outcomes, including suicidal thoughts and behaviours (STBs) (Gouveia-Pereira et al., 2022) associated with self-harm. This section provides an initial overview of self-harm, including global and national (UK) prevalence figures and associated health and wellbeing outcomes. The aetiology of self-harm is discussed within the framework of three prominent self-harm models: Four-Function Model of Self-Harm (FFM; Nock & Prinstein,2004; 2005); The Interpersonal-Psychological Theory of Suicidal Behavior (IPTS; Joiner, 2005); and the Integrated Motivational-Volitional Model of Suicidal Behaviour (IMV; O'Connor, 2011). Then, risk and protective factors for self-harm are presented. I present these models because, together, they offer a comprehensive, multidimensional framework for understanding self-harm by covering the functions and motivations of, and the progression

towards, self-harm. The FFM (Nock & Prinstein 2004; 2005) provides a strong foundation to understand self-harm at a behavioural level, while the IPTS model adds a motivational perspective and explains how self-harm may result in STBs (Joiner, 2005). Finally, the IMV model incorporates temporal dynamics and distinguishes between ideation and behavioural enaction, while accounting for moderating and volitional factors (O'Connor, 2011; O'Connor & Kirtley, 2018).

1.3. Self-Harm and Suicide: A Global and National Overview

1.3.1. Self-Harm Overview

Self-harm (defined throughout this thesis as any self-injury or -poisoning regardless of intent; Curtis & Thorne, 2018; NICE, 2022) is a multifaceted (Borschmann & Kinner, 2019; Fox et al., 2015; Richardson et al., 2024; Townsend et al., 2016), and prevalent behaviour (Lim et al., 2018; Xiao et al., 2022), which poses a major public health, social, and economic concern (Knipe et al., 2022; O'Connor et al., 2018). Recent meta-analyses report global lifetime self-harm prevalence at approximately 22%, with past-year self-harm prevalence ranging from 19.5% to 23.3% (Farkas et al., 2024; Lim et al., 2019; Xiao et al., 2022). UK-based studies show comparable lifetime rates of 15.5% to 18% (Morey et al., 2017; Muehlenkamp et al., 2012; O'Connor et al., 2016; Swannell et al., 2014), though one study utilising primary healthcare records reported a notably higher rate of 38.4%, possibly reflecting methodological or clinical differences (Trafford et al., 2023). These figures indicate self-harm is widespread, highlighting the need for effective identification and interventions.

Stigma surrounding self-harm means it is often a hidden behaviour so, consequently, prevalence are likely underestimates (Long et al., 2013). This underreporting has significant implications for policy development and clinical services as resources may not reflect true need. Despite this, recent figures indicate self-harm rates are increasing (Cybulski et al., 2021; McManus et al., 2019). Self-harm occurs in people of all ages (Hawton et al., 2015). However, onset typically occurs during adolescence (~13-years; Ammerman et al., 2018; Gillies et al., 2018; Stallard et al., 2013), and self-harm is most prevalent in adolescents and young adults (<24-years; Carr et al., 2016). Other

groups at increased risk include girls/young women (Gillies et al., 2018; Ohlis et al., 2020; Nock et al., 2008), particularly Black (Larkin et al., 2023) and South-East Asian (Bhui et al., 2007) women, and people with psychiatric and chronic physical health conditions (Singhal et al., 2014). Further, we are increasingly aware that sexual (Kidd et al., 2024; Marchi et al., 2022; Rogers & Taliaferro, 2020) and gender (Butler et al., 2019; Marchi et al., 2022; Marshall et al., 2018; White et al., 2023) minorities experience elevated rates of both self-harm and STBs. High-risk groups, like sexual/gender minorities, may experience group-specific factors alongside general factors, which increase their risk of self-harm (Bird et al., 2024; Favil et al., 2020; McMahon et al., 2010). This underscores the importance of identity-sensitive interventions and research tools to reduce self-harm in high-risk groups. Conceptually, self-harm is linked to suicide given the risk factors, functions, and intervention strategies they share (Knipe et al., 2022) and recognising this link is essential for designing interventions and research tools that address multiple self-harm antecedents simultaneously, instead of in isolation. Therefore, recognising links between self-harm and suicide is essential for addressing the broader public health concern they both represent.

1.3.2. Suicide Overview

Suicide prevalence is similarly alarming. Recent data from the World Health Organisation (WHO; 2024, 2025) indicates approximately 720,000 people die by suicide globally each year, equating to approximately one person every 40-seconds (WHO, 2018). Concerning evidence indicates UK suicide rates are rising (Bould et al., 2019). In England and Wales, there were 6,069 recorded suicides in 2023, the highest since 1999 (Hiam et al., 2025; Office of National Statistics (ONS); 2024), though this may partly correlate with changes in coronial recording procedures of suicide deaths which began in 2018 (Hiam et al., 2025; ONS, 2020). Evidence regarding whether suicide rates are increasing or decreasing globally is mixed. For example, earlier studies reported suicide rates were increasing (Curtin et al., 2019; Naghavi et al., 2019). Contrastingly, more recent WHO (2024) findings suggested a slight global decline between 2019 and 2021; however, these trends lack consistency across countries. For example, the Americas (North and South), Lesotho, Cyprus, Paraguay, Saudi

Arabia, Georgia, and Mexico (among others) showed increases in suicide mortality between 2000 and 2019, whereas Serbia, Venezuela, and Barbados experienced declines (Ilic & Ilic, 2022).

The prevalence of suicide attempts (SA) is less clear (Bachmann et al., 2018), however, recent global meta-analyses reported lifetime and past-year SA of 6% and 4.5% respectively (Lim et al., 2019). During the COVID-19 pandemic, suicide researchers predicted lockdowns may result in increased suicide prevalence (e.g., Standish, 2021). A recent meta-analysis and systematic review of global evidence on pre- and post-pandemic STBs found SI and SA increased significantly, whereas suicide death rates showed a non-significant decrease (Yan et al., 2023). However, considering suicide death rates remain critically high globally (WHO, 2024), and are associated with personal and societal costs (Jain et al., 2024; Orri et al., 2021), increasing understanding of and reducing suicide deaths remains a global priority.

Consistent with self-harm, more females than males attempt suicide (Bachmann, 2018; Bommersbach et al., 2022; Miranda-Mendizabal et al., 2019; Sahoo et al., 2023). In contrast to self-harm, however, men are at highest risk of suicide (Alicandro et al., 2019; Curtin et al., 2016; Glenn et al., 2020; WHO, 2019) experiencing a threefold risk compared to females (Bidaki et a., 2016; Miranda-Mendizabal et al., 2019), though this figure fluctuates between countries (Alicandro et al., 2019; Hu et al., 2023). Possibly, this relates to male reluctance to seek help, increased impulsivity in males, and the use of highly lethal means by men (Sher, 2019). There are exceptions to this ratio. For example, female suicide rates exceed that of males in Bangladesh (Bachmann et al., 2018), and no significant gender difference in suicide occur in India (Nock et al., 2008).

The average age of completed suicides varies by countries and biological sex (Bachmann et al., 2018; Naghavi et al., 2019). In Europe and the USA, rates are highest amongst individuals aged 45-64-years and 85-years+ (Bachmann et al., 2018), while in some African nations the highest rates occur in individuals <25-years (Bachmann et al., 2018). Elsewhere, recent data indicates the highest suicide rates occur <30-years in South Asia, Latin America, The Caribbean, North Africa, and the Middle East (Naghavi et al., 2019). Other groups disproportionally affected by suicide include

emergency/first responders (police officers, firefighters, emergency medical technicians/paramedics; Stanley et al., 2016), veterinarians/vet nurses (Schunter et al., 2022; Witte et al., 2019), autistic people (Brown et al., 2024), victims of violence (Castellvi et al., 2016) and victims of childhood maltreatment/abuse (Hoertel et al., 2015; Swahn et al., 2012), people with chronic mental health issues (Bidaki et al., 2016), and nurses/care-workers (Windsor-Shellard & Gunnell, 2019). Finally, as with self-harm, sexual and gender minorities (LGBTQIA+) are at increased risk of suicide compared to cisgender/heterosexual people. (Rogers & Taliaferro, 2020; Swannell et al., 2015; Thoma et al., 2019).

Recent global data indicates that reported rates of both self-harm and suicide (Bould et al., 2019; Curtin et al., 2016; Cybulski et al., 2021; Naghavi et al., 2019) are increasing, which may correspond with increased reporting and changes in coronial procedures, rather than because self-harm and suicide rates are rising (Carpenter et al., 2024a, 2024b; Hawton et al., 2015). These increases also coincide with increases in self-harm and suicide factors (e.g., depression, drug/alcohol use, anxiety) (Bachmann 2018; Glenn et al., 2020). Both self-harm and suicide prevalence are likely to be underestimates due to under-reporting, and national and international differences in how self-harm and suicide are recorded (Carpenter et al. 2024a, 2024b; Hawton et al., 2015; Tait & Carpenter, 2016) and defined (Jakobsen et al., 2023). For example, some deaths may be recorded as accidental, misadventure, or undetermined if no clear suicidal intent is established. Indeed, Hawton and colleagues (2015) highlight many deaths recorded as accidental poisonings may have been deliberate, particularly considering many poisoning deaths involve psychotropic drugs (i.e., alcohol, heroin, LSD, cocaine) which are likely to be deliberate overdoses (Hawton et al., 2015). This misclassification likely complicates the accuracy of tracking trends and evaluating the effectiveness of suicide prevention policies. Despite prevalence figures being underestimates, current self-harm and suicide figures present a concerning picture and highlight the need to improve understanding of why people self-harm and identify intervenable factors which may inform intervention, clinical practices, and policy. This is recommended by researchers in the field (Edmondson et al., 2016; Sheehy et al., 2019; Taylor et al., 2018).

1.3.3. Factors, Functions and Impact of Self-Harm

Self-harm is driven by complex, temporal interactions between various biological, social, and psychological factors (Hawton et al., 2012; Richardson et al., 2024) and is associated with a range of maladaptive health, social, and wellbeing outcomes. Individuals who self-harm are more likely to experience poor oral (Le et al., 2023), mental (Cipriano et al., 2017), and physical health (Bergen et al., 2012; Erlangsen et al., 2021), and poorer education and occupational outcomes (Kiekens et al., 2016; Mars et al., 2014). Moreover, compared to cisgender/heterosexual populations, self-harm is associated with increased and premature morbidity (Bergen et al., 2012; Hawton et al., 2020; Sinclair et al., 2011), including elevated risk of death by accidental poisoning and drug abuse (Hawton et al., 2020). The latter is perhaps unsurprising considering self-harm is correlated with licit/lawful and illicit substance use (Borschmann et al., 2017; Leza et al., 2024; Mars et al., 2014; Moran et al., 2015).

Self-harm is also associated with psychiatric issues (Cipriano et al., 2017; Mars et al., 2014; Richardson et al., 2024), which is particularly concerning considering people with mental health issues experience barriers when seeking physical health care, which contributes to reduced life expectancy (Coombs et al., 2021; Thornicroft, 2011). Additional consequences include financial hardships, divorce/separation (Borschmann et al., 2017), family problems, study/employment problems, difficulties with relationships with friends (Townsend et al., 2022), and overall reduced quality of life (Le et al., 2023; Zullig, 2016). Collectively, these findings highlight the importance of early, comprehensive care for individuals who self-harm to mitigate long-term health and wellbeing consequences.

Self-harm has long-lasting and wide-reaching impact on individuals, their family and social networks, and society more widely. Qualitative research describes the social isolation, stress, guilt, depression, distress, mental health issues, and hypertension experienced by friends and families of people who self-harm (Curtis et al., 2016; Ferrey et al., 2015; Marshall et al., 2023; Martin et al., 2024; Spillane et al., 2019). Self-harm also has wider social and economic impact. A recent systematic analysis of the Global Burden of Disease Study (GBD, 2019) rated self-harm as

the third highest injury-related cause of disability life adjusted years (DALY) in adolescents (aged 10-24 years). DALYs measure the overall impact of a disease or injury on the health and life expectancy of a population and each DALY accounts for the loss of one-year of full health (WHO, 2024). This ranking indicates the disproportionate impact on long-term health, and that self-harm contributes to significant loss of health, wellbeing, and life expectancy to individuals, underscoring the need for focused intervention strategies.

Additionally, self-harm is amongst the leading causes of hospital admissions (Chan et al., 2016; Geulayov et al., 2016) and, consequently, has significant economic impact on health services. Approximately 9% of people attend hospital at least once for self-harm (Ammerman et al., 2018). Data from the GBD Study (2019) reported self-harm was the second cause of injury death after road death injuries (29.1%) in 2013, accounting for 17.6% of injury deaths globally (Haagsma et al., 2016). Similarly, findings from the Multicentre Study of Self-Harm in England indicated self-harm results in approximately 200,000 hospital admissions annually (Geulayov et al., 2016; Tsiachristas et al., 2019). In the US, around 509,000 people attended emergency departments for self-harm annually between 2006 and 2013, (Canner et al., 2016), placing significant strain on health services. The estimated economic cost of NSSI and suicide in the USA between 2015 and 2020 was $510billion per annum (Peterson et al., 2024), while in Australia, the impact was AUS$55million (£300million) annually (Kinchin et al., 2017). These figures reflect the clinical burden of self-harm and STBs and suggest opportunities for intervention and prevention have been missed.

Similarly, in England, the average hospital cost is between £564 and £809 per self-harm episode. The authors extrapolated these findings across England and estimated a national annual cost of between £128.6 and £162million (Tsiachristas et al., 2017). Economic costs include in-patient and emergency hospital care, psychosocial assessments, medication, social care, and monies lost from missing work (Peterson et al., 2024; Sinclair et al., 2011; Tsiachristas et al., 2017; 2020). Indeed, suicide frequently affects young and middle-aged men who are beginning or establishing their careers (Naghavi et al., 2019). Their absence from the workplace impacts individuals personally and has wider societal

impact. These costs reflect the burden on healthcare systems but also the wider societal impact, underscoring the need to develop and invest in early, effective interventions. While reducing the personal impact of self-harm remains at the heart of self-harm research (Dyvesether et al., 2022), understanding the economic cost of self-harm is necessary to support service planning to better support people presenting at hospital, but also to develop and fund policies and strategies which reduce financial pressure on health services. This is essential if self-harm reduction efforts are to be effective (Dyvesether et al., 2022; Peterson et al., 2024; Segar et al., 2024).

However, most concerning, self-harm is the most significant predictor of death by suicide (Chan et al., 2016; Cheung et al., 2017; Geulayov et al., 2019; Gouveia-Pereira et al., 2022; Hawton et al., 2015). A large-scale study found suicide risk was 49-times greater in the year following self-harm (Hawton et al., 2015). In the UK, a recent study found almost a quarter of people who died by suicide had presented to emergency departments for self-harm-related injuries (Ross et al., 2023). Considering self-harm is under-reported and many people do not present to clinical services (Carpenter et al. 2024; Hawton et al., 2015; Tait & Carpenter, 2016), these figures are likely under-estimations. Furthermore, a recent sibling cohort study found suicide rates were significantly higher in siblings with self-harm history compared with their non-self-harming siblings (Erlangsen et al., 2021).

Suicide is a global health concern (WHO, 2023), therefore self-harm reduction efforts are essential to form key suicide prevention strategies and improve wider health and wellbeing outcomes. Despite the extensive literature regarding the impact of self-harm, its causal pathway remains poorly understood (Plener et al., 2015) and the timing and nature of key antecedents underpinning the onset and maintenance of self-harm remain unclear, particularly in high-risk, under-represented groups, like LGBTQIA+ individuals. Experts recommend research into its underlying factors and functions, and develop meaningful, effective research tools is recommended by experts (Nock et al., 2012; Ougrin et al., 2012; Smith et al., 2022). Given these concerns, this thesis seeks to contribute to the growing body of self-harm research by exploring antecedents of self-harm, with

particular attention to under-represented high-risk groups and emerging patterns.

1.4. Methods of Self-Harm and Suicide

Understanding methods used in self-harm and suicide is essential to inform intervention strategies (Cully et al., 2019). The most commonly reported method of self-harm is cutting (Gillies et al., 2018; St. Germain & Hooley, 2012; Wilkinson, 2013). Other methods include stabbing (Lim et al., 2014), scratching, burning (Lurigio et al., 2024; St. Germain & Hooley, 2012), chemical poisoning (Lim et al., 2014), head banging/hitting, and genital mutilation/castration (Lurigio et al., 2024). The most frequent methods of attempted and completed suicides are drug overdose/poisoning (Lim et al., 2014) and hanging (Bidaki et al., 2016; Large & Nielssen, 2010; Lim et al., 2014) respectively. In the UK, railway/trains (Marzano et a., 2019) account for approximately 4% of suicide deaths (Department for Transport, 2025). Poisoning accounts for a higher proportion of suicides in females, whereas railway/trains, hanging and firearms accounts for a higher proportion of suicides in males (McDonald et al., 2021; Norman et al., 2024). These patterns highlight the importance of gender-appropriate approaches addressing access to means. Other methods, such as road-related suicides (i.e., jumping onto roads, stepping into oncoming traffic; Norman et al., 2023) can have wider impact on people involved, or who witness, road-related suicides, underpinning the need to understand why this method is chosen to develop prevention efforts which limit access and foster protective environments. (Norman et al., 2023)

1.4.1 Access to Means

Access to means is closely linked to methods used for self-harm and suicide and are important considerations in intervention strategies and policy. For example, globally, hanging and self-poisoning are the most frequently used suicide method (McClelland & Platt, 2024). However, suicide by firearm is most reported in countries with easy access to firearms (e.g., USA; Glenn et al., 2020; Hawton et al., 2024). Contrastingly, deliberate self-poisoning using pesticides is a concern in low- and middle-income countries where they are easily accessible (Schölin et al.,

2023). Reducing access to means has resulted in reduced self-harm. In the UK in 1998, sales of paracetamol were restricted in an initiative to reduce the impact and toxic effects of overdoses (Bateman, 2007; Casey et al., 2020). A recent longitudinal UK study found paracetamol-related overdoses were declining (Casey et al., 2020). However, paracetamol remains the most common overdose drug in England (Geulayov et al., 2016). This likely relates to the frequency and accessibility of outlets selling paracetamol and suggests efforts to further restrict access to paracetamol may result in further decline in paracetamol-based self-poisoning.

Similarly, a Sri Lankan cross-sectional cohort study found restrictions on pesticide sales reduced pesticide-based hospital admissions (Noghrehchi et al., 2024). Elsewhere, a meta-analysis in Australia reported a reduction in suicides correlated with reduced access to means (Large & Nielssen, 2010). While restricting access to means does not address underlying causes, it provides reduction opportunities and affords time to support those in distress (Schölin et al., 2023). Identifying commonly used means provides important intervenable targets, including emergency tools for hanging prevention, crisis response training for first responders, prompt antidote interventions, and restricting access to toxic substances (McClelland & Platt, 2024). Restricting access to means is the leading intervention to prevent suicide (WHO, 2024), and is recommended by suicide researchers (Hawton et al., 2024; McDonald et al., 2021). However, policy and intervention should consider practical barriers alongside psychological signals (e.g., signage highlighting crisis helplines) (Joyner et al., 2025).

1.5. Aetiology of Self-Harm

Identifying key self-harm antecedents is key to understanding this complex behaviour and to developing effective interventions and is recommended by experts (Sheehy et al., 2019). Self-harm is frequently used to provide relief from negative thoughts and feelings (Edmondson et al., 2016; Gillies et al., 2018; Rasmussen et al., 2016) or elicit feelings of control (Edmondson et al., 2016). However, research has identified numerous social, emotional, behavioural factors preceding self-harm. Also, research has established that factors occur along a time continuum with distal

factors occurring earlier and proximal factors occurring closer to self-harm engagement (Fliege et al., 2009; Liang et al., 2024). Aetiologic factors can also be divided into two distinct categories: individual (e.g., mental health issues) and environmental (e.g., childhood abuse; Cipriano et al., 2017; Richardson et al., 2024). Understanding and identifying which, and when, factors precede self-harm underpins the development of appropriate, meaningful policies, interventions, and support programmes.

Another method to enhance our understanding of self-harm is using psychological models and theories which seek to explain why and how individuals develop self-harmful thoughts and behaviours. Early models of self-harm identified links between self-harm and emotional and psychological disturbances (Suyemoto & MacDonald, 1995). These models also suggested certain environmental and internal factors (e.g., family relations, anxiety) may result in self-harm (Bennun, 1984; Suyemoto & MacDonald, 1995). However, early models were somewhat simplistic as each offered a singular causal pathway to self-harm and self-harm researchers identified that multiple, varied factors precede self-harm (Suyemoto, 1998). Therefore, more complex models explaining why self-harm develops were needed to better understand the aetiology of self-harm (Gratz et al., 2003).

In the subsequent sections, I first briefly synthesise existing literature of key self-harm risk and protective factors. These factors are well-evidenced; however, they do not occur in isolation and people experience multiple, varied factors (Carballo et al., 2020; Townsend et al., 2016) which interact and present a complex, temporal pathway to self-harm, which is poorly understood (de Beurs et al., 2021; Fox et al., 2015). The following self-harm risk and protective factors are not the primary focus of this thesis. Instead, I will utilise CaTS to explore which factors are most salient, and when, in LGBTQIA+ and cisgender/heterosexual populations. This approach contributes to the literature by considering multiple factors simultaneously and across a longer timeline. Research which adopts multifactorial examination and research tools is recommended by experts (Franklin et al., 2016; Rogers & Taliaferro, 2020). Afterwards, I outline more recent, comprehensive models of self-harm: Four Function Model (Nock & Prinstein, 2004; 2005), Interpersonal Theory of Self-Harm (Joiner, 2005), and the Integrated Motivational-Volitional Model

(IMV: O'Connor, 2011; O'Connor et al., 2016; O'Connor & Kirtley, 2018).

1.5.1 Key Risk Factors for Self-Harm

The following factors are well-documented in the literature as increasing vulnerability to self-harm. Here, I present four common, well-evidenced risk factors a) age; b) cisgender females; c) bullying; 4) trauma. These factors are presented based on their consistent, and often intersecting, association with self-harm (Farooq et al., 2021a; Richardson et al., 2024) making them critical variables for understanding disparities in self-harm risk. They also reflect broader structural and social inequalities which shape people's self-harm experiences; however, people experience multiple and varied risk factors on their self-harm pathway (Carballo et al., 2020). The following overview of established self-harm factors is provided to contextualise the self-harm phenomenon, and these factors are not specifically examined empirically in this thesis.

1.5.1.1 Age

Adolescence is a key risk period for self-harm and is a growing public health concern (Brager-Larsen et al., 2022; Liu, 2023; Stallard et al., 2013). Onset typically occurs between 11- and 13-years (Ammerman et al., 2018; Brager-Larsen et al., 2022; Gillies et al., 2018; Morey et al., 2016; Muehlenkamp et al., 2019) which is consistent across genders (Moran et al., 2011; Roberts et al., 2020). However, onset can begin earlier (Stallard et al., 2013). A recent systematic review of children aged 6-12-years reported prevalence rates of 1.3% and 2.2% for suicide planning, SA, and self-harm, and 7.5% for SI (Geoffroy et al., 2022), highlighting the need for age-appropriate interventions. Typically, engagement peaks at ~16-years (Gillies et al., 2018), then declines towards young adulthood (Hawton et al., 2021; Moran et al., 2011; Torok et al., 2023). However, this varies across countries. For example, a cohort study in Iran found self-harm peaked at 22.5-years (Ramazani et al., 2025). This disparity across countries indicates the timing of self-harm is not universal, rather it is likely influenced by broader cultural factors.

Earlier onset (<12-years) is associated with increased self-harm severity, frequency, and increased risk of SAs (Ammerman et al., 2018; Brager-Larsen et al., 2022; Muehlenkamp et al., 2019; Roberts et al., 2020), with girls more likely to continue for longer than boys (Moran et al., 2011; Roberts et al., 2020). These findings highlight the importance of early identification and intervention to reduce impact on long-term wellbeing. Factors, including school performance (Townsend et al., 2016a), school connectedness, and bullying (Richardson et al. 2024) are particularly important to adolescents, emphasising school experiences and environments should be a priority for schools and public health policies. Research to better understanding factors unique to high-risk age groups will identify further intervenable targets.

Older individuals (+65-years) also face heightened self-harm and suicide risk compared to younger adults (Chai et al., 2020; He et al., 2021; Hoare, et al., 2024; Liu et al., 2020; Morgan et al., 2018; Segal et al., 2016). Data from the Global Burden of Disease Study found 15% of suicides recorded in 2017 were older adults (70+) representing the highest suicide mortality rates across all age groups. Recent data shows 5% prevalence of self-harm and 30% of SI in older adults (+50-years) (Stewart et al., 2023). However, stigma may contribute to under-reporting (Liu et al., 2023), therefore, true prevalence may be higher. Self-harm in older adults is a significant predictor of suicide (Cheung et al., 2017). While rates are lower than in adolescents, the impact is concerning. A study of 339 older adults (65-years+) found 76.4% of self-harm episodes were suicide attempts, and 12.7% repeated self-harm within 12-months (Cheung et al., 2017).

Age-specific factors include experiencing multiple comorbid physical health problems (Mellqvist Fässberg et al., 2016; Townsend et al., 2016a; Troya et al, 2019; Wand et al., 2017), desiring control over living situations (i.e., residential care homes), interpersonal issues (i.e., real or perceived abandonment), and age-related cognitive impairment (Wand et al., 2017). Older individuals are more likely to seek post-self-harm help (McManus et al., 2019), suggesting an opportunity for intervention. Tailored, appropriate interventions are necessary to better support and manage self-harm in this high-risk population.

1.5.1.2 Cisgender Females

Globally, across most age groups, cisgender females are consistently at most risk of self-harm (Gillies et al., 2018; Hawton & Harriss, 2008; Knipe et al., 2022; Mars et al., 2014; Moloney et al., 2024; Moran et al., 2011; Plener et al., 2015; Stallard et al., 2013). Self-harm in cisgender girls/women is most prevalent in adolescence/young adulthood (15-24-years; Griffin et al., 2018; McManus et al., 2019; Stallard et al., 2013), however older (60+-years) cisgender females also experience elevated risk (Troya et al., 2019). Cisgender females are approximately twice as likely to self-harm as cisgender males (Bakken & Gunter, 2012; Gillies et al., 2018; Moloney et al., 2024), with recent meta-analyses showing prevalence rates of 19.4% to 21.4% for cisgender females and 12.9% to 13.7% for cisgender males (Farkas et al., 2024; Moloney et al., 2024).

Lifetime prevalence observed a similar pattern between cisgender females (22.9%) and cisgender males (13.7%) (Farkas et al., 2024). Concerningly, these trends are increasing. McManus and colleagues (2019) reported increases from 6.5% to 19.7% between 2000 and 2014. Similarly, a 10-year registry study of self-harm trends in Ireland reported a 22% increase in cisgender female self-harm between 2007 and 2016 (Griffin et al., 2018). Reported increases may be linked to increased disclosure (Cox et al., 2024). Indeed, some evidence indicates cisgender females are more likely to engage in help-seeking behaviours (Bundock et al., 2020; McManus et al., 2019). However, quite why cisgender females experienced heightened self-harm risk is unclear, though it may be linked to increased levels of psychological distress compared to cisgender males (Lutz et al., 2023).

1.5.1.3. Bullying

The prevalence and impact of bullying is concerning for young people, families, and education providers (Heerde & Hemphill, 2018; Francis et al., 2022; Thomas et al., 2018). Bullying victimisation has multiple negative outcomes (Ahmed et al., 2022; Moore et al., 2022) and is a long-established and significant self-harm risk factor (Eyuboglu et al., 2021; Heerde & Hemphill, 2019; Islam et al., 2022; Karanikola et al., 2018; McEvoy et al., 2023). Interestingly, recent systematic and meta-analyses found being

either a perpetrator or victim of bullying increases self-harm risk (Heerde & Hemphill, 2019; Serafini et al., 2023; Thomas et al., 2018), possibly because bullying perpetrators experience factors underpinning both behaviours, and may be victims themselves. Bullying victimisation is also a risk factor for the development of factors associated with increased self-harm risk, including depression (Moore et al., 2022), meaning addressing bullying will likely have multiple long-term benefits. Additionally, cyberbullying may increase risk (Eyuboglu et al., 2021; Heerde & Hemphill, 2019; Islam et al., 2022) and likely occurs alongside traditional bullying. Indeed, recent evidence shows risk increases significantly if bullying is experienced across both settings (Heerde & Hemphill, 2019). Together, these findings highlight bullying, both traditional and digital, is a multifaceted, enduring self-harm factor, underscoring the need for comprehensive, early intervention strategies in schools, and the wider community.

1.5.1.4 Trauma

Several meta-analyses indicate all forms of childhood maltreatment (sexual abuse, physical abuse, neglect, and emotional abuse, parental neglect) are significantly associated with self-harm (Buckmaster et al., 2019; Fliege et al., 2009; Liu et al., 2017; McEvoy et a., 2023; Serafini et al., 2017: Swahn et al., 2012) and/or STBs (Angelakis et al., 2019; Ng et al., 2018). Among traumatic experiences, childhood sexual abuse significantly and consistently increases risk (Angelakis et al., 2019; Ford & Gómez, 2014). However, systematic reviews found all types of childhood mistreatment are salient risk factors in adulthood self-harm (Angelakis et al., 2019; Ford & Gómez, 2014). Traumatic events experienced during adulthood are also factors for self-harm. For example, abuse (Gómez et al., 2015), spousal/domestic abuse (Buckmaster et al., 2019; Dalton et al., 2019; Ford & Gómez, 2015), and being a victim of crime (McManus et al., 2023).

In isolation, experiencing traumatic events increases risk, but it also increases the prevalence of self-harm factors, (e.g., reduced self-esteem, depression; Fliege et al., 2009; Wang et al., 2023). Trauma is also linked to the development of dissociative strategies and disorders (Fliege et al., 2009; Ford & Gómez, 2014; van Schie et al., 2024), and a systematic review identified a potentially mediating relationship between traumatic

experiences, post-traumatic stress disorder, and self-harm (Ford & Gómez, 2014). Together, these findings highlight the significance of trauma in the development and continued engagement of self-harm and addressing the impact of traumatic events is an important aspect of clinical interventions (van Schie et al., 2024).

1.5.1.5 Other Factors for Self-Harm

Various other factors contribute to increased self-harm risk, including (but are not limited to), alcohol (Plener et al., 2015; Rahman et al., 2021; Swahn et al., 2012; Townsend et al., 2016), medication (Laukkanen et a., 2009; Miller et al., 2014; Troya et al., 2019), illicit drug use/abuse (Laukkanen et al., 2009; Mars et al., 2014; McEvoy et al., 2023; (Plener et al., 2015), and having criminal convictions (Karlsson et al., 2021). Over the past decade, social media and online engagement have changed dramatically and, perhaps unsurprisingly, internet (Marchant et al., 2017) and social media usage (Biernesser et al., 2020) have emerged as important risk factors. However, the impact of social media usage is less clear and warrants further exploration (Biernesser et al., 2020).

Personal and social difficulties, including insecure parental attachment (Buckmaster et al., 2019), poor family relationships (Buckmaster et al., 2019; Laukkanen et al., 2009; McEvoy et al., 2023; Rahman et al., 2021), smaller social circles (Erlangsen et al., 2021), and poor peer/friend relationships (McEvoy et al., 2023; Rahman et al., 2021) are consistently linked to self-harm. Furthermore, relationship problems are experienced by people attending hospital for self-harm-related injuries (Townsend et al., 2022). Together, these findings highlight the role of multiple co-occurring stressors on the development and escalation of self-harm, and it reinforces the importance of establishing which factors are salient, and when, to an individual during intervention.

1.6. Protective Factors for Self-Harm

Compared to risk factors, self-harm protective factors are less well-researched (Abdelraheem et al., 2019; Bird et al., 2024; McEvoy et al., 2023; Richardson et al., 2024). However, key

protective factors have been identified which may mitigate self-harm risk. For adolescents and young people, school-connectedness (Dorol & Mishara, 2021; Islam et al., 2022; Marraccini & Brier, 2017; Nielassoff et al., 2022; Richardson et al., 2024; Wasserman et al., 2021), school safety (Nielassoff et al., 2022), parental (Brent et al., 2013; Davis et al., 2017; Swahn et al., 2012), family (Brager-Larsen et al., 2022; Dorol & Mishara, 2021) and friend (Gillies et al., 2018; Hall & Melia, 2023) support, and parent-child interactions (e.g., communication, monitoring mother-child relationships; Ati et al., 2020) can provide a buffer against risk. Various social and familial support networks are consistently identified protective factors across all ages (Borowsky et al., 2013; Elbogen et al., 2021; Erlangsen et al., 2021; Holman & Williams, 2022; MartÍnez-Rives et al., 2025; McEvoy et al., 2023; Wasserman et al., 2021). These findings are replicated in low-middle income countries (Aggarwal et al., 2017), highlighting the importance of fostering and engendering safe social networks across locations. Indeed, recent evidence indicates strong support networks encourage help-seeking in young adults (Barnett et al., 2024; Hall & Melia, 2023) and act as a buffer against other risk factors, (e.g., unemployment; Virgolino et al., 2022). While social media can increase risk, evidence indicates online social support (even from strangers) can mitigate risk (Bird et al., 2024; MartÍnez-Rives et al., 2025; Patra et al., 2022) and supporting people to foster existing and new relationships may have multiple beneficial outcomes.

On an individual level, protective factors include reading books (Ati et al., 2020), longer sleep duration (Richardson et al., 2024), self-compassion (Suh & Jeong, 2021; Xavier et al., 2016), resilience (Islam et al. 2022), higher self-esteem (de la Barrera et al., 2020; Fonseca-Pedrero et al., 2022; Holman & Williams, 2022; Nielassoff et al., 2022; Wasserman et al., 2021), emotional intelligence (Nielassoff et al., 2022), established coping strategies (e.g., cooperation, perseverance; Nielassoff et al., 2022), emotion regulation (Brereton & McGlinchey, 2020; Wolff et al., 2019), and life satisfaction (Muehlenkamp & Brausch, 2019; Dorol & Mishara, 2021). Further, religious affiliation offers protection against attempted (Khan & Ungar, 2023; Lawrence et al., 2023; Poorolajal et al., 2021) and completed (Poorolajal et al., 2021; Wu et al., 2015) suicides. A recent meta-analysis reported differences between countries and religions (Poorolajal et al., 2021), however

religious affiliation may be useful considerations in self-harm and suicide interventions and policies, where relevant.

While examining the literature, it became evident social/family support and religiosity are the most examined protective factors. This limitation in the evidence-base of protective factors is highlighted by other researchers (e.g., Khan & Ungar, 2023). While protective factors are less well-researched, a recent review reported risk may be reduced by as much as 85% if one or more protective factors are present (Wasserman et al., 2021). Considering this, research identifying protective factors for self-harm is critical to enhance our understanding and provide evidence to support the development of effective support interventions. Having discussed key risk and protective factors, the next section will explore two populations at heightened risk of self-harm which are the focus of this PhD thesis: **cisgender/heterosexual and LGBTQIA+ populations**.

1.7. High Risk Populations: A Focus for Research

1.7.1 Cisgender/Heterosexual Populations

Self-harm remains a significant public health, social, and economic concern in the cisgender/heterosexual population. (Hawton et al., 2012; Liu & Mustanski, 2012; Kirtley et al., 2015; Knipe et al., 2022; O'Connor et al., 2018), and evidence indicates rising prevalence (Borschmann & Kinner, 2019; McManus et al., 2019). In England, increases are observed across both genders (cisgender males and cisgender females) but are most significant in young females (aged 16-24-years; Cybulski et al., 2021; McManus et al., 2019). These increases underscore the need for society-wide and targeted prevention strategies and interventions aiming to reduce self-harm and foster help-seeking (Borschmann & Kinner, 2019). While there is an extensive evidence-base of established factors for self-harm, our understanding of factors underpinning self-harm is evolving and societal changes may result in new factors emerging. Considering rising prevalence and the maladaptive health, social, and wellbeing outcomes associated with self-harm, including increased suicide risk, further research to expand our understanding of self-harm, key antecedents, and protective factors remains vital and is

recommended by self-harm researchers (McMahon et al., 2023; Smith et al., 2021; van Schalkwyk et al., 2023; Witt et al., 2025).

1.7.2. Lesbian, Gay, Bisexual, Transgender, Queer, Questioning, Intersex, Asexual+ (LGBTQIA+) Individuals

Lesbian, Gay, Bisexual, Transgender, Queer, Questioning, Intersex, Asexual+ (LGTBQIA+; Lewis & Reynolds, 2021) individuals experience increased self-harm risk compared to cisgender/heterosexual populations (Butler et al., 2019; Kidd et al., 2024; Marchi et al., 2022; Marshall et al., 2018; Rogers & Taliaferro, 2020; White et al., 2023). A meta-analysis reported lifetime LGBTQIA+ prevalence rates of 29.68% (Liu et al., 2019) compared to 14% in cisgender/heterosexual populations (Liu et al., 2019; McManus et al., 2019). Elevated rates of STBs are also well-documented, with lesbian, gay, and bisexual people being twice as likely to attempt suicide than their heterosexual peers (King et al., 2008; Marchi et al., 2022; Rogers & Taliaferro, 2020; Swannell et al., 2015; Thoma et al., 2019). For example, recent evidence suggests LGBTQIA+ individuals are between 1.8 and 7-times more likely to self-harm than cisgender/heterosexual individuals (Kapatais et al., 2023; Rogers and Taliaferro, 2020).

Within LGBTQIA+ groups, transgender and gender-diverse (TGD) individuals are at significantly higher risk of self-harm (Mann et al., 2019; Ross-Reed et al., 2019). Broadly, TGD describes people whose birth-assigned sex misaligns with their gender identity (King et al., 2020), whose gender identity is a fluid combination of male and female, or people rejecting binary genders (Thorne et al., 2019). Cisgender describes people whose gender identity aligns with their birth-assigned gender and body (Zhang et al., 2021). Lifetime prevalence estimates range between 46.4% (Arcelus et al., 2016; Liu et al., 2019) and 53.3% (Jackman et al., 2018) for TGD people compared to 6.4% in cisgender/ heterosexual populations (McManus et al., 2019). Furthermore, TGD individuals are at increased risk compared to their cisgender lesbian and gay peers. A recent meta-analysis reported TGD prevalence rates of 46.65% compared to 29.68% in sexual minority individuals (Liu et al., 2019). Additionally, TGD individuals experienced STB's almost 4-times higher than cisgender individuals (Rogers & Taliaferro, 2020), and between 29% and 45% of TGD individuals attempt suicide (Kohnepoushi et al.,

2023; Miller & Grollman, 2015), compared to 11.3% in cisgender/heterosexual populations (O'Connor et al., 2018). Historically, TGD self-harm has been researched under the LGBTQIA+ umbrella (e.g., Liu et al., 2019; Williams et al., 2021). This conflation is problematic as TGD individuals are under-represented or data is not extractable (Williams et al., 2021). Chapters 2 and 3 aim to address these gaps in the literature by examining factors underpinning TGD self-harm.

These disparities are not limited to Western countries. Much of the evidence is from the USA and Northern/Western Europe (e.g., Zachry et al., 2025). However, cross-cultural evidence shows similar trends. For example, a Ghanian study reported lifetime self-harm prevalence of 47% in LGBTQIA+ people compared to 18% in cisgender/heterosexual populations (Quarshie et al., 2020). Despite the increased risk experienced by LGBTQIA+ individuals, when reading the literature, I was unable to identify evidence of the social and health outcomes of self-harm in LGBTQIA+ individuals, though they likely correlate with negative outcomes experienced in cisgender/heterosexual populations (e.g., drug/alcohol use, financial difficulties; Borschmann et al., 2017; Mars et al., 2014). The consistently elevated self-harm and STB prevalence in LGBTQIA+ individuals is concerning and highlights the need to identify key intervenable targets in this high-risk group, addressing this is a central aim of this PhD thesis. The next section explores factors which may contribute to the elevated self-harm risk experienced by LGBTQIA+ people.

1.7.2.1 LGBTQIA+-Specific Factors

Elevated self-harm rates may relate to LGBTQIA+ individuals experiencing group-specific factors (e.g., stigma, discrimination) alongside general (e.g., hopelessness, depression) factors (Bird et al., 2024; McMahon et al., 2010; Williams et al., 2021). Indeed, a systematic review reported both group-specific and general (including female biological sex, racial minority status, lower sociodemographic status (education and financial wealth), younger age, depression, and anxiety) risk factors showed a medium effect size, compared to the small effect size observed in LGBTQIA+ -specific factors (internalised homophobia, LGBTQIA-related stigma and -discrimination) (Liu et al., 2019; 2019a). While effect sizes for group-specific factors were small, these findings

suggest the co-occurrence of general and group-specific factors may explain the elevated risk in LGBTQIA+ populations. Indeed, another review found LGBTQIA+ individuals from culturally diverse backgrounds who experienced LGBTQIA+-focused discrimination, housing instability, identity-based physical threats, and other identity-focused factors were 12-times more likely to experience STBs compared to individuals experiencing only general factors (Macedo et al., 2024). However, other reasons may underpin the observed increased risk.

LGBTQIA+ individuals also experience general population and cisgender/heterosexual risk factors, including adverse childhood experiences, abuse, depression, family conflict, and bullying (Gnan et al., 2019; Kidd et al., 2014; Wallace et al., 2024). However, these experiences may be greater in LGBTQIA+ compared to cisgender/heterosexual populations. For example, LGBTQIA+ individuals experience higher rates of mental health problems compared to cisgender/heterosexual individuals (Williams et al., 2021). Other studies report increased rates of violence, depression, bullying, and reduced support (Butler et al., 2019; Kidd et al., 2014, 2024; Ross-Reed et al., 2019) compared to cisgender/heterosexual people. These experiences likely compound LGBTQIA+ risk, especially when combined with group-specific factors. Indeed, Taylor et al. (2020) found that even after accounting for mediating factors like depression, anxiety, and self-esteem, lesbian, gay, and bisexual individuals still showed elevated self-harm risk compared to heterosexual peers, suggesting other factors likely contribute to the increased self-harm risk in LGBTQIA+ populations. These include coming out under age 16-years, not feeling accepted, marginalisation, discrimination, victimisation, homophobia, and identity-based violence (Gnan et al., 2019; Kidd et al., 2014; Wallace et al., 2024; Williams et al., 2021).

For TGD individuals, factors unique to their experiences, such as gender dysphoria, transphobia, and TGD-focused stigma and victimisation further elevate their risk (Arcelus et al., 2016; Jackman et al., 2018; Ross-Reed et al., 2019; Veale et al., 2017). Protective factors, like TGD-safe schools and gender-appropriate documentation, can act as buffers against TGD self-harm, if present (Bauer et al., 2016; Ross-Reed et al., 2019; Taliaferro et al., 2019). Evidence is emerging but remains limited and efforts to

reduce this disparity and increase understanding of TGD self-harm is recommended (Peterson et al., 2017; Price-Feeney et al., 2020; Taliaferro et al., 2019; Williams et al., 2021). Better understanding their distinct pathway is essential to develop meaningful interventions and policies.

In line with cisgender/heterosexual populations, research regarding LGBTQIA+ self-harm protective factors is limited (Ross-Reed et al., 2019). However, emerging evidence indicates social/family support, acceptance from others, LGBTQIA+-protective state and school policies and legislation, and LGBTQIA+ role models are salient protective factors against self-harm and associated risk factors (e.g., violence) (Green et al., 2022; Ross-Reed et al., 2019; Wallace et al., 2024). Some factors may be particularly salient in TGD people (Bauer et al., 2015; Taliaferro et al., 2019). However, TGD-focused research remains limited (Bird et al., 2024).

Together, these findings highlight the culminative impact of multiple factors experienced on the self-harm pathway of cisgender/heterosexual and LGBTQIA+ populations, and despite the growing evidence-base, further research examining both risk and protective factors for LGBTQIA+ self-harm is recommended by other researchers (Kapatais et al., 2023; Kiekens et al., 2023; Rogers & Taliaferro et al., 2020; Wallace et al., 2023; Williams et al., 2021). The next section explores key models and theories for self-harm, which offer varying explanations of why and how self-harm develops.

1.8. Models and Theories of Self-Harm

Psychological models and theories aim to enhance our understanding of self-harm which seek to explain why and how people develop self-harmful thoughts and behaviours. In this section, I first outline the history and background of self-harm theories and models, and briefly discuss two models which offered foundational, but limited, explanations of self-harm. These are: the Four-Function Model of Self-Harm and The Interpersonal-Psychological Theory of Suicidal Behavior. Then, I will discuss the Integrated Motivational-Volitional Model of Suicidal Behaviour, which, in contrast, offers a more comprehensive framework, and captures the interplay between

psychological, social, and contextual factors. This thesis adopts the IMV model as its guiding framework due to its emphases on the longitudinal and dynamic transition from ideation to enaction.

1.8.1 History and Background of Theories and Models of Self-Harm: The Four-Function Model of Self-Harm and The Interpersonal-Psychological Theory of Suicidal Behavior

Understanding why self-harm develops is key to enhancing understanding self-harm, but also to identify key intervenable targets and develop meaningful research and clinical tools and measures, and interventions. Models and theories of self-harm provide a structure of the aetiology of self-harm on which to base interventions and identify potential future research. Early self-harm models agree there is no sole cause or motive underpinning self-harm, however, correlations between emotional and psychological problems, and environmental factors were identified (Suyemoto & MacDonald, 1995). Further, these models posited self-harm was used to reduce inter- and/or intrapersonal negative emotions, feelings, and/or situations (Bennun, 1984; Suyemoto & MacDonald, 1995; Suyemoto et al., 1998). However, early models were simplistic, offering a singular causal pathway, and they failed to consider factors, or temporal relationships between factors, underpinning self-harm. Consequently, more recent models explored how and why self-harm develops, and which factors underpin and motivate self-harm development and repetition. Here, I briefly discuss two: Four-Function Model of Self-Harm, and The Interpersonal-Psychological Theory of Suicidal Behavior.

1.8.2. Four-Function Model of Self-Harm

The Four-Function Model (FFM) of self-harm (Nock & Prinstein, 2004; 2005) posits self-harm (described as NSSI/self-mutilative behavior by the authors) serves four key functions across dichotomous dimensions (see Table 2.; Bentley et al., 2014). These are whether reinforcement for self-harm is intra- and/or inter-personal, and whether reinforcement is positive or negative (Green et al., 2016; Power et al., 2016). These functions are not mutually exclusive, and self-harm may have multiple functions (Bentley et al., 2014; Klonsky, 2011). The elaborated theoretical

model of the social functions of self-harm (Nock et al., 2008) extends the FFM, by positing self-harm as socially reinforced, often by the caregiving responses it elicits.

While the FFM has empirical support (Nock and Prinstein, 2018), there is particular empirical support for intrapersonal negative reinforcement (affect regulation) (i.e., Akbari-Motlaq et al., 2023; Gholamezai et al., 2023; Hepp et al., 2020; Nock & Prinstein, 2005; Power et al., 2016; Shen et al., 2023; Steele et al., 2022; Yaghubi & Izadi-Mazidi, 2022). Recent evidence found the FFM provided a useful framework in adolescent and adult clinical and community samples (Dahlstrom et al., 2015; Hambleton et al., 2022; Steele et al., 2022) and offender populations (Power et al., 2016). However, evidence suggests gender differences in self-harm motivations, with cisgender females more likely to report intrapersonal drivers and cisgender males reporting interpersonal functions linked to societal norms (Green et al., 2016; Reinhardt et al., 2021; Shen et al., 2022).

Furthermore, evidence suggests interpersonal factors both limited and inconclusive (Hepp et al., 2020). This is surprising considering the wealth of evidence regarding the impact of social factors on self-harm across all ages (e.g., social/family networks; Borowsky et al., 2013; Elbogen et al., 2021; Erlangsen et al., 2021; Holman & Williams, 2022; MartÍnez-Rives et al., 2025; McEvoy et al., 2023; Wasserman et al., 2021). Therefore, it is possible the FFM does not consider the frequency or context of antecedents, or the relationships between factors. Indeed, this has been suggested by other researchers (i.e., Bentley et al., 2014; Green et al., 2016). Similarly, Gholamezai et al. (2023) identified additional pathways beyond the intra- and inter-personal factors proposed by the FFM: social (interpersonal boundaries, peer bonding, sensation seeking, toughness, autonomy) and communication (interpersonal influence, marking distress, revenge) factors. These factors mean despite the flexibility compared to earlier models, the FFM may not be sufficiently flexible or comprehensive to explain self-harm behaviours, particularly in different populations, and other models may more accurately capture the complexity of self-harm.

Table 2.
The Four-Function Model of Self-Harm

Reinforcement type	Negative	Positive
Intrapersonal	Decrease or eliminate aversive affective or cognitive state/s	Increase or generate desired affective or cognitive state/s
Interpersonal	Decrease or eliminate aversive social/interpersonal event/s	Increase or generate desired social/interpersonal event/s

Adapted from Bentley et al., 2014.

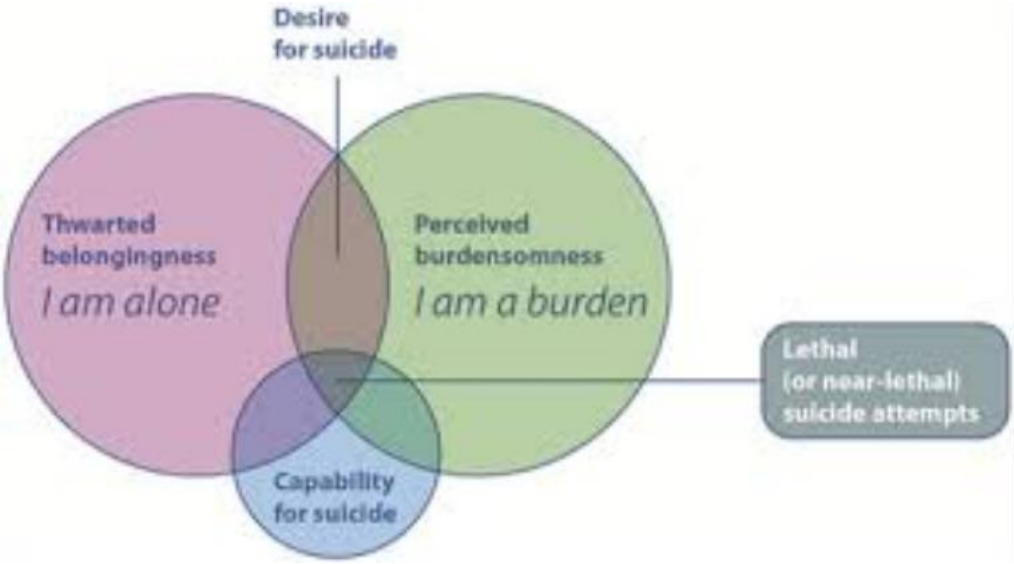
1.8.3 The Interpersonal-Psychological Theory of Suicidal Behavior

The Interpersonal-Psychological Theory of Suicidal Behavior (IPTS; Joiner, 2005) and the later expanded iteration by Van Orden et al. (2010) offer a nuanced framework to understand the psychological processes underpinning self-harm. The IPTS was the first theory to propose the ideation-to-enaction pathway (Keefner & Minton, 2024), positing that suicidal behaviour arises when two conditions are met: 1) fears of burdening others (perceived burdensomeness; PB) and social alienation (thwarted belongingness) result in the desire for death; and 2) people will not attempt suicide unless they have acquired capability (AC). In short, a person will not engage in suicidal behaviours unless they develop both the desire and the ability to do so (Hill & Pettit, 2014; Joiner et al., 2009; 2010) (see figure 2). PB reflects self-hatred and a belief one's existence and/or presence is a burden to others (Hill & Pettit, 2014; Joiner et al., 2009; Lieberman et al., 2023; Van Orden et al., 2010), while TB refers to social disconnectedness and low social connectedness (Hill & Pettit, 2014; Joiner, 2005; Van Orden et al., 2010)

These constructs are well-supported as risk factors for self-harm and STBs (Assavedo & Anestis, 2015; Campos et al., 2022) and STB's (Gill et al., 2023; Lieberman et al., 2023). However, their interaction is often mediated by other factors, including depression and anxiety (Barzilay et al., 2015), indicating the model may be reductionist. The second component, AC, develops through repeated exposure to pain or injury, through self-harm, accidents, or occupational exposure (Joiner et al., 2009; 2010).

Indeed, recent systematic reviews identified nurses (Basu et al., Groves et al., 2023), physicians/doctors (Duarte et al., 2020; Dutheil et al., 2019), veterinarians (Platt et al., 2010), and first responders (police, paramedics, firefighters; Stanley et al., 2016) experience elevated rate of self-harm and STBs compared to cisgender/heterosexual populations and evidence suggests AC mediates the transition from ideation to enaction (Littleton et al., 2024; Matney et al., 2017; May & Victor, 2016; Willoughby et al., 2015).

Figure 1.
The Interpersonal-Psychological Theory of Suicidal Behavior (IPTS)



Despite promising support, the IPTS has limitations. Few studies tested the model in full (Joiner et al., 2021) and it does not adequately consider individual differences. For example, factors like alcohol (Melson & O'Connor, 2019), impulsivity (O'Connor et al., 2012; Weatherall et al., 2018), having friends/family who self-harmed (O'Connor et al., 2012; Weatherall et al., 2018), abuse (Gómez et al., 2015, Gratz, 2003), and adverse childhood experiences (Gratz, 2003) may significantly influence the ideation-to-enaction pathway but fall outside the IPTS framework. Furthermore, desire for death is subjective and subject to change (Hill & Pettit, 2014), suggesting mitigating factors may reduce desire and interrupt or prevent self-harmful

thoughts and behaviours. like the FFM, the IPTS is reductionist and both models simplify a complex behaviour into a select psychological constructs. Further, the IPTS posits an almost linear pathway to self-harm and the FFM assumes traits are stable over time, whilst overlooking psychological, social, cultural, and environmental factors (Ricardson et al., 2024; Townsend et al., 2016.). Neither model captures the dynamic, temporal, and contextual nature of self-harm pathways. Whilst both offer invaluable insights, a more comprehensive framework is necessary, which considers the temporal interplay of multiple factors. The Integrated Motivational-Volitional (IMV) Model of Suicidal Behaviour (O'Connor, 2011; O'Connor & Kirtley, 2018) is discussed in the next section and aims to address these gaps.

1.8.4 The Integrated Motivational-Volitional Model of Suicidal Behavior (IMV)

The Integrated Motivational-Volitional Model of Suicidal Behavior (IMV; O'Connor, 2011; O'Connor & Kirtley, 2018) represents a more comprehensive account, addressing the limitations of previous models (i.e., the FFM, the IPTS) by incorporating proximal and distal factors while considering the temporal dynamics between them. The IMV model aims to explain why people engage in STBs. The model aims to predict which factorial types distinguish people with SI from those who attempt suicide. First, the IMV model considers self-harming and suicidal behaviours as unique, not symptomatic or resulting from mental disorders. Further, the IMV model seeks to identify relationships between multiple factors experienced along one's pathway to self-harm and suicide. These include background (distal) factors and proximal factors occurring close to, or which trigger, self-harm and/or suicidal behaviours. The IMV model also maps the pathway from SI and intent to suicidal behaviours, providing key factors which indicate where someone is along that pathway. Mapping pathways to self-harm and suicide this way identifies potential targets for intervention and prevention.

The IMV model is a three-phase model. The first, Pre-Motivational, phase outlines the broader biopsychosocial context which shape vulnerability to self-harm and suicide (McClelland et al., 2021). These are background events known to increase vulnerability to suicide, including life events, family

circumstances, deprivation (O'Connor, 2011), or genetic/individual factors, like depression, anxiety (O'Connor & Kirtley, 2018), and personality traits (Rasmussen et al., 2021). Second, the Motivational phase proposes concepts like defeat and/or humiliation create feelings of entrapment which triggers the development of self-harm ideation or SI (Cleare et al., 2021; Ordóñez-Carrasco et al., 2020; 2022). Entrapment is key to the progression towards the formation of suicidal intent (O'Connor & Portzky, 2018). Third, the Volitional phase describes factors (volitional moderators) which support the ideation-to-enaction transition. Volitional moderators can be biological, psychological, or social, and are necessary to progress from ideation to intent to enaction. These include impulsivity, exposure to suicidal behaviour (Branley-Bell et al., 2019), access to means, and fearlessness about death (Stenzel et al., 2020). The IMV model is shown in Figure 3.

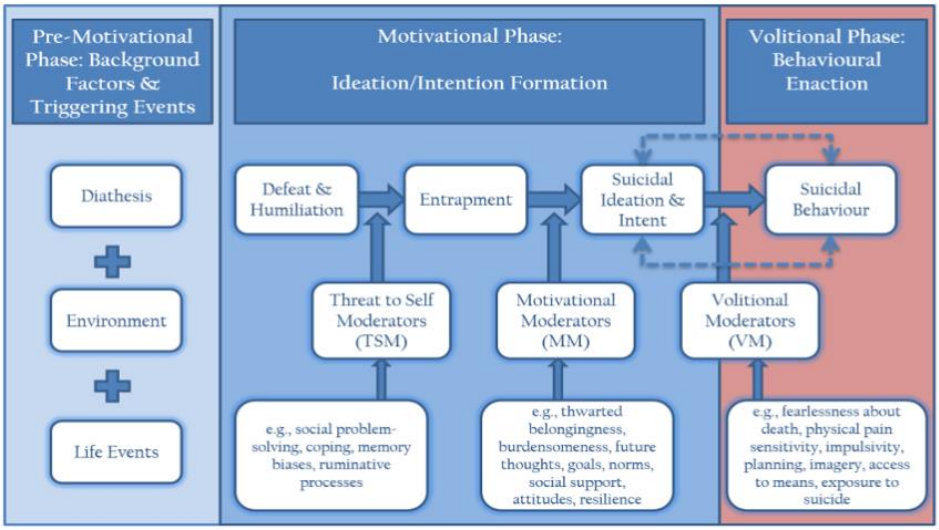
Recent evidence supports the IMV model, suggesting individuals who attempted suicide experience distinct factors not present in those with SI, including knowing someone who self-harmed, or who had attempted or died by suicide, impulsivity, thwarted belongingness, PB, loneliness, and fearlessness about death (Dhingra et al., 2015; 2016; Lucht et al., 2020; McClelland et al., 2021). These factors appear in the Volitional phase and support the IMV model's position that volitional moderators are necessary to progress from SI to enaction. Additionally, Dhingra et al. (2015) found specific, distinct factors need to be present in Pre-Motivational and Motivational phases for SI to occur. In their study, both the SI and SA groups experienced factors associated with the development of suicidal thoughts, including defeat, burdensomeness, entrapment, and belongingness. These factors occur in the Pre-Motivational and Motivational phases and were not present in the control group (people with no SI or attempt history). Recently, Zortea and colleagues (2019) found negative perceptions of parents was a significant background (pre-motivational) factor which increased the risk of SI developing. Other evidence supports the IMV model's position that defeat, humiliation, and entrapment during the Motivational phase triggers SI (Cleare et al., 2020; Lucht et al., 2020; Ordóñez-Carrasco et al., 2020). More recently, Rasmussen and colleagues (2021) found IMV model phases correlated with the SI pathway of sexual minority people. These findings are preliminary in relation

to LGBTQIA+ people; however, they are promising with regards using the IMV model to examine the self-harm pathway in other groups.

While the IMV model was initially developed to improve understanding of suicidal behaviours, research has shown it also applies to self-harm behaviours. Townsend et al. (2016), for example, used the Card Sort Task for Self-Harm (CaTS) to examine patterns in adolescent's self-harm pathway and found patterns align with the IMV model: life events occurring 6-months prior to self-harm corresponded with the Pre-Motivational Phase; subsequent negative emotions reflect the Motivational Phase where self-harm ideation and intent emerge; immediately before self-harm, impulsivity and access to means were consistent with the Volitional Phase of behavioural enaction. Evidence regarding the IMV model factors in LGBTQIA+ populations remains limited, though Rasmussen and colleagues (2019) found LGBT people reported higher levels of IMV factors compared to their hetero-cisgender peers. They recommend research further examines how well the IMV model explains LGBTQIA+ self-harm, particularly identity-specific stressors.

Figure 2.

The Integrated Motivational-Volitional Model of Suicidal Behaviour



In this PhD thesis, I will examine how the IMV model links to self-harm behaviours in both cisgender/heterosexual and LGBTQIA+

populations, particularly key antecedents and immediate triggers or signs of imminent self-harm. This focus is empirically examined in Chapter 7 and considered further in the general discussion (Chapter 8). There are significant deficits in understanding this area (Kirtley & O'Connor, 2015; Klonsky & May, 2014; Nock, 2008). Considering findings from Townsend and colleagues (2016) closely mapped onto the IMV model, this model may offer a more comprehensive, yet flexible, framework for understanding the temporal dynamics between factors and self-harm outcomes. While factors within the IMV model (e.g., defeat, entrapment) have been explored in LGBTQIA+-populations, these have been cross-sectional (Gužas & Skruibis, 2025; Rasmussen et al., 2021), Chapter 7 provides the first temporal examination of LGBTQIA+ self-harm pathways within the IMV framework.

Given that distal vulnerabilities interact with proximal stressors to shape the self-harm pathway, research requires tools capable of capturing dynamic processes across timepoints. In section 1.9. (below), I introduce the Cart Sort Task for Self-Harm (CaTS), which was designed specifically to examine self-harm antecedents across a timeline, allowing researchers to test the IMV model with a dataset. Chapter 5 provides a detailed account of CaTS, including its limitations which motivated and informed the development of a digital version (called CaTS-D). Chapter 4 outlines qualitative updates to ensure CaTS remains a relevant research tool, particularly in LGBTQIA+ populations. Chapters 6 and 7 present the pilot test phase of CaTS-D and its primary application in a research setting, respectively.

1.9. The Card Sort Task for Self-Harm (CaTS)

Pathways to self-harm are complex and multifaceted (Townsend et al., 2016) and evidence suggests complex interactions between varied and multiple factors result in self-harm (Carballo et al., 2020). However, historically, factors were investigated in isolation, or with one other factor (Townsend et al., 2016). Therefore, the complex, temporal dynamics between multiple co-occurring factors is poorly understood, limiting the predictive values of risk assessments (Dhingra et al., 2016; Fox et al., 2015). Experts in the field suggest we move from examining and identifying singular risk factors and develop multifactorial assessment and research tools (Franklin et al., 2016; Rogers &

Taliaferro, 2020). Research tools capable of determining whether particular experiences (or combinations of experiences) increase the risk for self-harm, as opposed to general psychopathology, are recommended by experts in the field (Gratz et al., 2003).

The novel Card Sort Task for Self-Harm (CaTS; Townsend et al., 2016; Wadman et al., 2017) was co-developed with young people with lived experience and clinicians to investigate dynamic interactions between multiple factors for self-harm and identify meaningful targets for intervention. Full description of how CaTS has been applied in research settings can be found in Chapter 5. However, in short, CaTS enables a qualitative approach by using 117-cards with evidence-based self-harm-related concepts written on them. Participants place relevant cards underneath appropriate timepoints (from 6-months before to after self-harm). These cards allow researchers to examine self-harm pathways and identify key tipping points which precede self-harm. For example, if study findings identify a factor which occurs at a particular timepoint in a population, these findings present an important intervenable target. This may be immediately prior to self-harm, or in the preceding days, weeks, or months.

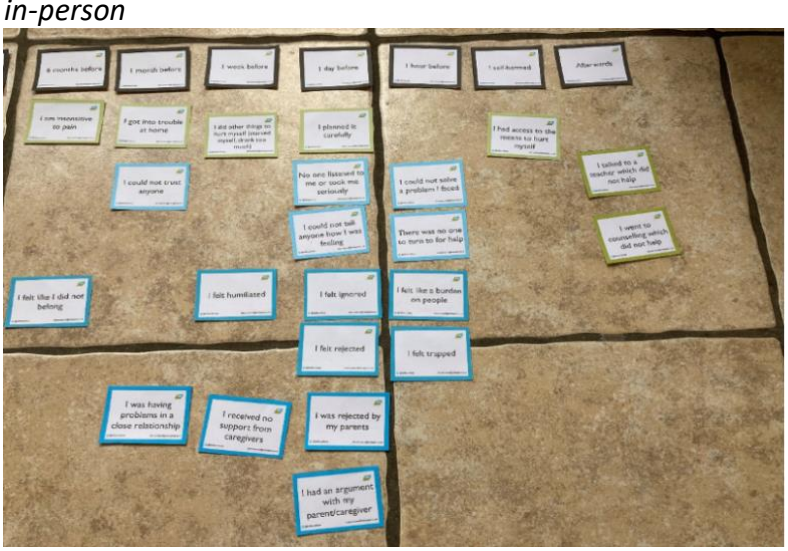
Several alternative timeline-based methods are employed in suicide research, including the Timeline Follow-Back Interview for Suicide Attempts (TLFB-SA; Bagge et al., 2013a, 2013b, 2017), which typically focuses on the 48-hours preceding a suicide attempt; the Pathway to Suicidal Action Interview (PSAI; Milliner et al., 2016), involves a narrative account of the attempt followed by probing questions; and Ecological Momentary Assessment (EMA), which captures one's real-time experiences and context over a period of days or weeks (Shiffman et al., 2008). In contrast, the Card Sort Task for Self-Harm (CaTS) differs in several meaningful ways: (1) it requires minimal training to administer, (2) it captures both proximal and distal factors across a broader timeline, and (3) it does not rely on verbalisation, allowing for more flexible and accessible completion.

To date, CaTS has been utilised to examine self-harm pathways in young people and adolescents (Lockwood et al., 2020), friends of people who self-harm (Bilello et al., 2024), and looked-after young people (Wadman et al., 2017). CaTS has also been used to compare self-harm antecedents in young adults and adults

(Lockwood et al., 2023). Currently, CaTS is a versatile research tool and has been utilised in both qualitative (Bilello et al., 2024; Lockwood et al., 2020) and quantitative (Lockwood et al., 2023; Townsend et al., 2016) research. An example of CaTS performed in-person is shown in figure 4., and description of how CaTS is used in previous in-person research is found in Chapter 5. Since CaTS' development in 2013, our understanding of factors preceding and resulting in self-harm has evolved (Hawton et al., 2015a), and new factors emerge as society evolves. For example, social media functions and usage has evolved exponentially in the past decade and may present both risk and protective factors for self-harm (Biernesser et al., 2020; Dyson et al., 2016; Memon et al., 2018). Similarly, while no increase in suicide rates has been observed post-pandemic (Johns et al., 2021), evidence suggests increases in hospital admissions for self-harm-related injuries (e.g., Wong et al., 2023; Olding et al., 2020). Similarly, systematic review evidence found post-Covid-19 community SI rates were significantly higher than pre-pandemic rates (Farooq et al., 2021). These events may present important self-harm factors not relevant when CaTS was first developed. Updating CaTS is essential to ensure it contains factors which accurately represent our current understanding of what underpins self-harm and, therefore, remains a meaningful research tool. This will ensure CaTS can capture self-harm pathways and identifying key intervenable targets.

Figure 3.

A*n example of the Card Sort Task for Self-Harm (CaTS) performed in-person*



1.9.1. The Card Sort Task for Self-Harm-Digital (CaTS-D)

Previous research applied CaTS during in-person sessions (i.e., Townsend et al., 2016). However, this application presents some limitations. First, in-person research is time-consuming, costly, and limits participation to people close to university or research settings. Second, during in-person sessions, research cards can only be used once, even though antecedents may be present across multiple or all timepoints in the self-harm pathway. Longitudinal research indicates persistent factors are associated with increased self-harm frequency (Kiekens et al., 2023), underscoring the enduring nature of certain factors and the need for research tools and methodologies capable of examining self-harm antecedents across time. Digital tools provide flexible, cost-effective options for researchers utilising technologies that most individuals use in their daily lives (Kruzan et al., 2022). Indeed, researchers in the field highlight the importance of developing effective, meaningful digital self-harm research tools to better reach populations (Smith et al., 2021).

To address these limitations, as part of my PhD I developed a novel web-app version of CaTS (called CaTS-Digital; CaTS-D). CaTS-D behaves like an app on a smartphone or tablet and is also compatible with desktops, making it widely accessible. Digital research tools are appealing: around 95% of people report owning a smartphone, and almost half of young people report being online almost constantly (Anderson & Jiang, 2018; Lenhart et al., 2010). Many are also familiar and comfortable with apps/web-apps (Russell et al., 2018) suggesting online approaches are an acceptable and effective way to reach large, representative samples (Smith et al., 2021). Digital tools also benefit researchers. For example, web-apps can reduce response burden (Silva & Davis, 2015; Roberts et al., 2022), increasing participant diversity (McDermott et al., 2013), and reducing recruitment and research costs while increasing recruitment efficiency (Smith et al., 2021). Importantly, CaTS-D allows participants to select multiple timepoints for each antecedent, overcoming a key limitation of the original design and providing fuller context to self-harm pathways. This facilitates the identification of distal, proximal, and persistent factors, clarifying how these interact over time in general and LGBTQIA+ populations. Consequently, CaTS-D

represents a versatile, accessible research tool capable of capturing large, diverse datasets and strengthening the evidence base for clinical practice, policy, and future research.

1.10. Gaps in the Self-Harm Literature

Key risk and protective factors have been identified. However, despite high prevalence and personal and society-wide impact, our understanding of functions, motives, and antecedents underpinning self-harm remains limited (Plener et al., 2015; Rasmussen et al., 2016; Stänicke et al. 2018). Considering rising prevalence and the range of maladaptive health, social, and wellbeing outcomes associated with self-harm, including increased suicide risk, further research to expand our understanding of self-harm and associated antecedents and protective factors is vital (Edmondson et al., 2016; Sheehy et al., 2019; Taylor et al., 2018). This is true in cisgender/heterosexual and LGBTQIA+ individuals who are at increased risk of self-harm. Examination and identification of cisgender/heterosexual (McMahon et al., 2023; Smith et al., 2021; van Schalkwyk et al., 2023; Witt et al., 2025) and LGBTQIA+ self-harm risk and protective factors is recommended (Kapatais et al., 2023; Kiekens et al., 2023; Rogers & Taliaferro et al., 2020; Wallace et al., 2023; Williams et al., 2021). Despite growing evidence of risk and protective factors linked to self-harm in these groups, there are several gaps in the literature.

First, compared to their cisgender/heterosexual peers, TGD individuals experienced elevated self-harm risk (Mann et al., 2019). Possibly, TGD individuals experience unique factors unique alongside general and other LGBTQIA+-specific factors. However, there is a small, but important evidence-base of self-harm factors in this high-risk group and there are few systematic reviews of TGD self-harm literature. This means our understanding of self-harm factors experienced by TGD individuals is limited and should be further examined. Identifying key intervenable targets in this high-risk group is essential to further our understanding of TGD self-harm and identify meaningful intervenable targets (Taliaferro et al., 2019). This is key for both researchers and clinicians (Kia et al., 2021) and the development of effective, meaningful policies.

Secondly, extant evidence indicates TGD people are at increased risk of self-harm (Mann et al., 2019; Ross-Reed et al., 2019). However, despite the prevalence and impact of STBs, no tools have yet been developed which accurately measure and/or predict self-harm and STBs (Glenn et al., 2017; Nock, 2012). Research and diagnostic measures used in the field historically rely on self-reporting (Gratz et al., 2014). Self-report methods provide important information but are limited as people may withhold personal information or may under-or over-estimate factors which increase risk (Glenn et al., 2017; MacDonald et al., 2019) and can result in biased or flawed recall (Glenn et al., 2017; Gratz et al., 2014). Considering this, there is a need to develop evidence-based risk assessment tools which are not contingent on self-report methods to identify, prevent, and treat self-harm and STBs (Cathelyn et al., 2021; Courtney et al., 2019) and improve health and wellbeing outcomes. To address deficits of self-reporting, researchers have begun developing tools capable of identifying objective markers of self-harm and STBs and with the goal of more accurately predicting these behaviours (Glenn et al., 2017).

The Implicit Association Task (IAT; Greenwald et al., 1998) is a computer-based implicit measure designed to objectively predict self-harm and STBs by identifying attitudes which operate automatically. Implicit associations have been observed in the general population (i.e., Glenn et al., 2019; Gray et al., 2020). However, no study has used implicit measures among TGD people. Identifying whether implicit bias to STBs is present in TGD people will support the development of meaningful tools which identify and treat STBs in this high-risk group. Indeed, researchers in the field recommend research examines implicit attitudes in different populations (Gratz et al., 2014).

Third, CaTS is a novel research tool. Since its development, our understanding of self-harm has evolved. Updating CaTS is essential to ensure it contains meaningful self-harm-related concepts. Further, considering LGBTQIA+ people are at increased risk, ensuring CaTS also contains concepts meaningful to their unique self-harm pathway is essential. This is especially important considering many tools and measures used to examine LGBTQIA+ mental health are often cisgender/heterosexual-centred and may not capture LGBTQIA+ experiences adequately (King et al., 2020;

Morrison et al., 2016). Considering this, capturing necessary amendments or additions from people with lived experience is an important step. Further, the in-person research previously utilising CaTS presented some limitations. First, it is time-consuming and costly to researchers and participants. Second, cards could only be placed under a single timepoint. However, because factors may occur across multiple or all timepoints, this could impede our understanding of which factors precede self-harm, and how and when factors interact to influence self-harm. A digital version of CaTS would address these limitations by providing a user-friendly, accessible research tool capable of capturing and storing large datasets.

Finally, research has identified general and LGBTQIA+-specific risk and protective factors. These are typically examined in isolation (Stanford et al., 2018; Townsend et al., 2016). However, factors rarely occur in isolation, instead people experience multiple factors (Carballo et al., 2020) which interact and present a complex, temporal self-harm pathway. CaTS is an ideal research tool to examine these pathways and enhance our understanding of antecedents and identify key tipping points and intervenable targets across both groups: cisgender/heterosexual and LGBQTIA+ populations.

1.711. Thesis Overview and Aims

During this PhD, I aim to address the gaps in the literature in the following studies. The overall research question answered by this thesis is to:

- examine the temporal dynamics of self-harm in cisgender/heterosexual and LGBTQIA+ populations, identify key intervenable targets and their timing, and explore pathway differences between cisgender/heterosexual and LGBTQIA+ self-harm pathways which may explain the increased risk experienced by LGBTQIA+ people, with the goal of informing group-specific prevention and support strategies.

These findings will be important for future research, clinical practice, and policy. The aims will be addressed in specific chapters within this thesis by a quantitative study examining implicit and explicit attitudes using secondary data from Project

Implicit (Chapter 2) which is the first study to examine possible differences between cisgender/heterosexual and TGD self-harm, the first systematic review of TGD-specific risk and protective factors to add context and meaning to the findings of Chapter 2, and improve understanding of the self-harm pathway in TGD populations (Chapter 3), a qualitative interview study to improve CaTS and increase its inclusivity (Chapter 4), a pilot CaTS-D study (Chapter 5), and a large-scale online study utilising CaTS-D in its first research setting (Chapters 7). Chapter 7 is the first study to capture the self-harm pathway of people in cisgender/ heterosexual and LGBTQIA+ populations to identify key antecedents of self-harm using CaTS-D. Methodologies for each study are discussed within the relevant chapter. Individual studies fill gaps in the literature and build on each other. The development of the web-app CaTS-D is be discussed in Chapter 5. CaTS-D provides a user-friendly research tool capable of capturing large datasets, while offering flexibility to researchers aiming to amend and apply the task to alternative populations or to investigate alternative behaviours (e.g., drug use, gambling addiction). All findings will be discussed and compared with the aim of answering the overall research question (Chapter 8).

Chapter 2 A Large-Scale Examination of Implicit and Explicit Self Harm Bias: Using secondary data from Project Implicit-Health (PIH) to explore attitudinal differences across transgender and cisgender people

Content warning: Please note this chapter contains images of self-harm.

As discussed in the thesis introduction (Chapter 1), extant evidence indicates TGD individuals are at increased risk of self-harm and suicidal thoughts and behaviours compared to cisgender individuals, including their LGBTQIA+ peers (Mann et al., 2019; Ross-Reed et al., 2019). However, to date, no research has determined whether explicit, observable risks align with or diverge from measures which capture more automatic responses, such as those captured using implicit measures. This represents an important gap in knowledge, because implicit measures reveal underlying cognitive and affective processes which individuals may be unwilling to report explicitly, particularly those in stigmatised groups who may experience barriers to health care. Indeed, qualitative research with TGD people found that negative attitudes towards TGD identities acted as a barrier to accessing healthcare (Mikulak et al., 2021). Understanding whether implicit and explicit indicators align or differ could enhance insight into self-harm and suicide risk mechanisms in TGD individuals and inform more effective prevention and intervention strategies.

This first empirical chapter in this thesis seeks to explore whether, compared to cisgender people, TGD people implicitly associated themselves more strongly with suicide- and death-related concepts using the Implicit Associations Tests (IAT). If findings indicate TGD people do implicitly associated themselves with these concepts, self-harm-related implicit cognition may prove a useful indicator/marker of self-harm and suicide risk in TGD people, especially among those less willing to openly express these cognitions or behaviours and may partly explain increased self-harm risk in TGD people.

2.1. Introduction

Despite the prevalence and impact of self-harm and suicidal thoughts and behaviours (STBs) experienced by TGD individuals (Mann et al., 2019; Ross-Reed et al., 2019), outlined in Chapter 1, the reasons driving their elevated risk remains unclear. Factors associated with self-harm in the general population (e.g., reduced self-esteem, depression, anxiety) are also present in TGD self-harm (Bird et al., 2024; Davey et al., 2016; Witcombe et al., 2018). Moreover, matched control studies suggest TGD individuals experience self-harm risk factors at higher rates than their cisgender peers, including bullying and depressive symptomology (Butler et al., 2019; Davey et al., 2016; Witcomb et al., 2018). Together, these may partly explain the elevated risk TGD people experience.

However, TGD individuals may implicitly associate themselves with self-harm-, suicide-, and death-related concepts at a greater extent than cisgender individuals, which may contribute to their self-harm risk. Research and diagnostic practices have predominantly relied on self-report (or explicit) methods (Gratz et al., 2016). Explicit methods provide valuable context and insight and capturing both is likely most effective at examining and identifying self-harm risk (Knowles et al., 2012; Kurdi et al., 2019; Powers et al., 2021); however, explicit measures have limitations. For example, individuals withholding personal information or under-or over-estimating factors contributing to their risk, and biased or flawed recall (Glenn et al., 2017; Gratz et al., 2016; MacDonald et al., 2019). Consequently, findings based solely on self-report may not adequately capture self-harm risk in TGD individuals. Considering these limitations, utilising research tools which are not solely contingent on self-report methods is crucial for effective identification, prevention, and treatment of STBs and improve health and wellbeing outcomes (Cathelyn et al., 2021; Courtney et al., 2019).

To address limitations of self-reporting, researchers have developed tools capable of identifying more objective markers which may help improve the prediction of STBs (Glenn et al., 2017). One such tool is the Implicit Association Task (IAT; Greenwald et al., 1998, 2021), a computer-based measure designed to assess attitudes which operate automatically. Automatic responses can be characterised as unintentional and uncontrollable (Dickstein et al., 2015; Glenn et al., 2017; Olson et

al., 2022; Steele et al., 2020). Instead of reflecting unconscious mental associations, IATs are estimates of behaviour tendencies (e.g., automatic biases), which may be influenced by social cues (e.g., self-harm concepts) (De Houwer, 2019).

Implicit associations may help explain why TGD people experience elevated STBs compared to cisgender people. Further, it may be a useful predictor of STBs in community and clinical settings (Dickstein et al., 2015; Glenn et al., 2017; 2019). Implicit associations with STBs have been identified in community samples of adults (Gratz et al., 2016; Gray et al., 2020) and adolescents (ages 12-19-years; Glenn et al., 2019). These findings suggest self-harm-related implicit associations are significantly stronger in those who experienced STBs compared to those without STB history (Dickstein et al., 2015; Glenn et al., 2017). Implicit associations have also been observed in outpatients (Steele et al., 2020), in-patients in psychiatric emergency departments (Nock et al., 2010; Tello et al., 2019), and in-patients with Borderline Personality Disorder (Gratz et al., 2016; Scheunemann et al., 2020; Steele et al., 2024). Heightened implicit self-harm associations may be present in TGD people. However, despite the high prevalence of STBs, no study has assessed implicit self-harm associations among TGD people. Researchers in the field recommend studies which examine implicit attitudes in different populations (Charlesworth et al., 2023; Gratz et al., 2014). Identifying whether implicit attitudes occur in TGD people may provide a partial explanation of why elevated STB rates occur in this population.

Importantly, while implicit measures like the IAT can reveal automatic, less controllable associations with self-harm, in isolation they may be insufficient to provide a comprehensive understanding of one's risk of STBs. Instead, explicit measures, such as depression and self-reported STBs risk, may be useful to utilise alongside implicit measures to identify STBs risk (Cha et al., 2016) and provide meaningful intervenable targets (Whittle et al., 2024; Witcomb et al., 2018). For example, depression is a well-evidenced STB risk factor in TGD (Chen et al., 2020) and general (Bachman et al., 2018; Glenn et al., 2020) populations, which may moderate or mediate the relationship between implicit attitudes and STB behavioural enaction, and is often addressed during self-harm reduction interventions (Hajek Gross et al., 2024). Further,

self-reported risk of STBs provide insight into acute self-injurious thoughts and behaviours and are used during self-harm-related hospital admissions and by paramedics to assess imminent risk (EM3, 2019).

Explicit measures are important for interpreting the personal significance of implicit findings, ensuring observed implicit biases are positioned within the context of meaningful and intervenable factors, and one's current psychological state. This is particularly important with sensitive, personal behaviours, like STBs, where staff performance and ethical concerns and responsibilities require monitoring and, if necessary, improving (Akinola & Rayner, 2022). By including explicit measures of depression and current STBs, this study this study examines whether TGD individuals show elevated responses across both implicit and explicit indicators of suicide-related risk. This study also explores whether implicit attitudes towards suicide- and death-related concepts offer predictive value beyond what participants are able, or willing, to report. Although implicit and explicit measures are analysed, their combined inclusion allows for a broader understanding of STB risk across different cognitive processes.

2.1.1. Study Aims

This study used secondary data from Project Implicit-Health (PIH) to identify whether stronger implicit associations towards STB and death-related concepts are more prevalent in TGD individuals compared to cisgender individuals. These associations may partially explain the elevated rates of STBs in TGD individuals.

2.1.1.1. Primary Hypotheses

Hypothesis 1: TGD individuals will exhibit stronger implicit associations with STB- and death-related stimuli (measured by the Death, Suicide, Cutting, and Brief Death IATs) compared to cisgender people.

Hypothesis 2: TGD individuals will explicitly report higher levels of STB risk (self-harm history, depression, current urge to self-harm, current suicide ideation (SI), current desire to die) compared to cisgender people.

2.1.1.2 Exploratory Analysis

Investigate whether demographic variables (age, education level, country of origin (USA vs. Other), and race (White vs. Other) are associated with implicit and/or explicit measures of STB risk across all gender groups.

2.2. Method

Overall, Project Implicit has captured the largest known collection of data on implicit and explicit bias (Leitner et al., 2016; Ratliff & Smith, 2024). Data was captured from the PIH database ((https://implicit.harvard.edu/implicit/user/pih/pih/index.jsp) between 2019 and 2025. The PIH website allows participants to explore, physical (e.g. healthy eating, exercise) and mental health-related IATs (e.g., Mental Health treatment), including STBS. Participants in this study chose to complete a self-harm IAT and were randomly allocated to one of four self-harm implicit measures: Death IAT, Suicide IAT, Cutting IAT, and Death Brief IAT. Considering we aimed to compare implicit scores between genders, we also excluded people who did not disclose their gender identity (*n*=2469) or birth sex (n=20). Data were also removed if participants were <18-years (*n*=1360) as minors cannot provide informed consent. Finally, responses were removed if participants provided consent, but did not complete implicit measures, did not complete sufficient trials (e.g., IAT=196; Brief IAT=140), if the error margin was >30%, and/or if response times were >300ms on 10% of the critical trials (*n*=112,697). These steps are in accord with previous self-harm IAT studies (e.g., Glenn et al., 2016). The number of participants included in each IAT are reported below.

2.2.1. Measures

2.2.1.1. Sociodemographic

Project Implicit captures a wide range of sociodemographic and psychosocial variables (e.g., country of citizenship, political ideology, self-esteem, anxiety, substance use). However, the current study focused on key sociodemographic factors (*age,*

race, educational attainment level, and country of residence) as independent variables. These variables were included based on their established associated with STB and their potential to confound relationships between variables and self-harm outcomes (Simon et al., 2024). Including these covariates allowed for a more accurate estimation of gender effects on STB outcomes, while maintaining the primary focus of the study on gender differences. Other variables were excluded to reduce the risk of overfitting and to ensure interpretation remained centred on gender effects (Du et al., 2025; Kuhn & Johnson, 2019).

2.2.1.2. Implicit Association Test (Greenwald et al., 1998; Nock et al., 2010)

Implicit cognition about self-harm was measured using the Death/Suicide Implicit Association Test (D/S-IAT; Nock et al., 2010). IAT tasks use reaction times when one classifies different stimuli to measure automatic mental associations they hold between concepts and self (e.g., *suicide + me;* Glenn et al., 2017). The category labels in three IATs were (1) "cutting" and "no cutting" (2) "*suicide" and "life" and (3*) "*death" and "life"*, *with the Brief IAT also using these category labels*. The stimuli for these categories were images of self-injurious cuts and words (see figure 4; *Cutting, Not Cutting, Me, Not Me, Death, Life, Suicide*). Blocks consisting of images or words which relate to the relevant behaviour or phenomena (i.e., images of self-harm cuts) are presented. Participants sort each stimulus into superordinate categories at the top left or top right of the screen by pressing corresponding keys on the keyboard. For example, participants may see 'death + me' paired in the upper left corner and 'life + not me' paired in the upper right corner of the screen.

Stimuli relating to these four categories appear individually in the centre of the screen and participants sort through them as quickly and accurately as possible into the superordinate categories by pressing the 'E' key for '*death*' or '*me*' words (e.g., "*dead*", "*self*", "*suicide"*) and the key 'I' for '*life*' or '*not me*' words (e.g., "*alive*", "*thrive*", "*their*"). Participants then complete a sorting task for the alternated category pairing condition, where both '*life + me*' and '*death + not me*' are paired together. Implicit tests followed the standard 7-block IAT structure and scoring procedure (Glenn et al., 2017; Greenwald et al., 2003), while the Brief IAT (B-IAT) on

PIH follows a 2-block structure (Sriram & Greenwald, 2009). An IAT *D*-score (see Greenwald et al., 2003, for more details about the IAT and https://pmc.ncbi.nlm.nih.gov/articles/PMC4259300/ for more details about the B-IAT) was calculated for each participant on each implicit task, in which positive scores represent a stronger association between STBs and the self (e.g., faster responding when '*death*' and '*me*' are paired to the same key relative to when '*life*' and '*me*' are paired). Negative scores represent a stronger association between non-STBs and the self (Glenn et al., 2017), thus lower bias.

Figure 4.
Stimuli presented in Project Implicit-Health (PIH) studies assessing implicit attitudes



2.2.2 Explicit measures

2.2.2.1. Depression

Depression was measured using the DASS-21 Depression subscale (Henry & Crawford, 2005; Lovibond & Lovibond, 1995). This included seven items with 4-point Likert scale response options (1=Did not apply to me at all; 2=Applied to me to some degree, or some of the time; 3=Applied to me to a considerable degree, or a good part of time; 4=Applied to me very much, or most of the time). See Appendix 1. for DASS-21.

2.2.2.2. Self-Harming Thoughts and Behaviours

Participants' self-injurious and suicidal behaviours history were identified using the Self-Injurious Thoughts and Behaviours Interview (SITBI; Nock et al., 2007). The SITIBI is a 20-item self-report questionnaire asking questions about prior STBs including items like '*Have you ever done anything to purposely hurt yourself without wanting to die [for example, cutting or burning your skin]?*'; '*Have you ever actually made a plan to kill yourself?*'; *Have you ever made an actual suicide attempt, where you wanted to kill yourself, even just a little?*'. Three additional items assessed lifetime SI, lifetime suicide plan, and lifetime suicide attempts using Yes/No responses.

2.2.2.3. Assessment of Iatrogenic Effects

To assess potential iatrogenic effects of the IAT, participants were asked two self-report questions before and after completing the IAT: (1) desire to self-injure ('*How much do you want to hurt yourself right now?*'); (2) desire to die ('*How much do you want to die right now?').* These items were not derived from standardised measures (e.g., the SITBI) but were developed for the current study to capture immediate affective responses (Cha et al., 2016a). These items were rated using a 5-point Likert scale ranging from 0 ('*not at all*') to 4 ('*extremely*') consistent with prior research examining acute responses to self-harm stimuli (Cha et al., 2016a).

2.3. Procedure

This study analysed secondary data from PIH. Following consent, participants completed all the following sections in random order (demographics, explicit measures and the IAT) and were randomly assigned to complete one of the four Implicit measures (Death, Suicide, Cutting, or Brief Death IATs). Afterwards, participants could view their IAT scores and receive feedback about their implicit attitudes. For more information regarding PIH recruitment and procedures see Glenn et al., 2017; French et al., 2025). Prior to analysis, study variables were checked for missing data, normality, and outliers.

2.3.1. Data Analysis

Analyses were conducted in SPSS-23. Implicit associations were scored following recommendations from Greenwald et al. (2003 which retains practice and test blocks, applies an error penalty, excludes extreme latencies, and standardises by individual variability). Scoring algorithms created an IAT *D*-Score which represents the difference between responses for each category pairing condition, divided by the standard deviation across the critical blocks (3 & 4 vs 6 & 7 in the IAT; Glenn et al., 2016). Conceptually, *D*-scores are similar to *Cohen's D* effect size (Glenn et al., 2017). Multiple linear regression models were fitted to examine whether gender identity (cisgender female, cisgender male, TGD) could predict IAT and explicit scores. In particular, whether TGD identity predicted increased IAT scores compared to cisgender men and cisgender women, while adjusting for sociodemographic variables age, race, and education attainment level (model 1), alongside explicit measures of depression and STBs history (model 2). Gender was dummy coded with cisgender female participants set as the reference category (coded as 0). The reference category was set as cisgender females based on both empirical evidence and methodological considerations. Consistent findings in the self-harm literature show cisgender females experience elevate rates of self-harm compared with cisgender males and other groups (e.g., Diggins et al., 2024; Knipe et al., 2022). During discussion with my supervisory team, we determined using the group with a well-established higher baseline risk as the reference category would facilitate clearer interpretation of relative risk and the direction of differences across gender groups. By using cisgender females as the reference group, comparisons with cisgender male and TGD participants could be interpreted contextually against a reference group already known to experience high levels of self-harm, allowing us to identify whether these groups experienced lower, comparable, or higher self-harm levels relative to a well-established point of comparison in the self-harm literature. This approach aligns with epidemiological practice where reference categories are selected based on theoretical rational and established risk profiles rather than solely demographic majority status (Hosmer et al., 2013.; Johfre & Freese, 2021).

Cisgender females served as the reference, therefore the coefficient for cisgender male estimates the difference relative to cisgender females, and the coefficient for TGD estimates the difference relative to cisgender females. Consequently, two dummy variables were created: one for cisgender male participants (coded as 1 for cisgender male, 0 otherwise), and one for TGD participants (coded as 1 for TGD, 0 otherwise). See table 3 for demographic data and variable coding.

2.3.2. Ethical and Safety Considerations

This chapter used secondary data from the PIH dataset. Before access, permission to use the de-identified data files was obtained from the original US researchers via my supervisor, Dr Brian O'Shea, who collaborates with PIH researchers. Data files were transferred and stored under the University of Nottingham's research data governance arrangements. In line with academic guidance for secondary data use, a full ethics review was not required as the dataset provided to me was already anonymised (i.e., no direct or indirect identifiers to participants or original researchers were included), no re-contact was required, attempted, or undertaken, and data use was in line with the original custodian's aims.

The conduct of this study followed the BPS Code of Human Research Ethics (2021), including risk minimisation, confidentiality, transparency, and accountability across the project. Data protection procedures outlined by the original institution responsible for data collection (University of Virginia) were adhered to, including data minimisation, restricted access, and secure storage. The anonymised data held at Nottingham was stored on secure servers with limited access to the researcher and were only retained for the necessary period to complete data analysis and write-up.

Considering the dataset concerns self-harm and suicide-relate content, risks and safeguards were considered. The study did not involve interacting with participants. Instead, risk management focused on researcher wellbeing. This included pre-briefing on exposure to material which may be distressing (i.e., images of self-harm, questions about suicide attempts), supervisory debriefing, signposting to appropriate support, and ensuring I

step away from material when and if necessary. These practices mirror ethical procedures across my PhD, and for other research in this field (National Institute of Health, 2017). Briefly, the original data was collected online, however, the recruitment process is outlined in section 2.3, and further information on data collection can be found in Glenn et al. (2017) and French et al. (2025).

2.4. Results

2.4.1. Participants

Descriptive statistics were computed to summarise demographic characteristics and key study variables. Participants aged 18-years were included (*n*=7607; cisgender male: *n*=1933; cisgender female *n*=5217, TGD *n*=457) with ages ranging from 18 to 120-years (*M*=27.63, *SD*=11.47). The latter is in line with the oldest verified lifespan (122-years; Medford & Vaupel, 2019). All demographic variables were coded for regression analyses (see table 2). Recorded country of residences were numerous. However, most participants (93.81%) were from the USA. Full breakdown of country of residence is available in appendix 2.

Table 3.
Demographic data across all participant groups (coding values in parentheses used in regression analyses)

Demographic Data (coded)	***No. of participants***
Gender identity	
Cisgender male	*N*=1933 (25.41%)
Cisgender female	*N*=5217 (68.58%)
TGD	*N*=457 (6.01%)
Education level	
Elementary (0)	*N*=6 (.1%)
Junior High (1)	*N*=37 (.5%)
Some High School (2)	*N*=286 (3.9%)
High School (3)	*N*= 1061 (14.6%)
Some college (4)	*N*= 2264 (31.2%)
Associate's degree (5)	*N*=650 (8.9%)
Bachelor's (6)	*N*=1291 (17.8%)
Some Graduate School (7)	*N*=519 (7.1%)

Masters (8)	*N*=770 (10.6%)
Postgraduate (9)	*N*=385 (5.3%)
Missing	*N*=341 (4.5%)
Race	
White (1)	*N*=5108 (67.1%)
Other (0)	*N*=2499 (32.9%)
Country of Origin	
USA (1)	*N*=7136 (93.81%)
Other (0)	*N*=471 (6.19%)

2.4.2. Implicit Associations

A series of multiple linear regressions were conducted to examine whether gender identity (cisgender female, cisgender male, TGD) predicted B/IAT *D*-scores on the four self-harm variants**.** Gender identity was dummy coded with cisgender female as the refence category, therefore the coefficients for cisgender males and TGD participants represent the differences relative to cisgender females. Age, race (White vs Other), education level, and country of origin (USA vs. Other) were included as covariates. Descriptive statistics were calculated for the overall IAT *D*-scores (*M*=-.24, *SD*=.51), which represents a composite score aggregated across the four IATs: Cutting, Suicide, Death, and Brief Death. Mean scores were also examined by gender identity: cisgender females (*M*=-.23, *SD*=.51), cisgender males (*M*=. -31, *SD*=.49), and TGD (*M*=0.112, *SD*=.50). Descriptive values are presented for context only and inferential comparisons within regression models reflect differences relative to the cisgender female reference group. Full regression results for all IAT models are presented in Table 4.

2.4.2.1. Cutting IAT Score

For the cutting IAT, the overall model was significant, F(6, 7551) = 16.56, p < .001, and explained 14.4% of the variance in Cutting IAT scores (R^2 = .144). TGD participants scored significantly higher IAT/D scores than cisgender females (*B = 0.159, SE* = 0.054, *β* = .065, *t* = 2.93, *p* = .003, 95% CI [0.053, 0.266], indicating stronger implicit associations with cutting. Cisgender males scored

significantly lower IAT *D*-scores than cisgender females (*B = -.137,* SE = 0.029, β = −.105, t = 4.749, *p* = < .001, 95% CI [-0.193, -0.080]), suggesting weaker implicit associations. Age (*B = -.013,* SE = 0.001, β = .262, t = -10.371, *p* = < .001, 95% CI [-0.015, -0.010]) was a significant negative predictor, indicating older participants scored lower on the Cutting IAT. Education level was also negatively associated with Cutting IAT scores (*B = -0.017,* SE = 0.008, β = .056, t = 2.229, *p = .026*, 95% CI [-0.032, -0.002]), suggesting participants with higher education levels showed weaker implicit associations. Race was also a significant positive predictor, with participants coded as White scoring higher than those coded as Other (*B* = 0.068, SE = 0.027, β = .056, t = 2.541, *p* = .011, 95% CI [0.015, 0.120]). Remaining covariates were non-significant.

2.4.2.2. Suicide IAT Score

For the suicide-related IAT, the overall model was significant, F(6, 7551) = 15.47, p <.001, and explained 14.4% of the variance in Suicide IAT scores (R^2 = .144). TGD participants scored significantly higher than cisgender females (*B = 0.133,* SE = 0.043, *β* = .069, t = 3.123, *p* = .002, 95% CI [0.050, 0.217]), indicating stronger implicit associations with suicide-related constructs. Cisgender males scored significantly lower than cisgender females (*B = -0.049,* SE = 0.024, *β* = -0.46, t = -2.055, *p* = .040, 95% CI [-0.096, -0.002]). Age (*B = -.009,* SE = 0.001, *β* = .233, t = -8.786, *p* = < .001, 95% CI [-0.011, -0.007]) and education (*B = -0.029,* SE = 0.006, *β* = -.121, t = -4.762, *p* = < .001, 95% CI [-0.041, -0.017]) were also significant negative predictors, indicating older participants and those with higher education attainment showed weaker suicide-related implicit associations. Race and country of origin were non-significant.

2.4.2.3. Death IAT Score

For the Death IAT, the overall model was significant F(6, 7551) = 18.79, p <.001 and explained 16.1% of the variance in Death IAT scores (R^2 = .161). TGD participants scored significantly higher than cisgender females (*B* = 0.159, *SE* = 0.054, *β* = .065, *t* = 2.933, *p* = .003, 95% CI [0.053, 0.266]), indicating stronger implicit associations with death-related concepts. Cisgender males scored significantly lower than cisgender females (*B* = -0.137,SE = 0.029,

β = -.105, t = -4.749, *p* = <.001, 95% CI [-0.193, -0.080]). In line with cutting IAT/D scores, age was a significant negative predictor (*B* = -0.009, SE = 0.001, *β* = -.213, t = -8.558, *p*= < .001, 95% CI [-0.011, -0.007]), indicating older participants showed weaker death-related implicit associations. Race was a significant positive predictor, with White participants scoring higher than those coded as Other (B = 0.068, SE = 0.027, *β* = .056, t = 2.541, p = .011, 95% CI [0.015, 0.120]). Country of origin and education level were non-significant.

2.4.2.4. Brief Death IAT Score

Finally, for the Brief Death IAT, the overall model was significant, F(6, 7551). = 14.68, p < .001, and explained 12.9% of the variance in IAT scores (R^2 = .129). TGD participants scored significantly higher IAT/D scores than cisgender females (*B = 0.*206, SE = 0.047, *β* = .112, *t* = 4.359, *p* < .001, 95% CI [0.113, 0.299*).* Age was a significant negative predictor (*B* = -0.010, SE = 0.001, *β* = -.254, t = -8.483, *p* = < .001, 95% CI[-0.012, -0.008]), indicating older participants showed weaker death-related implicit associations. Cisgender males did not differ significantly from cisgender females (*B* = -0.034, SE = 0.026, *β* = .034, t = -1.337, p = .181) and remaining covariates were non-significant.

Table 4.

Multiple Regression Results for Brief Death, Cutting, Death, and Suicide IAT D-Scores (Implicit dependent variables)

IAT Type	Predictor	B	SE B	Standardised βeta	t	P (sig.)	95% CI for B
Cutting	(Constant)	0.399	0.052	—	7.713	< .001	[0.298, 0.501]
	Country (Other)	-0.002	0.028	-0.002	-0.070	.944	[-0.057, 0.053]
	Age	-0.013	0.001	-0.262	-10.371	< .001	[-0.015, -0.010]
	Gender (Male)	-0.137	0.029	-0.105	-4.749	< .001	[-0.193, -0.080]
	Gender (TGD)	0.159	0.054	0.065	2.933	.003	[0.053, 0.266]
	Education (1–10)	-0.017	0.008	-0.056	-2.229	.026	[-0.032, -0.002]
	Race (White vs Other)	0.068	0.027	0.056	2.541	.011	[0.015, 0.120]

Suicide	(Constant)	0.030	0.042	—	0.705	.481	[-0.053, 0.113]
	Country (Other)	-0.014	0.024	-0.013	-0.593	.553	[-0.061, 0.033]
	Age	-0.009	0.001	-0.223	-8.786	< .001	[-0.011, -0.007]
	Gender (Male)	-0.049	0.024	-0.046	-2.055	.040	[-0.096, -0.002]
	Gender (TGD)	0.133	0.043	0.069	3.123	.002	[0.050, 0.217]
	Education (1–10)	-0.029	0.006	-0.121	-4.762	< .001	[-0.041, -0.017]
	Race (White vs Other)	0.036	0.022	0.036	1.652	.099	[-0.007, 0.078]
Death	(Constant)	0.042	0.044	—	0.969	.332	[-0.043, 0.128]
	Country (Other)	-0.020	0.024	-0.019	-0.847	.397	[-0.067, 0.026]
	Age	-0.009	0.001	-0.213	-8.558	< .001	[-0.011, -0.007]
	Gender (Male)	-0.137	0.029	-0.105	-4.749	< .001	[-0.193, -0.080]
	Gender (TGD)	0.159	0.054	0.065	2.933	.003	[0.053, 0.266]
	Education (1–10)	-0.017	0.008	-0.056	-2.229	.026	[-0.032, -0.002]
	Race (White vs Other)	0.068	0.027	0.056	2.541	.011	[0.015, 0.120]
Brief Death	(Constant)	0.177	0.047	—	3.784	< .001	[0.085, 0.269]
	Country (Other)	-0.052	0.027	-0.049	-1.919	.055	[-0.105, 0.001]
	Age	-0.010	0.001	-0.254	-8.483	< .001	[-0.012, -0.008]
	Gender (Male)	-0.034	0.026	-0.034	-1.337	.181	[-0.085, 0.016]
	Gender (TGD)	0.206	0.047	0.112	4.359	< .001	[0.113, 0.299]
	Education (1–10)	-0.010	0.007	-0.044	-1.487	.137	[-0.024, 0.003]
	Race (White vs Other)	0.011	0.024	0.012	0.466	.641	[-0.036, 0.059]

Note. TGD = Transgender/Gender Diverse. SE = Standard Error. CI = Confidence Interval. Education ranges from 1 (lowest) to 10 (highest). p values < .001 are reported as "< .001".

Across all four implicit measures (Cutting, Suicide, Death, Brief Death), TGD participant showed stronger implicit associations with self-harm, suicide, and death-related concepts compared to cisgender females**.** Effect sizes for TGD identity were small to moderate across the IATS. In the '*Cutting'* and *'Death'* IATs, the effect size was β = .065, and in the '*Suicide'* IAT the effect size was β = .069, all representing a small effect. In the *'Brief Death'* IAT the effect size was β = .112, which is a moderate effect.

2.4.3. Explicit Measures

Multiple linear regressions were conducted to examine effects of gender identity (cisgender female, cisgender male, TDG) on explicit self-reported depression (DASS-21) and STB measures (current urge to self-harm, current SI, and current desire to die). Models were controlled for the above-mentioned covariates.

2.4.3.1. Depression

For depression, the overall model showed that TGD participants reported significantly higher depression scores than cisgender females (*B* = 0.393, SE = 0.044, *β* = .116, *t* = 8.83, *p* < .001, 95% CI [0.306, 0.480]). Cisgender males reported significantly lower depression scores than cisgender females (*B* = -0.096, SE = 0.025, *β* = -.050, t = -3.81, *p* < .001, 95% CI [-0.145, -0.047]). Age (*B* = -0.015, SE = 0.001, *β* = -.217, t = -14.30, *p* < .001, 95% CI [-0.017, -0.013]) and education (*B* = -0.044, SE = 0.007, *β* = -.098, t = -6.56, *p* < .001, 95% CI [-0.057, -0.030] were significant negative predictors. White participants reported slightly higher depression than those coded as Other (*B* = 0.062, SE = 0.023, *β* = .035, t = 2.68, *p* = .007, 95% CI [0.016, 0.107]. Participants from the USA reported slightly higher depression than non-US residents (*B* = -0.145, SE = 0.074, *β* = -.026, t = -1.98, *p* < .05, 95% CI [-0.290, -0.001]).

2.4.3.2. Current Urge to Self-Harm

For current urge to self-harm, TGD participants reported significantly higher current self-harm urges compared to cisgender females (*B* = 0.455, *SE* = 0.046, *β* = .132, *t* = 9.92, *p* < .001, 95% CI [0.365, 0.545]). Cisgender males reported significantly lower urges than cisgender females (*B* = -0.096, SE =

0.026, *β* = -.049, t = -3.70, *p* < .001, 95% CI [-0.147, 0.045]). Age was a significant negative predictor (*B* = -0.008, SE = 0.001, *β* = -.114, t = -7.44, *p* < .001, 95% CI [-0.010, -0.006]) indicating younger individuals reported higher current urges. Education was also a significant negative predictor (*B* = -0.056, SE = 0.007, *β* = --.124, t = -8.09, *p* < .001, 95% CI [-0.070, -0.043]), with less-educated individuals reporting higher urges. All other demographic predictors were non-significant.

2.4.3.3. Current Suicide Ideation

For current SI, TGD participants reported significantly higher SI scores than cisgender females (*B* = 0.371, SE = 0.052, *β* = .095, t = 7.09, *p* < .001, 95% CI [0.238, 0.474]). Cisgender males did not differ significantly from cisgender females (*B* = -0.038, SE = 0.030, *β* = -.017, t = -1.26, *p* > .05, 95% CI [-0.096, 0.021]). Age was a significant negative predictor (*B* = -0.010, SE = 0.001, *β* = -.129, t = -8.33, *p* < .001, 95% CI [-0.012, -0.008]) indicating younger participants reported higher SI. Education was also a significant negative predictor (*B* = -0.050, SE = 0.008, *β* = .096, t = -6.24, *p* < .001, 95% CI [-0.065, -0.034]). Remaining covariates were non-significant.

2.4.3.4. Current Desire to Die

For current desire to die, TGD participants reported significantly higher scores than cisgender females (*B* = 1.024, *SE* = 0.126, *β* = .111, *t* = 8.14, *p* < .001, 95% CI [0.777, 1.270]). Cisgender males did not differ significantly from cisgender females (*B* = 0.040, SE = 0.071, *β* = .007, t = 0.56, *p* = .575, 95% CI [-0.100, 0.180]). Age was a significant negative predictor (*B* = -0.032, SE = 0.003, *β* = -.173, t = -11.08, *p* < .001, 95% CI [-0.038, -0.026]), indicating younger participants reported higher current desire to die. All other predictors were non-significant. Results from explicit measures can be found in Table 5.

Table 5.

Table summarizing regression results across four explicit measures

Outcome Variable	Predictor	B	SE	Standard-ised βeta	t	p-value (sig)	95% CI for B
Depression	TGD Identity	.393	.044	.116	8.83	< .001	[.306, .480]
	Cisgender Male	-.096	.025	-.050	-3.81	< .001	[-.145, -0.47]
	Age	-.015	.001	-.217	-14.3	< .001	[-.017, -.013]
	Education	-.044	.007	-.098	-6.56	< .001	[-.057, -030]
	Race (White=1; Other-0)	.062	.023	.035	2.68	< .05	[.016, .107]
	Country of residence (USA=1; Other=0)	-.145	.074	-.026	-1.98	< .05	[-.290, -.001]
Current Urge to Self-Harm	TGD Identity	0.455	0.046	.132	9.92	< .001	[.365, .545]
	Cisgender Male	-.096	.026	-.049	-3.7	< .001	[-.147, -.045]
	Age	-.008	.001	-.114	-7.44	< .001	[-.101, -.006]
	Education	-.056	.007	-.124	-8.09	< .001	[-.070, -.043]
	Race (White=1; Other-0)	.043	.024	.024	1.81	> .05	[-.004, .090]
	Country of residence (USA=1; Other=0)	-.082	.061	-.018	-1.34	> .05	[-.201, 0.38]
Current Suicide Ideation	TGD Identity	0.371	.052	.095	7.09	< .001	[.268, .474]
	Cisgender Male	-0.038	.03	-.017	-1.26	> .05	[-.096, .021]
	Age	-.010	.001	-.129	-8.33	< .001	[-.012, -.008]

	Education	-.50	.008	-.096	-6.24	< .001	[-.065, -.034]
	Race (White=1; Other-0)	-.007	.027	-.044	-.269	> .05	[-.060, .046]
	Country of residence (USA=1; Other=0)	-.118	.069	-.023	-1.7	> .05	[-.254, .018]
Current Desire to Die	TGD Identity	1.024	0.126	.111	8.14	< .001	[.777, 1.270]
	Cisgender Male	.040	.071	.071	.008	.575	[-.100, .180]
	Age	-0.032	.003	-.173	-11.08	< .001	[-.038, -.026]
	Education	.005	.019	.004	.284	> .05	-/032, .043]
	Race (White=1; Other-0)	.043	.065	.009	.655	> .05	[-.085, .170]
	Country of residence (USA=1; Other=0)	.084	.165	.007	.509	> .05	[-.240, .408]

TGD identity was a consistent predictor across all explicit measures (Depression, Current Urge to Self-Harm, Current SI, Current Desire to Die), with TGD participants reporting higher levels of distress and self-harm-related thoughts across all outcomes. For depression (β = .116) and current urge to self-harm (β = .132) effect sizes were moderate.

2.5. Discussion

Considering the elevated rates of STBs experienced by TGD individuals (Mann et al., 2019; Ross-Reed et al., 2019), the reasons underpinning the elevated risk is unclear. Possibly, TGD individuals implicitly associate themselves with self-harm-, suicide-, and death-related concepts at a greater extent than cisgender individuals, increasing their self-harm risk. Self-report measures have limitations such as under and/or over-estimation of contributing factors and flawed recall; Glenn et al., 2017; MacDonald et al., 2019). Implicit measures (e.g., the IAT) can offer a more objective measure to assess attitudes, especially those

that are more automatic/less controllable. Greenwald et al., 1998; 2021). This is the first study which has examined implicit attitudes to STBs in TGD individuals utilising the IAT, using secondary data from Project Implicit-Health (PIH). The aim of this study was to identify whether stronger implicit and explicit associations towards STB and death-related concepts are more prevalent in TGD individuals compared to cisgender individuals.

Hypothesis 1 predicted TGD individuals would exhibit stronger implicit associations with STB and death-related stimuli compared to cisgender males and/or females, and this hypothesis was supported across all four IATs (Cutting, Suicide, Death, Brief Death). TGD individuals consistently showed significantly higher implicit associations with death- and self-injury-related constructs, compared to cisgender females. These results indicate TGD people have stronger automatic associations with all four constructs, which could help explain why TGD people experience elevated rates of STBs. For example, the implicit associations presented here suggests TGD people may be at higher risk of STBs due to their stronger identification of the self with self-harm items. Though they may not disclose this in clinical, or other, settings. This is particularly important considering the stigma and discrimination experienced by TGD people accessing healthcare (Hughto et al., 2015), and the impact this may have on help-seeking and disclosure (Drabish et al., 2022). Within the framework of the IMV model, implicit associations (i.e., automatic self-identification with STBs) may operate in the pre-motivational stage and influence STB vulnerability by increasing stigma. These associations may contribute to constructs within the motivational phase (e.g., entrapment, hopelessness).

However, the IMV model literature is largely based on explicit self-report measures, rather than implicit measures, therefore it is unclear whether implicit attitudes are linked to the constructs within the IMV (e.g., entrapment). Recently, Freichel and colleagues (2025) conducted a network outcome analysis to test which psychological factors most strongly predict STBs. In their study, the IMV model was not directly tested, however several key IMV components (e.g., hopelessness) aligned with the IMV framework, offering some indirect support. Future research should examine whether implicit measures can complement explicit constructs within the IMV framework, offering a deeper

and more nuanced understanding of cognitive risk factors for STBs in TGD populations. Continuing efforts to improve TGD trust in healthcare services are essential. However, implicit tests offer an objective method of capturing TGD self-harm risk which complement existing explicit measures and may be particularly useful in emergency settings where self-harm risk needs to be identified objectively and promptly (Glenn et al., 2017; Millner et al., 2018; Smith et al., 2023).

Hypothesis 2 predicted TGD individuals would report higher levels of explicit STB risk (depression, current urge to self-harm, current SI, current desire to die). This hypothesis was supported across all explicit measures. TGD identity was a consistent, significant predictor across all explicit measures: depression, self-harm urge, SI, and perceived death risk. Contrastingly, cisgender males showed lower or non-significant levels on these measures when compared to cisgender females. Age and education also emerged as consistent predictors. Older individuals and those with a higher education level consistently reported reduced depression, self-harm urge, SI, and risk of death, indicating younger and less-education individuals were at increased risk. Specifically, TGD participants reported significantly higher levels of depression compared to cisgender females. These findings align with extant literature which documents elevated rates of depression among TGD people (Butler et al., 2019; Witcomb et al., 2018). The DASS-scale used in PIH studies is validated in TGD populations (Lindley & Bauerband, 2023), which strengthens the findings presented here.

Further, TGD people reported significantly higher levels of current urge to self-harm, current SI, and current desire to die than cisgender females. These findings support previous evidence which found TGD people endorsed lifetime self-harm and SI, and lifetime death wish at higher odds compared to cisgender people (Butler et al., 2019; Kirakosian et al., 2022; Thoma et al., 2019; Whittle et al., 2024).

Identifying key explicit measures is important as they provide person-centred evidence of factors which influence self-harmful behaviours and may provide important intervenable clinical targets (Whittle et al., 2024; Witcomb et al., 2018). However, reliance on self-report measures and tools may be problematic if

information is accidentally or deliberately misrepresented (Glenn et al., 2017; Gratz et al., 2016; MacDonald et al., 2019). Further, many explicit measures are not validated in TGD populations (King et al., 2020), therefore findings based on data captured by them may not adequately or fully capture TGD self-harm risk. Indeed, King and colleagues (2020) highlight the need to develop and validate mental health-related measures in TGD populations to ensure their efficacy. Despite these limitations, however, the present study found a consistent pattern of elevated explicit self-harm and distress scores in TGD people and provides a strong evidence-base of the importance of these factors in the pathway to TGD self-harm. Further, these findings support the value of combining explicit and implicit measures to identify self-harm risk amongst at-risk TGD individuals using an online crowdsourcing platform (e.g., PIH). Overall, the current findings revealed TGD individuals demonstrated strong implicit associations with self-harm- and death-related constructs; while not directly comparable to explicit scores, these implicit associations may reflect additional underlying risk processes not fully captured by self-report methods.

Some potentially protective factors also emerged. Increased age was associated with reduced depression and implicit and explicit outcome scores, highlighting the need for interventions targeting younger people documented by other researchers (Westers & Plener, 2020). Additionally, education level were robust negative predictors across all models, suggesting individuals with lower education levels showed stronger implicit associations with self-injury and death-related concepts, alongside depression and other explicit outcomes. Together, these findings support the protective role of older age and education (Chen et al., 2022: Rahman et al., 2018), and possibly education settings more widely (Bird et al., 2024; Campbell et al., 2025), regarding STBs and wider mental health outcomes. The link between reduced education attainment and increased self-harm risk for TGD people is documented in the literature. For example, a systematic review found SAs were highest in participants who had not completed high school (Adams & Vincent, 2019). The same review also found TGD participants with higher income reported fewer SAs than those on low incomes. Lower education attainment and lower income are likely frequently connected and highlight the need for school policies which engender TGD-safe environments and

enable TGD students to achieve their potential. Indeed, improving school safety for TGD students is recommended by experts in the field (Taliaferro et al., 2019), and was identified as a salient protective factor in the systematic review I undertook during this PhD (Chapter 3).

2.6. Limitations and Future Directions

Limitations of the study warrant consideration. First, participants were overwhelmingly White, female, and from the USA. Further research should focus on examining implicit self-harm associations in other countries and races. Second, the cross-sectional nature of the study means future behaviours cannot be predicted (Glenn et al., 2016). Future studies should track people longitudinally to explore the link between implicit attitudes and prospective self-harm behaviours (Glenn et al., 2017; Knowles & Townsend, 2012).

For example, researchers could examine whether self-harm occurs more frequently as implicit attitudes grow stronger, or whether these attitudes increase alongside other known risk factors. Glenn and colleagues (2017) found that stronger and more recent implicit associations were associated with more severe SA history. Similarly, a recent meta-analysis reported Death-IAT scores (reflecting stronger associations of self with death versus life) are higher in people with SA history (Sohn et al., 2021). In another study, Death-IAT scores predicted short-term future suicide attempts (Meissner et al., 2019). However, effect sizes were small and there was heterogeneity across settings, thus the Death-IAT should be seen as supplemental rather than an independent predictor.

Thus, this suggests a possible link between the strength of implicit associations and STB risk. However, their study does not provide evidence that increases in implicit associations over time directly cause increases in STBs, though the observed associations are consistent with this possibility and warrant further investigation. Also, data in the current study was captured online. Therefore, participants will have taken part in different remote settings (e.g., their home, workplace, alone, with company), and with varying potential distractions (e.g., music, television, people) during the task. Future research should capture implicit attitudes in

controlled settings to reduce the impact of potential distractors on participant responses. However, this approach would significantly limit sample size and scalability, and, therefore, impact the validity and interpretation of findings. While reducing distraction effects may not impact the large gender differences identified in this study, it will enhance the reliability and validity of measured attitudes, ensuring observed differences are not confounded by situational noise or external influences.

Furthermore, it is important to recognise limitations of implicit measures. First, the words used in some implicit tests (i.e., '*dead*', '*suicide*', '*pain*') may have different meanings to different people. These terms may be interpreted differently based on wider personal experience or culture. For example, '*suicide*' may result in a high IAT score because someone has been recently bereaved by suicide, rather than because they are at increased risk. Recently, Axt and colleagues (2021) investigated the effects of stimuli used in IAT studies to examine whether positive or negative words produce inconsistent measurement quality across three large-scale studies with >60,000 participants. The 64 words (32 positive, 32 negative) tested showed similar internal reliability and validity, suggesting neither is more nor less likely to distort IAT outcomes. However, examples of included stimuli were not suicide- or self-harm-specific. For example, negative words stimuli included terms such as 'grief', 'humiliate; and 'hurtful'.

Further, the current study used self-harm-related images, to date there is no research examining whether viewing image-based self-harm stimuli yields inconsistent measurement compared to neutral or positive images. It is possible, therefore, that suicide- or self-harm-specific items may distort IAT outcomes. Indeed, Jaroszewski and colleagues (2020) found that first-person suicide images (i.e., visual stimuli which simulates the experiences of STBs from the perspective of the person enacting it) elicited significantly different responses depending on participants STBs history. This indicates image/stimuli type and personal lived experience may impact responses and measurement validity.

Similarly, '*pain*' may relate to physical pain or injury, rather than mental pain and may elicit a high IAT score due to recent physical injury. However, Hussey and De Houwer (2018) note it is often the category label, rather than the specific stimuli, which drives

the effect in IATs. Future research should replicate Axt and colleague's work but include the self-harm-related image- and word-based stimuli used in the current study to examine whether death, suicide, and/or self-harm stimuli produces inconsistent measurements, and to clarify the influence of category labels versus specific stimuli.

Finally, while useful in certain settings, implicit tests do not capture intervenable targets which also increase self-harm risk, such as personal and social problems (Davey et al., 2015) or alcohol/substance use (Quarshie et al., 2020). Nor do they capture or identify TGD-specific risk factors like discrimination, prejudice, and gender dysphoria (Butler et al., 2019; Quarshie et al., 2020). When and where these factors occur are unique to one's self-harm pathway and provide important intervenable targets not captured by implicit measures. Indeed, a critical review of the predictive power of the IAT reported the IAT was independent of context, while behaviours (e.g., self-harm) are context bound (Meissner et al., 2019), and factors surrounding people's self-harm is key to both the development and reduction of self-harmful behaviours. Therefore, utilising implicit and explicit measures concurrently may be most effective (Kurdi et al., 2019) at identifying self-harm risk, and identifying factors most salient to TGD people.

This rationale underpins the use of the Card Sort Task for Self-Harm (CaTS) and its digital iteration (Card Sort Task for Self-Harm; CaTS-D) in subsequent chapters (Chapters 4-7) of this thesis. The CaTS enables the identification of contextual, temporal, and personally meaningful factors preceding self-harm, and offers a more nuanced understanding of risk. Furthermore, as a digital tool, CaTS-D is well-suited for engaging hard-to-reach populations (such as TGD individuals), who face potential barriers to accessing in-person research settings. Applying CaTS and CaTS-D in the remaining thesis chapters (4-7) reflects the limitations of implicit measures and the need for research tools capable of capturing the temporal complexity of self-harm pathways.

2.7. Conclusion

The findings presented here suggest TGD individuals implicitly and explicitly associate themselves with concepts of self-harm,

suicide, and death significantly more than cisgender females. This may help explain why TGD individuals experience elevated rates of self-harm (Ross-Reed et al., 2019; Thoma et al., 2019). Importantly, this study presents the first large-scale study of implicit STB associations in TGD individuals and offers novel insight into cognitive risk markers which may not be captured by self-report methods. The results from this chapter suggest more objective, implicit measures may help identify distress and STB risk in TGD populations where healthcare-based stigma and discrimination may make disclosure less likely. Implicit tests cannot identify key general or TGD-specific antecedents, such as TGD-specific victimisation, discrimination, or gender-dysphoria. However, by complementing explicit measures, they provide a methodological framework for combining implicit and explicit markers for TGD self-harm.

The next chapter in this thesis will build on these findings by identifying key TGD-specific factors which might further explain the increased risk experienced by TGD people beyond the implicit associations with self-harm and specific explicit scores identified in this chapter. This identification will support the development of targeted interventions and policies aimed at improving health and wellbeing outcomes in this high-risk group.

Chapter 3

Risk and Protective Factors for Self-Harm Thoughts and Behaviours in Transgender and Gender Diverse People: A systematic review

This chapter has been published:

Bird, K., Arcelus, J., Matsagoura, L., O'Shea, B., & Townsend, E. (2024). Risk and protective factors for self-harm thoughts and behaviours in transgender and gender diverse people: A systematic review. *Heliyon*, *10*(5). (https://www.sciencedirect.com/science/article/pii/S2405844024021054)

In Chapter 2, analysis of secondary data from Project Implicit Health demonstrated TGD people explicitly and implicitly associated themselves with self-harm, suicide, and death concepts significantly more than cisgender females. These findings may partially explain the elevated self-harm risk TGD people experience. However, while implicit measures reveal the presence of these associations, they do not identify which factors may underpin them. To address this gap, Chapter 3 presents a systematic review of literature which examined potential additional contributors to and factors for TGD self-harm. This systematic review aims to contextualise the findings of Chapter 2 by identifying which factors are related to TGD self-harm in the literature, and, thus, are likely to be important targets for intervention

3.1. Introduction

As outlined in Chapter 1 and evidenced in Chapter 2, TGD people are at increased risk of self-harm. As with the general population, TGD self-harm is muti-faceted and complex. However, TGD people experience a wider array of self-harm risk factors. Previous research has identified TGD people experience TGD-specific risk factors (e.g., transphobia Arcelus et al., 2016; TGD-related stigma, Veale et al., 2015) alongside more general correlates (i.e., hopelessness, Brausch et al., 2020; Liu et al., 2012; depression, McEvoy et al., 2023; Mustanski et al., 2013). Possibly, simultaneously experiencing TGD-specific and general risk factors

may increase risk (Liu et al. 2019; Jackman et al., 2018). These TGD-specific experiences may directly influence self-harm. They may also result in higher rates of depression, anxiety, or hopelessness which, in turn, might mediate the relationship between TGD-specific factors and self-harm (Bauer et al., 2015). Indeed, a longitudinal study of self-harm predictors in LGBT (Lesbian, Gay, Bisexual, and Transgender (Mustanski & Liu, 2013; Skerrett et al., 2015) youth found hopelessness and depression fully or partially mediated the relationship between self-harm and LGBT victimisation, perceived family support, and conduct disorder (Mustanski & Liu, 2013). Other studies report victimisation, prejudice, and discrimination, in particular, to be correlated with increased odds of negative mental health outcomes and self-harm in LGBTQ+ people (Price-Feeney et al., 2020; Skerrett et al., 2015; Williams et al., 2021). While these findings relate to the wider LGBT population, they suggest efforts to reduce LGBT-specific risk factors, like victimisation, may reduce self-harm by reducing depression and hopelessness. This may also be the case with TGD people. Indeed, Price-Feeney et al. (2020) suggest reducing TGD-specific factors (such as discrimination) is likely to reduce the disparity between self-harm and negative mental health experienced by TGD people.

Additionally, protective factors may mitigate TGD self-harm risk. Evidence suggests social and family support, reduced transphobia, TGD-safe schools or colleges, and having gender-appropriate documentation act as potential buffers against self-harm risk in TGD people (Bauer et al., 2015; Ross-Reed et al., 2019; Taliaferro et al., 2019). Indeed, studies found school and peer support were associated with reduced self-harm in both LGBT (Gnan et al., 2019) and TGD (Ross-Reed et al., 2019) populations. Furthermore, these protective factors are associated with reduced sexual and intimate-partner violence in TGD people (Ross-Reed et al., 2019). Worryingly, TGD people experience high rates of these events (Ross-Reed et al., 2019), and they are known risk factors for self-harm in TGD people (Taliaferro et al., 2019) Therefore, efforts to increase support for TGD people in school and wider social contexts may provide a protective buffer against self-harm, and correlating risk factors. Similarly, other studies have found family (Ross-Reed et al., 2019) and parental (Bauer et al., 2015) support and feeling connected to parents and non-parental adults (Taliaferro et al., 2019) offered protection against self-harm

outcomes. These protective factors may also mitigate other risk factors for self-harm. For instance, parental support for a young person's preferred gender may facilitate access to gender-affirming surgery or gender-appropriate documentation (Bauer et al., 2015), which subsequently buffer against self-harm. However, the literature regarding protective factors in TGD people is limited (Taliaferro et al., 2019) therefore the protective impact of these, and other, protective factors on TGD self-harm is unclear. Simultaneously experiencing both general and TGD-specific risk factors may result in TGD people being at increased risk of experiencing self-harm (Jackman et al., 2018; Liu et al., 2019). Furthermore, interactions between risk and protective factors may result in a unique pathway to self-harm in TGD people (Taliaferro et al., 2019). Examining correlates of self-harm in TGD people is necessary to ascertain why TGD people are at increased risk of self-harming behaviours (Liu et al., 2019). Synthesising extant literature and identifying key factors for TGD self-harm is important to identify meaningful and TGD-appropriate targets for intervention, develop interventions aimed at reducing self-harm prevalence (Liu et al., 2019), and develop intervention and support strategies which reduce self-harm in TGD and associated negative outcomes (Liu et al., 2019) in this high-risk group.

As outlined in Chapter 1, TGD self-harm has previously been researched under the LGBTQIA+ (Lesbian, Gay, Bisexual, Transgender, Queer/Questioning, Intersex, Asexual, and other gender identities/sexualities (Lewis et al., 2021)) umbrella (Gnan et al., 2019; Liu et al., 2019; Williams et al., 2021). This conflation is problematic as TGD people are often under-represented in these studies or TGD-specific data is not extractable (Williams et al., 2021). Interventions targeting TGD people may be inadequate because factors influencing TGD self-harm differs from others within the LGBTQIA+ umbrella. Indeed, research to better understand the distinct TGD self-harm pathway is essential and recommended by researchers in the field (Peterson et al., 2017; Price-Feeney et al., 2020; Taliaferro et al., 2019). Others have provided reviews of self-harm in TGD people (Mann et al., 2019; Marshall et al., 2016). However, these reviews focus on prevalence rates rather than identifying factors which may provide important intervenable targets. A recent scoping review found promising evidence of the protective function of peer support against self-harm and suicide in TGD people (Kia et al.,

2021). However, self-harm pathways are complex and multifaceted. Currently, there is no systematic review of self-harm risk and protective factors in TGD people: the current review fills this gap in knowledge to inform TGD-specific research and interventions to increase understanding of the TGD self-harm pathway and increase wellbeing of this high-risk group (Peterson et al., 2017). Identifying viable targets for intervention is key for researchers and clinicians (Kia et al., 2021).

3.1.1. Aims

Considering the paucity of research on risk and protective factors for self-harm in TGD populations this systematic review aims to critically examine and synthesise existing literature regarding risk and protective factors associated with self-harm in TGD people.

3.2. Method

3.2.1. Protocol and Registration

This review was conducted in accord with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis reporting guidelines (PRISMA; Liberati et al., 2009; Moher et al., 2009) and is registered on PROSPERO: CRD 42023396437. The protocol was developed in line with the Cochrane Handbook for Systematic Reviews (Higgins et al., 2011).

3.2.2. Search Strategy and Selection Criteria

Scoping searches identified relevant search terms and discussion between authors finalised search terms. Then, two authors (KB and LM) independently performed searches of PubMed, PsychInfo, Scopus, MEDLINE, and Web of Science databases. Searches were completed on 6thNovember 2023. Search terms included “self-harm”, “non-suicidal self injur*”, “suicid*”, “trans*”, and “gender divers*”. Full search terms appear in Appendix 3. Studies were included if participants self-identified as TGD (including identities under that umbrella term; see Appendix 4) with current or past self-harm and/or suicidality, and if they examined risk and/or protective factors for self-harm behaviours (see Table 6. for full inclusion/exclusion criteria). Eligible studies were imported into Endnote (Endnote, 2020), the reference

management system. Duplicates were removed, then studies were removed if they did not meet eligibility criteria. Titles and abstracts, and then full texts, were screened independently by two researchers (KB and LM). Independently, KB and LM extracted data, then cross-checked data extraction for accuracy. Extracted data included study details (author/s, date, study location), study design information (design type, recruitment method, self-harm outcome), participant characteristics (age, gender), measures used, and study findings. Discrepancies were resolved between KB and LM. Third author input was unnecessary.

3.2.3. Data Synthesis

Search results are presented in Figure 5. Due to significant heterogeneity of factors examined, we present a narrative synthesis of results of key risk and protective factors for TGD self-harm (Mann et al., 2019). Study characteristics and findings were summarised in descriptive tabular format grouped by risk factors and protective factors, then further synthesised by TGD-specific and general factors.

Table 6.
Inclusion and exclusion criteria used in systematic review screening process

Inclusion Criteria	Exclusion Criteria
English language peer-reviewed studies	Reviews, editorials, commentaries, or opinion pieces, grey literature, theses/dissertations, or conference proceedings
Any geographical location	Studies using parent/caregiver report
No start or end dates were used	Studies investigating self-harm or suicidality in TGD veterans or prison inmates
No age restrictions	
Only quantitative empirical studies	
Cross-sectional, longitudinal, cohort and mixed methods studies	

Measured outcome of self-harm (irrespective of suicidal intent), suicide ideation, and/or suicide attempt (attempt on own life or completed suicide)	
Studies must investigate risk and/or protective factors for self-harm in Transgender and Gender-Diverse (TGD) people	
Participants self-identifying as TGD (including diverse gender identities; see appendix 4.	

NB: Assorted studies investigated self-harm factors in TGD military veterans or prison inmates. TGD inmates Drakeford et al., 2018) and veterans (Aboussouan et al., 2019) experience unique challenges distinguishing them from the wider TGD community which may mean they experience different self-harm pathway. Consequently, these studies were excluded. Reference lists of key primary studies and review papers were searched for relevant articles.

3.2.4. Ethical and Safety Considerations

This chapter presents a systematic review of published literature and, therefore, did not involve collecting primary data. Consequently, formal ethical approval was not required. Instead, ethical considerations focused on research and reviewer integrity and transparency, and responsible synthesis of evidence. For example, transparent reporting, accurate and true representation of findings, and appropriate citation and referencing of original sources. The review followed PRISMA guidelines and used the Newcastle-Ottawa Scale to assess risk of bias within included studies. Both are well-established frameworks for systematic reviews to enhance methodological rigour, minimise my own author bias, and support reproducibility. To further enhance reliability, article screening, data extraction, and risk of bias assessment were conducted independently by myself and another researcher (LM). After each phase, we met and compared our findings and discussed differences in order to reach consensus and ensure the robustness and accuracy of the review process. Given the sensitive nature of self-harm and suicide content within the included studies, attention was given to researcher wellbeing. Potentially distressing material was handled cautiously, with opportunities for supervisory discussion should concerns arise.

3.3. Results

Of 8,707 records identified, 8,573 articles were screened by abstract. One-hundred and thirty-two articles had full texts screened. Overall, 78 studies were eligible for inclusion in this review (see Figure 1. for PRISMA search results summary). A full list of excluded papers with reasons for their exclusion is available (see Appendix 5). Full data extraction is available on request.

3.3.1. Study Characteristics

Of 78 eligible studies, 68 were conducted in community settings, and 10 in clinical settings. Other key study (location, study design, risk and/or protective factors examined, self-harm outcomes, and key findings) and participant (*n*, gender identity, age-range, and mean ages) characteristics are presented in table 7.

3.3.2. Sample Characteristics

Participants included across studies totalled 322,144. Participant numbers in individual studies ranged from 16 to 27,715 (*M*=4077.78, *SD*=12770). Ages ranged from 7- to 98-years. The combined mean age from studies, including participants' mean age at baseline, was *M*=27.73(*SD*=7.40). Other sample characteristics are included in Table 7.

3.3.3. Measures of Risk and Protective Factors

Most studies used validated measures of risk and/or protective factors, though measures varied significantly. However, we found little evidence many measures were validated in TGD populations which may be problematic if they cannot sufficiently capture TGD specific issues (King et al., 2020). For example, ten studies used the Patient Health Questionnaire (PHQ) for Depression (Busby et al., 2020; Drescher et al., 2023; Gower et al., 2018; Kaplan et al., 2016; 2020; Kuper et al., 2020; Strauss et al., 2019; 2020; Taliaferro et al., 2018) but there is no evidence PHQ is validated in TGD populations, meaning PHQ may not reliably assess depression in TGD people. This may be the case with other measures used by studies in this review. Some measures were validated in TGD populations, so are appropriate to capture TGD experiences. Perhaps unsurprisingly, these were TGD-specific

measures (e.g., Gender Minority Resilience Model (Brennan et al., 2017; Burish et al., 2023; Cogan et al., 2020; 2021; Drescher et al., 2023; Kaplan et al., 2020; Rabasco & Andover, 2020; Testa et al., 2019); Transgender Congruence Scale (Burish et al., 2023; Jackman et al., 2018); Transgender Identity Survey (Perez-Brumer et al., 2015); Hamburg Body Drawing Scale (Claes et al., 2015; Davey et al., 2016). See table 7. for full list of risk and protective factor measures used across all studies.

Figure 5.

Flow diagram illustrating the systematic review search process

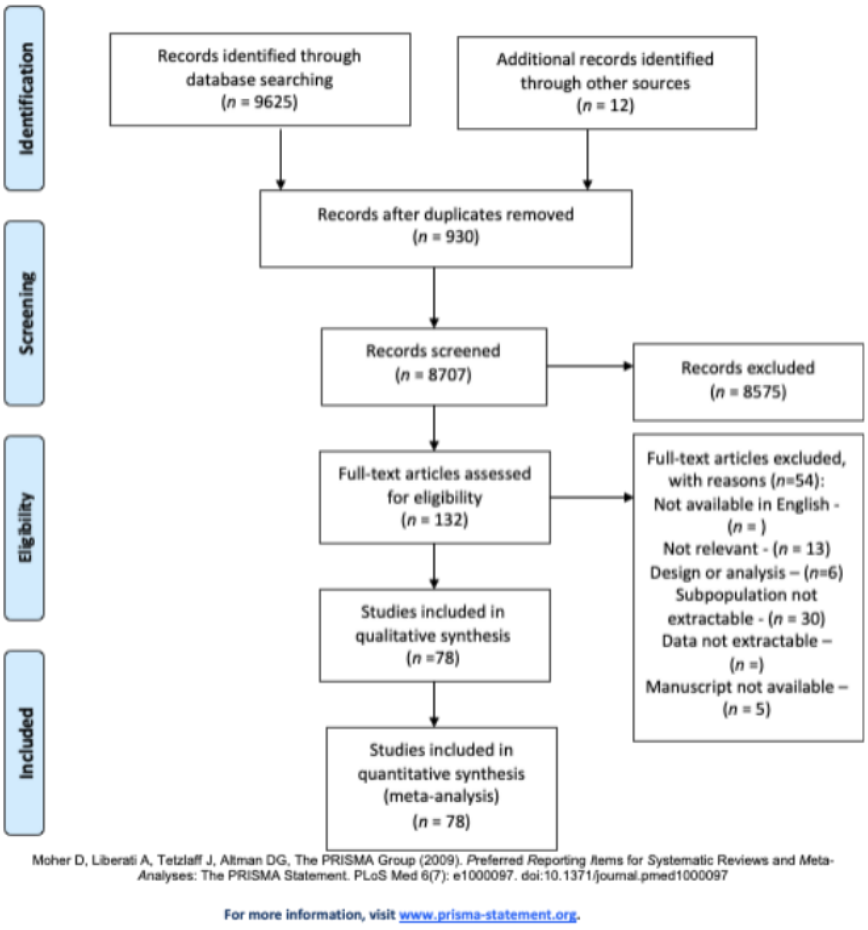


Table 7.

Summary of Study and Sample Characteristics and Findings

Author/s & date (Location)	Study design	Participant characteristics	Outcome measures (Demographics, risk factors, protective factors)	Self-harm definition &measure	Key findings
Arcelus et al. (2016) (UK)	Cross-sectional	*n*=268 Natal female: 45.2% Natal male: 50.7% Did not answer: 4.1% Age range: 17-25 years (M=19.9)	Demographics Psychopathology: SCL-90; Self-esteem: RSE; Transphobia victimisation: Experiences of Transphobia Scale; Interpersonal functioning: IIP-32; Social support: MSPSS	NSSI: SIQ	• Natal sex (female) & severity of clinical symptomology significantly associated with NSSI • Transphobia, low self-esteem & interpersonal problems significant predictors of psychopathology levels which is a risk factor for NSSI
Almazan et al. (2021) USA)	Cross-sectional	*n*=27,715 Trans woman: 38.3% Trans man: 29.1%	Demographics Severe psychological distress:	Past-year suicide ideation & suicide attempt measure not provided	• Exposure to gender-affirming surgery significantly associated with reduced past-year

		Nonbinary: 30.2% Cross-dresser: 2.5% 18+ (not provided)	K-6; Past-month binge alcohol use & past year tobacco smoking: all 1-item		suicide ideation, but not past-year suicide attempts • Participants with all desired surgeries had significantly reduced suicide ideation & attempts
Andrew et al. (2020) (USA)	Cross-sectional	*n*=155 Non-binary: 25.2% (no further breakdown provided) AFAB: 75.5% Age range not provided (M=29.86)	Demographics Trauma exposure: Life Events Checklist; Nightmares: Trauma-Related Nightmare Survey; PTSD: PTSD checklist for DSM-5	Suicide risk: SBQ-R	• Nightmare frequency significantly associated with increased suicide risk • Nightmare severity was not significantly associated with suicide risk
Austin et al. (2022) (USA & Canada)	Cross-sectional	*n*=372 Trans man: 89.2% Non-binary/gender fluid: 32.8% Man: 9.4%	Demographics LGBTQ-related stigma: 5-items from NHAI; Interpersonal & environmental LGBTQ	Suicidality: 2-items from DSM-5	• Interpersonal microaggressions significantly associated with suicide attempts • Familial emotional neglect, reduced school

		Trans Woman: 11.6% Woman: 3.2% Demiboy: 1.1% Transgender: 0.3% Other: 0.8% Two-Spirit: 05% *** NB these categories are not mutually exclusive*** 14-18 years (M=15.99)	microaggressions: Interpersonal LGBTQ Microaggressions subscale & Environmental LGBTQ Microaggressions subscale (adapted from LGBQ Microaggressions On-Campus Scale)		belonging & internalised self-stigma significantly associated with past 6-months suicidality • Reduced school belonging associated with past 6-months suicidality but not lifetime suicide attempts • Internalised stigma associated with suicide ideation but not suicide attempts
Azeem et al. (2019) (Pakistan)	Cross-sectional	*n*=156 Transgender Age range not provided (M=39.26)	Demographics Depression: Hamilton Rating Scale for Depression Self-reported family income, illicit substance use and smoking: measures not provided	SI: Scale for Suicide Ideation	• Illicit substance use and depression significantly associated with suicide ideation • Age, smoking, and family income not significantly associated with suicide ideation
Barboza et al. (2016)	Cross-sectional	*n*=350	Demographics	Suicidal Risk: 2 items	• Discrimination significantly associated

(USA)	Transgender MTF: 62% FTM: 35% Age range not provided	Victimisation: 2 items; Substance use: 1 item covering 10 illicit substances; Family social support & Counselling or psychotherapy use: both 1-item	with increased odds of suicide attempts • Non-discriminatory physical victimisation significantly associated with increased odds of suicide ideation & attempts • Being white, lower levels of perceived family support, lack of psychological counselling/psychotherapy for TGD-related services, & past alcohol problems significantly associated with increased odds of suicide ideation& attempts • Housing instability significantly associated with increased suicide attempt risk

					• Higher education levels marginally associated with suicide ideation
Basar & Oz (2016) (Turkey)	Cross-sectional	*n*=116 Trans men: 75.9% Trans women: 24.1% Median: 25-years	Demographics Discrimination: PDS; Depression: BDI Resilience: RSA; Social support: MSPSS	Suicide attempt history; NSSI: ascertained by clinical interview	• Reduced resilience (lower RSA score) significantly associated with suicide attempt history but not NSSI
Bauer et al. (2016) (Canada)	Cross-sectional	*n*=380 Transgender MTF: 52.6% FTM: 47.4% 16+ (M=32.7)	Demographics Chronic illness/pain, immigration history, religious upbringing, childhood abuse & mental health disorders: self-reported; Transphobia: Experiences of Transphobia Scale; Transphobic harassment & violence; medical transition status,	Past year suicide ideation & attempts: dichotomous scale	• Social support, reduced transphobia, medically transitioning though hormones/surgery, & having personal identification documents changed to appropriate/preferred sex were significantly associated with reductions in suicide risk • Parental support for gender identity was

			hormone use, social transition status, being perceived as cisgender: self-reported; Social support: Medical Outcomes Study Social Support Scale		significantly associated with reduced suicide ideation • Lower self-reported transphobia associated with decrease in suicide ideation & suicide attempts • Religiosity & spirituality AND gender support from other sources except parents were not significantly associated with reduced suicidality
Brennan et al. (2017) (USA)	Cross-sectional	*n*=83 Trans women/MTF: 40% Trans men/FTM: 29% Various gender nonconforming identities: 31%	Demographics Depression: CES-D; Anxiety: Becks Anxiety Inventory; Gender Minority Stress: GMSR	Suicide ideation, suicide attempts & NSSI: dichotomous scale	• < 40years more likely to have NSSI than >40 years • Distal stress (gender-related discrimination, gender-related rejection, gender-related victimization, & non-affirmation of identity)

		19-70 years (Not provided)			weak positive predictor of suicide attempts • Resilience factors (pride & community connectedness) were marginal negative predictors of suicide attempt • Distal stress had weak positive relationship with suicide ideation • NSSI: age had moderate negative relationship • Suicide ideation: age had moderate positive relationship
Becerra et al. (2021) (USA)	Cross-sectional	*n=1369* Transgender 18+ (Not provided)	Demographics Psychological distress: K-6; Abuse/violence: 4-items; Partner abuse/violence: 24-items:	SI & SA: 4questions with Y/N responses	• Abuse, violence, sexual partner abuse/violence are significantly associated with suicidal thoughts and behaviours • Harassment & abuse while using the bathroom

			Harassment/abuse due to bathroom use: 3-items		is significantly associated with suicide attempts
Bosse et al. (2023) (USA)	Cross-sectional	*n*=286 Transgender and Nonbinary 18-25 years (M=21.5)	Demographics Parental acceptance-rejection: Parental Acceptance-Rejection Questionnaire; Sibling acceptance-rejection: Elder Sibling Acceptance-Rejection Questionnaire; Depression: CES-D	Suicidality: 1 item for suicide ideation, planning & attempts	• No significant relationship between race, ethnicity, ASAB, whether living with parent & suicidality • Older age significantly associated with fewer lifetime suicide planning and attempts • Higher education significantly associated with fewer lifetime suicide plans and attempts & past year suicide ideation & attempts • Higher family rejection significantly associated with increased lifetime and past year suicidality

					• High sibling rejection was not associated with past year suicide attempts • Rejection from male parent particularly significant
Budhwani et al. (2018) (Dominican Republic)	Cross-sectional	*n=298* Transgender women Age range not provided (M=26)	Demographics Sexual abuse, psychological abuse, torture, attempt on own life by another: dichotomous Y/N; Depression: 1 item; Illicit drugs: Dichotomous Y/N (in past 6-months); Income & education level: self-report	Suicide attempts: dichotomous Y/N	• Psychological abuse, torture & experiencing a murder attempt significantly associated with suicide attempt • Experiencing psychological abuse increases suicide attempt risk 3-fold • Experiencing torture or a murder attempt almost 3x more likely to attempt suicide • Depressed transgender women were 4x more likely to attempt suicide

					• Transgender women who used illicit drugs were 2x more likely to attempt suicide • Experiencing sexual abuse not associated with higher odds of suicide attempt compared to non-attempters • Low monthly income, age, & low education attainment not significantly associated with suicide attempt
Burish et al. (2022) (USA & Canada)	Cross-sectional	*n*=139 Transgender or nonbinary 18+ (M=33.78)	Demographics Gender Minority Stress: GMSR Social Support: Perceived Social Support Scale from Family & Friends Scale;	Suicidality: SBQ-R	• Optimism emerged as a significant protective factor • Body acceptance was a significant protective factor (and it predicted optimism) • Social support, community

			Optimism: LOT-R; Body Acceptance & Congruence: Transgender Congruence Scale		connectedness & pride were not significant protective factors
Busby et al. (2020) (USA)	Cross-sectional	*n*=868 (n=86 identified as transgender) 18+ (Not provided)	Demographics Depression: PHQ-9; Discrimination: EDS; Interpersonal Victimization: Interpersonal Victimization Scale-Revised; Social Connectedness: UCLA Loneliness Scale; LGBTQ Affirmation: 3-items from LGBTQ Identity Affirmation Scale (modified from original 12-item scale)	Past year suicide ideation; lifetime suicide attempts; NSSI: 1 item from the Youth Risk Behavior Survey	• Victimisation, discrimination, connectedness, & LGBTQ affirmation were not significantly related to suicide and NSSI outcomes for transgender students • Some results were under wider LGBTQ umbrella so impossible to extract transgender-only data
Campbell et al. (2023)	Cross-sectional	*n*=1078 gender-conversion treatment	Demographics	Suicide attempts: dichotomous Y/N	• Exposure to gender conversion therapy is

(USA)		*n*=24192 control Transgender 11-17 years when gender conversion efforts began (Not provided)	Gender conversion efforts: 1 item	& number of attempts	significantly linked with increased risk of SA in adolescents
Cerel et al. (2021)	Cross-sectional	*n*=2784	Demographics	Past year suicide ideation &	• Exposure to suicide attempts & suicide
(USA)		27.3% transgender female 27% transgender man 38.7% non-binary 1.2% transgender unspecified 5.7% transgender other 18+ (M=34.35 suicide exposure; M=31.33: no suicide death exposure)	Suicide attempt exposure, support from family of origin, mental health diagnosis, being a POC, gender binary status & gender identity: all self-reported	attempts: 4-items with dichotomous Y/N	increases likelihood of recent suicide ideation, recent & lifetime suicide attempts, lifetime NSSI, & at least one current mental health diagnosis • Exposure to the suicide attempt of a TGD person increased suicide ideation but not suicide attempts • Exposure to suicide attempts & suicide more closely correlated with

					suicide ideation than suicide attempts • NSSI history, female natal sex, younger age, & lacking family support & exposure to suicide attempts & suicide were associated with suicide ideation & attempts • Being white, NSSI history, & lacking familial support differentiated those with suicide ideation from those with suicide attempt in people exposed to suicide attempt and suicide
Chen et al. (2019) (China)	Cross-sectional	*n*=1309 Transgender men: *n*=622 Transgender women: *n*=687	Demographics Feelings towards natal sex, seeking hormone therapy, seeking gender reassignment surgery,	Self-harm, suicide ideation & suicide attempts measured using dedicated items (not specified)	• **Regarding suicide ideation:** • Transgender men: disliking natal sex, seeking gender reassignment surgery, depression, risk

	Age range not provided (Transgender men M=3.78; Transgender women M=22.89; Overall M=23.31)	intense conflicts with parents regarding sexuality, discrimination or violence in public due to sexuality, childhood adversity (incl. Bullying and insults at school), Seeking MH support services & history of major depressive disorder: all measured using unspecified measures Depression: CESD-9; Self-esteem: RSE	for major depressive disorder, self-harm, seeking mental health services all significantly predicted increased risk of suicide ideation • Transgender women: disliking natal sex, current or past major depressive disorder, depression, risk for major depressive disorder, self-harm, seeking mental health support services all significantly predict increased suicide ideation risk • ALL: disliking natal sex, seeking gender reassignment surgery, intense conflicts with parents, current or past major depressive

		disorder, depression, risk for major depressive disorder, self-harm, & seeking mental health services all significantly increased suicide ideation risk • **Regarding suicide attempts:** • Transgender men: Experiencing violence and/or discrimination in public, current and/or past major depressive disorder & self-harm all significantly. predicted increased suicide attempt risk • Transgender women: Being separated/divorced, current or past major

					depressive disorder, and self-harm all significantly predicted suicide attempt risk • ALL: Education level high school or equivalent, being married, being separated/divorced, intense conflicts with parents, self-harm & seeking mental health services all significantly predicted increased suicide attempt risk • No significant relationship between self-esteem, & self-harm & suicide
Chen et al. (2020) (China)	Cross-sectional	*n*=250 Transgender women 18+	Demographics Anxiety & depression: K-10	Suicide ideation & attempts: dichotomous Y/N	• Lack of residential status, bisexuality, homelessness before age 18, experiences of verbal, physical, or sexual

		(M=27.9)	Discrimination (incl. verbal abuse), mental health status, PTSD screening, access to mental health services, alcohol & drug use, physical abuse, harassment (restricted personal freedom, economic control due to gender identity), sexual violence: all dichotomous Y/N		violence, alcohol use, & severe mental health disorders were all significantly associated with suicide ideation & and prior suicide attempts • Moderate or severe psychological distress were associated with prior suicide attempts • Suicide ideation was strongly correlated with severe psychological distress • Moderate or severe psychological distress was significantly associated with prior suicide attempt
Chinazzo et al. (2023)	Cross-sectional	*n*=213	Demographics	Suicide ideation & attempts: dichotomous Y/N	• Socioeconomic deprivation & depressive symptoms significantly

(Brazil)	Transgender boys/men: 48.6% Transgender girls/women: 20.8% Non-binary: 30.7% 13-25 years (M=18.53)	Depression: MDS; Discrimination: Lifetime & Daily Discrimination Subscale; Gender Distress: TYC-GDS; Socioeconomic Status: Deprivation Scale Social Support: MSPSS; Social Support relating to gender identity: 1 item; Gender Positivity: Gender Positivity Scale	associated with suicide ideation & attempts • No significant relationship between discrimination & suicide ideation & attempts • Gender distress associated with suicide ideation (binary transgender people experience higher distress than nonbinary people • Gender positivity a significant protective factor & may counteract gender distress • Social support & support relating to gender were non-significant (friends' support for gender identity, affective support, positive social interaction support, and

					emotional/information support)
Claes et al. (2015) (UK)	Cross-sectional	*n*=155 Transgender men: *n*=52 Transgender women: *n*=103 17- 77 years (M=34.52)	Demographics Psychological Symptoms: SCL-90-R; Body Dissatisfaction: HBDS; Transphobia/victimisation: Experiences of Transphobia Scale; Interpersonal Problems: IIP-32 Perceived Social Support: MSPSS; Self-Esteem: RSE	NSSI: SIQ	• NSSI significantly associated with younger age (M_{age} = 26.98 vs. M_{age} = 38.91) • Transgender males are significantly more likely to SH than Transgender women (57.7% vs 26.2%) • Psychological/clinical symptomology significantly associated with NSSI • Transgender women report lower self-esteem, but this is not significantly related to NSSI • Transgender women reported significantly more body dissatisfaction but not significantly related to NSSI

					• Transphobia, interpersonal problems not significantly related to NSSI • Trans people with NSSI reported finding it harder to be assertive & sociable & were more aggressive • Transgender men received more social support but not significantly related to NSSI, though people with NSSI reported less family support • NSSI significantly associated with younger age, being male, and reporting more psychological symptoms
Cogan et al. (2020)	Cross-sectional	*n*=155	Demographics	Suicide risk: SBQ-R	• Gender minority stressors (discrimination, gender-related rejection, gender-

(USA)		Various gender identities 18-67 years (M=29.86)	Gender minority stress: GMSR; Traumatic experiences: Life Events Checklist for DSM-5		related victimisation, non-affirmation of gender identity, internalised transphobia, negative expectations of future events, concealment) and trauma are significantly associated with suicide risk • Community resilience specified in GSMR (community connectedness, pride) did not significantly mitigate suicide risk nor did it moderate relationships between stressors & risk
Cogan et al. (2021a) (USA)	Cross-sectional	*n*=29.86 Various gender identities 18-67 years	Demographics Traumatic experiences: Life Events Checklist; Gender Minority Stressors: GMSR	Suicide risk: SBQ-R	• Proximal stressors (internalised stress, internalised transphobia, negative expectations due to gender identity, concealment of gender

		(M=29.86)			identity) were all significant predictors of suicide risk • Sexual violence was a significant predictor of suicide risk
Cogan et al. (2021b) (USA)	Cross-sectional	*n*=29.86 Various gender identities 18-67 years (M=29.9)	Demographics Lifetime Trauma Exposure; LEC-5; Distal gender minority stressors: GMSR	Suicide risk: SBQ-R	• Distal stressors (gender-related discrimination, rejection, victimisation & nonaffimation) were significantly associated with suicide risk & related to proximal stressors (internalized transphobia, negative expectations for future events, and concealment) • Proximal stressors (internalised stress, internalised transphobia, negative expectations due to gender identity, concealment of gender

					identity) also significantly related to suicide risk
Cramer et al. (2016) (UK)	Cross-sectional	*n*=27658 Various gender identities 18+ (not provided)	Demographics Interpersonal correlates (HRD: family rejection, childhood harassment, rejection, discrimination); HRD in workplace, healthcare settings, health insurance; TGD-related physical assault, lifetime TGD-related intimate partner abuse; sexual assault; connection to TGD community; family support & co-worker support: measures not specified	Suicidal thoughts & behaviours: 4-items with dichotomous	• Family rejection, childhood harassment, rejection & discrimination (HRD), workplace HRD, healthcare HRD & sexual assault were all significantly associated with suicide ideation & attempts • Past year health insurance HRD, past year TGD-related physical assault & lifetime intimate partner violence were all significant associated with suicide attempts, but not suicide ideation • Family & co-worker support were significantly correlated with reduced

			suicide attempts, but not suicide ideation • Marginalised status (sexual, racial & disability linked to suicidal thoughts & behaviours risk • Discrimination & victimisation were significantly associated with past year suicide attempts • Being less out with TGD identity was a protective factor • Sexual minority, racial minority, lower education, lower income, military experience, disability status, & being uninsured were significantly associated with past year suicidal

					thoughts & behaviours risk
Davey et al. (2016) (UK)	Cross-sectional	*n*=97 Control*: n*=97 60 Transgender women 37 Transgender men Control: 60 cisgender women 37 cisgender men Age range not provided (Transgender: M=36.18; Control M=37.16)	Demographics, incl. civil status, living situation TGD people were asked for treatment stage & hormone status; General Psychopathology: SCL-90-R Self-Esteem: RSE; Body Satisfaction: HBDS; Perceived Social Support: MSPSS	NSSI: SIQ-TR	• TGD group had significantly higher prevalence of current NSSI than control group • TGD men had significantly higher prevalence rates of current NSSI than TGD women • TGD NSSI group (TGD individuals reporting current NSSI) reported significantly higher psychopathology, lower self-esteem, lower body satisfaction & social support compared to the TGD no NSSI group & cisgender no NSSI group • TGD people with NSSI were significantly younger than both other groups

					(cisgender & TGD no NSSI)
de Graaf et al. (2020) (Canada, UK, Netherlands)	Cross-sectional	*n*=2771 Natal male: *n*=937 Natal female: *n*=1834 13+ (M=15.99)	Demographics, incl. age at assessment, year of assessment, full-scale IQ, parents' marital status, & parents' social class IQ: Wechsler Intelligence Scale for Children & Wechsler Adult Intelligence Scale; Parent social status/education: Hollingshead's Four-Factor Index of Social Status (non-validated scale); Items from the CBCL & YSR were used to measure desire to be the opposite sex, poor peer	Suicidality = Item 18 from CBCL & Item 91 from YSR	• Natal sex (female) & behavioural & emotional problems were consistent predictors of suicidality across clinics & measures used • CBCL: Toronto-Amsterdam contrast: clinic, birth assigned sex, parents' marital status & social class, & general emotional & behavioural problems were all significant predictors of suicidality • Toronto-London contrasts: clinic, birth assigned sex, & general behavioural & emotional problems were all

	relations & behavioural problems	significant predictors of suicidality • Amsterdam-London contrast: clinic, birth assigned sex, & general behavioural & emotional problems were all significant predictors of suicidality • YSR: Toronto-Amsterdam: birth assigned sex, poor peer relations, & general emotional & behavioural problems were significant predictors of suicidality • Toronto-London: clinic & behavioural & emotional problems were significant predictors of suicidality • Amsterdam-London: clinic & general behavioural & emotional problems were

					significant predictors of suicidality • Mixed findings regarding parent's marital status & social class depending on scale (results were significant on CBCL, but not for YSR)
dickey et al. (2015) (USA)	Cross-sectional	*n*=773 Various gender identities Age range not provided (M=34.5)	Demographics Depression & Anxiety: DASS-21; Feelings about body: BIS	NSSI: ISAS	• Depression, anxiety & stress were significantly associated with NSSI • NSSI significantly associated with lower BIS scores (i.e., lower body image)
Drescher et al. (2021) (USA)	Cross-sectional	*n*=70 Transgender men: 43.4% Transgender women: 25.7% 4Non binary: 40%	Demographics Homelessness & perceptions about safety: 1-item (these were adapted from the LGBT Health & Services Needs	Suicidality (ideation & attempts): Dichotomous Y/N	• Suicide ideation was significantly associated with history of sexual violence, homelessness, & perceived lack of CRSA safety (safety in local area)

		18-65 (M=29.97)	in New York State study & Seattle LGBT Commission 2010 Needs Assessment Survey respectively) Physical violence & sexual violence victimisation: 3-items		• Suicide attempts were significantly associated with sexual violence history, homelessness, & perceived lack of CSRA safety (safety in local area) • Partner violence was not significantly associated with suicide ideation or attempts • No demographic (age, gender identity, ethnicity, household income, education attainment level, & current financial situation) characteristics were significantly associated with suicide ideation or attempts
Drescher et al. (2023)	Cross-sectional	*n*=115 Transgender	Demographic Depression: PHQ-9	Suicide intent & risk: SHI	• Emotion dysregulation was significantly correlated with suicide

(USA)		Non-conforming 18+ (M=27.61)	Gender Minority Stressors/Resilience: GMSR Emotion Dysregulation; DERS-SF		ideation, suicide attempts, suicide intent, and risk • Victimisation was significantly associated with suicide ideation, suicide attempts, suicide intent, and risk • Rejection was significantly associated with suicide ideation & suicide risk • Discrimination was significantly associated with suicide risk only
Edwards et al. 2012) (USA)	Cross-sectional	*n*=106 Transgender women: 40.6% Transgender men: 32.1% Questioning: 7.5% Genderqueer: 2.8%	Demographics Emotional Stability: Suicide Resiliency Inventory-25; Relational Support: Perceived Social Support from Family (PSS-FA) and Friends (PSS-FR)	Suicide risk: SBQ-R	• High levels of perceived support from friends & family significantly associated with their emotional stability which, in turn, was negatively associated with suicide risk

		Nonbinary/gender fluid: 1.9% Neutrois: 0.9% Trans: 0.9% Intersex: 0.9% Not provided: 12.3% 18-65 years (M=29.17)			• Participants with higher levels of support experienced increased emotional stability which led to lower suicide risk • Independently there was no relationship between perceived support & suicide risk
Goldblum et al. (2018) (USA)	Cross-sectional	*n*=290 Transgender 18-65 years (M=37.01)	Demographics In-school gender-based victimisation: 2 items; Effect of gender-based victimisation: 1 item	Suicide attempt history: 2-item	• Younger age (<45) significant associated with suicide attempts • Transgender men significantly more likely to attempt suicide than transgender women • Ethnicity was significantly associated with suicide attempts • Multi-racial or 'other' were significantly more likely to attempt suicide, but White, African

					America, and Latina/o also reported high suicide attempt history • Higher socioeconomic status was significantly associated with reduced suicide attempts compared to lower & middle status • School-based gender-based violence was significantly associated with suicide attempts in transgender men and women
Gower et al. (2018) (USA)	Cross-sectional	*n*=2168 Natal female: 68.1% Natal male: 31.9% No age range provided but USA grades 5, 8, 9, 11 (ages 10-18)	Demographics Parent connectedness: 3-item scale not validated; Youth Development Opportunities: 7-item scale from	Suicide ideation and attempts: Dichotomous Y/N	• Feeling connected to parents was associated with significantly lower odds of suicide ideation and attempts • An increase in connectedness results in a one-unit reduction in

	(M not provided)	Developmental Assets Profile; Teacher student engagement: 4-items from Student Engagement Inventory; Feeling safe in community: 2-item scale not validated; School safety: 1-item scale not validated; Depression: PHQ-2; Alcohol, drug, cigarette use in past 30 days: Dichotomous Y/N Single items measured how much you feel other adult relatives, friends, & adults in the community care about you	odds of suicide ideation and attempts • Having caring adults in the community & feeling safe at school were associated with significantly lower odds of suicide ideation and attempts

Green et al. (2022a) (USA)	Cross-sectional	*n*=11914 Nonbinary: 63% Trans male: 29% Trans female: 8% 13-24 years (M=17.62)	Demographics Depression: PHQ; Victimisation, Receipt of puberty blockers, & exposure to GICE: all 1-item Gender-affirming hormone therapy: 3 items with binary responses; Parent support for gender identity: 2 items	Suicidal thoughts & behaviours: 2 items from YRB survey	• Receipt of gender affirming hormone therapy was associated with significantly lower odds of past year suicide ideation & attempts • Gender affirming hormone therapy also significantly associated with lower rates of depression
Grossman & D'Augelli (2007) (USA)	Mixed methods	*n*=55 Trans female: *n*=31 Trans male: *n*=24 15-21 years (Trans female M=17.5 Trans male M=19.5)	Demographics Relation between suicide attempts & TGD status: RHAI; Lethality of suicide attempt determined by interviewer using lethality rating scale;	Suicide ideation: 3 items; Suicide attempts: Questions used in previous TGD suicide studies (cited) inc. whether drugs and/or alcohol	• Childhood gender nonconformity was not significantly associated with suicide attempts • TGD-related suicide ideation, parental verbal abuse, parental physical abuse, lower body esteem (especially weight satisfaction & thoughts of

			Childhood Gender Nonconformity: GCS; Childhood Parental Abuse: Child & Adolescent Psychological Abuse Measure Body Esteem: Body-Esteem Scale for Adolescents & Adults	was used at the time	how others evaluate one's own body) were all significantly associated with suicide attempts • Sexual minority status was significant factor for life-threatening behaviours in TGD youth
Grossman et al. (2016) (USA)	Longitudinal (First panel data)	*n*=129 MTF: *n*=44 (34%) FTM: *n*=44 (31%) MTDG: *n*=14 (11%) FTDG: *n*=31 (24%) 15-21 years (M=18)	Demographics Painful & provocative events components of IPTS: PPES	Suicide ideation & attempts: 2 parts of SHBQ Suicide ideation components of IPTS: INQ Capacity for self-harm components of IPTS: ACSS	**Regarding suicide ideation:** • FTM & FTDG experienced increased suicide ideation compared to MTF & MTDG • White Caucasian group reported greater suicide ideation than other racial groups but no significant differences between Hispanic & non-Hispanic groups

		• Suicide ideation lower in people who attended religious services • Perceived burdensomeness & thwarted belongingness were independently significantly associated with suicide ideation • Only perceived burdensomeness was significant in full model • Acquired capability to enact was not significantly associated with suicide ideation, but painful & provocative events were associated with greater acquired capability for lethal self-harm
		Regarding suicide attempts:

		• FTDG identity was significantly associated with suicide attempts • Non-Hispanic & Caucasian youth significantly associated with suicide attempts compared to Non-Hispanic & Black/African American youth • Frequent religious service attendance was associated with fewer suicide attempts • Suicide ideation & acquired capability for self-harm was significantly associated with increased suicide attempts • Thwarted belongingness & perceived burdensomeness were both significantly

		associated with suicide attempts • Painful & provocative events were significantly associated with suicide attempts • No significant interaction effects between perceived belongingness & painful/provocative events or between perceived burdensomeness & thwarted belongingness • There was a significant interaction effect between thwarted belonginess & perceived burdensomeness & painful provocative events: thwarted belongingness had a significant positive

					association with suicide attempts only for those who experienced moderate amount of painful provocative events • Thwarted belonginess had no effect on those who experienced almost no painful provocative events
Jackman et al. (2018) (USA)	Cross-sectional (quantitative in-person interviews with survey)	*n*=332 Transgender 16+ (M=34.56)	Demographics Enacted stigma: EDS Felt Stigma: SCS; Transgender congruence: TCS Family support of TGD identity: 1-item; Friend support: 4-items from MSPSS;	NSSI: SITBI	• Age, felt stigma, & trans congruence were significantly associated with past year self-harm • Each 1-year increase in felt stigma was significantly associated with an increase x 1 year was associated with a 2.33 increase in odds of past-year self-harm

			TGD community connectedness: 5-item subscale from GMSR		• Each increase of 1-year of age was associated with decreased odds of self-harm by factor of 3.23 • Enacted stigma & income were not significantly associated with increased past-year self-harm • Increase of one point on transgender congruence scale was associated with decreased odds of past-year self-harm by factor of 0.74 suggesting higher gender dysphoria levels associated with past year self-harm • Protective factors not significant
Kaplan et al. (2017) (Lebanon)	Cross-sectional interview surveys	*n*=54 Trans females	Demographics Depression: PHQ-& PHQ-9;	Suicide ideation: 4-items; Suicide attempts: 2-items	• Suicide attempt history was significantly associated with lower general social support,

	18-58 years (M=27)	General social support & social isolation: Items from Social Relationship Scale; Peer Support: 1-item regarding friends support of TGD identity; Gender identity openness: 2-items from RHS	lower social integration, lower peer support • Suicide attempt history was significantly associated with being more open about TGD identity in public & past or current hormone use • Depression was not significantly associated with suicide attempts. However, 55% of those who experienced a SA also experienced depression • History of sexual abuse & sex work was not significantly associated with suicide attempts • Education attainment, age, homelessness, & relationship status were not significantly

					associated with suicide attempts • Past & current hormone use were both significantly associated with suicide attempt history
Kaplan et al. (2020) (Lebanon)	Longitudinal	*n*=16 Trans women 22-50 years (Median=26-years)	Demographics Sexual health & behaviour: 11-items measuring STI history; 13-items assessing sexual risk behaviour; & 23-items measuring sexual relationship power; Mental Health (Anxiety & Depression): HADS; Depression: PHQ-9; PTSD: 4-item Primary Care PTSD Screen	Suicidality: (thoughts, plans, & attempts ever & in past 3 months): Dichotomous Y/N	• Higher social cohesion was significantly correlated with reduced suicidal thoughts at 3-months post-test • Increased community connectedness was associated with reduced depression • War event exposure was associated with higher anxiety

	Family acceptance: 9-item measure of family acceptance; Lifetime trauma: 25-item Trauma History Questionnaire; Social Support: Social Cohesion Scale; GMSR & MDPSS; Gender affirmation, identity & expression: TGD specific Multigroup Ethnic Identity Measure, 6-items measuring gender typicality, & Outness Inventory; 31-items measuring desire/satisfaction of transition; 22-items measuring gender affirmation; 5-items measuring gender affirmation satisfaction;

			War exposure: War Event Questionnaire; Transphobia: 35-item scale (validated in population)		
Klein & Golub (2016) (USA)	Cross-sectional	*n*=3458 Transgender & Nonconforming 19-98 (M=36.69)	Demographics Substance misuse: Dichotomous Y/N; Family rejection: 7-items	Lifetime history of suicide attempts: Dichotomous Y/N	• Younger age, binary gender identity, non-white race/ethnicity, lower education & income, & being unemployed were all significantly associated with suicide attempt history • Family rejection also significantly associated with a history of suicide attempts • Relationship between substance misuse & suicide attempts was not measured

Kota et al. (2020) (USA)	Cross-sectional	*n*=928 Trans women 18-65 years (M=35)	Demographics Perceived stigma: 4-items from RHM; Psychosocial impact of gender minority status: 4-items from TAIM; Depression: 6-items from BSI; Anxiety: 3-item subscale from BSI; Excessive drinking: 3-items; Non-inject drug use & Injection drug use: both 1-item; Intimate Partner Violence: 3-items; Sexual abuse: 3-items; Child Sexual Abuse: 1-item; HIV status: 1 item	Suicide ideation: 2-items - 1 regards past-year suicide ideation & one whether this related to gender status	• 33% reported suicide ideation • Anxiety, perceived stigma of being transgender, the psychosocial impact of gender minority status, experiencing sexual abuse, family verbal abuse, & stranger verbal abuse were all significantly associated with higher odds of suicidal ideation • Partner support was a significant protective factor

Kuper et al. (2021) (USA0	Cross-sectional	*n*=1896 Gender identity other than birth assigned sex: 78.1% AFAB 14-30 (M=-21.1)	Demographics Gender related affirmation: 7-items; Gender-related self-concept: 7-items; Victimization (Gender & Sexual Orientation-related): 6-items; Desire for gender-affirming medical care: 1-item; Depressive symptoms: PHQ-9; Social Support: Friend & family support: MSPSS;	Past year suicide ideation, attempts & suicide risk: SBQ-R Past year suicide attempts: binary variable modified SBQ-R	• **Risk Factors:** Region of USA & race/ethnicity were not significantly associated with suicide-related outcomes • Gender identity & sexual orientation were significantly associated with suicide ideation, attempts & positive suicide risk score • Gender-related victimisation & depressive symptoms were independently associated with suicide ideation, attempts & positive suicide risk score • Gender-related self-concept negativity was positively associated with suicide ideation & attempts

	• Sexual orientation-related victimisation was positively associated with suicide attempts • Queer identity was positively associated with suicide ideation • Pansexuality was positively associated with suicide risk • **Protective Factors:** Age was negatively associated with suicide ideation & attempts • Male identity & friend support were negatively associated with suicide attempts (i.e., acted as protective factors) • Family support was negatively associated with suicide ideation

Leon et al. (2021) (USA)	Retrospective clinical data	*n*=185 AFAB: 86.6% AMAB: 13.4% 7-25 years (Median at clinic enrolment: 16.3; Median at most recent clinic visit: 18.6)	Demographics Social transition; Medical transition; Mental health history (diagnoses, history of suicide ideation & attempts, psychiatric hospitalisation, history of abuse, bullying & victimisation) all captured from electronic medical records	Documented in medical records	• Depression was significantly associated with NSSI • History of abuse (emotional, physical or sexual) was significantly associated with NSSI • Anxiety was non-significant • AFAB, transmasculine, mood disorder history, & abuse were significantly associated with NSSI • Age, race, ethnicity, social transition status, medical transition status, rural zip code residence, & nonmetro country residence were not significantly associated with a history of NSSI
Maguen et al. (2010)	Cross-sectional	*n*=153	Demographics	Suicide attempts: Dichotomous Y/N	• Age & sex assigned at birth (female) were

(USA)		Gender identity female: 25% Somewhat female: 20% Equally both: 25% Somewhat male: 24% Male: 6% 18+ (M=47)	Mental Health Treatment: 3 items; TGD-related verbal abuse & physical violence: 2 items; IV drug use: 1 item;	& number of attempts	significantly correlated with past suicide attempts • Younger individuals were more likely to report attempted suicide • Psychiatric hospitalisation, ASAB (female) & TGD-related violence were all significantly associated with suicide attempts • Intravenous drug use was non-significant
Mak et al. (2020) (USA)	Retrospective medical record	*n*=6327 Trans men: 2,875 (45%) Trans women: 3,452 (55%) 3-45	Demographics Mental health diagnoses as stated on EMR: incl. anxiety disorders, ADHD disorders, ASD, bipolar disorders, depressive disorders, schizophrenia spectrum disorders,	Suicide Attempts: Emergency Medical Records (as defined by ICD-9 or ICD10) Suicide Ideation: Binary variable: Ever or never	• Suicide ideation & attempts were 2-5 times higher for those with 1-2 mental health diagnoses • Suicide attempts were 7 times higher in those <18 than >45 years of age • Past suicide ideation & attempts were associated

		(age groups: 3-17, 18-25, 26-35, 36-45, >45)	substance use/abuse, conduct/ disruptive disorders, eating disorders, dementia, other psychoses, & personality disorders		with 3times increased likelihood of suicide attempts • No difference between trans men & and trans women regards suicide attempts
Maksut et al. (2020) (USA)	Cross-sectional	*n*=381 Trans women 15-29 (not provided)	Demographics Perceived, anticipated & enacted stigma (related to TGD status): Gender Identity Stigma Scale; Sexual behaviour stigma: Sexual Behavior Stigma Scale; Severe Psychological Distress: Kessler Scale	Suicide ideation & attempts: 1-item each	• Suicide ideation was significantly associated with lower income, bisexual, pansexual, queer & asexual sexualities • Suicide ideation was significantly associated with discriminatory comments from family, verbal harassment & family exclusion • Suicide ideation was significantly associated with being poorly treated in a healthcare facility,

					verbal harassment, & rape • Suicide attempts were significantly associated with younger age, not living in urban/suburban area (i.e., rural), rejection by friends, feeling unprotected by police, & avoiding healthcare services • Being poorly treated in a healthcare facility, being blackmailed, & hearing gossip from healthcare workers were significantly associated with suicide attempts
Marx et al. (2021) (USA)	Cross-sectional	*n*=610 Transgender & gender nonconforming	Demographics Sexual victimisation: 1-item;	Suicide ideation: 1-item	• Sexual victimisation, sexual harassment victimisation, drug use, & bias-based peer victimisation were all

		14-18 years (M=15.81)	Sexual harassment victimisation: 1-item; Bias-based peer victimisation: 1- item; Problematic drug use: 6-items Parental monitoring & support: 7-items; School belonging: 6-items		significantly associated with suicide ideation • School belonging & greater parental support were negatively associated with suicide ideation (i.e., are protective factors)
Moody & Smith (2013) (Canada)	Cross-sectional	*n*=134 Man/boy: 37.6% Woman/girl: (37.6% Trans: 50.4% Transgender (51.1% Transexual/transsexual: 45.1% FTM: 27.1% MTF: 29.3% On FTM Spectrum:15%	Demographics Optimist; LOT-R; Social support: PSS-FR & PSS-Fa; Suicide resilience: SRI-25; Reasons for living; RFL	Suicidal behaviours: SBQ-R	• Perceived social support from family and friends, emotional stability, optimism, & child-related concerns (reason for living) were associated with lower suicidal behaviour scores indicating these factors provide some protection from suicidal thoughts

	On MTF Spectrum:17.3% Genderqueer: 24.8% Two-spirit: 7.5% Transman: 24.8% Transwoman: 30.8%) Man of trans experience: 8.3% Woman of trans experience: 7.5% Androgyne: 8.3% Woman, boy, gender blender, bi-gender, polygender, pangender, cross-dresser, transvestite, intersexual, drag king: 30.4% Other (gender bent, third gender, gender fucker, trans woman):10.6%	and behaviours in TGD people • Emotional stability (part of suicide resilience) was found to be a significant protective factor • There were no significant differences in suicidal behaviours between FTM or MTF people

		(participants may be in multiple categories) 18-75 years (M=36.75)			
Parr & Howe (2019) (USA)	Mixed-methods (Cross-sectional survey data included in this review)	*n*=182 Trans female: n=107 (26.6%) / Trans male: n=75 (18.7) / genderqueer/GNC: n=44 (10.9%) / Other: n=48 (11.9%) 14-65 years (not provided)	Demographics Identity nonaffirmation microaggression events: 3-items; Depression, acute sadness & loneliness: 2-items from SBQ-R	Past-year suicide ideation & lifetime suicide ideation & attempts: 2-items from SBQ-R	• A 1x unit increase in frequency of identity nonaffirmation microaggression events was significantly associated with 2.54x increased odds of past year suicide ideation or 3.20x increased odds of lifetime suicide attempts • A 1x increase in plausible values (as defined using latent logistic regression reflecting TGD persons level of TGD identity was significantly associated with a 4.13x increase in odds of past year suicide

		ideation & 3.31x odds increase of lifetime suicide ideation or attempts • Each unit increase of identity nonaffirmation or denial microaggression events reported were significantly associated with a 1.39x increased odds of past year suicide ideation when adjusted for events which didn't impact social engagement • A 1x increase in number of identity nonaffirmation events leading to feeling emotionally wearied or apathetic were significantly associated with a 21% increase odds of past year suicide

					ideation when adjusted for increases in events producing emotional pain • Increases in number of paining events were significantly associated with a 21% increase in odds of past year suicide ideation
Perez-Brumer et al. (2015) (USA)	Cross-sectional	*n*=1229 Transgender: FTM n=532; MTF n=697 (but included multiple gender identities) Age & mean not provided	Demographics Structural Stigma: 4-item composite index based on gender minority measure; Internalized Transphobia: Transgender Identity Survey	Lifetime & past-year suicide attempts: 2-items	• MTF trans identity, being white, college education or higher (compared to high school or less education) were all significantly associate with decreased odds of lifetime suicide attempts • Higher levels of internalised transphobia were significantly associated with increased

			odds of lifetime suicide attempts • College or higher education was significantly associated with decreased odds of past-year suicide attempts • Higher level of internalised transphobia was associated with past year suicide attempts, but not statistically significant • MTF identity, being white, & attaining college education or higher were all significantly associated with fewer lifetime suicide attempts • Lower levels of structural stigma were associated with decreased odds of lifetime suicide attempts

Peterson et al. (2017) (USA)	Retrospective chart review	*n*=96 MTF: *n*=54 MTF: *n*=31 Gender fluid/nonbinary: *n*=15 12-22 years (M=17.1)	Demographics Psychosocial assessment at outset appointment: drug/alcohol use; history of legal problems/arrest; gang involvement; involved in fights; history of being bullied; feel safe at home; interest in weight change: All dichotomous Y/N; Body image concerns: 1-item	Suicide attempt history; cutting or self-injurious behaviour history: Dichotomous Y/N	• Older age was significantly associated with increased likelihood of suicide attempts • Drive for weight change (weight gain & weight loss) was significantly associated with suicide attempt history • Self-harm history was significantly associated with suicide attempts • FTM identity (compared to MTF) were significantly more likely to have suicide attempt & self-harm history • Body dissatisfaction or body mass index (BMI) were not significantly linked to suicide attempts

Rabasco & Andover (2020)	Cross-sectional	*n*=96 Transgender woman: *n*=71 Transgender man: *n*=26 Gender nonconforming: *n*=8 Gender queer: n=9 Other: *n*=19 12-22 years (M=17.1)	Demographics Minority stressors: GMSR; Gender Identity State Policy Score	Suicide ideation: BSS	• Victimisation & discrimination separately were statistically significant predictive of lifetime suicide attempts • Gender identity-specific state policies moderated victimisation & discrimination effects on suicide attempts: increased victimisation or discrimination increased suicide attempts at low level state policy but not medium or high levels • Fewer gender-affirmative state policies is significantly associated with increased discrimination & victimisation, & increased suicide attempts

Ross-Reed et al. (2019) (USA)	Cross-sectional	*n*=858 Natal male: *n*=453 Natal female: *n*=435 11-19 years (not provided)	Demographics Sexual violence, dating violence, Dichotomous Y/N; Gender identity Y/N to either Cis or Gender Minority; 14 resiliency questions (family, peer, school, & community): 4-point Likert scale	NSSI & past-year suicide attempts: Dichotomous y/N	• Community support was non-significant in relation to NSSI and suicide attempts • Family support was significantly correlated with lower odds for suicide attempts & NSSI • Peer support was significantly correlated with NSSI
Russell et al. (2018a) (USA)	Cross-sectional	*n*=129 Transgender Gender non-conforming 15-21 years (not provided)	Demographics Depressive symptoms: BDI for Youth; Chosen Name Use: Whether preferred name was different from name given at birth; Are you able to go by your preferred name at	Suicidal Ideation & behaviour: SHBQ	• Chosen name use in more contexts predicted lower depression & reduced suicide ideation & behaviours - an increase of one context (home, work, school, with friends) predicted a 5.37 unit decrease in depressive symptoms, a

			home; school; work with friends Social Support: CASSS		29% suicide ideation decrease & a 56% decrease in suicidal behaviour • Depression, suicide ideation & suicidal behaviour were lowest when chosen name was used in all 4 contexts
Scheim et al. (2020) (USA)	Cross-sectional	*n*=22,286 Trans woman: 35.6% Trans man: 33.1% Nonbinary AFAB: 25.5% Nonbinary AMAB: 5.8% 18+ (M=30.9)	Psychological Distress: K-6 Gender concordant identification: 1 item	Suicide ideation: 3-items	• Participants with all identity concordant documents for preferred name & gender had lower prevalence of suicide ideation & planning (adjusted prevalence ratio [APR] 0·78; 95% CI 0·72–0·85) • Having some (vs no) concordant documents were associated with small reductions in suicide ideation (APR 0·95; 0·91–

					0·98) & planning (APR 0·93; 0·86–1·00) • Participants with some or all gender identity concordant documentation were significantly less likely to attempt suicide than those with no documents
Seelman (2016) (USA)	Cross-sectional	*n*=2325 Trans male: 43.7% Trans female: 30.9% Gender nonconforming natal female:16.6% Gender nonconforming natal male: 2.2% Crossdresser male:4.7% Crossdresser female:1.9%	Demographics, incl. disability status Generation (time period) when participant attended college & age in college; Denial of bathroom access in college; Gender-appropriate housing in college (due to trans status);	Lifetime suicide attempts: Dichotomous Y/N	• Race, annual household income, physical or mental disability, being denied access to a school bathroom due to being transgender, being denied access to gender-appropriate campus housing due to being transgender were all significantly associated with lifetime suicide attempts

	18-76 years (M=31.02)	Interpersonal victimisation: experience of harassment/bullying; physical assault/attack; sexual assault by teachers/staff at school/college due to trans status	• Being a TGD POC & having a physical or mental disability are all associated with suicide attempts • Denial of access to appropriate bathrooms & denial of access to appropriate campus housing were both significantly associated with lifetime suicide attempts • TGD people experiencing interpersonal victimisation (bullying, harassment, physical attack, sexual assault, harassment) from other students (but not teachers/staff) are 1.36x more likely to attempt suicide

Snooks & McLaren (2020) (USA)	Cross-sectional	*n*=848 Trans men: *n*=197 Trans women: *n*=614 18-80 years (M=26.27)	Demographics Gender affirming surgery: Y/N/I'd rather not say; Interpersonal Needs: INQ-R; Depression: CES-D	Suicidal thought & behaviours: SBQ-R	• Perceived burdensomeness significantly predicted suicidal thoughts & behaviours • Dispositional hope was a protective factor against suicidal thoughts & behaviours when perceived burdensomeness was lower, however not when perceived burdensomeness was higher
Staples et al (2018) (USA)	Cross-sectional	*n*=237 Gender identity other: 55.9% FTM: 24.6% MTF: 10.2% Nonbinary: 9.3%	Demographics Distal TGD stress: Daily Heterosexist Experiences Questionnaire; Internalized TGD negativity; transgender identity scale (TGIS)	Suicide ideation: BSS; NSSI: DSHI	• Race/ethnicity were not significantly associated with suicide ideation or NSSI • Visibility as TGD and degree of maleness/femaleness were all significantly

		18-44 years (M=28)			associated with NSSI & suicide ideation • Harassment and victimisation were both positively associated with suicide ideation & NSSI • Internalised TGD-negativity was significantly associated with suicide ideation but not NSSI
Strauss et al. (2019) (Australia)	Cross-sectional	*n*=859 Transgender Gender diverse 14-25 years (M=19.37)	Demographics Depressive Symptoms: PHQ-A; Anxiety: GAD-7; Self-reported psychiatric diagnoses, exposure to negative experiences, peer rejection, issues with educational setting, issues with	Self-reported adverse health outcomes (incl. self-harm, suicidal thoughts & attempts - lifetime and past-year	• Factors significantly associated with lifetime desire to self-harm: Accommodation issues, bullying, discrimination, experiencing a significant loss, helping others with mental health issues, lack of family support, peer rejection, & school/university/TAFE issues

		accommodation, bullying, body dysphoria, discrimination, employment issues, experiencing significant loss, isolation from TGD people, isolated from services, helping others with mental health, lack of family support	• Factors not associated with desire to self-harm: Body dysphoria, employment issues, feeling isolated from not knowing TGD people, feeling isolated from services • Factors significantly associated with lifetime self-harm: Accommodation issues, bullying, discrimination, employment issues, experiencing a significant loss, feeling isolated from services, helping others with mental health issues, lack of family support, peer rejection, school/university/TAFE issues

		• Factors not associated with lifetime self-harm: Body dysphoria, feeling isolated from TGD people • Factors significantly associated with lifetime engagement in reckless life-endangering behaviours: Accommodation issues, body dysphoria, bullying, discrimination, employment issues, experiencing a significant loss, feeling isolated from services, lack of family support, peer rejection, school/university/TAFE issues • Factors not associated with lifetime engagement in reckless life-

		endangering behaviours: Feeling isolated from other TGD ppl, helping others with mental health issues • Factors associated with lifetime suicide ideation: Accommodation issues, body dysphoria, bullying, discrimination, employment issues, experiencing a significant loss, feeling isolated from services, helping others with mental health issues, lack of family support, peer rejection. school/university/TAFE issues • Factors not associated with lifetime suicide ideation: Feeling isolated from other TGD people

					• Factors associated with lifetime suicide attempts: Accommodation issues, bullying, discrimination, employment issues, experiencing a significant loss, feeling isolated from services, lack of family support, peer rejection, school/university/TAFE issues • Factors not associated with lifetime suicide attempts: Body dysphoria & feeling isolated from not knowing other TGD people
Strauss et al. (2020) (Australia)	Cross-sectional	*n=8*59 Transgender Gender diverse: 29.7% Trans men/men: 15%	Demographics Depressive symptom: PHQ-A (for adolescents); Anxiety: GAD-7;	Self-harm & suicidal behaviours (self-harm ideation, self-harm, reckless	• Abuse (extrafamilial physical abuse, familial physical abuse, extrafamilial sexual abuse, intimate partner abuse other familial abuse

		Trans women/women: 48.5% various nonbinary identities (incl. nonbinary trans masc, nonbinary transfemme, agender, bigender, pangender, and others) 14-25 years (M=19.37)	Self-reported psychiatric diagnoses: range of diagnoses listed (e.g., PTSD, eating disorders, substance use disorders) & *n* selected those which had received formal diagnoses; Exposure to abuse: various questions about negative experiences associated with poor mental health - 6 items	behaviour endangering life, suicide ideation & suicide attempts): 5 items (3-point scale)	(including emotional & verbal abuse & neglect)) were all significantly associated with self-harm & suicidal behaviours • Familial sexual abuse was significantly associated with suicide attempts & reckless behaviour which may endanger own life only
Suen et al. (2018) (Hong Kong)	Cross-sectional	*n*=106 Assigned male at birth: 63.2% Assigned female at birth: 38.8% 25->44 years (not provided)	Demographics Satisfaction with relationship status: Y/N; Quality of Life: 1-item- 6-point scale	Suicidality: 4-point scale - "never thought of suicide", "have had thoughts of suicide", "have often had thoughts of suicide", "have	• Quality of life, age & monthly income together explained 15.8% of variance in suicidality • Quality of life was negatively & marginally significantly associated with suicide ideation (*p*=.058)

		attempted suicide"	• Age (15-24) was significantly associated with suicidality and were significantly more likely to report suicide ideation than >44 years (*p*=.041) • Monthly Income (<HK$6000) was significantly associated with increased likelihood of suicide ideation • Reduced quality of life was significantly associated with suicide ideation compared to people without suicide ideation (*p*=.007) • Age, monthly income & quality of life combined explained between 15.8% & 22% of variance in suicide ideation depending on analysis

					• TGD people aged 15-24 years were more likely to report suicide ideation (*p*=.041) • Quality of life negatively predicted suicide ideation (*p*=.058)
Taliaferro et al. (2018) (USA)	Cross-sectional	*n*=2168 Transgender, genderqueer, genderfluid, or unsure about gender identity AMAB: 31.5% AFAB: 67.2% AFAB Declined to answer: 1.2% School grades 5, 8, 9, & 11 were given. These ages are 10 - 16 years (not provided)	Demographics Gender identity: Y/N beside relevant gender identity; Depressive Symptoms: PHQ-2; Gender- based bullying/victimisation (2-items); Physical bullying/victimisation: 1-item Parent connectedness: 3-items;	Past year NSSI: How many times? >10= repetitive	• Past year NSSI was significantly associated with depression & gender-based or physical bullying victimisation • Greater connectedness to parents & non-parental adults were significant protective factors • There was a significant interaction between non-parental adult connectedness & gender-based bullying victimisation: Those who reported such

			Teacher/school adult relationships: Student Engagement Instrument: Friend caring: 1-item; Connectedness to non-parental adults: 2-items; School safety: -item		victimisation to non-parental adults were less likely to report NSSI • Depression was the most significant risk factor associated with repetitive NSSI • Parent connectedness & school safety were the most important protective factors to mitigate NSSI
Taliaferro et al. (2019) (USA)	Cross-sectional	*n*=1635 Transgender or gender nonconforming: AMAB: 32% AFAB: 68.1% 14/15 years & 16/17 years (not provided)	Demographics Assigned sex & gender identity: 2-items; Family substance use: 2-items; Physical health problems & mental health problems: both 1-item; Positive screen for depression: 2-items;	NSSI: 2-Item scale - 1 asking about past year NSSI engagement & how many times Suicide attempts: Ever attempted suicide, in past year, or no	• Being a natal female was significantly associated with increased likelihood of NSSI • People in Grade 9 (age 14/15) & receiving free/reduced price lunches were more likely to report NSSI • Mental health difficulties, being a victim of teasing

	Physical or sexual abuse: 3-items; Relationship violence, witness to family violence & teasing: all 2-items; Bullying: 4-items; running away, violence perpetrator, skipped school, cigarette smoking, alcohol use, binge drinking: all 1-item Parent connectedness: 3-items; connectedness to other adults: 2-items; school engagement & teacher/ school adult relationships: both 6-items; neighbourhood safety: 2-items; prescription drug misuse:	due to gender/gender expression, running away from home, & alcohol use were all significantly associated with NSSI (leading factors: mental health problem, depressive symptoms, alcohol use) • No significant difference in NSSI by race/ethnicity or school location (city or other) • Long-term mental health problems, depression, running away, substance use were all significantly associated with experiencing both NSSI & suicide attempts • Physical or sexual abuse, relationship violence, bullying victimisation, less

		4-items; illegal drug use: 5-items; multiple sexual partners: 2-items; bullying perpetrator: 4-items; friend caring, sport participation, involvement in school activities, religious activities, physical activity, school plans, academic achievement, school safety: all 1-item	non-parental connectedness to adults, academic achievement, & marijuana use differentiated this group (NSSI & suicide attempts) from the NSSI only group: Leading factors were mental health problems, running away from home, lower levels of connectedness to non-parental adult, & marijuana use • Mental health problem, physical or sexual abuse, relationship violence, bullying victimisation, less parental connectedness, lower grades, lower levels of perceived school safety, & running away from home were all

					significantly associated with suicide attempts • Increased parental connectedness & school safety differentiated NSSI & suicide attempt group from NSSI only group
Tebbe & Moradi (20120 (USA)	Cross-sectional	*n*=353 Transgender (trans women, trans men, non-binary) 18-66 years (M=25.21)	Demographics Prejudice & discrimination: DHEQ: Internalized antitrans attitudes: IHS; Fear of antitrans stigma: Gender-Related Fears subscale of Transgender Adaptation & Integration Measure; Drug use: Brief DAST; Alcohol use: AUDIT; Depressive symptoms: CES-D	Suicide risk: SBQ-R	• Internalized anti-trans attitudes, drug use & depression all had a direct significant association with suicide ideation & attempts • Perceived discrimination, fear of anti-trans stigma, family support, significant other support, friend support, & alcohol use were not directly significantly related to suicide ideation & attempts

		Social Support: Family, Friend, & Significant Other subscale of MSPSS		• No difference by group (trans women, trans man, non-binary)
Testa et al. (2012) Cross-sectional (USA)	*n*=271 Tran women: n=179 Trans men: n=92 18-69 years (M=37)	Demographics Physical violence: 1 item, then 1 item regarding how many times these were gender-identity related; Sexual violence: 1 item, then 1 item regarding how many times these were gender-identity related; Alcohol abuse: Dichotomous Y/N; Illicit substance use: Dichotomous Y/N	Suicide ideation & attempts: Dichotomous Y/N & how many times	• Physical violence was significantly associated with suicide ideation in trans women but not trans men • Physical violence was significantly associated with suicide attempts in trans men and trans women • Sexual violence was significantly associated with suicide ideation in trans men but not trans women • Sexual violence was significantly associated with suicide attempts in

				trans men and trans women
Testa et al. (2016) Cross-sectional (USA & Canada)	*n*=816 Trans man; Trans woman; female to different gender; male to different gender; Intersex 18+ (M=32.53)	Demographics External & internal gender minority stress: GMSR; Belongingness & perceived burdensomeness: INQ-121	Past year suicide ideation: SIS; Lifetime suicide ideation: 1-item; Lifetime suicide attempts: SA: 1-item	• **Regarding Model 1 (GMSR):** • Indirect path of rejection to suicide ideation through internalised transphobia & negative expectations but not non-disclosure was significant • Indirect path from non-affirmation to suicide ideation through internalised transphobia & negative expectations but not through non-disclosure was significant • Internalised transphobia & negative expectations were significantly positively associated with suicide ideation, but non-

					disclosure was non-significant **Regarding Model 2 (IPTS):** • Examined associations between internal gender minority stressors & suicide ideation through perceived burdensomeness & thwarted belongingness: Model fit was excellent • Indirect path to suicide ideation through thwarted belongingness & perceived burdensomeness • Thwarted belongingness & perceived burdensomeness were each significant predictors of suicide ideation
Toomey et al. (2018)	Cross-sectional	*n*=1773	Demographics including	Lifetime suicide behaviour:	• Nonheterosexuality, identifying as a

(USA)	Trans female: *n*=202 Trans male: *n*=175 Nonbinary: *n*=344 Questioning: *n*=1052 11-19 years (M=14.7)	highest parental education level, urbanicity, & gender identity	Dichotomous Y/N 1-item: "Have you ever tried to kill yourself?"	racial/ethnic minority (non-White), older adolescents (age not specified) were all associated with higher odds of reported suicide behaviour • Higher parental education level & residing in urban spaces were significantly associated with lower odds of suicide behaviour • Within each gender identity group: Transgender adolescents: non-heterosexual sexual orientation was associated with higher odds of suicide behaviour • For questioning adolescents: parent

					education (higher) was a protective factor • Trans adolescents identifying as bisexual, gay, or lesbian were associated with higher odds of reporting suicidal behaviour • No sociodemographic characteristics were significantly associated with suicidal behaviour in nonbinary adolescents
Treharne t al. (2020) (Aotearoa/New Zealand & Australia)	Cross-sectional	*n*=700 (TGD: *n*=293; cisgender; *n*=308) 18-74 years (M=30)	Demographics Discrimination: EDS; Psychological Distress: K-10 Perceived social support: MSPSS; Resilience: BRS	Suicidal ideation: SIDAS Suicide ideation & attempts: Series of single items about suicidality; Self-harm: DSHI	• TGD people were significantly more likely to have lifetime suicide attempts compared to cis people • Younger age significant for cis but not TGD people • TGD people who live with people were 5x more

			likely to have suicide attempts than those who live alone • Discrimination was significantly associated with suicide attempts in TGD people compared to cis people • Distress was significantly associated with suicide ideation in TGD & cis people • Distress was significantly associated with suicide ideation & attempts in TGD people only • Higher social support was significantly associated with reduced self-harm in TGD people but not cis people • Higher resilience was a significant protective

					factor for cis people but not trans people
Trujillo et al. (2017) (USA)	Cross-sectional	*N*=78 Transmen: 33.3% Transwomen: 37.2% Another gender:29.5% 18+ (not provided)	Demographics Anti-trans discrimination: HHRDS; Depression & Anxiety: HSCL-25 Perceived social support: MSPSS	Suicidality: SBQ	• Anti-TGD discrimination was positively related to suicide ideation • Harassment & rejection were both positively associated with suicide ideation • Depression was a significant predictor of suicide ideation • Anxiety was not significantly related to suicide ideation or attempts • Depression was a mediator between discrimination & harassment & suicide ideation • Social support from significant other (not from

					family or friends) moderated experiences of harassment & rejection with suicide ideation (so buffers impact)
Turban et al. (2019) (USA, incl. Guam, American Samoa, & Puerto Rico & military bases)	Cross-sectional	*n=27715* Crossdresser: 2.6% Trans woman: 63.4% Trans man: 21.1% Nonbinary/genderqueer AFAB: 8.5% Nonbinary/genderqueer AMAB: 4.5% 18->65 years (M=31.2)	Demographics Lifetime exposure to GICE: binary Y/N; Experiencing GICE <10yrs; Binge Drinking during past month: >1 -day consuming >5 alcoholic drinks; Cigarette & illicit drug use (excl. marijuana); Psychological distress: K-10	Suicide ideation I in past year / SA requiring inpatient hospitalisation in past year; Lifetime suicide ideation & attempts	• 19.6% reported lifetime GICE exposure • Lifetime GICE exposure was significantly associated with severe psychological distress during previous month & lifetime suicide attempts • Recalled lifetime GICE exposure was also significantly associated with higher odds of lifetime suicide attempts • After adjusting for statistically significant demographics, GICE exposure <10yrs was significantly associated

					with increased odds of lifetime suicide attempts
Veale et al. (2017) (Canada)	Cross-sectional	*n*=923 Trans girls/women Trans boys/men Nonbinary AFAB Nonbinary AMAB 14-25 years (Not provided)	Demographics Enacted stigma: Enacted Stigma Index; Stress: Single items from General Wellbeing Schedule School connectedness: School Connectedness Scale; Family Connectedness: 7-items (non-validated); 19-25 yr. olds were given 8-item Parent Connectedness Scale; Friend Support: 1-item; Social Support: 19-25 yr. olds: Medical Outcomes Study Social Support Survey	Suicidality: NSSI, suicide ideation & attempts: Dichotomous Y/N	• Enacted stigma, discrimination, & harassment were all positive predictors of NSSI, suicide ideation & suicide attempts (especially for NSSI) • Social support was negatively associated with NSSI, suicide ideation & suicide attempts • For 14–18-year-olds: family connectedness was the strongest protective factor

Veale et al. (2021) (Aotearoa/New Zealand)	Cross-sectional	*n*=610 Trans and nonbinary 14-83 years (M=32.1)	Demographics GICE: 1-item; Mental Health: K10; Family rejection: GMSR (1-item); Internalised transphobia: 3-items from Gender Identity Self-Stigma Scale	NSSI, suicide ideation & attempts: using questions from the NZ Youth 2000 series: No to more than 5 times (5-point scale)	• GICE exposure x 2 increased odds of NSSI & suicide ideation • GICE exposure was associated with 4x increased odds of suicide attempts
Wang et al. (20210 (China)	Cross-sectional	*n*=1293 Transgender & gender queer 13-29 years (M=21.93)	Demographics Depression: CESD-9; Anxiety: GAD-7; Presence or absence of parental psychological abuse; Self-esteem: RES	Suicide & self-harm risk: 4-items	• Trans women were at increased suicide and self-harm risk compared to trans men & gender queer people • Parental abuse was significantly associated with suicide & self-harm risk • Parental psychological abuse/neglect was significantly associated

					with risk of suicide & self-harm • Depression was significantly associated with self-harm & suicide in trans women & gender queer people
Woodford et al. (2018) (USA)	Cross-sectional	*n*=214 Transgender 18+ (M=22.83)	Demographics LGBTQ interpersonal microaggressions & victimisation on campus (frequency): 7-items incl. bathroom use & being referred to as old/natal gender; Victimisation: Sexual Orientation Victimisation Questionnaire	Suicide attempts: 1-item	• TGD people reported significantly more suicide attempts than cis-LGBQ peers • Victimisation was significantly associated with TGD suicide attempts • Resilience was significantly associated with decreased odds of suicide attempt • TGD environmental & interpersonal microaggressions were

					not significantly related to suicide attempts • Pride & outness (with gender identity) were not significantly associated with suicide attempts
Yadegarfard et al. (2014) (Thailand)	Cross-sectional (between groups)	*n*=260 Trans women: n=129 Cis men: n=131 15-25 years (M=20)	Demographics Family Rejection: 6-item measure designed for this study (no measure exists); Social Isolation: SSA; Loneliness: ICLA Loneliness Scale-Short; Depression: DASS-21 (short version); Sexual Risk Behaviour: 'series of questions'	Suicidal thoughts & attempts: PANSI	• Compared to cis people, TGD people reported significantly higher family rejection, lower social support, higher loneliness, higher depression, lower protective factors (PANSI-Positive) & higher negative risk factors (PANSI negative) related to suicide behaviour • Social Isolation was a significant predictor of TGD suicidal thinking

Yockey et al. (2020) (USA)	Cross-sectional	*n*=790 Transgender 18+ (not provided)	Demographics Interpersonal Violence: Y/N; Lifetime substance use (cigarettes, alcohol, vaping, & prescription drugs): 4-items Y/N	Suicidal Behaviours 3-items Y/N	• Gender, age, marital status, income, transgender status disclosure, & alcohol usage were all significantly associated with suicide ideation • Age, marital status, income, transgender status disclosure, & interpersonal victimisation were all significantly associated with suicide planning • Gender, victimisation, alcohol use, cigarette smoking, vaping, & use of illegal/prescription drugs were all significantly associated with suicide attempts

Yockey et al. (2022) (USA)	Cross-sectional	*n*=27715 Transgender, nonbinary, genderqueer and others 18+ (not provided)	Demographics Psychological victimisation and harassment: 1 item Y/N; Family support: 1-item 3-point scale	Past year suicide ideation: 1- item Y/N	• Older age (25-44 & 65+) was significantly associated with decreased suicide ideation in the past year • Asian/Pacific Islanders reported decreased suicide ideation compared to White people • Lower income was significantly associated with increased suicide ideation • Gender identity (nonbinary/genderqueer) was significantly associated with increased suicide ideation • Having a neutral or unsupportive family was significantly associated with increased suicide ideation

					• Victimisation & violence were significantly associated with suicide ideation
Zeluf et al. (2018) (Sweden)	Cross-sectional	*n*=796 Trans feminine: 19% Trans masculine: 23% Gender nonbinary: 44% Transvestite: 14% Missing: 0.2% 15-94 years (not provided)	Demographics TGD-related victimisation: 3-items (not specified); Stigma: SCS; Trans-related healthcare issues; 2-items; Change of legal gender: 1-item; Illicit drug use & risky alcohol consumption: 1-item each Life Satisfaction: Life Satisfaction Scale; Social Support: 1-item; Practical support: 1-item;	Past year suicide ideation: Yes once; yes, several times; No Lifetime suicide attempts: Yes, between past 2 weeks & 1 year ago; yes, more than a year ago; No	• Unemployment or long-term sick leave, country of birth other than Sweden, & risky alcohol consumption were significantly associated with suicide ideation • Older age was significantly associated with decreased risk of suicide ideation (older age offers some buffering effect against suicide ideation) • After controlling for above covariates: Offensive treatment in past 3-months, lifetime exposure to TGD-related

	Openness with trans identity: not specified	violence, less satisfaction with contacts with friends/acquaintances & less satisfaction with own psychological wellbeing were significantly associated with suicide ideation • Unemployment or long-term sick-leave, illicit drug use in past 6-months, & risky alcohol consumption were significantly associated with lifetime suicide attempts • After controlling for these variables: Offensive treatment in past 3-months, lifetime exposure to TGD-related violence & never having practical support remained significantly associated

			with lifetime suicide attempts • TGD-related victimisation was significantly associated with suicidality despite access to gender-affirming healthcare • Protective factors: legal gender recognition & access to gender-affirming healthcare were non-significant (though they measured desire to or whether it had begun, rather than completed medical transition) • There was no significant association between stigma & suicidality • There were no differences in suicidality between TGD experiences

						(identity) nor judicial status
• Zwickl et al. (2021) • (Australia)	• Cross-sectional	• *n=928* • Trans male: 26% • Trans female: 22% • Gender non-binary: 14% • Gender Queer: 4% • Agender:2% • Gender Fluid: 2% • Gender Neutral: 1% • Other - 3% • 18-79 years • (Median=28 years)	• Demographics • Access to gender affirming hormones; access to gender affirming surgery; Access to trans support groups (Y/N/Unsure); • Perceived discrimination from employment, housing, healthcare, &/or government services: items about different aspects of these factors;	• Self-harm & suicide attempts: 1-item each Y/N/prefer not to say	• States of residence within Australia & locality (rural vs. metropolitan) were not significantly different in the proportion of suicide or self-harm • Unemployment, depression, desiring gender-affirming surgery in the future, history of physical assault, & institutional discrimination (incl. discrimination while accessing healthcare, including gender affirming healthcare), in employment, housing, & accessing gov services) were all significantly associated with increased

	• Self-reported depression diagnosis: Y/N; • Physical assault: Y/N	odds of lifetime suicide attempts • Access to TGD support groups was not a significant protective factor • Being presumed male at birth was significantly associated with lower odds of lifetime suicide attempts • Physical assault was reported by 23% & was significantly associated with a 200% increase in lifetime suicide attempt odds • Unemployment was significantly associated with 55% higher odds of lifetime suicide attempts • Self-reported depression was significantly

		associated with 300% increased odds of suicide attempts • Not being able to access surgery was significantly associated with 73% increased odds of suicide attempts

Papers are ordered alphabetically:

Abbreviations:

ACSS = Acquired Capability Suicide Scale
ASAB = Assigned sex at birth
AUDIT = Alcohol Use Disorders Identification Test
BDI = Beck Discrimination Inventory
BIS = Body Investment Scale
Brief-DAST = Brief Drug Abuse Screening Test
BRS = Brief Resilience Scale
BSI = Brief Symptom Inventory
BSS = Beck Scale for Suicide Ideation
CAPA = Child & Adolescent Psychological Abuse Measure
LEC-5 = Lifetime Events Checklist for DSM-5
LOT-R = Life Orientation Test-Revised
MTDG = Male to different gender
MDS = Modified Depression Scale
MSPSS = Multidimensional Scale of Perceived Social Support
MTF = Male to Female
NHAI = Nungesser Homosexual Attitudes Inventory
NSSI = Nonsuicidal Self-Injury
PANSI = Positive & Negative Suicide Ideation Inventory
PDS = Perceived Discrimination Scale
PHQ-9 = Patient Health Questionnaire
POC = Person of Colour
PPES = Painful & Provocative Events Scale
PSS-Fa = Perceived Social Support-Family
PSS-Fr = Perceived Social Support-Friends
PTSD = Post-Traumatic Stress Disorder

CASSS = Child & Adolescent Social Support Scale
CES-D = Center for Epidemiological Studies Depression Scale
CBCL = Child Behavior Checklist
DASS-21 = Depression Anxiety Stress Scales
DHEQ = Modified Daily Heterosexist Experiences Questionnaire
DERS-SF = Difficulties in Emotion Regulation Scale-Short Form
DSHI – Deliberate Self-Harm Inventory
EDS = Everyday Discrimination Scale
FTDG – Female to different gender
FTM = Female to male
GAD-7 = Generalised Anxiety Disorder Scale
GCS = Gender Conformity Scale
GICE = Gender Identity Change Efforts
GMSR = Gender Minority Stress & Resilience Measure
HADS = Hospital Anxiety & Depression Scale
HBDS = Hamburg Body Drawing Scale
HRD = Harassment, rejection & discrimination
RFL = Reasons for Living Inventory
RHAI = Revised Homosexuality Attitude Inventory
RHM = Reactions to Homosexuality Measure
RHS = Reactions to Homosexuality Scale
RSA =Resilience Scale for Adults
RSE = Rosenberg Self-Esteem Scale
SBQ-R = Suicide Behaviors Questionnaire-Revised
SCL-90-R = Symptom Checklist 90-Revised
SCS = Stigma Consciousness Scale
SHBQ = Self-harm Behaviors Questionnaire
SHI = Self-Harm Inventory
SIDAS = Suicidal Ideation Attributes Scale
SITBI = Self Injurous Thoughts & Behaviors Interview
SIQ = Self-Injury Questionnaire
SIQ-TR = Self-Injury Questionnaire-Trauma Related
SRI-25 = Suicide Resilience Inventory-25
SS-A = Social Support Appraisals Scales
STI = Sexually Transmitted Infections
TAFE= Technical & Further Education
TAIM = Transgender Adaption & Integration Measure
TCS = Transgender Congruence Scale
TYC-GDS = Trans Youth CAN! Gender Distress Scale
TYC-GPS = Trans Youth CAN! Gender Positivity Scale
YRB = Youth Risk Behavior Survey
YSR = Youth Self Report

HRDS = Heterosexist, Rejection, & Discrimination Scale
HSCL-25 = Hopkins Symptoms Checklist-25
IHS = Internalized Homonegativity Subscale
IIP-32 = Inventory of Interpersonal Problems
INQ = Interpersonal Needs Questionnaire
INQ-R = Interpersonal Needs Questionnaire-Revised
ISAS = Non Suicidal Self-Injury and Inventory of Statements about Self-Injury
IPTS = Interpersonal Psychological Theory of Suicide
K-6 = Kessler Psychological Distress Scale-6
K-10 – Kessler Psychological Distress Scale-10

3.3.4. Assessment of Methodological Quality

Bias risk and methodological quality were assessed using the Newcastle-Ottawa Scale adapted for cross-sectional studies (Modesti et al., 2016), case-control and cohort studies (Wells et al., 2021). These assess bias risk in three areas: participant recruitment/selection, participant comparability, and outcome. Studies are awarded a maximum of 9-(cohort and case-control) or 10-points (cross-sectional). Studies are rated high (7-10 points), moderate (4-6 points), or low. (0-3 points) quality. These quality categories have been used in previous systematic reviews of suicidality and self-harm (Maksut et al., 2020; Williams et al., 2021). Two reviewers (KB & LM) independently assessed methodological quality of studies and achieved full agreement.

Thirty-six cross-sectional studies received a 'high' quality rating. The remaining thirty-seven were 'medium' quality, indicating some bias (results of quality assessment are presented in Table 8). Bias was associated in the following three areas. First, fifty-three studies omitted data comparing respondents and non-respondents, which is important to increase external validity of results (Hansen et al., 2014). Second, twenty-seven cross-sectional studies did not control for confounding variables. Future studies should control for covariates to ensure their impact on findings is understood and accounted for (Pourhoseingholi et al., 2012). Finally, sixty-three studies did not justify sample size despite most having in excess of 200-participants. Including a power analysis would be an effective way for future studies to improve in terms of quality.

The case-control study (Davey et al., 2016) was rated 'high' quality where bias related to outcomes ascertained using self-report methods. Finally, the cohort study (Kaplan et al., 2020) received a 'medium' rating where bias related to a selective participant sample and not controlling for covariates. Three studies used medical records (Leon et al., 2021; Mak et al., 2020) or chart review (Peterson et al., 2017) methods. No bias risk assessments exist for these methods, so quality assessment is not possible. However, as they provide valuable evidence regarding TGD self-harm, they were included. However, there are limitations to consider. For example, it is difficult to determine whether information was missed, misinterpreted, or mis-

recorded by clinicians, which may impact our understanding as establishing causal relationships between factors and outcomes is difficult (Panchek et al., 2007)**.** The heterogeneity of risk and/or protective factors investigated across eligible studies precludes meaningful results from a meta-analysis (Polihronis et al., 2022). Consequently, a narrative synthesis was used to describe and summarise findings.

Table 8.
Results of the risk of bias and quality assessments.

Cross-sectional studies:								
Author/s (Date)	**Representativeness of sample**	**Sample size**	**Non-respondents**	**Risk factor measure**	**Comparability**	**Assessment of outcome**	**Statistical test**	**Quality rating**
Arcelus et al. (2016)	Y	Y		YY		Y	Y	Moderate
Almazan et al. (2021)	Y		Y	Y	YY	Y	Y	High
Andrew et al. (2020)				YY		Y	Y	Moderate
Austin et al. (2020)	Y		Y	YY		Y	Y	Moderate
Azeem et al. (2019)	Y		Y	Y	Y		Y	Moderate
Barboza et al. (2016)	Y			Y	Y	Y	Y	Moderate

Başar & Öz. (2016)	Y				YY		Y	Y	Moderate
Bauer et al. (2015)	Y	Y			YY	YY	Y	Y	High
Becerra et al. (2021)	Y				YY	YY	Y	Y	High
Brennan et al. (2017)	Y				YY		Y	Y	Moderate
Bosse et al. (2022)	Y			Y	YY	YY	Y	Y	High
Budhwani et al. (2018)					Y	YY	Y	Y	Moderate
Burish et al. (2022)	Y	Y	Y		YY		Y	Y	High
Busby et al. (2020)	Y				YY	YY	Y	Y	High
Campbell et al. (2023)	Y					YY	Y	Y	Moderate

Cerel et al. (2021)	Y				Y		Y	Y	Moderate
Chen et al. (2019)	Y				YY		Y	Y	Moderate
Chen et al. (2020)	Y				YY		Y	Y	Moderate
Chinazzo et al. (2023)	Y				YY		Y	Y	Moderate
Claes et al. (2015)	Y				YY	Y	Y	Y	Moderate
Cogan et al. (2020)	Y			Y	YY		Y	Y	Moderate
Cogan et al. (2021a)	Y			Y	YY		Y	Y	Moderate
Cogan et al. (2021b)	Y				YY	YY	Y	Y	High
Cramer et al. (2022)	Y		Y		YY		Y	Y	Moderate

de Graaf et al. (2020)	Y	Y		YY		YY	Y	High
dickey et al. (2015)	Y			YY		Y	Y	Moderate
Drescher et al (2021)	Y			Y	YY	Y	Y	Moderate
Drescher et al. (2023)	Y			YY		Y	Y	Moderate
Edwards et al. (2019)	Y			YY	YY	Y	Y	Moderate
Goldblum et al. (2012)	Y			Y	Y	Y	Y	Moderate
Gower et al. (2018)	Y			YY	YY	Y	Y	High
Green et al. (2022a)	Y		Y	YY	YY	Y	Y	High

Grossman & D'Augelli (2007)	Y			YY	Y	YY	Y	High
Grossman et al. (2016)	Y			YY	YY	Y	Y	High
Jackman et al. (2018)	Y			YY		Y	Y	Moderate
Kaplan et al. (2016)	Y	Y		YY		Y		Moderate
Klein & Golub (2018)	Y		Y	Y	YY	Y	Y	High
Kota et al. (2020)	Y			YY	YY	Y	Y	High
Kuper et al. (2018)	Y			YY	YY	Y	Y	High
Maguen & Shipherd (2010)	Y			Y	YY	Y	Y	Moderate

Maksut et al. (2020)	Y				YY	YY	Y	Y	High
Marx et al. (2019)	Y	Y	Y	Y			Y	Y	Moderate
Moody & Smith. (2013)	Y				YY	YY	Y	Y	High
Parr & Howe. (2019)	Y				YY	YY	Y	Y	High
Perez-Brumer et al. (2015)	Y				YY	YY	Y	Y	High
Rabasco & Andover (2020)	Y				YY	YY	Y	Y	High
Ross-Reed et al. (2019)	Y				YY	YY	Y	Y	High
Russell et al. (2018a)	Y				YY	YY	Y		Moderate

Scheim et al. (2020)	Y		Y	YY	YY	Y	Y	High
Seelman. (2016)	Y		Y	Y	YY	Y	Y	Moderate
Snooks & McLaren (2020)	Y			YY	YY	Y	Y	High
Staples et al. (2018)	Y			YY	YY	Y	Y	High
Strauss et al. (2019)	Y			YY	YY	Y	Y	High
Strauss et al. (2020)	Y			YY		Y	Y	Moderate
Suen et al. (2018)	Y			Y		Y	Y	Moderate
Taliaferro et al. (2018)	Y			YY	YY	Y	Y	High
Taliaferro et al. 2019)	Y	Y	Y	Y	YY	Y	Y	High

Tebbe & Moradi. (2016)	Y			Y	YY		Y	Y	Moderate
Testa et al. (2012)	Y				Y	Y	Y	Y	Moderate
Testa et al. (2015)	Y		Y	Y	YY	Y	Y	Y	High
Toomey et al. (2018)	Y				Y	Y	Y	Y	Moderate
Treharne et al. (2020)	Y				YY	YY	Y	Y	High
Trujillo et al. (2017)	Y				YY		Y	Y	Moderate
Turban et al. (2019)	Y		Y	Y	Y	YY	Y	Y	High
Veale et al. (2017)	Y			Y	YY		Y	Y	Moderate
Veale et al. (2021)	Y				YY	YY	Y	Y	High
Wang et al. (2021)	Y				YY	YY	Y	Y	High

Woodford et al (2018)	Y	Y	YY	YY	Y	Y	High
Yadegarfard et al. (2014)	Y		YY		Y	Y	Moderate
Yockey et al. (2020a)	Y	Y	Y	YY	Y	Y	High
Yockey et al. (2020b)	Y	Y	Y	YY	Y	Y	High
Zeluf et al. (2018)	Y		YY	YY	Y	Y	High
Zwickl et al. (2021)	Y		Y		Y	Y	Moderate

Cohort/Longitudinal studies:

Author/s (Date)	**Representativeness of exposed cohort**	**Selection of non-exposed cohort**	**Ascertainment of exposure**	**Demonstration outcome of interest was not present at**	**Comparability of cohorts on basis of design or analysis (Max 2*)**	**Assessment of exposure**	**Was follow-up long enough for outcome**	**Adequacy of follow up of cohorts**	**Quality rating**

				start of study			**s to occur?**		
Kaplan et al. (2020)		Y	Y				Y	Y	Medium
Case-Control Studies:									
Author/s (Date)	**Case Definition Adequate**	**Representativeness of Cases**	**Selection of Controls**	**Definition of Controls**	**Comparability of cases & controls**	**Ascertainment of exposure**	**Same method for cases & controls**	**Non-response rate**	**Quality rating**
Davey et al. (2016)	Y	Y	Y	Y	YY		Y		High

NB. Ratings were in accord with the Newcastle-Ottawa Scales adapted for cross-sectional, case-control, and cohort & longitudinal studies.

3.3.5. Risk and Protective Factors for Self-Harm and Suicidality in TGD People

3.3.5.1. Protective Factors

Overall, few studies examined protective factors for TGD self-harm. The heterogeneity of protective factors investigated made it difficult to classify factors into domains. However, some themes were identified. These are social and/or family support, connectedness, and school-related factors. Due to heterogeneity of remaining protective factors, they were classified as TGD-specific and general protective factors.

3.3.5.1.1. Social and/or Family Support

Thirteen studies found a significant correlation between social, and/or family support and reduced TGD self-harm and suicidality (Barboza et al., 202016; Bauer et al., 2015; Cramer et al., 2022; Gower et al., 2018; Kaplan et a., 2016; 2020; Kota et al., 2020; Kuper et al., 2018; Marx et al., 2021; Moody & Smith, 2013; Treharne et al., 2020; Yadegarfard et al., 2014; Zeluf et al., 2018). Ross-Reed et al. (2019) also found family support correlated significantly with reduced suicide attempts and NSSI, though community and peer support were non-significant. Similarly, Trujillo and colleagues (2017) found partner support moderated risk, but family/friend support did not. A further study found perceived social support significantly associated with emotional stability which, in turn, was negatively associated with suicide risk (Edwards et al., 2020). However, independently there was no relationship between social support and suicide risk.

Both Zeluf et al. (2018) and Yockey et al. (2022) found receiving neutral or no support correlated with increased risk of self-harm, suggesting receiving positive social support may reduce risk. Only five studies reported non-significant findings (Burish et al., 2023; Chinazzo et al., 2023; Claes et al., 2015; Jackman et al., 2018; Tebbe & Moradi, 2016), though participants with self-harm history in Claes and colleagues (2015) study received less support than people without self-harm history. Overall, findings provide compelling evidence of the protective and mitigating nature of social support on TGD self-harm and suicidality and highlight the importance of TGD people having accessible avenues of support.

Further, they align with findings from a recent scoping review examining the role of peer support in reducing TGD suicide risk (Kia et al., 2021).

3.3.5.1.2. Connectedness

Three studies found parental connectedness associated with significantly lower odds of self-harm and/or suicidality (Gower et al., 2018; Taliaferro et al., 2018; 2019). Two further studies found connectedness to non-parental adults a significant protective factor (Taliaferro et al., 2018; 2019). Brennan et al., 2017) found community connectedness a marginally negative predictor of suicide attempts. However, two studies found no correlation (Burish et al., 2023; Cogan et al., 2020). Surprisingly, transgender community connectedness was non-significant (Jackman et al., 2018). Two studies investigated social connectedness with mixed results. One study each found social connectedness a non-significant (Busby et al., 2020) and significant (Brennan et al., 2017) protective factor. 'Friend caring' was investigated by two studies. This was included as a connectedness factor in line with previous studies of self-harm in minority youth (Hawton et al., 2022). A study each found 'friend caring' significantly (Taliaferro et al., 2019) and non-significantly (Taliaferro et al., 2018) correlated with reduced self-harm and suicidality. Overall, evidence presented indicates connectedness may be an important protective factor against TGD self-harm and suicide risk.

3.3.5.1.3. School-Related Protective Factors

Three studies found feeling safe at school significantly correlated with reduced suicidality (Gower et al., 2018; Taliaferro et al., 2018; 2019). The 1-item scale used to measure school safety was ambiguous, so it is unclear whether school safety relates to TGD-specific or general school safety. Additionally, its ambiguity possibly elicited participant responses which were either TGD-specific and general, or both, so further clarity here is important. School belonging was also a significant factor (Marx et al., 2021). Other school-related factors investigated were teacher/school adult relationships (Gower et al., 2018; Taliaferro et al., 2018; 2019), sports participation, and involvement with school activities (Taliaferro et al., 2019). Considering the protective nature of

school safety there was, surprisingly, no correlation between these factors and reduced self-harm. Possibly, a safe school environment offers more protection than individual associated factors. Also, effects may be limited to students in these studies and further research may yield different results. However, the evidence presented here suggests ensuring a safe school environment for TGD students may provide a key self-harm and suicide prevention opportunity.

3.3.5.2. Risk Factors

Investigated risk factors also varied greatly, however there was some homogeneity. These were assigned sex at birth (ASAB), age, race/ethnicity, income, education level, gender identity, and depression or depressive symptoms, drug and alcohol use, gender-minority stressors, victimisation, and discrimination. The remaining risk factors were investigated by fewer than five studies. These are listed in Table 7.

3.3.5.2.1. Assigned Sex at Birth

Eleven studies examined ASAB. Of these, eight found being assigned female at birth (AFAB) significantly correlated with lifetime and current NSSI/suicide attempts (Arcelus et al., 2016; Cerel et al., 2021; Claes et al., 2015; de Graaf et al., 2020; Leon et al., 202; Maguen & Shipherd, 2010; Strauss et al., 2019; Taliaferro et al., 2019). Additionally, Jackman et al. (2018) found transgender men were significantly more likely to use NSSI to reduce 'bad feelings'. Given their identity, these participants were likely AFAB. Two studies found no significant correlation (Bosse et al., 2023; Suen et al., 2018), while Zwickl et al. (2021) reported being assigned male at birth was associated with lower odds of suicide attempts. Finally, one study (Kuper et al., 2018) reported birth-assigned sex a significant predictor of suicide, though which birth-assigned sex was not clarified. However, overall, findings indicate TGD people AFAB are in particular need of support.

3.3.5.2.2. Age

Twenty-four studies investigated age as a risk factor. Six reported no significant correlation between age and self-harm and/or suicidality (Azeem et al., 2019; Kaplan et al., 2016; Leon et al.,

2021; Perez-Brumer, 2015; Rao Azeem et al., 2019; Treharne et al., 2020; Zeluf et al., 2018) and one (Peterson et al., 2017) found older age associated with increased suicide attempts. The remaining studies found younger age significantly correlated with self-harm and/or suicidality (Bosse et al., 2023; Brennan et al., 2017; Budhwani et al., 2017; Cerel et al., 2021; Claes et al., 2015; Davey et al., 2016; Goldblum et al., 2012; Jackman et al., 2018; Klein et al., 2016; Kuper et al., 2018; Maguen & Shipherd, 2010; Mak et al., 2020; Maksut et al., 2020; Suen et al., 2018; Toomey et al., 2018; Yockey et al., 2020; 2022). This is in line with evidence regarding self-harm/suicidality in the general population (Beckman et al., 2018) and highlights the need for interventions targeting young TGD people.

3.3.5.2.3. Depression or Depressive Symptoms

Nineteen studies investigated depression or depressive symptoms. Seventeen reported a significant correlation between depression or depressive symptoms and self-harm and/or suicidality (Arcelus et al., 2016; Azeem et al., 2019; Budhwani et al., 2017; Chen et al., 2019a; 2020; Chinazzo et al., 2023; dickey et al., 2015; Kuper et al., 2018; Leon et al., 2021; Strauss et al., 2019; Taliaferro et al.,2018; 2019; Tebbe & Moradi, 2016; Trujillo et al., 2017; Wang et al., 2021; Yadegarfard et al., 2014; Zwickl et al., 2021). Two reported no correlation (Kaplan et al., 2016; Kota et al., 2020). However, one of these (Kaplan et al., 2016) reported 55% of participants with suicide attempt history also experienced depressive symptoms suggesting a possible relationship. Overall, these findings indicate depression and depressive symptoms are a significant risk factor for self-harm and suicidality and are a key intervenable target.

3.3.5.2.4. Physical and Sexual Assault

Both sexual assault/rape (Becerra et al., 2021; Cogan et al., 2021; 2021a; Cramer et al., 2022; Drescher et al., 2021; Maksut et al., 2020; Marx et al., 2021; Strauss et al., 2020; Testa et al., 2012) and physical assault (Chen et al., 2020; Leon et al., 2021; Seelman, 2016; Strauss et al., 2020; Taliaferro et al., 2018; 2019; Testa et al., 2012; Yockey et al., 2020; Zwickl et al., 2021) are strongly correlated with TGD self-harm. All studies examining these factors recorded significant results. These results are deeply concerning

but unsurprising considering TGD people experience high rates of both sexual and physical violence (Testa et al., 2012). Supporting TGD who experience physical or sexual assault is likely to be an essential self-harm reduction strategy and will reduce the wider negative impact on mental health and wellbeing.

3.3.5.2.5. Illicit Drug and Alcohol Use

In total, four (Barboza et al., 2016; Chen et al., 2020; Yockey et al., 2020; Zeluf et al., 2018) of six (Barboza et al., 2016; Chen et al., 2020; Kota et al., 2020; Tebbe & Moradi, 2016; Yockey et al., 2020; Zeluf et al., 2018) studies reported alcohol use associated with self-harm. Similarly, six (Azeem et al., 2019; Budhwani et al., 2017; Tebbe & Moradi, 2016; Marx et al., 2021; Yockey et al., 2020; Zeluf et al., 2018) of eight (Azeem et al., 2019; Budhwani et al., 2017; Kota et al., 2020; Maguen & Shipherd, 2010; Marx et al., 2021; Tebbe & Moradi, 2016; Yockey et al., 2020; Zeluf et al., 2018) studies found illicit drug use correlated with self-harm. These findings are in line with the general population (Tebbe & Moradi, 2016) and strongly indicate reducing drug and/or alcohol use is likely to be important in reducing self-harm risk in TGD populations. Drug and alcohol use may also be linked to other mental health outcomes and self-harm risk factors (Budhwani et al., 2017; Gower et al., 2018). Therefore, identifying whether drugs and/or alcohol are being utilised and addressing their use may have wide-reaching health and wellbeing benefits for TGD people.

3.3.5.2.6. Gender-Minority Stressors

All seven studies (Barboza et al., 2016; Brennan et al., 2017; Cogan et al., 2021; 2021a; Kuper et al., 2018; Rabasco & Andover, 2020; Testa et al., 2017) examining gender-minority stressors reported significant relationships with self-harm and suicide-related outcomes. Six used the Gender-Minority Stress-Resilience Measure which examines the impact of proximal (internalised transphobia, negative expectations of future events, concealment of gender identity) and distal (gender-related discrimination, rejection, victimisation, non-affirmation of gender identity) stressors. Two studies reported distal stressors were significant predictors of suicide ideation, attempts, or risk (Brennan et al., 2017; Cogan et al., 2021a) and were associated with proximal

stressors (Cogan et al., 2021a). However, one was a weak predictor (Brennan et al., 2017). Two of the studies reported proximal factors were significant predictors of suicide risk (Cogan et al., 2021; 2021a). Other studies focused on the individual stressors of gender-related victimisation (Barboza et al., 2016; Kuper et al., 2018; Rabasco & Andover, 2020) and discrimination (Barboza et al., 2016) which were all significantly associated with suicide ideation and attempts. Finally, Testa et al. (2017) found an indirect path between rejection and suicide ideation through internalised transphobia and negative expectations, and an indirect path between identity non-affirmation to suicide ideation through internalised transphobia. Further, they found both internalised transphobia and negative expectations were significantly correlated with suicide ideation. Identity nondisclosure, however, was not significant in any pathway.

Overall, sixteen studies examined discrimination as a distinct risk factor. Two found no correlation (Burish et al., 2023; Kaplan et al., 2016). However, fourteen reported a significant correlation between discrimination and self-harm (Barboza et al., 2016; Brennan et al., 2017; Chen et al., 2019a; Chinazzo et al., 2023; Cramer et al., 2022; Drescher et al., 2023; Maksut et al., 2020; Rabasco & Andover, 2020; Strauss et al., 2019; Testa et al., 2017; Treharne et al., 2020; Trujillo et al., 2017; Veale et al., 2017; Zwickl et al., 2021). A further study did not investigate a correlational relationship but reported TGD people experienced high levels of discrimination. The authors state this is the primary reason for mental health difficulties in TGD people (Chen et al., 2020), a notion supported by others (Trujillo et al., 2017). As a distinct factor, victimisation was examined by eleven studies. Of these, ten reported a significant correlation between victimisation and self-harm (Becerra et al., 2021; Cramer et al., 2022; Goldblum et al., 2012; Marx et al., 2021; Staples et al., 2018; Taliaferro et al., 2018; Testa et al., 2017; Yockey et al., 2020; Woodford et al., 2018; Zeluf et al., 2018), and only one (Busby et al., 2020) reported no correlation. The findings presented here suggest gender-minority stressors, particularly victimisation and discrimination, are consistently significant in their impact on self-harm. Efforts to reduce these negative experiences and ensure their impact is identified and mitigated during interventions, will be key to addressing TGD self-harm.

3.3.5.2.7. Other Risk Factors

Race/ethnicity, income, education level, and gender identity were also examined. However, results were ambiguous. The mixed findings indicate no racial or ethnic group within the TGD community is at increased risk. Further, the heterogeneity in gender identities examined precludes further examination by gender identity. Findings also suggest income, education level, and gender identity are likely not salient risk factors for TGD self-harm or suicidality. However, because findings are mixed, we recommend researchers continue capturing these data to provide further clarity. Despite the ambiguity of findings here, clinicians should identify whether these factors are present as they may provide intervenable targets for some TGD people.

3.4. Discussion

This review examined and synthesised extant literature of self-harm risk and protective factors in TGD people. Clearly, TGD people experience a complex, nuanced pathway to self-harm. Three key protective (social and family support; connectedness to parents and other adults; school safety) and six risk (younger age; AFAB; depression/depressive symptoms; physical and sexual assault; drug and alcohol use; gender-minority stressors, particularly victimisation and discrimination) factors were identified. Conclusions from this review are somewhat limited due to factor heterogeneity, self-harm-related definitions, and outcome measures used. Further, replication of studies is lacking so conclusions and recommendations are made with some caution. Despite factor heterogeneity across 78 eligible studies, some crucial protective and risk factors for TGD self-harm were identified. These are important factors for clinicians to discuss with patients to create tailored, person-centred interventions (Abdelraheem et al., 2019).

3.4.1. Key Protective Factors

Protective variables presented are possible resilience factors due to their correlation with lower odds of self-harm. Social and/or family support and connectedness, especially to parents and adults, are key protective factors against TGD self-harm. This is in line with existing evidence of the protective impact of support

and connectedness on TGD suicidality (Kia et al., 2021). Family and social support may also mediate relationships between self-harm and other correlating risk factors. For example, parent connectedness has been associated with reduced substance use (Gower et al., 2018). Therefore, encouraging and supporting TGD people to utilise existing support networks may be a key self-harm reduction strategy and reduce risky behaviours (such as substance use) associated with self-harm and wider negative health outcomes in TGD people. Additionally, family/parent counselling and support groups may foster support of TGD people, thus increasing wellbeing and addressing self-harm risk.

Furthermore, TGD people lacking support (i.e., homeless; temporary housing; socially isolated; rural) need particular attention. The level and quality of existing support should be among the first factors to be established when supporting TGD people seeking help for self-harm/suicide-related behaviours. There may be differences between types of support and connectedness which should be explored in future research. For example, compared to the protective nature of parental support the impact of wider community support is less clear. This may be because negative views of TGD people differs between places or the local TGD community in included studies may be small or inaccessible which impacts how connected TGD people feel to their wider community. Understanding this will be useful to develop strategies to support TGD people and stigma-reduction programmes for the wider community.

School safety also emerged as a protective factor. These findings are supported by a recent systematic review of the role of school on LGBTQ+ students' suicidal thoughts and behaviours (Taliaferro & Muehlenkamp, 2017). TGD youth experience gender-identity-based hostility, victimisation, and harassment in school which cis youth do not (Gower et al., 2018). Therefore, schools which foster a TGD-safe environment may mitigate these experiences and TGD students' self-harm risk. Creating safe spaces, being supportive of TGD students, staff/teacher training, and reducing stigma, discrimination, transphobia, and bullying in schools are strategies education settings can be implemented to engender a safe environment for their TGD students. However, findings would benefit from replication and longitudinal examination to provide a stronger evidence-base and causal effects of these protective

factors. Further, these studies were all performed in the USA which may yield findings specific to the USA, or, indeed, individual US states. The presence or absence of gender-affirming school policies in other countries may yield different results and highlight the differences between different gender-affirming school policies and their impact on TGD wellbeing and self-harm.

3.4.2. Key Risk Factors

Overall, evidence from this systematic review shows younger age and people AFAB are at increased risk of self-harm/suicidality. These correlations correspond with evidence of increased risk in young people and adolescents and cis females (Beckman et al., 2018). It is interesting that increased risk is related to being AFAB and not gender identity. Possibly, there are biological factors associated with being AFAB regardless of gender identity (Peterson et al., 2017) or social learning effects relating to high rates of self-harm in people AFAB (Leon et al., 2021). There were differences in age groups investigated. However, some studies did not specify ages, making it difficult to identify whether TGD people are at increased risk at certain ages. Future research should report age-related data in detail to evidence whether certain age-groups are at particular risk. However, the evidence presented suggests the risk for younger TGD people AFAB remains high. Drug and alcohol use is also a key factor. Substance use in TGD people is often linked to other risk factors for self-harm (e.g., victimisation; Marx et al., 2021), so it may be a maladaptive coping mechanism employed to enable people to cope with other stressors. However, the relationship between substance use and increased self-harm and suicide outcomes is concerning. Therefore, establishing the presence of substance and alcohol use during intervention should be quickly established and may have wider benefits for TGD people.

Concerningly, TGD exposure to both physical and sexual assault are high (Becerra et al., 2021), and, unsurprisingly, are key factors for TGD self-harm. TGD people face significant barriers, including further victimisation, when assaults are reported to police (Testa et al., 2012), which may further increase self-harm risk. Addressing these barriers and ensuring reported TGD assaults are taken sympathetically and seriously by police is likely to be key in reassuring TGD victims of physical and sexual assaults and may

also act as a buffer against self-harm. Efforts to reduce sexual and physical assault exposure and provide resources and support are necessary to improve self-harm and wellbeing outcomes in TGD people. Also, in accord with self-harm in the general population (McManus et al., 2019), depression is a key risk factor. Depression is highly prevalent in TGD people (Russell et al., 2018a; Zwickl et al., 2021) and often associated with other self-harm risk factors. For example, Azeem and colleagues (2019) suggest the comorbidity between depression and substance (alcohol and drug) use may be due to substances being used as a maladaptive coping mechanism to combat depression and other mental health difficulties. However, while there may be temporary respite, substance use instead increases self-harm risk (Azeem et al., 2019). Consequently, substance use treatment programmes may be a good way to reduce depression and self-harm and improve wider TGD health outcomes.

Finally, gender-minority stressors (internalised transphobia, negative expectations of future events, concealment of gender identity, gender-related discrimination, rejection, victimisation, non-affirmation of gender identity) are key risk factors for self-harm in TGD people. Discrimination and victimisation are particularly important. Both are highly prevalent in TGD people (Drescher et al., 2023; Miller & Grollman, 2015) and may be linked to wider negative health outcomes (Miller & Grollman, 2015) alongside self-harm. This is in accord with the Gender Minority Stress Model (GMS) (Hendricks & Testa, 2012) which posits the high rates of mental distress and disorders experienced by TGD people (including self-harm) relate to TGD-specific factors, such as discrimination. Consequently, TGD-specific factors may be key in understanding TGD self-harm risk (Tebbe & Moradi, 2016). Furthermore, TGD-specific factors may act as mediators between self-harm and other risk factors, such as drug and alcohol use (Miller & Grollman, 2015). Therefore, discrimination- and victimisation-reduction policies may be key to mitigating TGD self-harm. However, overall, studies included in this systematic review examined general self-harm factors (e.g., depression, age). TGD people are at increased risk of self-harm, and the GMS offers an explanation for this increased risk, however the current evidence-base largely focuses on general factors, not TGD-specific factors. Consequently, there is insufficient evidence to make claims regarding the importance of TGD-specific factors to TGD self-

harm. Further examination of TGD-specific factors is essential to ascertain whether TGD-specific factors explain the increased self-harm risk TGD people experience. Moreover, examining other gender-minority stressors within the GMS model (i.e., rejection, gender non-affirmation etc.) will be useful to explore the GMS model further and to establish the effects of these identity-related risk factors on TGD self-harm.

3.5. Limitations

This chapter identifies some important risk and protective factors for TGD self-harm which provide important intervenable targets. However, there are limitations to consider. First, that few measures are validated in TGD populations is concerning and may mean we lack a clear picture of which factors impact the self-harm pathway for TGD people. It is essential measures are developed for and validated in the populations they investigate for evaluations to be meaningful (King et al., 2020). Considering this, we recommend researchers in the field commit to validating measures in TGD populations to ensure they appropriately capture TGD experiences and meaningful intervenable targets can be identified. Second, the significant heterogeneity of factors investigated means they do not provide a robust evidence-base on which to make recommendations regarding potential intervenable targets. Further, heterogeneity meant meta-analysis of reported effect sizes was impossible. Replicating studies would further support conclusions presented here and identify the salience of other possible risk and protective factors for TGD self-harm. Additionally, TGD-specific factors are under-researched. Therefore, the impact these have on TGD self-harm is unclear and the extant evidence is not sufficient to explain the increased self-harm risk experienced by TGD people, nor provide further support for the GMS model. We recommend research of TGD-specific self-harm factors to address this deficit in understanding.

Further, there was significant variation in self-harm-related outcome measures. This is representative of the difficulty measuring self-harm outcomes highlighted by others (Papadima, 2019). Moreover, the exclusion criteria and excluding grey literature, qualitative research, and PhD theses, possibly excluded potentially informative studies. For example, studies unavailable

in English were excluded. This potentially limits the generalisability of the review findings to Western and/or English-speaking nations. Though studies from Pakistan, Lebanon, China, Hong Kong, and Dominican Republic, and others, were included and provide some generalisability. However, findings may not be generalisable to developing countries. Also, findings may not be generalisable to all TGD people as data regarding transition status and gender identity was insufficient to analyse. There may be differences between people at different stages of transition or of different gender identities. More robust evidence to clarify this may provide further opportunities for targeted support. The exclusion of doctoral theses, and grey and qualitative literature was guided by other systematic reviews in the area to prioritise methodological rigour, replicability, and feasibility. However, exclusion may have limited the breadth of evidence relating to TGD self-harm and TGD-specific risk and protective factors. Qualitative research, for example, offer rich and contextualised insight into complex lived experiences (Lim, 2024) and, therefore, may offer insight into factors important to TGD self-harm (e.g., gender minority stressors; Cogan et al., 2021; 2021a) that may not be captured by structured quantitative research. Grey literature and doctoral theses often address emerging and/or under-researched topics, (e.g., TGD mental health), and can incorporate community-based or participatory approaches which provide nuanced context of key factors for self-harm (e.g., social affirmation, gender-affirming environments) (Bagnall et al., 2025; Christensen et al., 2022) which could enhance understanding of key antecedents and protective factors. Excluding these sources may mean the narrative analysis presented here possibly overlooked or under-discussed important evidence and early-stage findings, and reduce our understanding of specific, or unique, constructs underpinning TGD self-harm. This is particularly relevant considering the historic under-representation of TGD people in published, peer-reviewed research (Bird et al., 2024; Williams et al., 2021). Including these sources may have added important, group-specific context to the findings presented here, and their exclusion results in constraint on the conclusions drawn from these findings. Future reviews could complement this review by including qualitative, grey, and thesis literature, using established frameworks (e.g., CASP, 2018, for qualitative studies) to balance inclusivity with quality and replicability.

Finally, the cross-sectional methodology employed by almost all included studies means causation cannot be determined. Future research should consider designing studies which examine causal, longitudinal, and temporal relationships between factors and self-harm outcomes. Additionally, case-control studies would provide comparisons of self-harm correlates between TGD and cisgender/heterosexual people which would provide insight into factors distinguishing the two populations and may provide support for the GMS model and explain the disparity between self-harm risk in cisgender/heterosexual and TGD populations.

3.6. Conclusion

Self-harm, and suicidal thoughts and behaviours, are common among TGD people. Investigated across 78 eligible studies, three protective and six risk factors for TGD self-harm were identified. Salient risk factors are younger age, being assigned female at birth, physical and sexual abuse, drug and alcohol use, depression or depressive symptomology, and gender-minority stressors (especially discrimination and victimisation). Protective factors are social and family support, connectedness (particularly to parents and adults), and school safety. If present, these factors provide important targets for prevention and intervention. Future research should seek to reduce heterogeneity by investigating lesser-researched factors, especially TGD-specific factors. This may identify other key factors for TGD self-harm and explore why TGD people experience increased self-harm risk. The evidence here shows TGD people experience a unique, complex pathway which needs further examination to ensure intervention is appropriate and meaningful to reduce self-harm risk in this high-risk group.

This review chapter identified factors which are important targets for intervention. Most factors were general, rather than TGD-specific, and most were already included in the novel self-harm research tool CaTS, introduced in Chapter 1 (section 1.5) (e.g., depressive symptomology, drug/alcohol use, physical abuse). However, some key factors identified in this chapter are not currently included in CaTS (e.g., sexual abuse, gender minority stressors). The results presented here indicate these may be meaningful additions to CaTS to ensure it adequately captures

TGD self-harm. Given the heterogeneity and lack of consistent associations among the other factors examined, no specific, modifiable targets for intervention could be identified, nor could any evidence-based additions to CaTS could be recommended at this stage. This does not mean, however, that other factors are not salient to TGD people, rather the lack of clarity likely reflects the heterogeneity of factors examined across included studies. In Chapter 4, I present a qualitative study which sought to provide further context to TGD self-harm and explore whether participants could identify meaningful additions to CaTS to enhance its inclusivity.

Chapter 4

Co-developing the CaTS-E: thematic analysis of content updates for the Card Sort Task for Self-Harm (CaTS) with people with lived self-harm experiences

This chapter has been published in JMIR Mental Health as a two-phase co-production study with Chapter 6: **Bird, K.,** Greentree, I., O'Shea, B., & Townsend, E. (2025). Co-Developing Content Updates for the Card Sort Task for Self-Harm–Digital (CaTS-D) With People With Lived Self-Harm Experiences: Pilot Study and Thematic Analysis. *JMIR Mental Health*, *12*(1), e71296.

Additionally, I co-authored a paper which discussed recruitment and fake participant issues experienced during this chapter: French, B., Babbage, C., **Bird, K.,** Marsh, L., Pelton, M., Patel, S., ... & Rennick-Egglestone, S. (2024). Data integrity issues with web-based studies: an institutional example of a widespread challenge. *JMIR Mental Health*, *11*(1), e58432. (doi:10.2196/58432).)

The factors identified in Chapter 3 may be important additions to CaTS to ensure its inclusivity and relevance to TGD people. However, the heterogeneity of factors examined across studies meant the findings of the systematic review are limited to the factors examined by researchers. It is possible, perhaps even likely, that other meaningful factors are important in the TGD self-harm pathway. Quantitative methodology does not allow identification of factors beyond what is the focus of a particular study. For example, if a study examines depression participants are not given opportunity to discuss additional salient factors which may enhance our understanding of TGD self-harm. This empirical qualitative study sought to capture participants views of CaTS, including whether additional cards were necessary to ensure CaTS contains meaningful factors which can better describe the TGD self-harm pathway.

Initially, considering the dearth of TGD-specific self-harm research (Bird et al., 2024; Williams et al., 2021), particularly longitudinal research (Vigny-Pau et al., 2021), the original focus of this PhD thesis was TGD people. The interview study (Chapter 4) was first advertised in TGD and LGBTQIA+-safe spaces, including charities

and other support organisations, the LGBTQIA+ Psychology Network, and the University's SONA system. These efforts were entirely unsuccessful and led me to advertise the study online, in particular on Reddit. I was immediately inundated with potential participants, but I quickly realised they were not real participants. For example, all respondents had similarly structured email addresses (i.e., firstname_secondname followed by a series of numbers), and all were Gmail accounts, which seemed an unlikely coincidence. Despite initial suspicions, study information was emailed, and potential participants were asked to provide informed consent and return a completed wellbeing form. Those that were returned contained information which further raised concerns about their genuity. Largely, this was due to wellbeing plans being returned signed but minus any required information or contained information such as a mobile phone number for a GP, or a hotel or industrial address as a home address. These led me to suspect these participants were not genuine. Subsequently, I did not pursue their recruitment further. Fortunately, these fake participants were identified before participation, so little time, and no funding, were wasted.

However, I had to reconsider the focus of my PhD. After speaking with my supervisors, it was decided I should widen the PhD focus and recruitment efforts to include the wider LGBTQIA+ umbrella, though recruitment was also largely unsuccessful. My supervisory team and I then opted to widen the focus again to also include cisgender/heterosexual people. This recruitment drive was successfully aimed at cisgender/heterosexual and LGBTQIA+ populations. While this led to changes in the research population, the initial focus on TGD populations remains valuable. The earlier studies (Chapters 2 & 3) provided important findings regarding the elevated self-harm risk experienced by TGD people, and what underpins it, and highlight the need for further research in TGD populations. Furthermore, it informed the design of the remaining thesis studies.

4.1 Introduction

Historically, factors for self-harm have been investigated in isolation (Stanford et al., 2018; Townsend et al. 2016), which limits our understanding of the temporal dynamics between multiple self-harm factors and whether co-occurring factors

mediate or mitigate self-harm risk. Understanding complex temporal dynamics between risk and protective factors is recommended by researchers (Cipriano et al., 2017; Stanford et al., 2018; Whitlock et al., 2013). The Card Sort Task for Self-Harm (CaTS; Townsend et al., 2016) was developed to address these issues by using 117-cards which participants use to describe their self-harm pathway over time using seven timepoint cards (6-months prior, 1-month prior, 1-week prior, 1-day prior, 1-hour prior, I self-harmed, and afterwards) and 106-cards with self-harm-related thoughts, behaviours, feelings, events, and self-harm supports/services. However, since CaTS' creation in 2013, novel factors have emerged which need including to ensure CaTS remains a relevant and appropriate research tool. For example, recent systematic (Dyson et al., 2019) and narrative (Biernesser et al., 2020) reviews reported emerging evidence of both positive and negative effects of social media usage on self-harm.

Additionally, evidence indicates self-isolation, financial hardship, and loneliness resulting from the Covid-19 pandemic and associated restrictions may increase self-harm and suicidal thoughts and behaviours (Farooq et al., 2021). Consequently, cards allowing participants to document the impact of new factors emerging since 2013 may be important additions. Furthermore, some cards may need re-wording or updating to incorporate changing social views and our understanding of self-harm. The National Institute for Health and Care Research (NIHR) in the UK emphasizes Patient Participation and Involvement (PPI) in all funded research. Also, the continued development of CaTS in collaboration with people with lived experience is recommended by other researchers utilising CaTS (Lockwood et al., 2023).

4.1.1. Adapting CaTS for High-Risk Groups – LGBTQIA+ Individuals

There is increasing awareness that LGBTQIA+ (Lesbian, Gay, Bisexual, Transgender, Queer/Questioning, Intersex, Asexual, and other gender identities/sexualities; Lewis & Reynolds, 2021) people are at increased risk compared to their cisgender (someone whose gender identity aligns with their birth-assigned gender and body; Zhang et al., 2021) and heterosexual (Jackman et al., 2016; Liu et al., 2019) peers. Lifetime LGBTQIA+ self-harm

prevalence estimates between 49.5% and 65.35% have been reported (Gnan et al., 2019; Jadva et al., 2023). High prevalence rates demonstrate the need for meaningful research tools capable of examining and identifying antecedents to LGBTQIA+ self-harm. However, many tools and measures used to examine LGBTQIA+ mental health are often cis- and hetero-centred and may not capture LGBTQIA+ experiences adequately (King et al., 2020; Morrison et al., 2016). Other researchers have sought to adapt CaTS for other high-risk populations, including autistic people (Pelton et al. Unpublished Manuscript). Co-producing self-harm tools and measures alongside people with lived experience is highly valuable and recommended by researchers in the field (Marsilio et al., 2021; Morrison et al., 2016). Considering the increased risk of self-harm LGBTQIA+ people face (Jackman et al., 2016; Liu et al., 2019a), it is important to identify whether CaTS requires amendments or additions to ensure it contains meaningful, relevant factors for people who identify as LGBTQIA+.

4.1.2. Research Aims

Chapter 4 presents findings from a qualitative interview study with cisgender-heterosexual and LGBTQIA+ people with a history of self-harm who were asked their views on CaTS. These included the relevance of cards, the timeline, clarity, language, and wording on cards, and whether participants felt amendments or additions to CaTS were needed. We also asked whether LGBTQIA+-specific additions were needed to allow LGBTQIA+ people to best document their self-harm pathway using CaTS. These findings are important to ensure CaTS is contemporary, sensitive, and appropriate for use in a diverse population which is essential for CaTS to remain a useful, meaningful, and inclusive self-harm research tool.

4.2 Method

4.2.1 Recruitment

Semi-structured one-on-one interviews were conducted online with people with experienced self-harm. Ethical approval was received from the University of Nottingham's Ethics Committee (S1557). Participants were recruited via social media and via

existing relationships with relevant organisations (i.e., mental health charities; LGBTQIA+ organisations). Inclusion criteria are listed in Table 9. Because the study aimed to capture views from both LGBTQIA+ and cisgender/heterosexual people, advertising efforts targeted both groups. Participants expressed interest by contacting the lead researcher (KB) via email who emailed them full study information, consent form, and a wellbeing plan. Participants were encouraged to ask questions prior to providing informed consent. The wellbeing plan ensured participants were supported before and after participation and detailed that safeguarding concerns would be disclosed to relevant parties should they arise. The plan provides information of support organisations and details what would occur should participants become distressed during and after the study. The wellbeing plan required participants to detail their post-study activities and provide details of a trusted person, their GP, and the address they will be at during the interview in the event they become distressed during the study and researchers needed to call an ambulance. A copy of the Wellbeing Plan is available in Appendix 6. Once participants completed and returned consent forms and wellbeing plans, a mutually convenient meeting was organised using a Zoom or MS Teams link, and a PowerPoint document containing the original CaTS was emailed to participants to consider prior to the interview.

Table 9.
Interview study inclusion criteria

Inclusion criteria	
	Aged 18+ years
	UK residents
	Self-reported history of self-harm (current and/or past)
	Access to tablet, smartphone, or desktop/laptop computer

4.2.2 Procedure and Data Analysis

Online interviews took place between June 2023 and February 2024. Research shows online interviews elicit comparable participant-researcher rapport to in-person interviews, are a similar length, and are popular with participants (Jenner et al., 2019). The interview schedule (see Appendix 7) explored

participants' views of existing CaTS cards and concepts, the timeline, language, clarity, and wording on cards, and whether cisgender/heterosexual and/or LGBTQIA+-specific additions/ amendments were necessary to ensure CaTS contains meaningful, relevant factors. Before interviews, participants provided verbal confirmation they had read and understood study information and felt comfortable taking part. Interviews were undertaken by KB, lasted between 40-minutes and 1.5-hours, and were audio/video recorded. Interviews were manually transcribed verbatim. All transcripts were anonymised using pseudonyms chosen by each participant. Afterwards, participants were asked if their emotional state had246eee changed during the study and additional debrief information, including signposting to support services and organisations, was emailed to participants. Interviews were followed by a pre-arranged call 24-hours post-study to ensure participants' mood had not been negatively impacted by taking part. Participants received a £10 Amazon voucher as renumeration for their time.

4.2.2.3. Thematic Analysis

Thematic analysis (TA) was used to identify themes in the dataset. This approach was considered most appropriate compared to other qualitative analysis methods because it is not underpinned by a specific epistemological or theoretical framework (Braun & Clark, 2022; Clark & Braun, 2017). Various analysis methods have been utilised in self-harm research, and it was important to perform appropriate analysis to achieve the aim of the study. Here, I briefly describe methods not appropriate for this study, and why. First, Interpretative Phenomenological Analysis (IPA) has been used in self-harm research (e.g., Miller et al., 2021). However, IPA is rooted in phenomenology and hermeneutics, emphasising how people make sense of their lived experiences (Eatough & Smith, 2017; Smith et al., 2021a). Spiers & Riley (2019) illustrated the differences between approaches by applying both TA and IWA to the same qualitative dataset. Whereas IPA captured existential, idiographic elements of individuals' sense-making of their experiences, TA facilitated exploration of shared experiences across the whole participant group. Considering the aim of the present study was to identify broader themes relevant to develop additions and amendments to the CaTS framework, TA was more suitable analytical method.

Similarly, TA was chosen over content analysis, which primarily involves counting and categorising the frequency of codes and phrases within large amounts of text (Neuendorf, 2018). Contrastingly, TA allows for the exploration of underlying patterns of meanings within participants' experiences. Other qualitative approaches, such as grounded theory and hermeneutic phenomenology required a higher level of theory-driven interpretation (Vaismoradi et al., 2016), that was not necessary for this study. The flexibility of TA enabled the generation of codes and identification of key features within the data to inform amendments and/or additions to CaTS variants.

Thematic analysis (TA) was conducted using the six analytic phases described by Braun and Clarke as a flexible guiding structure (Braun & Clarke, 2022; Clarke & Braun, 2017): (1) familiarisation with the data; (2) generating initial codes; (3) searching for themes; (4) reviewing themes; (5) defining and naming themes; and (6) producing the final report. However, the analytic approach used in this chapter aligns with **a** codebook or coding-reliability form of TA (Roberts et al., 2019), rather than reflexive TA.

Codebook TA emphasises the development and iterative refinement of a shared coding framework and involves multiple coders working toward coding consistency. As outlined by Roberts et al. (2019), this approach typically includes: (1) generating initial codes informed by theory, prior research, and data familiarisation; (2) refining and extending these codes through independent coding and intercoder review; (3) developing a structured codebook with clear definitions and inclusion/exclusion criteria; (4) applying and refining the codebook across the dataset to ensure coding consistency; and (5) interpreting the resulting patterns to generate themes and analytic conclusions.

In this chapter, after familiarisation myself with the data, I generated an initial coding framework and applied it to the transcripts in NVivo (v.9). A second researcher independently coded the same transcripts, and discrepancies were discussed and resolved collaboratively, contributing to the development of a shared and consistent codebook. This codebook was then applied

to the full dataset, and overarching themes were developed through iterative comparison, refinement, and team discussion. This process ensured a coherent, transparent, and reliable coding structure from which final themes were developed.

4.2.3. Ethical and Safety Considerations

Ethical approval for this study was obtained from the University of Nottingham's Ethics Committee (see page 241; S1557). Considering the study sought views about self-harm-related constructs ensuring participant wellbeing was paramount. Prior to the study, participants were provided with information detailing the purpose of the study, what was required of them, potential risks, and their right to withdraw at any point without consequence. They were also advised they could withdraw their data up to one-week post-participation. Written informed consent was obtained prior to participation.

Prior to interviews, participants were required to read and complete a Wellbeing Plan (appendix 6.) which was developed in line with wellbeing plans utilised by other SHRG members in previous self-harm research. The wellbeing plan asked participants to provide their GP details and the address where they were to take part in the study in case of emergencies during interviews, a brief discussion about a planned post-study to improve mood if needs be, acknowledgement they have easy access to the details of a trusted person they can contact post-study if necessary, and details of some enjoyable activity/ies they will take part in post-study to regulate mood. These details were taken to allow me to intervene and seek help should a participant become significantly distressed during the interview, and to encourage participants to engage with supportive people and activities afterwards to mitigate any mood reduction.

During interviews, participants were reminded they could decline any questions. Interviews were conducted in a supportive, professional manner, and I monitored participant tone and presentation. After the interview, I engaged participants in discussion about post-interview plans to move conversation away from self-harm. I also arranged to follow-up with them the following day to ensure their mood remained stable and they were not impacted negatively by taking part in the interview

study. While the study centred around self-harm, it did not seek in-depth discussion about personal experiences. No participants showed signs of distress during or after the interview.

Finally, all data were anonymised with participants selecting their own pseudonym. Identifiable data was redacted and all data were securely stored in line with the University of Nottingham's data protection protocol.

4.3. Results

Demographic data are presented in Table 10. Participants (*n*=13) aged between 21- and 29-years (*M*=24.67, *SD*=4.95) from the UK were interviewed. Nine participants were LGBTQIA+ (*Mage*= 23.56, *SD*=3.24) and four were cisgender-heterosexual (*Mage*=23.75, *SD*=3.59). Participant characteristics varied, ensuring wide representation within the LGBTQIA+-community. Data including potentially identifiable information (e.g., location) was omitted from quoted extracts to ensure confidentiality.

Table 10.
Demographic characteristics of participants (Interview study)

Demographic characteristics	% of participants
Sexual orientation	
Bisexual	46.15%
Lesbian	7.69%
Queer	7.69%
Pansexual	7.69%
Heterosexual	23.08%
Nonbinary	7.69%
Gender identity	
Cis male	15.38%
Cis female	69.23%
Questioning	15.38%
Ethnicity	
Chinese	7.69%
White British	76.92%
Mixed (White & African)	7.69%
Mixed (White & Asian)	7.69%

Initial interview questions focused on the clarity and relevance of wording on cards. Here, data was descriptive and explicit, thus is

presented as such. Thematic analysis identified themes resulting in the creation of thirteen new cards and amendments to wording on specific cards. Additional suggestions included capturing neurodiversity data and emphasising sexual violence trigger warnings. Participants provided themes for cards and most offered literal suggestions regarding how cards could be worded.

4.3.1. Language, terminology, and minor updates

4.3.1.1. Update Terminology

Overall, participants felt the cards were clear and relevant to self-harm, however some felt terminology should be updated. This related specifically to cards including 'forum'. Coral explains:

"...there was like these two cards around…. 'I read about self-harm on the Internet' and 'I discussed self-harm in a forum' ... I don't know if it's a little bit like old-school...maybe changing it to social media or something like that because...like although some people still use forums, I don't know if that's totally relevant or not."

Others also felt 'forum' should be replaced with 'social media/the internet' to reflect changing internet habits (see Appendix 8. for additional quotes). Consequently, cards containing 'forum' will be updated to 'social media/the internet' to reflect changing internet usage and associated terminology. Additionally, several participants suggested updating cards using 'girlfriend/boyfriend' to a gender-neutral term. Coral explains gender-neutral language is necessary to ensure inclusiveness:

"...there was one here 'I had an argument with my boyfriend/girlfriend'. I think that should just be changed to 'partner', so it's a bit more inclusive..."

Others agreed the word 'partner' would capture all romantic relationships, regardless of your sexuality/gender expression (see Appendix 8 for further quotes). Changing cards worded 'girlfriend/boyfriend' will ensure they are relevant to all romantic relationships, regardless of marital status, gender expression, or sexuality. Resultantly, these cards will be updated to reflect changing discourse around inclusivity.

4.3.1.2. Capture Neurodiversity Data

While neurodiversity was not the study focus, or specifically asked, several participants discussed the overlap between neurodiversity and LGBTQIA+ identities. Participants felt capturing neurodiversity alongside demographic data would be useful. For example, Bronwyn said:

> *"There's obviously the big overlap with LGBTQIA and neurodiversity, and I'm not sure how much of neurodiversity is completely captured. Maybe it could be something that is talked about before the task...if you're gonna get some demographics beforehand, can they just type in or like click a button that says like, Yep, this neurodiversity…people tend to want to say 'by the way I have this sort of neurodiversity'. So, they want to kind of explain why they're saying things in a certain way"*

Other participants highlighted the LGBTQIA+ and neurodiversity overlap, and how neurodiverse people like the option of explaining or discussing their neurodiversity (see Appendix 8). Consequently, we recommend researchers capture neurodiversity alongside sociodemographic data to allow participants to describe this important aspect of their journey.

4.3.1.3. Highlight Sexual Violence Trigger Warnings

Some cards relate to sexual violence. The introductory information contains a trigger warning to alert participants to this. However, one participant, NE, felt this should be more significant:

> *"...Luckily I don't have experience with that but I know people who do and I feel like if they were doing this card sort, that would have been very...triggering for them...But when I was doing the pilot study...it just feels like it comes out of nowhere, which can be quite triggering for some people... there was almost definitely was a sexual assault warning before the study. But I think emphasising that would be very good..."*

While only one participant highlighted this, ensuring trigger warnings are clear and explicit will ensure participants are

forewarned some cards contain terms relating to violence and sexual violence. Evidence regarding the effectiveness of trigger warnings in reducing distress is mixed (Bellett et al., 2018; Charles et al., 2022). However, trigger warnings do not lead to task avoidance (Bruce & Trigger, 2020) and evidence suggests people expect and/or support trigger warning use in research to forewarn people of potentially traumatic content (Bellett et al., 2018; Charles et al., 2022). Consequently, we recommend researchers present content and trigger warnings in recruitment and consent literature regarding content relating to potentially traumatic events.

4.3.1.4. Timeline – Additional 'Before 6-months' Timepoint

Overall, participants felt the existing timeline is appropriate to capture self-harm factors at specific times pre- and post-self-harm. However, nine participants felt an additional timepoint to capture historic events would be beneficial to examine why self-harm began, or to document a particular historic event occurred which links to other factors. Below we present two key quotes but see Appendix 8. for further quotes. Selma explains:

"…some people will…develop, like, self-injurious patterns really early on. Like, I know it was the case for me…and that is relevant in how there's self-injury…I think, you know, maybe you could have, like, a card that says, more like 'historical', but maybe in, like, a different wording..."

CH agrees documenting historic experiences is important when examining people's self-harm pathway:

"…I know that lots of people suffer with self-harm for, like, years, so maybe it should start like a year back or like 2 years plus, like have more options…I wrote to maybe include like a one year before and like a two years plus…But, like, a 'before' box would work as well…"

Together, the quotes indicate participants feel capturing historic events with an additional 'before 6-months' timepoint is important. Participants discussed the longitudinal nature of self-harm and the association between historic risk factors and subsequent self-harm and how an additional 'before 6-months'

timepoint would allow researchers to capture important data. Here, Selma discusses why historic factors are important to document when considering one's self-harm pathway:

"…there's like 'I was abused'…ermm….so I think that's the case for a lot of people who self-harm…but a lot of the time is more historical...so people have that in their history. It might not be relevant, like directly relevant, to their most recent episode of self-harm, but it might contribute to why they started self-harming in the first place…"

Other reasons for including an earlier timepoint focused on significant childhood/historic events, particularly experiencing physical and/or sexual violence, which may result in factors for self-harm or in the onset of self-harm (see S4. for further quotes). Participants felt documenting historic events occurring prior to 6-months before a self-harm episode will provide deeper understanding. In particular, traumatic events which may result in self-harm and other related risk factors. Participants clearly felt an additional timepoint is important. Therefore, a card entitled 'Before 6-months' will be added to ensure CaTS captures historic events which impact later self-harm and related factors is an important addition.

4.3.2 Additional Cards

Participants were asked whether cards or concepts were missing from CaTS. Thematic analysis identified themes which provided evidence for the creation of twelve new cards.

'I did not feel comfortable in my body'

Participants recognised not feeling comfortable in their body as a risk factor. Two participants explicitly related this to gender dysphoria, but remaining participants discussed how general body image issues are a self-harm factor. The overarching theme encompassed not feeling comfortable in one's body and participants felt CaTS should include a card relating to this. Here, James Hogg discusses how not feeling comfortable in one's body develops for different reasons:

"...something to do with body image or feeling as if your body is not right...self-harm's very common with people with body dysmorphia, but also you know a lot of body dysmorphia comes with gender identity and stuff like that...being bullied can also cause you to have issues with your body as well, that you didn't have before. So, you know...I think it's a very common thing that people who have self-harm experience that isn't currently covered and it also just by coincidence also links quite heavily to the LGBTQ-plus community."

CH agrees a card incorporating body image issues would be useful for both LGBTQIA+ and non-LGBTQIA+ people:

"...Umm, I think that maybe there could be a card for like for dysphoria. More fear like a, maybe, like a 'I don't feel...that my body is correct' or like 'I, I hate my body' card or something, because I feel like that's general enough to apply to non-LGBT people, but then like I know body dysphoria is like a big thing for trans people."

Similarly, NE agrees a card documenting body-image issues would apply to people in different communities for various reasons:

"…you would probably need to add more specific ones because these ones [the current cards] could all apply to people in the community. But…there's no cards on like especially for transness. I am nonbinary, so…I feel like I can contribute a lot in this area, but there's no cards on…gender dysphoria, or just general body dysmorphia, which I think could contribute even for…non-LGBT people…"

Together these quotes (and others in Appendix 8) indicate CaTS requires a card allowing participants to document body image issues as a self-harm risk factor. This aligns with emerging literature showing body-image issues are associated with self-harm (Akram et al., 2022). Body image issues are also associated with general psychopathology (i.e., depression, anxiety; Linardon et al., 2022). Depression and anxiety are well-evidenced factors for self-harm (Duarte et al., 2020) and already included in CaTS. Possibly, a temporal relationship between body-image issues and other factors exists which increases self-harm risk. Including a card relating to body-image issues would ensure CaTS can

examine this pathway. Many participants explicitly discuss gender dysphoria and body dysmorphia; however, participants using CaTS may not have received specific diagnoses, nor feel their experiences fit into diagnostic categories. Including a card which incorporates body discomfort as a general term will appeal to more participants than cards applying to specific body image-related diagnoses. The term 'I did not feel comfortable in my body' was selected because feeling comfortable in one's body is associated with body-image issues and is a phrase used in measures of body appreciation (i.e., Body Appreciation Scale-II; Tylka & Wood-Barcalow, 2015). Further, it is sufficiently broad to be relevant for various body-image issues across multiple gender identities.

'I felt I did not fit in'

Participants discussed feeling not fitting in with wider society, or sometimes their own community, and this relates to both LGBTQIA+ and cisgender/heterosexual people. Here, NE describes conflict within the LGBTQIA+ community can make people feel they do not fit in with people they should fit in with:

"…I would say there's quite a lot of infighting in the community which I think could severely isolate a person. I know there's a card on 'I felt isolated'…But maybe having like another card that's… something to do with I felt excluded from people who should…people I should be fitting in with or people I, I thought I could trust something along those lines…"

Similarly, James Hogg discussed in-fighting within the LGBTQIA+ community can result in people feeling they do not fit in, and this may lead to self-harm:

"...obviously you've got the whole LGBTQ umbrella. But then within that each one of those letters in that acronym will have different issues related to their sexual identity or their gender identity. So, you know, there's infighting in the trans community, there's infighting between bisexual people and homosexual people, you know...so, one thing I noticed...was that there wasn't a question that kind of related to the feeling of not fitting in...with queer people there's obviously the idea of not fitting in with the straight people...but then also within the community itself, as I

said, there's infighting. There's rejection within the community because you're not properly trans, you're not properly gay, you're not properly whatever. So, I feel like...the feeling of not fitting in drives a lot of people to isolation and therefore self-harm."

While NE and James Hogg discuss not fitting in from an LGBTQIA+ perspective, the concept may impact people from various sociodemographic backgrounds. Coral highlights this:

"...I think there was another one...maybe like 'I felt like I didn't belong in my community'. I think that could be quite...a big one, especially if there's like a religious community or culture or something that I guess could be related."

Here, Coral talks about how people from different social groups can feel they do not fit into their community could be a factor for self-harm. Jo agreed:

"Yeah, I think also maybe a feeling accepted or, or feeling not accepted, or erm, kind of not fitting in with people. I think that can be relevant for a few different characteristics like culture as well…"

These quotes identify 'not fitting in' as an important factor (see Appendix 8 for further quotes). Not fitting in is strongly associated with isolation (Hetrick et al., 2020), which is already captured within CaTS. However, not fitting in may precede isolation. Indeed, James Hogg states this at the end of his quote: "*the feeling of not fitting in drives a lot of people to isolation and therefore self-harm".* Adding a 'not fitting in' card will allow participants to document this concept in their pathway and ensures CaTS can examine temporal relationships between not fitting in, isolation, and self-harm.

'I found support/a community on social media' and 'Social media/online content was negatively impacting my mental health'

Participants discussed the positive and negative impact of social media, and online content, on self-harm. First, Jo talks about the support people can find online:

"...you've also got the flip side of people's self-harm, I think is particularly common at finding communities online, especially if you don't kind of feel accepted or have a place in the real world. I guess then, I think social media can actually be somewhat of a safe haven as well because you can present yourself differently or you can like share stuff easier with strangers online than you can face to face with people that you actually know. So, I think, yeah, obviously it can be toxic, and it can be a scary place. But I think for people who are struggling, it can also be quite a helpful place...it could be like...'I reached out online which helped' or I yeah, 'I received peer support online and found a community online' or something like that because I think online support is missing from those [cards]..."

Here, Jo discusses how social media can provide solace, community, and a sense of belonging, especially if one lacks this in the 'real world'. She acknowledges social media can be toxic, but she clearly feels the positive effects of social media interaction should be documented within CaTS. Belle also highlights how online self-harm groups can provide a sense of community and belonging:

"...people are doing this too like 'that's nice'. Like I'm not the only one doing it. And then you feel like you can compare and almost not do it with them in some way, even though it's your own pain, it's not the same...You're not experiencing the same thing, but you make it feel like it's an altogether group thing."

Seeing self-harm content online may engender a sense of community and belonging. However, NE discusses how social media can negatively impact mental health:

"...I feel like younger kids, like 13,14 social media is gonna be a huge impact on your mental health...If you're self-harming...that probably would be good to mention something about. I'm not sure what specific cards you would have...something mentioning about how...social media is impacting your mental health, or you know, like seeing if...other people are clearly doing much better in life..."

Here, NE discusses the impact comparing yourself negatively with others on social media can have on mental health and self-harm, particularly in younger people. Others agree (see Appendix 8 for

further quotes), here Artemis highlights how social media may negatively impact people for various reasons:

"...There could be sort of just a generic 'I felt like social media was impacting my mental health'...it would mean different things to different people, but it would be kind of a useful catch all you know, with sort of whether that's doing scrolling or kind of looking at people on Instagram or sort of feeling kind of bad about yourself...."

CaTS was developed prior to the significant rise in social media and smartphone usage which occurred over the past decade (Marchant et al., 2021), so the original version does not contain social media-related cards. The quotes presented here highlight the significant presence of social media in contemporary life and its potential impact on self-harm. The positive and negative impact social media has on self-harm has been documented by others (i.e., Dyson et al., 2016; Marchant et al., 2021), and participants clearly feel cards allowing users to document social media experiences and its impact on self-harm are important additions.

'I was bullied on social media' and 'I was discriminated against on social media'

Alongside the potentially negative impact of social media on self-harm, participants talked specifically about being bullied or discriminated against online being a factor for self-harm. Artemis says:

"...social media…it's more sort of a tool that kind of exaggerates things in your life rather than a standalone thing. So, you know, if you're talking to friends, it allows you to talk to them 24/7 rather than just when you're with them or if you're taking, you know, pictures, it allows you to send them to all your friends rather than...one by one. So, it...allows you to do things on…a bigger and quicker scale. So, it's sort of...initial things are kind of already encompassed by the cards...so maybe 'I was bullied' would include bullied over social media or bullied as a result of social media 'cause...it would be exacerbated by social media..."

Here, Artemis says social media is an extension of one's life and allows things to occur "*on a bigger and quicker scale*", rather than being a separate experience. They state bullying occurs online/social media as well as in-person, and CaTS needs cards which capture online experiences. CS agrees and feels CaTS should also include online discriminatory experiences:

"...something...that's sort of social media. It could look around things like cyberbullying, or things like...sexual harassment on...Facebook or Instagram, or even like something like, I don't know...homophobic abuse on Twitter that someone may, might have, like, maybe responded to you on there...anything like that would be I think, quite relevant"

The narratives here underline bullying and discrimination occurs in-person and online. Clearly participants feel CaTS should provide opportunities to document whether online bullying or discrimination precedes self-harm. Possibly, other phenomena may occur in dual settings. Future research should explore whether other factors occur online and in-person, and whether additional cards should explicitly refer to factors occurring online.

'I had an upsetting sexual experience' and 'I was sexually abused or assaulted'

Selma talked at length about the *'I was raped'* card, and how some people may be reticent to select that card, even though they had experienced rape, but may select a card describing unsettling sexual experiences. Selma also felt CaTS should include a card relating to being the victim of sexual assault:

"…there's one card that says 'I was raped.' And I think a lot of people, even if it did happen to them, they're not going to pick it because just reconciling with that term takes a lot of, like, inner work…I think a lot of people, they would not, especially if they're…in the midst of their healing journey, they're not going to pick that card, even if it's relevant to them. I think there needs to be a bit like more nuanced like, like an 'upsetting, like sexual experience'… I don't think a lot of young women like, would outright say, 'oh, I was raped'… things are changing culturally, and people are using that term more freely, but there's still a lot

of stigma…Whereas if you say, oh, you know, 'I had, like, a upsetting sexual experience', I'm not even saying sexually abused because even…implying abuse, I think for some people it's even too much…even though… sometimes clearcut rape or abuse does occur. But it takes the victim a long time to…reconciliate with the fact that it happened…they wouldn't pick that card even though it might have actually objectively happened, you know?"

Here, Selma talks at length about two things. First, she highlights rape does not always occur, but unsettling sexual experiences may occur and be a significant factor. Second, Selma feels people may not reconcile their experience with the 'I was raped' card. A card allowing people to document unsettling sexual experienced would address these issues and be used in lieu of the 'rape' card if they feel unable to select that card or relate rape to their experience. Others agreed a card covering sexual abuse/assault is necessary to include (see Appendix 8 for additional comments). The narrative presented shows CaTS should include cards relating to both sexual abuse/assault and unsettling sexual experiences. Furthermore, sexual assault in adults (Watters & Yalch, 2022) and childhood sexual abuse (Troya et al., 2021) are known antecedents for self-harm. Therefore, additions to CaTS which explore their impact on self-harm in relation to other factors will provide valuable insight.

'I was bullied because of my sexuality or gender identity' and 'I was discriminated against because of my sexuality or gender identity'

LGBTQIA+ participants discussed being bullied and/or discriminated against and how, for LGBTQIA+ people, this occurs for numerous reasons. CaTS currently includes cards documenting generic bullying and discrimination experiences. However, LGBTQIA+ participants felt discriminatory and bullying experiences specific to sexual and/or gender identity were important to include in CaTS. CS explains:

"I think it would be good to have a bit more...LGBT specific...I'm maybe thinking something like...discrimination that someone might face. Or I don't know a card, for example saying, I don't know, 'I've been bullied or discriminated against because of my sexuality or identity' or whatever, so something may be more

identity specific...bullying...so, it could be maybe a bit more, erm, specific [to their LGBTQ+ identity ..."

Artemis agrees gender-specific factors are important, and discusses how cards which explicitly specify LGBTQ+-specific experiences will encourage people to select cards if relevant:

"...if your LGBTQ identity did tie into any kind of episodes of self-harm, so having that there might make you think, oh...was that part of the reason why I ended up self-harming, you know, because I thought it was just because I was feeling, you know, really sad that day. But looking back, the day before...someone had, you know, pointed out something or someone was...being really prejudiced and, yeah, it's all kind of like reflection, but I think having said that [a card] explicitly mentions just an LGBTQ+ identity might be quite useful...you could have, you know, 'I felt discriminated against because of my...'sexual identity, gender identity, trans identity'...sort of almost, yeah, combine a few into the same card..."

Zoe also felt LGBTQ+-related specific discrimination or bullying cards may encourage people to select cards relevant to their self-harm:

"…because there's so many ways of discriminating as well. It might be easier to pick it out if it's prompted, I guess [LGBTQ+ identity]. Because I feel like for me, when I think of discrimination that, like a few that come to mind. So yeah, I guess it could be interesting to explore the different types of discrimination…"

Here, Zoe states people may connect the existing 'discrimination' card with other discriminatory experiences. Participants highlight how LGBTQIA+ people experience identity-related discrimination and bullying alongside other bullying and discrimination experiences (see Appendix 8 for further comments). Therefore, adding LGBTQIA+-specific discrimination and bullying cards will allow participants to document both experiences. These will increase CaTS' inclusivity and relevance to LGBTQIA+ self-harm and are important considering LGBTQIA+ people are at increased self-harm risk (Jadva et al.,2023) and tools used to examine self-harm are frequently insufficient to capture LGBTQIA+-specific experiences (King et al., 2008). Furthermore, while LGBTQIA+

people experience greater levels of discrimination and bullying compared to their cisgender/heterosexual peers (Butler et al., 2019), cis-women also experience elevated levels of gender-based discrimination (Hennein et al., 2021; Kurcharska, 2018). Therefore, these cards may also be relevant to cis women.

'I was questioning my sexuality or gender identity'

Additionally, LGBTQIA+ participants felt people question their sexuality and/or gender identity needed opportunity to document this if relevant to their self-harm. Artemis explains:

"...maybe in events…erm...things to do with exploring your kind of identity. I was exploring my gender identity, my sexuality...being with someone or by, you know, just sort of thinking about it, kind of reflecting internally...something like having an identity crisis or 'I was questioning my sexuality and my gender identity', or yeah, I think there's, 'there's a lot of questioning' I think just in general and that might be a big factor..."

NE agrees questioning one's identity may be important for some to document:

"...I'm pretty sure there is a card about saying 'I didn't understand how I felt' or something like that...I, I think if you're having an LGBT-specific one either adding another one or just changing the wording of that where it's, I didn't understand like myself or my identity or I was struggling with my identity and how I felt or something like that..."

Artemis expands this by describing how exploring your identity can trigger feelings of uncertainty around societal acceptance and expectations of others:

"…or…say you were sort of with someone and you thought, 'oh, I think maybe I'm attracted to them' or 'I'm not', you know, 'quite allowed to be'. 'I shouldn't be' and sort of…kind of event triggering something… like this…isn't what I should be doing. You know, 'my family wouldn't accept that', 'I can't be doing that'…But yeah, having that kind of, yeah, sort of exploring or thinking about or kind of reflecting on some aspect of your

identity and not being happy with that might be quite triggering…"

The narrative here shows questioning one's gender identity or sexuality can lead to internal conflict or confusion and people are concerned how others may react. People questioning their gender identity or sexuality may experience elevated rates of mental health difficulties and self-harm (Brown et al., 2023). Therefore, a card has been added allowing people to document questioning one's sexuality and/or gender and self-harm (see Appendix 8 for additional quotes).

'Self-harm gave me a feeling of control'

The final theme identified was the sense of control self-harm can elicit. Participants talked of feeling powerless, and how self-harm can help people regain some autonomy. Selma explains:

"...I thought maybe it would be good to have something 'cause I know, again for a lot of women who self-harm, it's sort of a way to regain bodily autonomy, bodily ownership...erm, and I think it could be good to have a term that kind of captures that on the cards like 'I felt like, I ...powerful'... I put 'ownership'... I can remember some feelings very clearly in this. Yes, this feeling of like ownership of power, of control."

Zoe also talked about how external factors elicit a lack of control, and how self-harm can help people regain control:

"…I don't know if this was mentioned as well, but… one of them is like the lack of control…more as a general feeling of lack of control. Yeah, and how, when people's lives seem to not be in order. Umm, I guess self-harms one of the ways that they try to get control back…"

Similarly, Belle agrees self-harm can help people regain control:

"...like the thoughts of like wanting to feel something, not necessarily like...yeah, just wanting to feel, not necessarily even like pain or like feeling upset...It's just feeling something…and wanting to take control, like a control thing..."

The narrative here indicates people who self-harm may feel they lack control and autonomy. Participants feel self-harm can be used to regain some control, and this may relate to external or internal factors. This is in accord with findings from recent qualitative systematic reviews where participants described self-harm as a mechanism to regain control related to distal, proximal, and/or internal factors (Stänicke, 2021; Peel-Wainwright et al., 2021). Indeed, regaining control may be an important factor for repeated self-harm. Considering this, a card entitled 'Self-harm gave me a feeling of control' has been added to CaTS.

4.4. Discussion

The aim of this qualitative interview study was to garner views of people in LGBTQIA+ and cisgender/heterosexual people about the content of CaTS, whether cards are worded appropriately, and whether important cards are missing that are relevant to both LGBTQIA+ and cisgender/heterosexual people. This process was done to identify amendments or additions to improve the relevance of CaTS to ensure it remains a meaningful, relevant self-harm research tool. Based on the research questions and grounded in the data, we clarified participants felt cards were clearly and appropriately worded, and concepts on cards were largely relevant to self-harm. Resultantly, additions and future cards will be worded following a similar linguistic format. However, participants suggested changes to ensure CaTS uses contemporary and inclusive terminology: changing 'forum' to 'online/social media' and using the gender-neutral term 'partner' where relevant.

Further, participants discussed the importance of capturing neurodiversity status. In accordance with extant literature (Loy-Ashe, 2023, McDonnell, 2023), participants highlighted links between neurodiversity and LGBTQIA+ identity and expressed the need for neurodiverse people to document their neurodiversity. Capturing neurodiversity data alongside other sociodemographic data would identify neurodiverse-specific self-harm antecedents. Furthermore, researchers may identify links between neurodiversity and self-harm (i.e., (Marchant et al., 2021). We recommend researchers capture neurodiversity data using categories (e.g., Autism/ASD; ADHD; Dyslexia; Dyspraxia; Aspergers; Other) in line with suggestions from service providers

who support neurodivergent people (i.e., Diversity Project; The Brain Charity). Finally, one participant discussed a clearer, concise trigger warning relating to sexual violence content. Because trigger warnings are commonplace, expected, and people support their use in research (Bellet et al., 2018), we recommend researchers very explicitly state some cards relate to physical and sexual violence during recruitment and informed consent to avoid unnecessary surprise or discomfort.

4.4.1. New Cards

The heterogeneity of factorial themes developed from these data mirrors the heterogeneity, complexity, and variety of factors for self-harm experienced. However, Thematic Analysis identified themes which supported the development of twelve new cards, and one timeline card. First, analysis showed participants felt CaTS should include a 'before 6-months card'. Participants felt this would allow people to document significant childhood or historic events important to their self-harm pathway. This inclusion will enable CaTS to examine historic factors and identify whether specific historic factors are temporally linked to subsequent factors, and eventual self-harm. Because participants were aware the study aimed to identify potentially new cards, most offered suggestions regarding how cards could be worded. While some LGBTQIA+-specific cards were developed from the data, overall, participants (including LGBTQIA+ participants) suggested themes and cards which could be applicable to people from various backgrounds.

The twelve cards created from themes identified within the data are:

- 'I don't feel comfortable in my body'
- 'I felt I did not fit in'
- 'I found support/a community online'
- 'Social media/online content was negatively impacting my mental health'
- 'I was bullied on social media'
- 'I was discriminated against on social media'
- 'I had an upsetting sexual experience'
- 'I was sexually abused/assaulted'

- ‘I was bullied because of my sexuality or gender identity’
- ‘I was discriminated against because of my sexuality or gender identity’
- ‘I was questioning my sexuality or gender identity’
- ‘Self-harm gave me a feeling of control’

Adding these cards ensures CaTS/CaTS-E contains factors relevant to self-harm and remains a useful, meaningful research tool. LGBTQIA+-specific additions are important to increase the inclusiveness of CaTS. This is particularly important considering self-harm prevalence in LGBTQIA+ people is elevated (Gnan et al., 2019; Jadva et al., 2023; Babbage et al., 2022) and tools used to examine mental health in LGBTQIA+ people are often cisgender/heterosexual-centred (King et al., 2008; Morrisson et al., 2016). The LGBTQIA+-specific cards added to CaTS will allow people to document whether factors specific to LGTBQIA+ people are key antecedents to self-harm in this high-risk group. These details are important to capture considering researchers largely focus on general risk and protective factors, meaning group-specific factors are poorly researched (Liu, 2012). Therefore, the impact group-specific factors have on self-harm is not understood.

Using CaTS with the additions developed here will address this deficit in understanding by identifying whether self-harm in LGBTQIA+ people is preceded by particular group-specific factors. Future research with LGBTQIA+ people may identify further additions and is recommended to increase the inclusivity and relevance of CaTS. The remaining additional cards may be relevant to people from various backgrounds and for different reasons. Further, they are important additions reflecting changes in what can result in self-harm. For example, the rise in social media usage and the way we use and engage with others online has changed dramatically over the last decade. Without exception, participants in this study discussed the negative impact social media can have on self-harm. This impact is supported by other researchers in the field (i.e., (Bird et al., 2024; George, 2019; Tørmoen et al., 2023) who report increases in self-harm risk correlate significantly with increased time spent on social media.

However, participants also discussed the benefits of a community and sense of belonging which can be found online. A recent narrative review discussed benefits including being able to communicate authentically with peers online (Biernesser et al., 2020), meaning social media may provide solace to some. Findings regarding social media are polarised. However, adding social media-related cards allows participants to document these experiences and ensure CaTS includes cards relating to a concept which has an evidence-based impact on self-harm behaviours. Their addition increases the relevance of CaTS ensuring it remains a useful and meaningful research tool to examine self-harm in cisgender/heterosexual and LGBTQIA+ people and identify key antecedents which can be targeted during intervention. Future research may identify additional cards or support the development of a set of cards specific to a particular population. The study demonstrates the flexibility of CaTS and how amendments and additions can easily be made.

4.5. Strengths and Limitations

The primary strength of this study was the use of in-depth interviews which allowed the authors to explore factors for self-harm missing from CaTS, and amendments necessary to increase the relevance and meaningfulness of CaTS to ensure it remains a useful research tool. We were able to elicit in-depth motivations and experiences which impact self-harm and may not have been relevant when CaTS was originally developed. Further, we were able to elicit LGBTQIA+ experiences which will increase CaTS' inclusivity and relevance to LGBTQIA+ self-harm. Qualitative research aims to create descriptions and interpretations.

Our primary limitation pertains to our sample. Significant effort was placed into recruiting transgender and gender-diverse participants. Sadly, these focused recruitment drives were largely unsuccessful. It is possible transgender and gender-diverse people experience factors for self-harm which differ from the wider LGBTQIA+ community and were not identified by participants in this study. Future research should capture transgender and gender-diverse views of CaTS, and other self-harm tools, to ensure they contain meaningful items which capture self-harm experiences of transgender and gender-diverse people. Additionally, participants ages ranged from 21-29-years. Younger

adolescents, or older adults, may identify other self-harm factors, or highlight amendments to CaTS which increase its relevance and appropriateness to a wider age-range. Indeed, previous CaTS research highlights differences between young (18-25-years) and older (26-57-years) adults self-harm antecedents (Lockwood et al., 2023). Similarly, most participants were White British. People from other racial backgrounds may experience factors specific to their racial or ethnic background which do not appear in the existing cards/task. Future research should focus on racial and ethnic groups to address this deficit. Furthermore, while some participants may have past or current clinical intervention or treatment, this sample was community-based. A clinical sample may identify additional factors relevant to clinical or in-patient self-harm experiences.

4.6. Conclusion

This chapter presents important additions and amendments to CaTS, rooted in lived experience, to ensure it remains a valuable self-harm research tool. These include wording amendments, and the addition of thirteen cards reflecting changes in our understanding of self-harm and the lived experiences of those who engage in self-harm. These evidence-based updates reflect emerging antecedents for self-harm which were not relevant when CaTS was originally developed, ensuring it continues to capture the complexity of self-harm. While these updates can be used during in-person research, the development of a digital version offers further opportunities for accessibility, and possible improved data management. The next chapter (Chapter 5) outlines the development of CaTS-Electronic (CaTS-E), a digital iteration of CaTS.

4.7. Author Epistemological Standpoint and Reflexivity

This study is underpinned by an interpretivist epistemological position, which assumes knowledge about self-harm, suicide, and identity-based experiences is socially and psychologically constructed and shaped by one's own experiences and positionalities (Hiller, 2016). Rather than seeking to explain causes and effects, interpretivist approaches prioritise understanding how individuals make sense of their lived experiences (Hiller, 2016). In this approach, participants' accounts

are viewed as situated interpretations, shaped by interpersonal, cultural, and structural contexts.

This epistemological view aligns closely with TA, which is compatible with various qualitative epistemological paradigms but is often applied within interpretivist frameworks which emphasise meaning-making, subjectivity and context (Braun & Clarke, 2006; 2013). Within this perspective, themes are 'constructed' through a reflexive, iterative process, rather than discovered as objective entities within the data (Braun & Clarke, 2019). Thus, the aim is to generate an analytically rich understanding of how individuals make sense of their own self-harm experiences within broader sociocultural environments. Because this study adopts an interpretivist epistemology, my reflexive position was not only acknowledged but treated as an integral part of meaning-making. My own personal and professional experiences shaped how I attended to participants' language, which codes I prioritised, and how themes were constructed. Thus, the final themes represent a co-produced interpretation shaped by participants' accounts and my position.

4.7.1 Author Reflexivity

As an interpretivist researcher, I acknowledge I bring my own standpoint to the analysis process. My position as a White British cisgender female, heterosexual researcher, thus not a member of the LGBTQIA+ community, undoubtedly shaped my engagement with participants and the resulting data. Although I have close personal friendships with LGBTQIA+ individuals, I approached the data analysis aware I do not share lived experiences of LGBTQIA+ individuals, such as navigating sexuality and/or gender and any associated identity-based discrimination. This external status required sensitivity to cultural knowledge and experiences that participants discussed, and it required ongoing reflexivity to avoid imposing assumptions grounded in my own social positioning and experiences. My interpretations are informed by my position within the same socio-cultural environment as participants, enabling me to describe and interpret their accounts while recognising the shared societal frameworks which shape meaning making (Pervin & Mokhtar, 2022). From this perspective, understanding is co-constructed and -developed, rather than discovered.

Additionally, I have a personal history of self-harm. This carried the potential to influence my emotional responses while collecting, cleaning, and analysing the data and my interpretive decisions, consciously and/or unconsciously. Further, I approached analysis with the awareness that my background might facilitate empathy and introduce some bias. For example, through heightened awareness of certain factors or triggers, or through identification with some participant's experiences. To mitigate this, I ensured I adhered to the interview schedule where possible and responded to what participants said, rather than add my own experiences to the dialogue during interiews and data analysis. I engaged in reflexive practices, including analytical and reflexive journalling, supervision discussions, and discussions with SHRG members to mitigate negative impact on me personally, or the data. I did this throughout interview, coding, theme development, and data analysis. These practices enabled me to monitor my reactions, articulate possible assumptions, and maintain transparency about how my perspective and experiences shaped interpretative choices.

My personal position shaped the coding and analytical decisions in Chapter 4. I endeavoured to ensure moments where my personal experiences correlated with the data were acknowledged. For example, participants discussing how self-harm elicited feelings of control. I also made conscious effort to avoid overly sympathetic interpretations. This was less challenging, as participants were offering suggestions about how cards could be worded. During interviews, this helped me maintain focus on the interview schedule, and during coding and analysis it meant I was not required to seek deeper meaning for themes. Finally, because I am a non-LGBTQIA+ researcher, this prompted me to ensure I avoided assumptions about LGBTQIA+-specific experiences and endeavoured to ground interpretations exclusively in participant's own language and framing.

Finally, while I endeavoured to avoid bias and adding emotion or context based on my own experiences, I also feel my self-harm history had some positive effects (and will continue as such moving forward in my research career). For example, I largely avoided disclosing my self-harm history to participants, at the beginning of one interview the participant was almost abrasive

and antagonistic and clearly felt self-harm research and researchers were essentially emotionally removed from participant experiences. They stated the CaTS was simply a list of standard self-harm experiences put together by researchers with little thought. I felt it important to first outline how and why CaTS was developed (i.e., from the literature, PPI, professionals, and experts in the field), and also to disclose my own self-harm. Once I did this, the participant immediately relaxed, and it felt they felt I was 'one of us' (e.g., someone who has self-harm, therefore understands). Here, immediate reflection led to my disclosure, which changed the way the participant viewed me and, I believe, ensured I elicited much richer data from this participant than had I not disclosed my own experiences.

Overall, these reflexive considerations contributed to an analytical process that was transparent, iterative, and critically aware. With the analysis, I aimed for credibility, coherence, and sensitivity to context, and to acknowledge the co-produced nature of themes, interpretations, and final cards and amendments presented.

Chapter 5

CaTS-Digital (CaTS-D): Designing and Developing a Web-Application for Self-Harm Research

Chapter 5 begins by outlining the procedure for using CaTS during in-person research (e.g., Townsend et al., 2016), the limitations of this approach, and how a digital version could address them. The chapter then details the development of the digital version, CaTS-D, a process which required considerable time, involved experimentation with various software programmes, and multiple iterations before arriving at a version suitable for pilot testing (Chapter 6) and subsequent primary large-scale application (Chapter 7). Documenting this development process captures CaTS-Ds technical evolution but also demonstrates its influence on the broader research outcomes of this thesis, and its potential value for future self-harm research.

5.1. CaTS: An In-Person Guide

CaTS was introduced and described in Chapter 1 (section 1.5). Here, I present a recap of how CaTS is applied in research settings, offering context for why a digital version will be a valuable research tool. CaTS was originally developed to address limitations in traditional risk assessment tools, which often examine isolated factors rather than the dynamic interplay of multiple influences (Townsend et al., 2016). Therefore, the temporal dynamics between multiple factors is poorly understood, limiting the value of risk assessments (Dhingra et al., 2016; Fox et al., 2015). Experts in the field recommend developing multifactorial research tools which can determine whether specific antecedents increase self-harm risk, rather than focus on singular risk factors (Franklin et al., 2016; Gratz et al., 2003; Rogers & Taliaferro, 2020). The novel CaTS was co-developed with young people with lived experience and clinicians, and from the self-harm literature. CaTS uses 117-cards with evidence-based concepts on them which participants use to describe their pathway.

During in-person research (e.g., Townsend et al., 2016; Wadman et al., 2017), participants would be invited to take part in a room with a table on which to complete the task. The researcher

explains how to complete CaTS and remains in the room to support the participant, if necessary. Timeline cards are placed at the top of a table with space beneath each timeline card for cards to be placed. Participants are given a set of cards (usually printed on A4 paper) with self-harm related behaviours, events, feelings, thoughts, and services/support on them. There are also cards relating to what happens after a self-harm episode. These arbitrary categories were created to present cards to participants in smaller, more manageable sets. Participants are instructed to look through the cards and place the cards relevant to their self-harm pathway underneath the timepoint relevant to their self-harm experiences. In this application, lag sequential analysis (Faraone, 1987) allows researchers to identify when key tipping points occur prior to self-harm.

CaTS requires minimal training, captures distal and proximal factors, and does not rely on verbalisation, resulting in a flexible and accessible research tool. However, CaTS has some limitations. For example, in-person research can be time-consuming for both participants and researchers. Further, it limits participation to individuals located near where researchers can conduct research. These factors limit the number of participants that can be recruited, and possibly who can be recruited. For example, young people who may rely on caregivers or people with mobility issues. Resultantly, findings and recommendations are often based on smaller samples, which can limit their reliability and generalisability. Larger samples are preferable because they provide more robust evidence and allow for stronger, more confident conclusions (Lakens, 2022).

Finally, in Townsend et al. (2016), participants could only select cards once. Therefore, participants were asked to place cards under the most pertinent timepoint for their self-harm pathway. However, factors may occur at multiple timepoints. A digital version would allow participants to select multiple timepoints to more accurately represent the frequency of self-harm antecedents. CaTS is a strong, flexible research tool but its current in-person nature restricts who can participate and how many participants can be recruited. This can reduce the reliability and generalisability of findings. A digital version of CaTS would address these limitations by allow larger, more inclusive samples and, consequently, more robust findings.

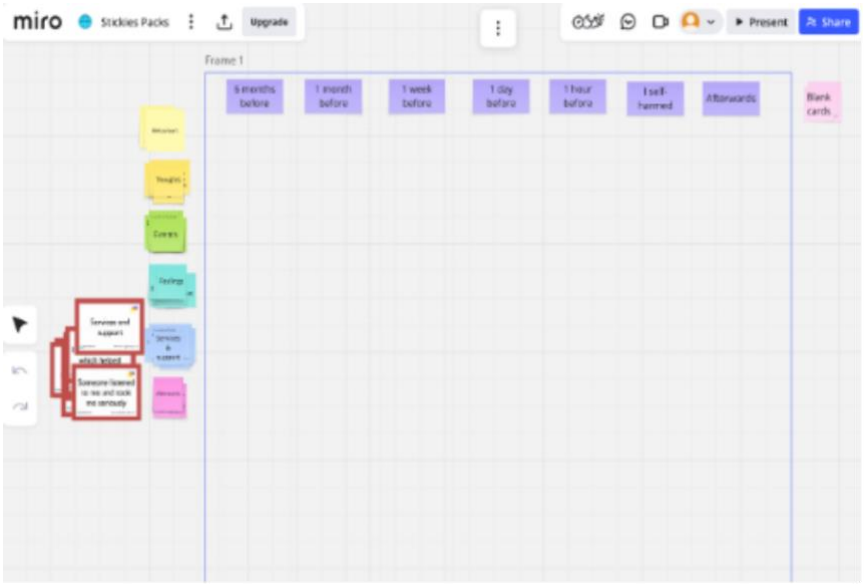
5.2. Initial Design Phase

Initially, I considered whether CaTS-D would translate to a laptop/desktop and be used in a similar way to the in-person version of CaTS. I used Miro (www.miro.com/app) to create a version (V.01) virtual whiteboard with digital 'post-it notes'. This allowed me to create a digital version very similar to the in-person version which would allow participants to move cards to the relevant timepoint, move cards back if incorrect, and add their own cards. Miro allowed me to design cards which simulated the in-person CaTS (see figures 7 and 8). During attempts to complete CaTS, it soon became clear V.01 was quite laborious to complete online. The size of a user's screen dictates how much of the board is visible. These issues can be addressed by zooming in or out, however, this presents further issues. For example, zooming in results in only part of the screen visible (see figure 6.) and makes navigating the whiteboard difficult, particularly when one is 'holding' a card. Contrastingly, when the entire whiteboard is visible, the wording on the cards is small and, therefore, difficult to read (see figure 7). On smaller screens, text would become difficult to read, thus creating a frustrating user experience. Consequently, Miro is not an ideal tool for smartphones or tablets, potentially limiting recruitment opportunities, particularly considering approximately 95% of people report owning a smartphone (Anderson & Jiang, 2019; Lenhart, 2010).

After this, I considered whether software compatible with smartphone, tablet, and desktop usage might increase participation opportunities, and produce a more user-friendly application. I contacted the Digital Research Team (DRT) at the University of Nottingham to discuss whether and how they could support me in developing a digital version of CaTS. The team informed me they were able to co-design the digital CaTS with me and develop either a web-app or a smartphone application ('app') version. However, this service was incredibly costly: DRT quoted £20,000 to develop a web-app, and £40,000 to develop an app. These were far beyond the budget I had as a PhD student and, consequently, I was unable to pursue this avenue to develop a digital version of CaTS. However, these discussions did provide valuable understanding of differences between apps and web-apps, and which was likely the best option for me to pursue. For

example, apps provide interactive structure to capture data (Simons et al., 2018). They present various benefits, including frequent usage in an increasingly digitally literate population (Weisel et al., 2019). However, apps are downloaded onto a smartphone/tablet for future use. For the proposed studies within this PhD thesis, this was unnecessary, because participants would not need to download the apo, nor retain it on their tablet/smartphone after study completion. Instead, web-apps (web-applications) offer a useful alternative. The Digital Research Team advised they behave like apps from a user perspective, but are not downloaded to a device and, thus, do not take up space on individual's devices. The team also advised they are easier, and often quicker, to develop because their digital structure is less complex compared to apps.

Figure 6.
Initial prototype (V.01) of CaTS-D created in Miro when zoomed out

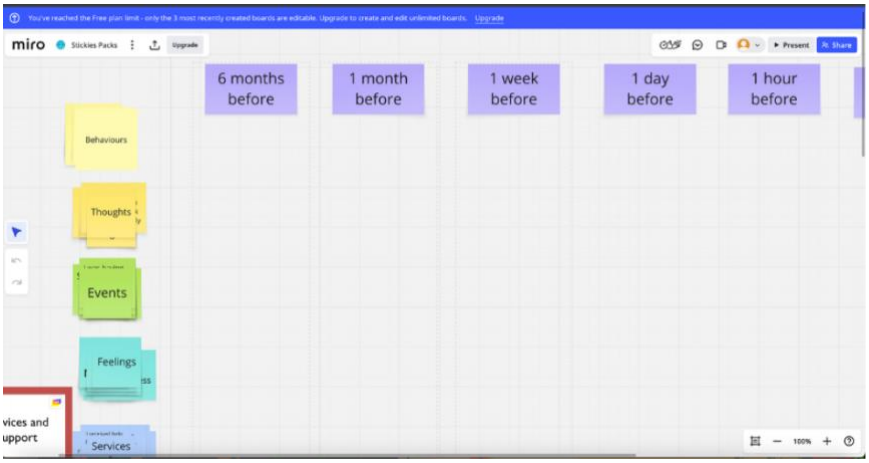


Users access the programme by following a link which takes them to the web-app (in this case, CaTS-D) to navigate and complete. Essentially, unlike other web-based options, web-apps behave like an app without installation (Tindel & Jamadar, 2018). Indeed, web-apps reduce attrition and non-responders compared to browser-based studies (Roberts et al., 2022), because they are engaging, provide a smoother mobile experience, provide easy re-

access, and reduce subjective response burden (Link et al., 2014; Roberts et al., 2022).

Figure 7.

Initial prototype (V.01) of CaTS-D created in Miro when zoomed in



5.3. Version 2 utilising Figma (V.02)

To further investigate potential software and design opportunities, my supervisor, Professor Townsend, introduced me to Professor Chris Greenhalgh, a computer science expert at the University of Nottingham, who suggested I collaborate with a Human Computer Interaction Masters student in the School of Computer Science (YW) to design a used-friendly CaTS application (V.02). The work we conducted collaboratively formed part of her Masters dissertation and was an essential step in the development of CaTS-D and I attended frequent meetings with YW and her dissertation supervisor, Professor Greenhalgh. I first introduced CaTS to YW, then the first iteration (V.01), and the issues raised during this phase. YW provided guidance at this stage, advising that existing digital card-sorting software is better suited for smaller-scale card tasks (i.e., with fewer cards).

Therefore, developing a bespoke task was necessary. Prior to the development of V.02, initial discussions centred around a version which presented a card which users would either accept or reject, depending on whether the concept was relevant to their self-harm pathway. Once all cards were processed, the accepted cards are re-presented, and users work through these and identify which timepoint/s the cards occurred at (‘6-months before', ‘1-month before’, ‘1-week before’, ‘1-day before’, ‘1-day before’, ‘1-

hour before', 'I self-harmed', 'Afterwards'). After discussion with YW and Professor Greenhalgh, it was clear this would be time-consuming to complete because users would essentially have to go through many cards twice (~40+ minutes to complete). This is an important design factor considering the ideal length of time spent completing online research is approximately 20-minutes (Revilla & Ochoa, 2017).

During the next design phase, we sought to simplify the task and reduce completion time. Because YW and Professor Greenhalgh are not self-harm experts and YW expressed concern the sensitive nature of CaTS may delay and/or complicate the ethics process for her dissertation, we collectively felt cards could be amended to a non-sensitive concept. Consequently, I developed a version of CaTS which was not self-harm based to allow YW to more easily gain ethical approval in order to pilot test the web-app. The subsequent paper was a key part of her Masters dissertation. Therefore, we chose 'revising for an exam'. I referred to appropriate literature to develop a version of CaTS which could, in theory, examine the exam revision pathway. This version of CaTS included the same timeline, number of cards, and arbitrary categories used in the original CaTS (Townsend et al., 2016). For parity, each arbitrary category also included the same number of cards, and the same number of protective- and risk-related cards as the original CaTS. Example cards developed and used in V.02 include '*I sought revision advice from other students which helped*', '*I asked my parents for support and guidance*', '*I felt stressed about the exam*', '*I felt anxious about the exam'*, '*I created a revision plan or timetable*', and '*I maintained a good sleep schedule*'. A full list of cards used in V.02 are available in Appendix 9.

It is important to state, this version was developed to pilot test V.02 using non-sensitive constructs, and the focus of this co-production process was the development of V.02 within the framework and requirements of YW's Masters programme. If appropriate, the CaTS cards could be transplanted into the V.02 framework for future self-harm research utilising CaTS.
YW suggested presenting six cards simultaneously under each timepoint. The first timepoint ('6-months before') would appear at the top of the screen, and the categories ('Services & Support', 'Feelings', 'Thoughts', Events', 'Behaviours') would be listed

below. Users would select the first category (e.g., ‘Feelings’). Then, six cards within that category would appear below the timepoint. Users select all cards relevant to their self-harm pathway before moving to the next screen where another six cards appear, and so forth. Once all cards had been presented and either selected or not, the user would then select the next category (e.g., ‘Thoughts’) and the same process follows, until all categories had been worked through. Then, the next timepoint would appear (e.g., ‘1-month before’), and the user would again select and work through each category in the same way. See figures 8. and 9. for an example of this process. Figure 8. shows the design framework and figure 9. Shows the user face as seen by participants. The task is complete when all timepoints and categories have been processed.

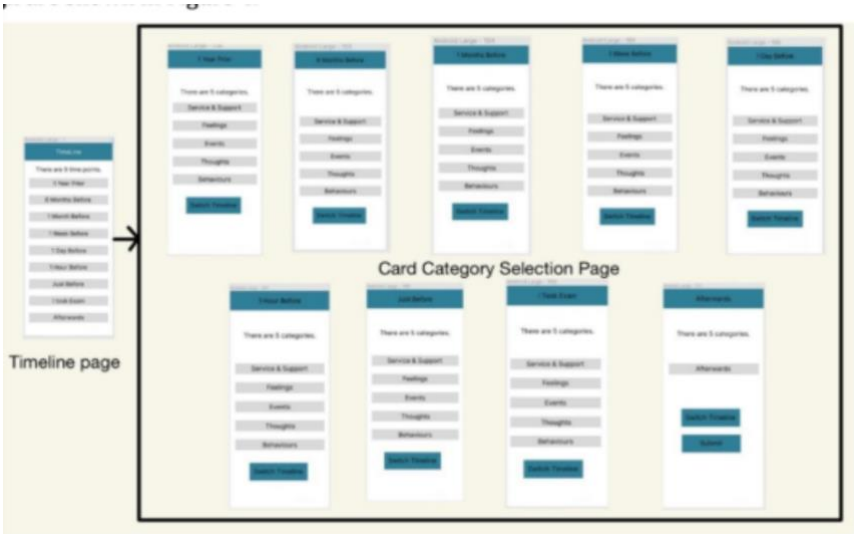
The six cards in the ‘Afterwards’ category were only available under the ‘Afterwards’ timepoint to reduce user overload. Users were able to switch between timepoints if needed. Once complete, users were presented with unused cards to reconsider them and had opportunity to add cards not included. They were also able to select a timepoint and view all selected cards and amend them, if necessary. This design was partly based on requirements YW needed to adhere to for her dissertation. YW suggested JS frameworks (Angular, React, and VUE), and Figma. She opted to utilise VUE in initial development, and Figma to develop the final application to achieve her dissertation aims.

Figure 8.
An overview of the user process when utilising V.02 CaTS-D



As part of her Master's project, YW developed this prototype which included study information and informed consent pages in accord with her dissertation ethical requirements and captured some demographic data (age only) to demonstrate the software could capture such data.

Figure 9.
A representation of screens presented to users in V.02 to navigate to each category at each timepoint.



During my own pilot testing, this version seemed convoluted and confusing. It took time to navigate between screens and complete the task. There was also significant repetition because cards are presented so many times (five in total). Essentially, participants see every card as each timepoint is presented, and again afterwards to check whether any had been excluded in error. I considered whether this would result in drop-out because users could not ascertain how much of the task remained, and users might feel they are simply repeating the same action multiple times. Further, V.02 was only compatible with smartphones/ tablets. While this is likely a preferred mode for many people, it may reduce accessibility for some participants. Therefore, a version compatible with these modes and a desktop would be preferable. Despite these concerns, the software was responsive and visually appealing. After working with YW, I connected with a web and software developer, and personal friend (IG), to

continue development of CaTS-D which addressed limitations of, but also used key components of, V.02. These included basic layout, card design, and the systematic method of working through cards. However, the task needed to be far simpler and quicker to complete. IG offered to support me in developing CaTS-D to achieve my PhD thesis aims.

5.4. Version 03 (V.03) Developed in react.JS

The final prototype (V.03) was developed using react.js. React.js is deployed to develop large, complex, interactive, user-friendly modular interfaces (Aggarwal, 2018; Chen et al., 2019). Further, react.js creates interfaces easily adaptable by researchers (Bhalla et al., 2020) which allows for additions and amendments to be made quickly and easily without affecting the performance of the web-app. Finally, react.JS is structured so information is unidirectional (Aggarwal et al., 2018). In short, this means data flows in one direction which simplifies how data moves, and is saved, through the web-app, and results in clean and easily maintainable data (Madurapperuma et al., 2022; Naik & Oza, 2023). Unidirectional data flow also makes change to web-apps easier to track (Chen et al., 2019). In contrast, other frameworks (e.g., Angularjs; Green & Seshadri, 2013) utilise two-way binding where data flows in multiple directions. Double-binding can ensure development is a speedy process, but performance is impacted when too much data passes backwards and forwards through the web-app (Ramos et al., 2017). Considering these factors, react.JS was the most appropriate development framework for this project.

These benefits of react.JS also support the systematic workflow introduced in V.02. While V.02 followed a mostly logical format, the process had potential to confuse users or possibly become disinterested and drop-out. To address this, we streamlined the start-to-end process to reduce confusion and time spent on the task. Second, considering the ideal time spent on online research is approximately 20-minutes, it was essential the task could adhere to reduce attrition.

To complete v.03, users view the consent information, given a unique identifier, and instructions. Then, users are presented with a card with all timepoints underneath. Users select all relevant

timepoints, or ‘not applicable’ and move to the next card. They continue this way until all cards are completed. All cards have all timepoints underneath (‘6-months before', ‘1-month before’, ‘1-week before’, ‘1-day before’, ‘1-day before’, ‘1-hour before’, ‘I self-harmed', ‘Afterwards’) (see figure 10). However, six cards only pertain to after self-harm (e.g., ‘I *felt better after self-harm*’, ‘*I felt worse after self-harm*'). To reduce user overload, these cards appear after participants have worked through the remaining cards. Users are told the remaining cards relate to what happened after their most recent self-harm episode and they are asked to select ‘Yes’, ‘No’, or ‘Not applicable’ for the remining six cards. This also reduces completion time. There is option to add blank cards and select relevant timepoints at the end. Example cards with multiple timepoint options selected are presented in Figure 10.

Figure 10*. Examples of cards presented in CaTS-D with various timepoints highlighted.*



The initial prototype, V.03. was presented to my supervisory team and other colleagues for feedback across numerous phases. Feedback and outcomes are presented in table 11. Feedback was addressed and V.04 re-presented to my supervisory team for further bug testing. Once glitches were cleared and amendments finalised, CaTS-D (V.04) was suitable for pilot testing **(Chapter 6),** before being used in a large-scale study, presented in (**Chapter 7**). The reactJS. architecture can be seen in figure 11.

Table 11.
Bug-testing feedback and outcomes

Feedback	Outcome
Include visible progress bar	Included
Spelling, grammar, and punctuation errors	Amended
Standardise how demographic data is listed	Amended
Standardise card colours to avoid confusion	Amended

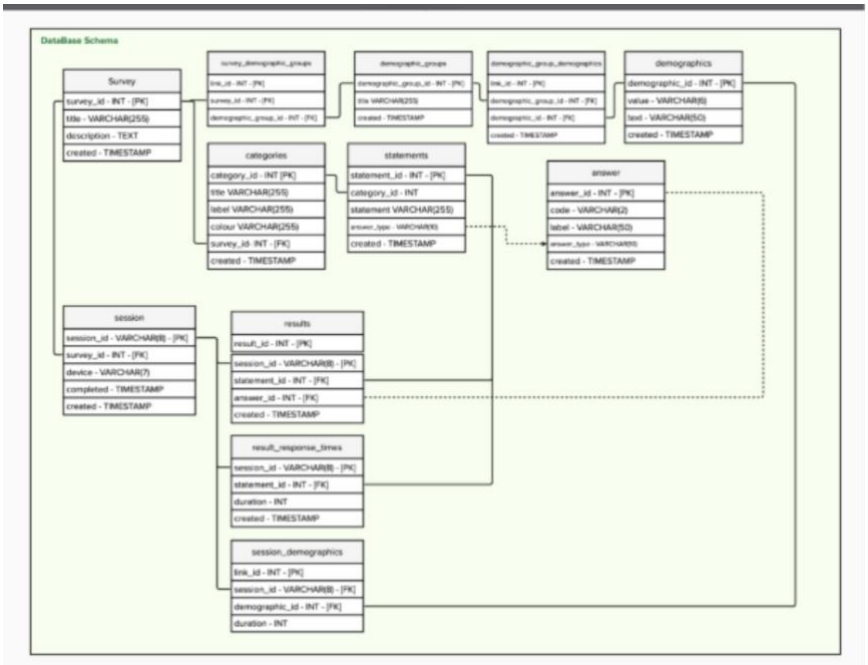
5.5. Limitations and Future Considerations

From its inception, CaTS-D has developed into a user-friendly, yet powerful research tool capable of capturing and storing data. However, there are limitations which may be useful to address in future research and development. For example, V.02 presented users with unselected cards post-task and these could be included if necessary. For example, if a user did not select '*I was bullied'*, '*I was taken into foster care'*, and *'I was angry'* at all when they were presented, they would be presented with them again post-task and give the option to select timepoints, if necessary, or confirm the card was not applicable. This may be useful in V.02 considering users work through cards multiple times. During the development of V.03, IG advised presenting cards with all timepoints underneath (as in V.03) which would increase user focus and reduce selection errors. However, future work could include presenting not selected cards post-study to ascertain if it is necessary in future iterations.

Despite this limitation, CaTS-D may be a useful research tool, with scope for refinement as knowledge of self-harm and digital research practices evolves. Establishing its utility requires

empirical testing, first through pilot testing, and then within its intended research context. The following two chapters address these steps: Chapter 6 reports on pilot testing, while Chapter 7 presents CaTS-D's application in its primary research setting.

Figure 11.
CaTS-D architecture in react.JS



5.6. Conclusion

This chapter has outlined the development of CaTS-D, a digital version of CaTS. Documenting this process is important to demonstrate the evolution and relevance of CaTS-D to the overall research aims of this thesis, and its potential for broader application. The development process was time-intensive, taking place over almost 3 years. The professionalism, usability, and overall quality of CaTS-D was greatly enhanced by the support and input of Professor Greenhalgh and YW, and particularly IG who offered to develop CaTS-D gratis, partly as a friend, but also to provide an example of his development skills as he set up his own company. I am truly grateful for their support in the development of CaTS-D. However, this process would have been far quicker if I had adequate funding to pursue support from the Digital Research Team, earlier in my PhD. Furthermore, now CaTS-

D has been developed it is, in principle, available to use for future research. However, there are considerations before future applications.

First, CaTS-D could remain hosted by the University of Nottingham, and researchers would be given their login where they create and disseminate their CaTS-D study and access their data. However, some countries (e.g., China, Germany, Russia) require data captured in those countries to be stored within those countries (called `data localisation') (Taylor, 2020a). This presents issues for researchers capturing data across countries, including not capturing data from specific countries, or paying for servers in multiple countries to ensure data is saved in countries' which require this. The latter requires appropriate technical support and funding to cover additional server costs. Second, the CaTS-D framework could be emailed to researchers, however they would have to budget for technical support to place CaTS-D on a server and build their access portal (i.e., the front pages including study information, informed consent, and demographic information). These factors are standard for digital tools, and should not prevent researchers applying CaTS-D, however they must be considered.

Once CaTS-D was developed, and capturing and saving data, the pilot phase was essential for assessing the tool's appropriateness and readiness for wider application. The next chapter (Chapter 6) documents the pilot phase and outcomes, and the first study utilising CaTS-D is presented in Chapter 7.

Chapter 6:

Co-developing the CaTS-D: a pilot study of the Card Sort Task-Digital for Self-Harm (CaTS) with people with lived self-harm experiences

This chapter has been published in JMIR Mental Health as a two-phase co-production study with Chapter 4: **Bird, K.,** Greentree, I., O'Shea, B., & Townsend, E. (2025). Co-Developing Content Updates for the Card Sort Task for Self-Harm–Digital (CaTS-D) With People With Lived Self-Harm Experiences: Pilot Study and Thematic Analysis. *JMIR Mental Health*, *12*(1), e71296.

The development of CaTS-D outlined in Chapter 5 described the iterative process resulting in a functional prototype. However, it is essential to assess its usability and acceptability through real-world applications. Chapter 6 explores how CaTS-D performed in practice through pilot testing. This pilot phase aimed to evaluate the usability and overall suitability of CaTS-D to either guide further development and/or establish CaTS-D as a usable research tool. Chapter 6 discusses methodology, and insights gained from this initial pilot phase.

6.1. Introduction

As discussed previously (see Chapters 1 & 5), the original CaTS presents some limitations. First, in-person research is time-consuming for both researchers and participants and limits recruitment opportunities. To address this, we developed a web-app version of CaTS, called CaTS-Digital (CaTS-D). Digital tools provide a flexible, cost-effective option for researchers utilising technologies most individuals use daily (Kruzan et al., 2022). They are also a useful, effective way to reach large, representative samples (Smith et al., 2021). Indeed, approximately 95% of people report owning a smartphone (Anderson, 2018; Lenhart et al., 2010) and 45% of young people report being online almost constantly (Anderson et al., 2018). Furthermore, many people are engaged and comfortable (Russell et al., 2018) using smartphone 'apps', suggesting research undertaken online is likely a favourable option. Digital tools also benefit researchers. For example, web-apps can reduce response burden (Roberts et al., 2022; Silva, 2015), which may result in more valid responses

(Smith et al., 2021). There is also evidence online research increases participant diversity (McDermott & Roen, 2013). Further, online methods may reduce recruitment and research costs while increasing recruitment efficiency (Smith et al., 2021). Therefore, CaTS-D may be an efficient, versatile, accessible self-harm research tool allowing researchers to capture large, diverse datasets. CaTS-D will also increase the efficiency of data management and analysis procedures.

Second, a digital prototype of CaTS was created following patient and public involvement (PPI) which identified that participants would favour a digital version (Lockwood et al., 2023). Lockwood and colleagues (2023) reported similar sequential results to in-person CaTS research, suggesting CaTS-D is capable of capturing data comparable to the in-person version. Finally, the existing CaTS version only allows participants to use each card once. During previous in-person research (e.g., Townsend et al., 2016) participants were asked to place cards under the most pertinent timepoint. However, items may be relevant at multiple, or all, timepoints. Consequently, research utilising CaTS may not provide a complete picture of self-harm antecedents, or which factors occur more frequently than others. CaTS-D would address this deficit by allowing participants to select multiple timepoints for each card and better document their self-harm pathway. This would improve our understanding of self-harm and its antecedents and provide researchers with a stronger data set on which to base recommendations.

CaTS-D was developed using react.js, a JavaScript library capable of developing modular user interfaces (ReactJS, 2024). CaTS-D is accessed via a link or QR code and it was primarily designed to optimise smartphone usage with a vertical layout allowing people to complete the task at their own pace and convenience. Performing CaTS-D involves participants working through cards individually. Each card has all timepoints underneath, and participants select all relevant timepoints for each card before moving to the next card (see Figure 14. for an example card presented in CaTS-D with selected timepoints). Participants select ‘not applicable’ to cards not relevant to their most recent self-harm episode. It is not possible to simultaneously select timepoints and ‘not applicable’.

Participants work through all cards in random order in this manner until the task is complete. There is an opportunity at the end to manually add up to four cards not already included in the task. Here, we present findings from the pilot study which assess the usability and feasibility of the web-app CaTS-D. The pilot study will inform targeted amendments and updates to enhance user experience, increase task completing, and reduce attrition. To identify these amendments/updates, we captured feedback on this version of CaTS-D (V.04), focusing on performance, design, and content (i.e., whether items/cards needed adding or re-wording). Finally, we also present feasibility data and mood findings to assess whether participation in self-harm studies using CaTS-D impacts participants' emotional wellbeing. Feasibility testing is a vital step to make sure CaTS-D is safe and suitable research tool.

6.1.2. Study Aims

This pilot study aimed to establish the feasibility and usability of CaTS-D and assess the impact on participants' mood.

6.2. Method

6.2.1. Participants

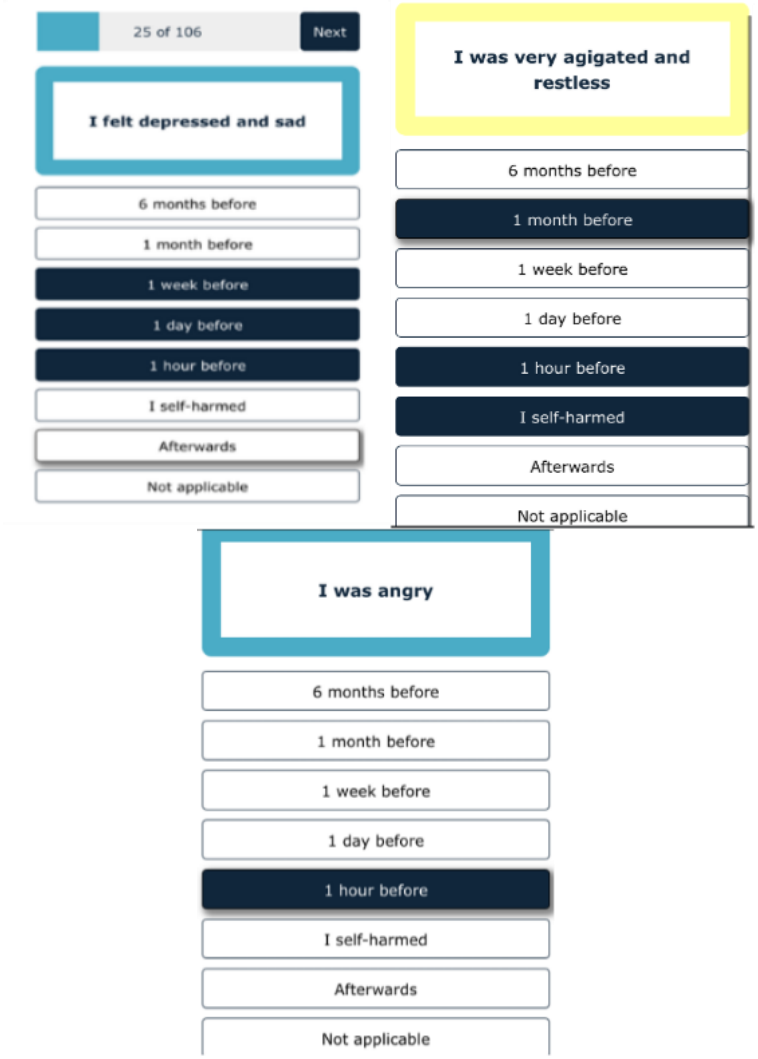
UK-based individuals (*n*=13) with lived self-harm experience, internet access, and a smartphone, tablet, or desktop, and aged 18+-years were invited to participate via email and social media advertisements through gatekeepers (mental health organisations). Undergraduate and postgraduate students at the University of Nottingham were recruited via recruitment noticeboards. Participants received a £10 Amazon voucher renumeration. This research adhered to and was approved by the University of Nottingham's School of Psychology Ethics Committee (S1543R).

6.2.2 Study Procedure

Participants followed the link provided by the research team, which took them to the web-app, CaTS-D. Study information and instructions on how to complete CaTS-D were presented first. Participants provided informed consent by clicking a button at the

bottom of the page. A unique identifier was provided at this stage, and participants were advised to email KB within a week from taking part with the identifier should they wish to withdraw data. Then, participants completed a brief wellbeing plan, which involved participants confirming they had details of a trusted person to hand should they need it, and to undertake a post-study activity to improve mood. Details of support organisations were presented, and participants were advised that these would be provided again afterwards.

***Figure 10**. Examples of cards presented in CaTS-D with various timepoints highlighted*



Participants were asked for their demographic information (age-range, sexuality, gender identity, sex assigned at birth, ethnicity, current employment/education status, household income, and education level). Data were collected between November 2023 and January 2024. All data, including consent, was captured during a single session per participant. In line with other self-harm studies (i.e., Lockwood et al., 2023; Townsend et al., 2016), participants completed CaTS-D while reflecting on their most recent self-harm episode. Participants selected all timepoints relevant to that card, or 'not applicable'. They worked through cards until the task was complete. To control for order effects, cards were randomly presented each time (Reisner & Juntunen, 2015; Snooks, 2020). However, seven cards relate to what occurred post self-harm, these cards were presented after all other cards (e.g., '*I felt worse after self-harm*', '*I felt better after self-harm', 'Self-harm stopped me from killing myself'*). Response options for post self-harm cards were 'yes', 'no', and 'not applicable'. Only one option could be selected. Participants were able to enter up to four missing items and select relevant timepoints, mirroring the blank cards included in the in-person variant of the task.

Afterwards, to assess feasibility, participants were asked questions based on the System Usability Scale (SUS; Kruzan et al., 2022). This scale evaluates overall usability and acceptability of technical products including software, hardware, and websites (O'Brien et al., 2017). Questions focused on whether instructions were easy to follow, how participants found completing CaTS-D on their device, and whether CaTS-D was easy or difficult to complete (see Appendix 10). We used a marginally revised SUS with some items re-worded to increase relevance to CaTS-D (i.e., changing 'system' to 'web-app'). An open-ended question requesting further feedback was included to elicit additional comments after each question, and again at the end of the SUS. Questions in the SUS required dichotomous or Likert-scale responses. Questions 1-3 captured dichotomous (Y/N) responses, those selecting 'no' could also free-type feedback regarding their experiences using CaTS-D. Remaining 12 items were scored on a 5-point Likert scale (ranging from 1 (strongly disagree) to 5 (strongly agree)).

To monitor the emotional impact of using CaTS-D, participants rated their emotional state at the beginning and end of the study by completing a visual analogue scale (VAS). This was presented as a scale ranging from 0 (illustrated with a sad face) to 10 (illustrated as a smiling face). Participants were prompted: "Please rate your current mood on the scale below". Pre- and post-study VAS data was analysed to identify whether participating in the study impacted mood. Participants were signposted to support organisations after the study and presented with cute animal pictures as part of debriefing. These images were presented after the post-study VAS was completed to avoid influencing participant responses. This presentation aligns with previous CaTS studies (Lockwood et al., 2023; Townsend et al., 2016; Wadman et al., 2017) and is recommended good practice to mitigate distress when conducting sensitive research (Nittono et al., 2012). Full instructions and debrief are available in appendix 13.

6.2.3. Ethical and Safety Considerations

This pilot study received ethical approval from the University of Nottingham's School of Psychology Ethics Committee (S1543R) and was explicitly designed to test the feasibility and acceptability of the CaTS-D. As with any pilot involving an evolving tool, there was uncertainty and the possibility of participant burden, particularly because CaTS-D was still undergoing iterative development. Further ethical considerations relating to the sensitive nature of the content (self-harm and suicide) and the use of remote participation, which could potentially impact participants' wellbeing, were identified and considered.

Consequently, safeguards were implemented before recruitment to minimise risk. During the informed consent process, participants were clearly told that they were testing a preliminary, unrefined prototype and that their feedback would directly inform revisions ahead of the full-scale study (Chapter 7). Participants were also made aware the pilot study involved sensitive topics and were encouraged to consider their current wellbeing and their capacity to participate safely.

To further support participants, a brief wellbeing plan had to be completed prior to the study. This included confirming they had

access to a trusted person's contact details and identifying a post-study mood-improvement task. Pre- and post-study VAS mood ratings were also collected to monitor any immediate impact of participation. Had VAS results shown a significant mood reduction, further amendments and pilot testing would have been undertaken. Feedback gathered during the pilot study was used to refine and improve the CaTS-D (see Section 6.3.5), allowing issues to be identified and addressed in a controlled and ethically managed manner before progressing to the large-scale study.

6.3. Results

6.3.1 Data Analysis

Data were downloaded as a .CSV file, transported into an Excel spreadsheet, and analysed using SPSS (2021, Version 28.0). Descriptive statistics regarding participant characteristics were analysed to characterise feasibility and engagement (Deady et al., 2020). A general inductive approach was used to analyse qualitative responses for feedback on CaTS-D regarding whether concepts or cards were missing or needed updating (Thomas, 2006).

6.3.2 Participant Characteristics

In total, thirteen participants participated, ages ranged between 18-30 years. Demographic data is presented in Table 12. On average, participants spent *M*=16.32 (*SD*=12.12) minutes completing the task. This is reassuring considering the ideal length of time spent completing online studies is ~20-minutes (Revilla, 2017).

Table 12.
Pilot Study Demographic Data

Demographic	**Percentage**
Ethnicity	White British: 69.23% White other: 7.69% British Asian: 7.69% British Chinese: 7.69% British Indian: 7.69%
Gender identity	Cis female: 69.23%

	Cis male: 15.38% Non-binary: 15.38%
Birth-assigned sex	Assigned female at birth: 76.92% Assigned male at birth: 15.38% Prefer not to say: 7.69%
Sexuality	Heterosexual: 38.45% Bisexual: 30.77% Other: 30.77%
Marital status	Single/never married: 92.31% Married: 7.69%
Education level	Bachelor's: 23.08% College/University - no degree: 46.15% PhD/Doctoral degree: 23.08% A- or T-Levels: 7.69%
Employment status	Employed full-time: 28.57% Employed part-time: 30.77% Unemployed: 30.77% Prefer not to say: 7.69%
Household income	£20,000-£29,000: 7.69% £40,000-£49,000: 15.38% £50,000-£59,000: 7.69% £60,000-£69,000: 7.69% £70,000-£79,000: 7.69% £100,000+: 7.69% Prefer not to say: 38.46%

6.3.3. Emotional State (Visual Analogue Scale)

The mean pre-study score on the emotional VAS was 7 (*SD*=1.25) and 5.89 (*SD*=.52) afterwards. Therefore, scores persisted around the mid-range of the scale (1-10) before and after completion. A paired-samples t-test was conducted to compare pre- and post-study VAS scores. This did not represent a significant difference ($t(9) = 1.59$, $P = .15$).

6.3.4. Feasibility of CaTS-D

The maximum mean score for all SUS subscales was 5. Higher scores indicate greater perceived usability (O'Brien et al., 2017), therefore a mean score of 4 was selected as a test value. This is in-line with other pilot studies which used the SUS to assess feasibility of self-harm and suicide interventions in smartphone applications (O'Brien et al., 2017). Mean scores on the SUS

subscale ranged from 3 to 5 (*M*=4.65, *SD*=.53). However, the mean response for Q10 ('***I think that I would like to use this web-app frequently'***) was 3. This represented 'neither agree nor disagree' which was an appropriate response considering the nature of the web-app for single-use research purposes. Across all 15 SUS questions, there were some non-responders. High scores on remaining questions are reassuring and indicate participants will not struggle to complete CaTS-D and should complete the task competently and efficiently. Considering the recorded mean was higher than the test score (4), statistical tests were not run. A full list of SUS questions, means and standards is presented in Table 13.

6.3.5. Qualitative Feedback

Participants were given the opportunity to provide written feedback on all SUS questions. Overall, participant responses suggested pre-study instructions should be made clearer. Responses were provided for three questions (*'Were instructions easy to follow?'; 'Are cards visually appealing?'; 'Did the instructions make completing the task easy?'*). Feedback reported by participants included:

- "I wouldn't say they were difficult, but there were a few things that I missed originally, such as it being related to my most recent occasion of self-harm"
- "The timeline questions were a bit confusing, and I wasn't always sure how 'I self-harmed' matched up with the card. For some things it was just happening basically always"
- "I was not sure when I had to tick the 'I self-harmed' box"

We recommend researchers ensure instructions are clear when utilising CaTS-D in research, including ***which self-episode the research relates to***, that p***articipants can select multiple or all timepoints***, and to explicitly state ***'I self-harmed' should be selected if factors are relevant during the moment of self-harm***'.

Table 13.
Mean and standard deviation scores from SUS questions

SUS question	Mean (*SD*)
How easy did you find performing the task on your device?	4.64 (4.33)
I felt very confident using the web-app.	4.5 (2.61)
I found the various functions in this web-app were well integrated	4.5 (1.30)
I found the web-app unnecessarily complex	4.75 (3.05)
I found the web-app difficult to use	5 (4.47)
I needed to learn a lot of things before I could get going with this web-app	5 (3.78)
I think that I would like to use this web-app frequently	3 (2.94)
I think that I would need the support of a technical person to be able to use this web-app	5 (4.47)
I thought the web-app was easy to use	5 (.2.68)
I would imagine that most people would learn to use the web-app very quickly	4.64 (4.02)
Is the wording on the cards easy to read?	4.78 (3.49)

6.4. Discussion

This pilot study aimed to assess the usability, feasibility and acceptability of CaTS-D, and capture feedback of CaTS-D in order to identify amendments to increase the usability of this novel web-app. Assessing usability, feasibility and acceptability is an essential part of web-app development to ensure the web-app is easy to use and complete in order to reduce attrition (Shitkova et al., 2015). The pilot data presented here suggests CaTS-D is a promising web-application for use in self-harm and suicide-related research. It can be used to examine and identify key self-harm antecedents which can be targeted during intervention, if present. High scores on the SUS were endorsed by participants across all items. Responses to SUS questions indicate participants found CaTS-D consistent, easy to use, and easy to perform. Further, participants felt confident using CaTS-D, did not feel CaTS-D was unnecessarily complex, and was well integrated.

Regarding card design, feasibility data showed participants felt the font and card interface were easy to read and visually appealing. Additionally, participants felt they would not need technical support or learn anything to use the web-app. Considering the nature of online research, this is reassuring and indicates future participants will be able to complete CaTS-D remotely without difficulty. Finally, although VAS scores decreased slightly post-study, statistically participants' emotional state was not negatively affected by completing CaTS-D. A slight mood reduction may be due to the effects of thinking about self-harm experiences. Indeed, previous CaTS research noted mixed results with VAS reductions in mood shown for younger people but not for adults (Lockwood et al., 2023). However, there is no evidence that partaking in self-harm research has significant negative impact on mood (Lockwood et al., 2018). This is reassuring but further studies can confirm whether our sample was too small (low power) to detect an effect. Importantly, the positive mood induction at the end of the study ensures participants will not be negatively impacted by taking part in studies using CaTS-D.

The large number of non-responders to the open-ended feasibility questions is disappointing. This may suggest participants were fatigued having responded to each card and completed the CaTS-D immediately prior to answering SUS questions. Indeed, response burden is associated with increased attrition and unwillingness to engage in research (Roberts et al., 2022). Further, some non-responses may be due to the wording of questions. For example, Q6. discusses features being 'well integrated'. Possibly, participants were unsure how this concept related to CaTS-D or did not understand 'integrated' in this context, so chose not to respond. Wording this question differently may have yielded more responses. Despite this, feedback was positive and indicate CaTS-D is easy to use, does not require additional learning or support to complete, and people feel comfortable completing CaTS-D. This indicates that CaTS-D is a feasible, acceptable, and useful self-harm research tool.

Qualitative feedback was brief, and suggested instructions could be clearer. Based on this feedback, we make the following recommendations for researchers using CaTS in future research:

- **Instructions should explicitly highlight which self-harm episode (i.e., first ever, most recent) should be considered by participants taking part in the study**
- **Ensure instructions clearly explain 'I self-harmed' is a timepoint which can be selected if cards are relevant to the point of self-harm**
- **To explicitly state all timepoints (including 'I self-harmed') can be selected if necessary.**

Following these recommendations will reduce participant confusion and ensure data captured in future studies directly relates to the research question.

6.5. Strengths and Limitations

Participant demographics included a range of employment statuses, education levels, and household incomes, suggesting CaTS-D may be acceptable across different backgrounds. Most participants (~70%) were White British. While this is lower than the proportion reported in recent UK population estimates (81%; ONS, 2022), the small sample size (*n*=13) means these figures should be interpreted with caution. Further, the sample size may indicate a marginal or trending effects, suggesting a potential reduction in participant mood which warrants further examination. Further research with a later sample would clarify whether this trend represents a meaningful mood change. Further feasibility testing with larger and more diverse samples, including participants from other countries, is recommended.

6.6. Conclusion

These findings indicate participants can complete CaTS-D easily and confidently. Using CaTS-D addresses some issues faced by researchers, such as gathering data from hard-to-reach populations (McDermott et al., 2013). Further, the anonymity CaTS-D offers may be preferable, including people in hard-to-reach populations. Considering most people use smartphones and devices daily (Russelll et al., 2018; Smith et al., 2021), tools developed for online mental health research are increasingly necessary and, in some instances, preferable to in-person

research (Luxton et al., 2011; McManama et al., 2017). While many people quickly navigate new websites or web-apps (Jobe, 2013), accessibility and efficiency are essential (Shitkova et al., 2015). Consequently, assessing the feasibility of newly developed web-apps is an important, necessary step. CaTS-D is a novel, unique research tool allowing participants to document their bespoke self-harm pathway. Results from this pilot study indicate CaTS-D as a feasible, usable research tool, suitable for capturing large-scale self-harm data.

The pilot testing described in Chapter 6 provided crucial insight into the usability and acceptability of CaTS-D, including some improvements. Following the adjustments made, based on participant feedback in this study, and including the amendments/additions identified in Chapter 4, CaTS-D was ready for deployment in the main study of this thesis. Chapter 7 presents this next study where CaTS-D is utilised in full research setting to explore self-harm pathways in cisgender/heterosexual and LGBTQIA+ populations.

Chapter 7

Examining temporal pathways to self-harm in cisgender/heterosexual and LGBTQIA+ populations using the novel Card Sort Task for Self-Harm-Digital (CaTS-D)

After pilot testing CaTS-D to ascertain its usability and feasibility in Chapter 6, CaTS-D was utilised in a large-scale study of self-harm in two groups to examine the temporal pathways between factors and identify key self-harm antecedents.

7.1. Introduction

As discussed in this thesis introduction (Chapter 1), self-harm remains a significant health, public, and economic concern within the general population. Recent evidence indicates self-harm rates are increasing (Cybulski et al., 2021; McManus et al., 2019). We are also increasingly aware, compared to cisgender/heterosexual people, LGBTQIA+ people are at increased risk of self-harm (Kidd et al., 2024; White et al., 2023). However, despite increasing rates, our understanding of functions, motives, and antecedents underpinning self-harm in cisgender/heterosexual and LGBTQIA+ populations remains limited (Rasmussen et al., 2016; Stänicke et al. 2018). LGBTQIA+ people may experience unique factors which may increase their risk (e.g., discrimination; Wallace et al., 2024; Williams et al., 2021). However, in both groups it remains unclear how these and other co-occurring factors interact to influence self-harm across both groups.

Prior research often focused on isolated self-harm factors (Townsend et al., 2016) and longitudinal studies typically span over substantial time periods. For example, Stanford and colleagues (2017) collected data over a 6-year period while a recent systematic review reported longitudinal follow-up durations between 0.5- and 20+-years (Liu et al., 2022a). Short-term follow-ups (e.g., 0.5-1-year) are more likely to capture immediate risk factors for repetition (or suicide) but may miss persistent influences. Contrastingly, longer follow-ups (e.g., 10-20-years) capture more distal outcomes (Liu et al., 2022a) but delay the availability of findings. Consequently, Liu and colleagues (2022a) recommend between 1- and 3.5-years for longitudinal follow-up to balance immediacy and depth. While this timeframe

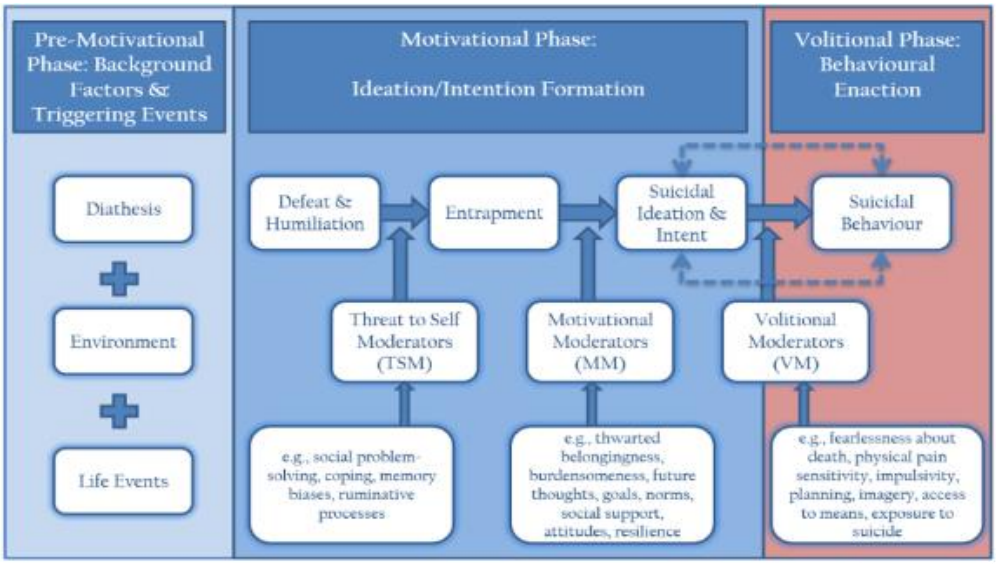
is valuable for identifying temporal and causal relationships in self-harm (Valencia-Agudo et al., 2018; Uh et al., 2021, it remains resource- and time-intensive. To address these challenges, CaTS-D was developed to enable rapid data collection and allow multiple self-harm factors to be examined across a timeline within significantly shorter time periods than traditional longitudinal studies.

This chapter presents findings from the initial application of CaTS-D in a research setting following its development and pilot testing phases (Chapters 4-6). The current study examined self-harm pathways in both cisgender/heterosexual and LGBTQIA+ individuals and evaluated whether the Integrated Motivational-Volitional Model (IMV; figure 16; O'Connor, 2011; O'Connor & Kirtley, 2018) provides a useful framework of the temporal self-harm pathway. Previous CaTS research broadly supported the IMV model (Townsend et al., 2016), making it a suitable theoretical framework for the current study and a logical choice to test further utilising CaTS-D. To recap, the IMV model (figure 16.) is a three-phase model which considers the temporal dynamics between various distal and proximal factors for self-harm in order to explain why people self-harm: (1) the Pre-Motivational stage compromising background factors which increase vulnerability such as life events or individual factors; (2) the Motivational phase where factors including defeat, humiliation, and isolation occur; (3) the Volitional phase where factors such as impulsivity and self-harm exposure which supports the ideation to enaction transition occurs.

7.1.2. Study Aims

The aim of this thesis chapter is to examine whether the data captured by CaTS-D supports the IMV model and to explore new insights into the temporal structure of self-harm pathways in both LGBTQIA+ and cisgender/heterosexual populations.

Figure 12.
The Integrated Motivational-Volitional Model of Suicidal Behaviour



7.2. Method

7.2.1. Participants

All participants were recruited via Prolific (https://www.prolific.com/), and were aged 18+-years, based in the UK, and had self-reported self-harm history. Prolific offers a verified participant pool which can be targeted using pre-screening criteria to allow researchers to target specific groups. This enabled me to select the above criteria in two separate recruitment drives: one for LGBTQIA+ individuals, and one for cisgender/heterosexual individuals.

7.2.1.1. Power Analysis

A priori power analysis was conducted to determine the minimal sample size required to detect a medium effect size. Assuming an effect size of $d = 0.5$, a significance level of $\alpha = .05$, and power $(1 - \beta) = .80$, the required sample size was $n = 51$ per group. This estimate was informed by data from Lockwood et al. (2023) who recruited two groups ($n = 66$ and $n = 43$, respectively), utilised an earlier digital version of CaTS, and employed the same analytical

method (Indicator Wave Analysis) as the current study. The achieved power in the current study was .81, which is considered medium according to Cohens (1988) criteria. Therefore, the proposed sample size of *n* = 50 per group is deemed appropriate and sufficient.

7.2.1.2. Study Procedure

The study procedure closely mirrored the pilot study presented in Chapter 7. Eligible participants accessed the study through the link provided in the Prolific study information page which took them to the web-app, CaTS-D. Participants were first presented with study information and CaTS-D completion instructions, which were reviewed prior to providing informed consent by clicking a button at the bottom of the page. A unique identifier was provided at this stage, and participants were advised to email KB within a week from taking part with the identifier should they wish to withdraw data. Then, participants completed a brief wellbeing plan, which involved participants confirming they had details of a trusted person to hand should they need it, and to undertake a post-study activity to improve mood. Details of support organisations were presented, and participants were advised that these would be provided again afterwards.

Participants were asked for their demographic information (age-range, sexuality, gender identity, sex assigned at birth, ethnicity, current employment/education status, household income, and education level). Data were collected between October 2025 and March 2025. All data, including consent, was captured during a single session per participant. In line with other self-harm studies (i.e., Lockwood et al., 2023; Townsend et al., 2016), participants completed CaTS-D while reflecting on their most recent self-harm episode. Participants selected all timepoints relevant to that card, or 'not applicable'. They worked through cards until the task was complete. To control for order effects, cards were randomly presented each time (Reisner & Juntunen, 2015; Snooks, 2020). Seven cards relate to what occurred post self-harm, these cards were presented after all other cards (e.g., '*I felt worse after self-harm*', '*I felt better after self-harm', 'Self-harm stopped me from*

killing myself'). Post self-harm card responses were limited to 'yes', 'no', and 'not applicable', with only one option selectable. Participants were able to enter up to four missing items and select relevant timepoints, mirroring the blank cards included in the in-person variant of CaTS.

Consistent with previous self-harm research (e.g., Lockwood et al., 2023, Townsend et al., 2016; Wadman et al., 2017), participants rated their emotional state before and after the study using a visual analogue scale (VAS) to assess the impact of CaTS-D in research settings. This was presented as a scale ranging from 0 (illustrated with a sad face) to 10 (illustrated as a smiling face). Participants were prompted: "*Please rate your current mood on the scale below*". Pre- and post-study VAS data was analysed to determine whether participation affected mood. In the debrief information, participants were signposted to support organisations' and presented with cute animal pictures. Images were presented after the post-study VAS was completed to avoid influencing participant responses. This presentation aligns with previous CaTS studies (e.g., Lockwood et al., 2023; Townsend et al., 2016; Wadman et al., 2017) and is recommended practice to mitigate distress when conducting sensitive research (Nittono et al., 2012). Full study instructions and debrief are available in appendix 13.

7.2.1.3. Ethical and Safety Considerations

Ethical approval for this chapter was granted by the University of Nottingham's School of Psychology Ethics Committee (S1543R). Participants provided informed consent and were given clear information about the study aims, procedures, the sensitive nature of the content, their right to withdraw at any time without consequences, and how their data would be handled and stored. Based on feedback from the pilot study (Chapter 6; Section 6.2.3.), an example card was added to the consent materials to help clarify what participation would involve.

Risks to participants were similar to those identified in the pilot study (Chapter 6), mainly arising from reading and considering sensitive self-harm and suicide-related constructs digitally and

remotely. These were managed using the same safeguards implemented previously in Chapter 6: completion of a brief wellbeing plan, identifying a trusted person, confirming a post-study mood-enhancing activity, and collection of pre- and post-study VAS mood ratings. Data were collected anonymously and stored securely on University of Nottingham servers with access restricted to the research team. To mitigate risk stemming from remote participation, consent materials detailed the sensitive nature of the task and encouraged participants to consider their current wellbeing and whether taking part is appropriate. Details of relevant support services (e.g., Samaritans) was provided during the post-study debrief.

In line with the pilot study (Chapter 6), eligibility criteria required participants to be UK-based, aged 18 years or older, have lived experience of self-harm, and have internet access and access to a smartphone, tablet, or desktop computer. Data were collected anonymously and stored on secure University of Nottingham servers. Access to data was restricted to my immediate supervisory team and retained in accordance with University data storage protocol. My own wellbeing as a researcher was also considered. I regularly engaged in reflective practices (journalling, engaging in supervisory debrief) to ensure my wellbeing.

7.2.2. Data Analysis

7.2.2.1. Data Preparation and Pre-Statistical Manipulation

Initially, data were downloaded as a .CSV file and imported into Excel. Participants were divided into two groups: cisgender/ heterosexual and LGBTQIA+ people. Then, data for each group were organised into separate timepoints. The high number of cards in CaTS-D (*n*=130) means individual analysis of each card is too complex for Indicator Wave Analysis (IWA). To reduce the complexity, cards were grouped into categories following procedures used in prior sequence analyses (Lockwood et al., 2023; Townsend et al., 2016; Wadman et al., 2017). Seventeen categories used in a previous IWA CaTS study (Lockwood et al., 2023) were used. Additional cards (developed from the qualitative study in Chapter 4) were adopted and categorised. This additional categorisation was initially performed by KB and reviewed by another researcher in the Self-Harm Research Group

(SHRG) at the University of Nottingham. Full agreement was achieved. See table 13 for a list of categories and their included cards. However, discussion arose regarding the card '*I felt energised*'. In Lockwood et al. (2023), this card was the sole item in the '*Positive emotions*' category. Following discussion between KB and another SHRG researcher, this category was renamed '*Energised*' as this was considered a more accurate reflection of the concept, particularly because feeling energised might be physical rather than emotional. All cards were used at least once and, therefore, all were categorised. In total, 37 categories were developed, including the original 17 categories used by Lockwood et al., including '*Accessed support that helps*', '*Executive Functioning*', '*Humiliation and defeat*', '*Lack of support*', '*Negative social media*', and '*Negative life events/social problems*'. Some categories contained a single card, reflecting a distinct concept not represented elsewhere. A full list of categories, and their included cards are presented in table 14.

Table 14.
Categorisation of Cards used in Indicator Wave Analysis (IWA)

Category	Included card/s
Access to Means*	I had access to the means to hurt myself
Accessed support that did help*	I depended on a caregiver for help and support; I phoned a helpline which helped; I read a self-help book - it helped; I received help and support from a user-led service (i.e., Harmless); I received therapy which helped; I saw my GP which helped; I talked to a friend which helped; I talked to a social worker which helped; I talked to a teacher which helped; I talked to my caregiver which helped; I went to counselling which helped; Someone listened to me & took me seriously; I trusted a caregiver; A&E staff were friendly and understanding
Accessed support that did not help*	I phoned a helpline which did not help; I read a self-help book - it did not help; I received therapy which did not help; I saw my GP which did not help; I talked to a friend which did not help; I talked to a social worker which did not help; I talked to a teacher which did not help; I talked to my caregiver which did not help; I went to counselling which did not help; No one listened to me or took me seriously; A&E staff were not friendly and understanding
Acquired capability*	I am insensitive to pain; I was not afraid of death
Alexithymia	I did not know what I was feeling
Bad memories	I thought about being treated badly as a child
Burdensomeness*	I felt like a burden on people
Lack of support	I could not tell anyone how I was feeling
Energized*	I felt energized

Executive functioning*	I could not solve a problem I faced; I could not think of anything else to do; I struggled to make decisions
Exposure*	I discussed self-harm on social media or the internet; I knew someone who was self-harming; I read about self-harm on the internet; Lots of people I knew were doing it; Someone I knew killed themselves
Feeling negative after self-harm*	I felt worse after self-harm
Feeling positive after self-harm*	I felt better after self-harm
Gender or sexuality-based negative events or life problems	I was bullied because of my sexuality or gender identity; I was discriminated against because of my sexuality or gender identity
Hopefulness	I felt hopeful about the future; I felt I could change for the better in future
Hopelessness	I felt very hopeless about the future; I wanted to die; I wanted to kill myself
Hospitalised after self-harm	I went to hospital for overdose or self-injury
Humiliation & defeat	I felt defeated; I felt humiliated; I felt I could not change for the better in future; I felt I would not be able to change myself in the future
Impulsivity*	I did it on impulse without planning
In control	Self-harm gave me a feeling of control
Lack of belonging*	I was rejected by my parents; I felt abandoned; I felt rejected
Lack of support*	I received no support from caregivers; I could not tell anyone how I was feeling; There was no-one to turn to for help

I was questioning my sexuality or gender identity	I was questioning my sexuality or gender identity
Loneliness, entrapment & isolation*	I isolated myself from others; I felt I could not escape from feelings or situations; I felt I did not fit in; I felt ignored; I felt like I did not belong; I felt trapped; I could not trust anyone
Maladaptive behaviours	I did other things to hurt myself (starved myself, drank too much); I got involved with a gang; I had unprotected sex; I was drinking alcohol; I was drunk
Maladaptive sense of self	I did not feel comfortable in my body
Negative feelings*	I felt depressed and sad; I felt disgusting; I felt exhausted; I felt numb; I felt very anxious; I felt worthless; I hated myself; I was angry; The mental pain was unbearable
Negative life events or social problems*	I got into trouble at home; I got into trouble at school/work; I was having nightmares; I got into trouble with the police; I had a problem at school; I had a problem at work; I had an argument with my partner; I had an argument with my friend; I had an argument with my parent/caregiver; I moved to a different home; I moved to a different school; I was a victim of a crime; I was being abused mentally; I was being physically abused; I was bullied; I was having problems with a close relationship; I was taken into a residential care home; I was taken into foster care; Someone close to me died; Someone close to me left
Negative sexual experiences	I was raped; I had an upsetting sexual experience; I was sexually abused or assaulted

Negative social media	Social media/online content was negatively impacting my mental health; I was bullied on social media; I was discriminated against on social media
Negative sexual experiences	I had an upsetting sexual experience; I was sexually abused or assaulted
Planned self-harm*	I planned it carefully
Positive social media	I found support/a community on social media
Restlessness	I was very agitated and restless
Self-harm stopped me from killing myself	Self-harm stopped me from killing myself
Substance use	I was high on drugs; I was taking illegal drugs
Unable to sleep	I was not able to sleep

* denotes categories previously used in Lockwood et al. (2023)

7.2.2.2. Handling Incomplete Data

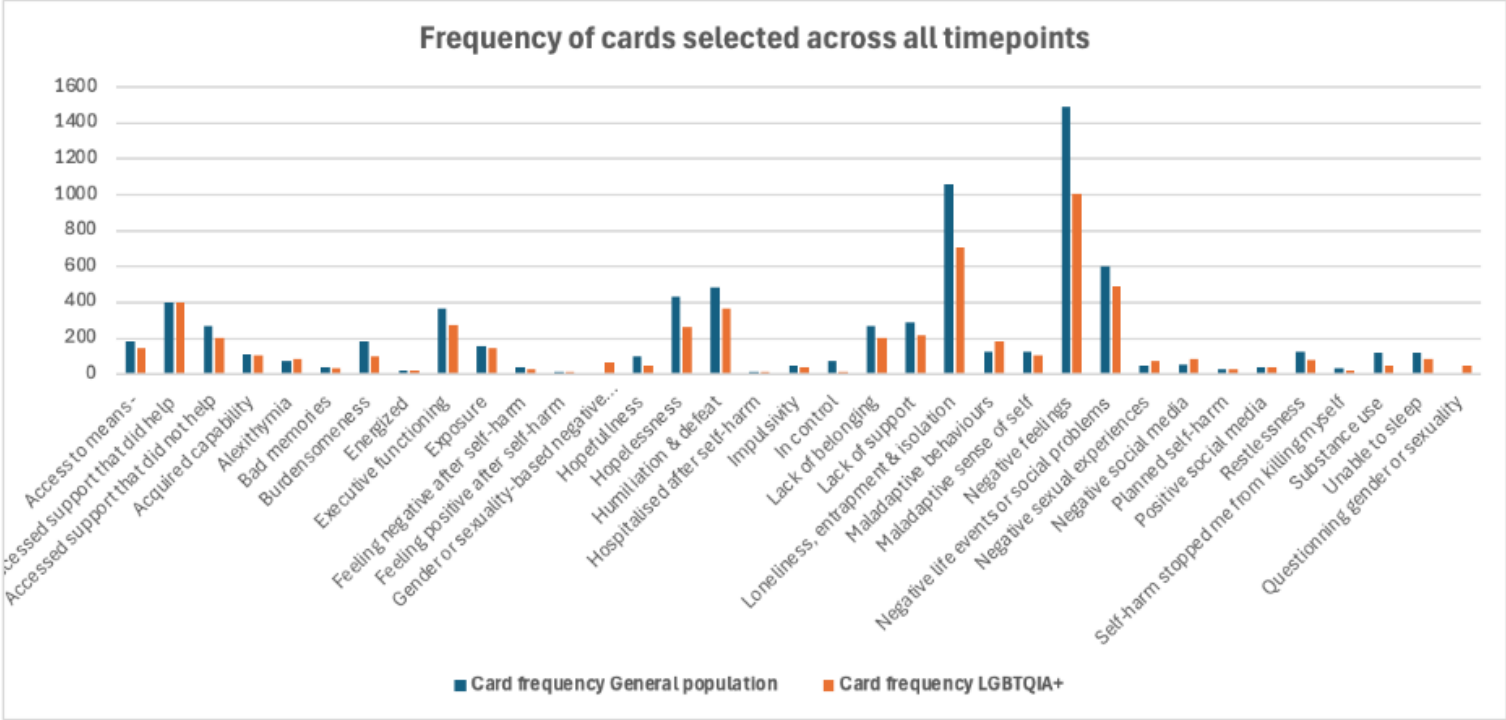
Five participants did not specify their gender (*N* = 3: 'Prefer not to say'; *N* = 2: 'Null'). Of those who selected 'Null', one was excluded as they only selected two cards, and all demographic data was missing. It is likely this resulted from a coding error or drop-out. The remaining four participants were included and placed in the cisgender/heterosexual group due to their responses in other demographic categories (e.g., straight/ heterosexual). Eight participants were excluded from analysis (GP *N* = 4; LGBTQIA *N* = 4) for selecting 'not applicable' to previous self-harm or for all cards.

7.2.2.3. Indicator Wave Analysis

Indicator Wave Analysis (IWA) assesses interdependence between events by analysing multiple behaviours, events, and concepts on a timeline (Keatley & Clarke, 2018). To perform IWA, categories were organised into timepoints, and frequencies were calculated for items within each timepoint related to the most recent episode of self-harm. A frequency table of the number of occurrences of categorised cards was generated (Figure 13). Lastly, to produce standardised residuals (SRs), a chi-square analysis was performed in SPSS (v.29, IBM Corp., 2022) for most recent self-harm episode for each group: cisgender/heterosexual and LGBTQIA+ people. In IWA, SRs are used as descriptive variables which measure the strength of the difference between observed and expected values, to identify key points of interest, by indicating when an event (or concept) is happening more or less frequently than would be expected by chance. While Chi-square analysis was performed to examine card frequencies, the resulting statistic was not use for inferential purposes, therefore tests assumptions were not evaluated (Lockwood et al., 2023). These statistics identified which categories were more, or less, likely to occur at specific timepoints than would be expected by chance. This suggests an association between cards within a category being selected at a particular timepoint than would occur by chance. A threshold value of ≥2.0 was used to identify meaningful associations, consistent with prior studies utilising CaTS and IWA (Lockwood et al., 2023), and the established method for evaluating categorical variables using Chi-Square (Sharpe, 2015).

Figure 13.

A bar graph displaying the frequency of cards selected across both groups



7.3. Results

7.3.1. Participant characteristics

In total, 118 participants participated, aged between 18 and 60-years (*M* = 35.79, *SD* = 10.28).

- The cisgender/heterosexual group (*N* = 68) ranged in age from 18 to 60-years (*M* = 36.36, *SD* = 10.28). Participants were predominantly White British (83.08%), cisgender males (58.46%), and most reported no neurodivergent conditions (67.69%).
- The LGBTQIA+ group (*N* = 50) ranged in age from 20- to 60-years (*M* = 34.96, *SD* = 10.36). Participants were predominantly White British (76%), bisexual (64%), and cisgender females (40%).

Most participants completed the study via desktop (78.57%). Remaining participants took part via mobile (19.05%) and tablet (2.38%). Overall, 60.1% of participants reported their last self-harm episode was >6-months before the study. A full breakdown of full demographic details and time since most recent self-harm are presented in table 15. and figure 14. respectively. This research adhered to and was approved by the University of

Table 15.
Demographic Data by Group

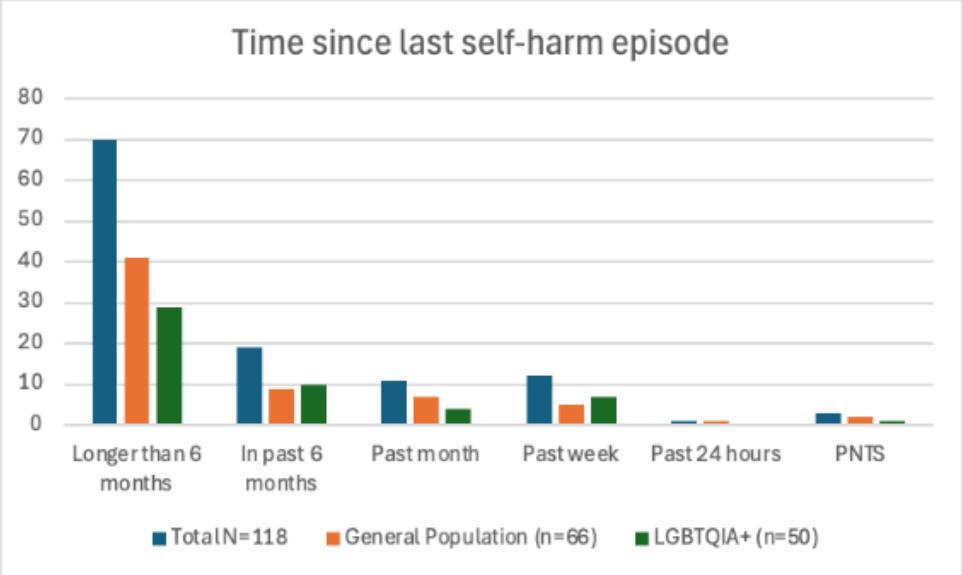
Category	Total (%)	Cisgender/Heterosexual (%)	LGBTQIA+ (%)
Ethnicity			
Asian or Asian British – Indian	2 (1.69%)	1.54%	2.00%
Asian or Asian British – Pakistani	3 (2.54%)	3.08%	2.00%
Black, Black British – African	5 (4.24%)	1.54%	8.00%
Black, Black British – Caribbean	1 (0.85%)		2.00%

Multiple – White and Asian	1 (0.85%)	1.54%	2.00%
Multiple – White and Black African	1 (0.85%)	1.54%	N/A
Multiple – White and Black Caribbean	3 (2.54%)	1.54%	4.00%
Prefer not to say	1 (0.85%)	1.54%	76.00%
White – British	95 (80.51%)	83.08%	N/A
White – Irish	1 (0.85%)	1.54%	N/A
White – Other	2 (1.69%)		4.00%
NULL	3 (2.54%)	3.08%	2.00%
Gender			
Cisgender boy/man	44.07%	53.85%	28.00%
Cisgender girl/woman	38.98%	40.00%	40.00%
Gender questioning	2.54%	N/A	6.00%
Non-binary	2.54%	N/A	6.00%
Other	2.54%	N/A	6.00%
Prefer not to say	2.54%	N/A	2.00%
Transgender boy/man	3.39%	N/A	8.00%
Transgender girl/woman	1.69%		4.00%
Neurodivergent Conditions			
ADHD	14.41%	10.77%	18.00%
Asperger's	1.69%	3.08%	N/A
Autism/ASD	11.86%	4.62%	22.00%
Dyslexia	2.54%	1.54%	4.00%
Dyspraxia	0.85%		2.00%
Multiple conditions	6.78%	3.08%	12.00%
None	53.39%	67.69%	34.00%

Other	5.93%	4.62%	8.00%
Prefer not to say	1.69%	3.08%	N/A
NULL	0.85%	1.54%	N/A

Figure 14.

Time Since Most Recent Self-Harm Episode



PNTS = Prefer not to say

7.3.2. Emotional state (Visual Analogue Scale)

Two participants were excluded from the VAS analysis as they did not complete the post-study VAS. The overall mean score on the emotional VAS before completing CaTS-D was 6.68 (*SD*=2.05) and 5.75 (*SD*=2.13) afterwards. Mean VAS scores by group are presented in table 16. Scores persisted around the mid-range of the scale before and after completion. This represented an overall significant difference (t(122)=6.01, *p*=<.001). Individual analysis of each group found reported significant differences in pre- and post-study VAS scores, with both reporting significantly reduced mood post-study (cisgender/heterosexual: (t(73)=4.74, *p*=<001); LGBTQIA+: (t70)=4.01, *p*<.001)).

Table 16.
Pre- and post-study mean VAS scores by group

Participant group	Pre-study VAS mean score	Post-study VAS mean score
Cisgender/heterosexual	*M*=6.52 (*SD*=2.13)	*M*=5.76 (*SD*=2.17)
LGBTQIA+	*M*=6.70 (*SD*=1.88)	*M*=5.83 (*SD*=2.18)

7.3.3. Frequency analysis

Overall, people in the cisgender/heterosexual group selected 7520 cards and LGBTQIA+ individuals selected 5736 cards across all timepoints. The frequency of selected cards across groups and timepoints is presented in table 17. The frequency of cards selected in each category for each group is presented in figure 13. While total frequencies of cards selected at each timepoint varied, the overall pattern was consistently similar between groups. For example, for both groups the three most commonly-selected categories were '*Negative feelings*', '*Loneliness, entrapment, and isolation*', and '*Negative life events*'. Interestingly, categories selected more frequently by LGBTQIA+ people were 'M*aladaptive behaviours*', '*Alexithymia*', '*Gender- and sexuality-based negative events or life problems*', '*Negative sexual experiences*', '*Negative social media*', and 'Q*uestioning sexuality or gender identity*'.

Table 17.
Card frequencies per timepoint by group

Timepoint	Total	Cisgender/ Heterosexual	LGBTQIA+
Before 6 months	1503	825	678
6 months before	1356	771	585
1 month before	1634	904	730
1 week before	1642	935	707
1 day before	1741	1051	690
1 hour before	1949	1114	835
I self-harmed	1606	875	731
Afterwards	1825	1045	780
Total	13256	7520	5736

Tables 18 and 19. presents the top 10 most frequently selected cards for each group across all timepoints. Interestingly, both groups reported feelings of hopelessness, loneliness, entrapment, and isolation, and negative feelings, particularly depression/ sadness, anxiety, and exhaustion. Both groups also report having access to means across most timepoints. Other high occurring cards were feeling burdensomeness and not belonging for the cisgender/heterosexual group. In the LGBTQIA+ group, high occurring cards were not being able to tell people their feelings, feeling they could not change for the better, and decision-making difficulties. Frequencies for all cards selected across all timepoints per group are included in appendix 12.

Table 18.
Top 10 card frequencies across all timepoints (Cisgender/ Heterosexual)

Card	Total frequency across all timepoints
'I hated myself'	213
'I felt very hopeless about the future'	188
'I felt like a burden on people'	185
'I felt worthless'	183
'I felt trapped'	181
'I felt depressed and sad'	180
'I felt very anxious'	176
'I felt exhausted'	173
'I felt I did not belong', 'I was angry'	163
'I had access to the means to hurt myself', 'I could not escape from feelings or situations'	162

Table 19.
Top 10 card frequencies across all timepoints (LGBTQIA+)

Card	Total frequency across all timepoints
'I had access to the means to hurt myself'	148
'I felt worthless'	138
'I felt depressed and sad'	137
'I felt I could not escape from feelings or situations'	125
'I felt very anxious'	124
'I could not tell anyone how I was feeling'	121

'I felt very hopeless about the future'	115
'I felt like I did not belong'	114
'I felt I would not be able to change myself in the future', 'I struggled to make decisions'	112
'I felt exhausted'	109

7.3.4. Indicator Wave Analysis Graphs

Standardised residuals from the chi-square statistic were used to develop category by timepoint frequency matrix for each group. The IWA graphs are developed from this matrix and act as guides to identify key points of interest, rather than report associations between variables, across each groups self-harm pathway. A chi-square test of independence indicated a significant association between category and timepoint for the LGBTQIA+ group, $\chi^2(238, N = 5,753) = 1620.07$, $p < .001$. Similarly, a chi-square test of independence indicated a significant association between category and timepoint for the cisgender/heterosexual group, $\chi^2(238, N = 7,539) = 2057.07$, $p < .001$. These data are presented in table 20. To identify key points of interest in both groups, Indicator Wave graphs are presented and discussed. These graphs highlight important indicators at specific timepoints and allow between-group comparisons to be made.

For example, for both groups at the 'Afterwards' timepoint, the categories 'being hospitalised', 'feeling negative after self-harm', and 'feeling positive after self-harm' all exceeded the threshold (SRs of >2; Lockwood et al., 2024) and occurred more often than is expected by chance compared to other indicators. Next, an initial IWA graph was created documenting significant (SR = >2) categories. However, graphs were too complex to interpret visually. Therefore, four arbitrary groups were created: life events, individual factors, support-related factors, and social media. In the LGBTQIA+ group, only the category 'Positive social media' was selected, and this was incorporated into the support-related factors graph to maintain consistency.

Table 20.
Chi-square statistics used to develop Indicator Wave Graphs

Participant group	Chi-squared value (to two decimal places)	Degrees of freedom	Significance level
Cisgender/ heterosexual	2057.07	238	<.001
LGBTQIA+	1620.07	238	<.001

7.3.4.1. Cisgender/Heterosexual Individuals

For the cisgender/heterosexual group, across the 35 categories, 26 categories had SRs (±2) which indicated cards within the category were selected more frequently than would be expected by chance (Lockwood et al., 2023). Categories never reaching ±2 were '*Access to means*', '*Acquired capability*', '*Burdensomeness*', '*Lack of belonging*', '*Lack of support*', '*Maladaptive behaviours'*, and '*Substance use*', and were excluded from IWA graphs. Other categories which reached chance levels only in the cisgender/heterosexual people group were '*Bad memories*' which only peaks at 'before six-months'

7.3.4.2 LGBTQIA+ Individuals

For the LGBTQIA+ group, across the 35 categories, 27 categories had SRs (±2) which indicated cards within the category were selected more frequently than would be expected by chance (Lockwood et al., 2023). Categories not reaching ±2 were '*Access to means', 'Bad memories',* '*Burdensomeness'*, '*Lack of belonging*', '*Maladaptive behaviours'*, '*Maladaptive sense of self', 'Negative social media',* and *'Restlessness'* and were excluded from IWA graphs. Categories were placed in smaller groups to produce three easily interpretable indicator wave graphs. Largely, these were categorised similarly to the cisgender/heterosexual group to aide comparison. Only LGBTQIA+ individuals reported a lack of support above chance, occurring the day before self-harm. Within the IMV model (O'Connor & Kirtley, 2018), this acts as a motivational moderator transitioning between entrapment and ideation/intent.

7.3.4.3. After Self-Harm

Some cards only appeared in the 'Afterwards' timepoint (e.g., '*I felt worse after self-harm', 'I felt better after self-harm'*) and were not selectable at earlier timepoints. Consequently, they do not appear on the IWA graphs which are based on categories available across all preceding timepoints. In the cisgender/heterosexual group, the SRs for these categories all exceeded the level than would be expected by chance ($z = \pm 2$; Lockwood et al., 2023). These were '*I was hospitalised after self-harm*' ($z = 8$) '*Feeling positive after self-harm*' ($z = 9.3$), and '*Feeling negative after self-harm*' ($z = 14.3$). In the LGBTQIA+ group, SRs for these exceeded the level expected by chance ($z = \pm 2$). These were 'I *was hospitalised after self-harm*' ($z = 7.1$) feeling positive after self-harm ($z = 7.1$), '*Feeling negative after self-harm*' ($z = 10.2$), '*In control*' (z = 9.7), and '*Self-harm stopped me from killing myself*' (z = 10). These data are presented in table 21 for comparison.

Table 21.
Post self-Harm categories and Z-Scores

Statement	Cisgender/heterosexual Z-score	LGBTQIA+ Z-score
I was hospitalised after self-harm	8.0	7.1
Feeling positive after self-harm	9.3	7.1
Feeling negative after self-harm	14.3	10.2
In control	N/A	9.7
Self-harm stopped me from killing myself	N/A	10.0

Figure 15.
*Indicator Wave graph showing the temporal organisation of **life events** along the **cisgender/heterosexual** self-harm pathway.*

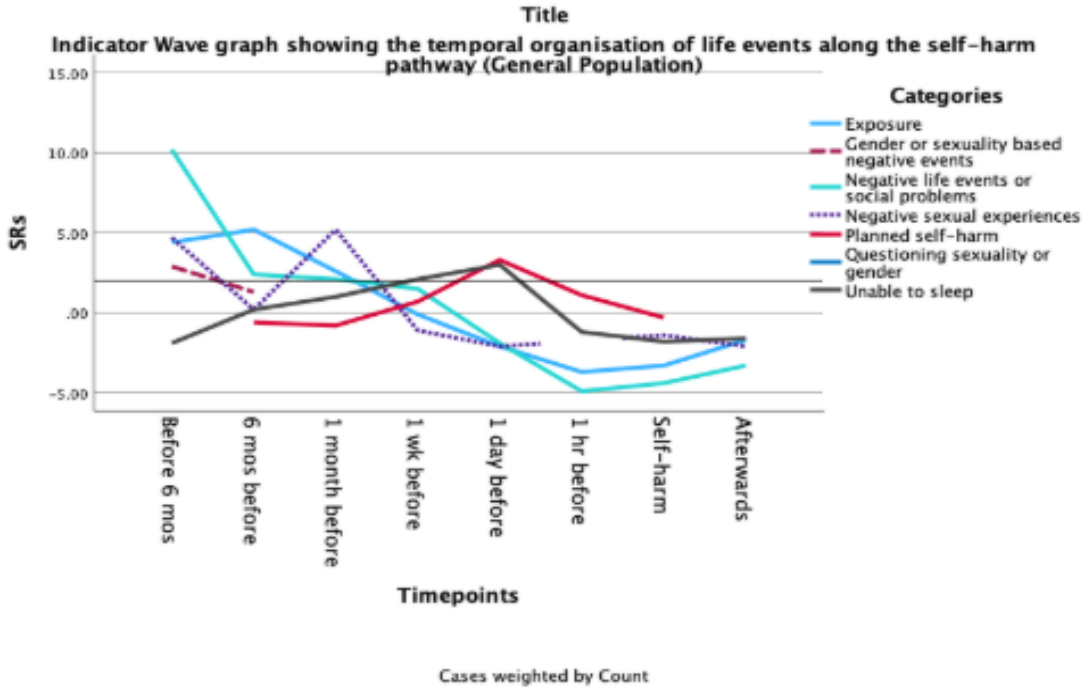


Figure 16.

*Indicator Wave graph showing the temporal organisation of **life events** along the **LGBTQIA+** self-harm pathway*

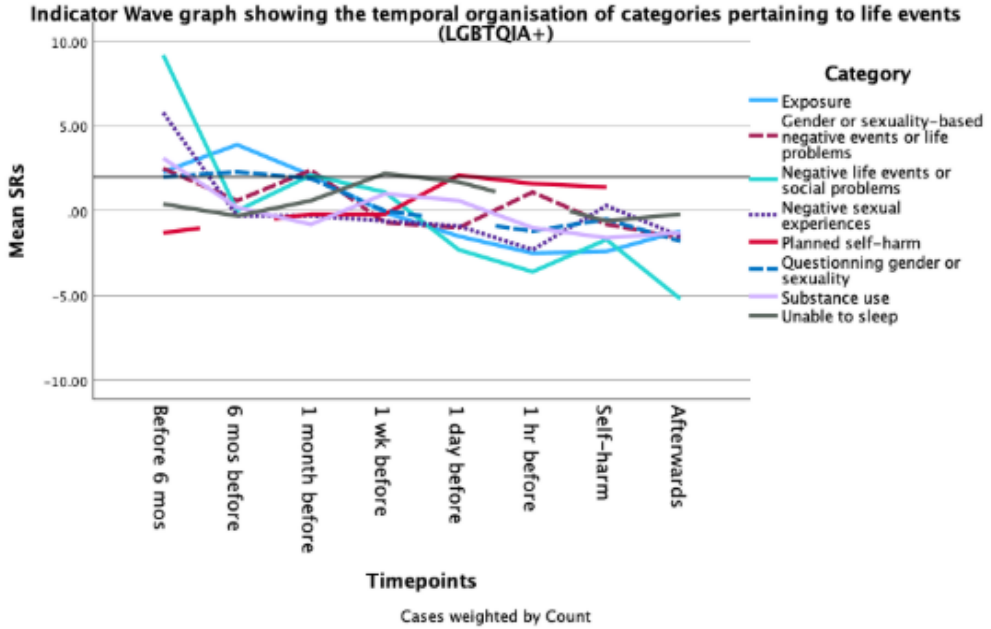


Figure 17.

Indicator Wave graph showing the temporal organisation of ***individual-level factors*** *along the* ***cisgender/heterosexual*** *self-harm pathway.*

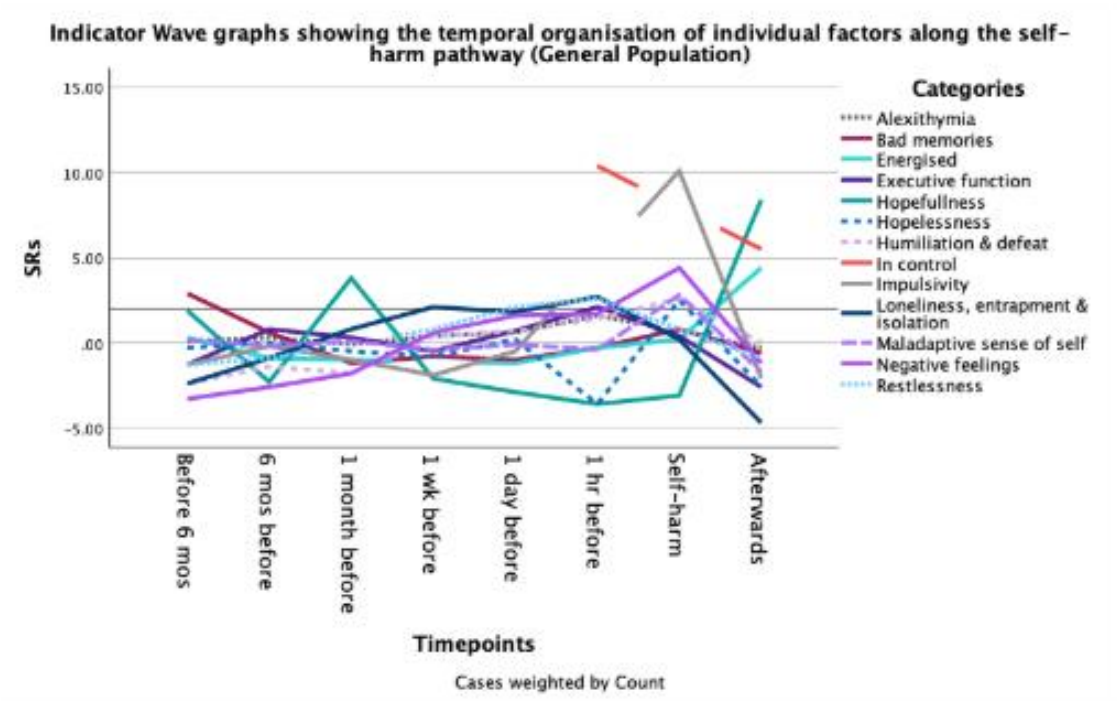


Figure 18.
Indicator Wave graph showing the temporal organisation of ***individual-level factors*** *along the* ***LGBTQIA+*** *self-harm pathway.*

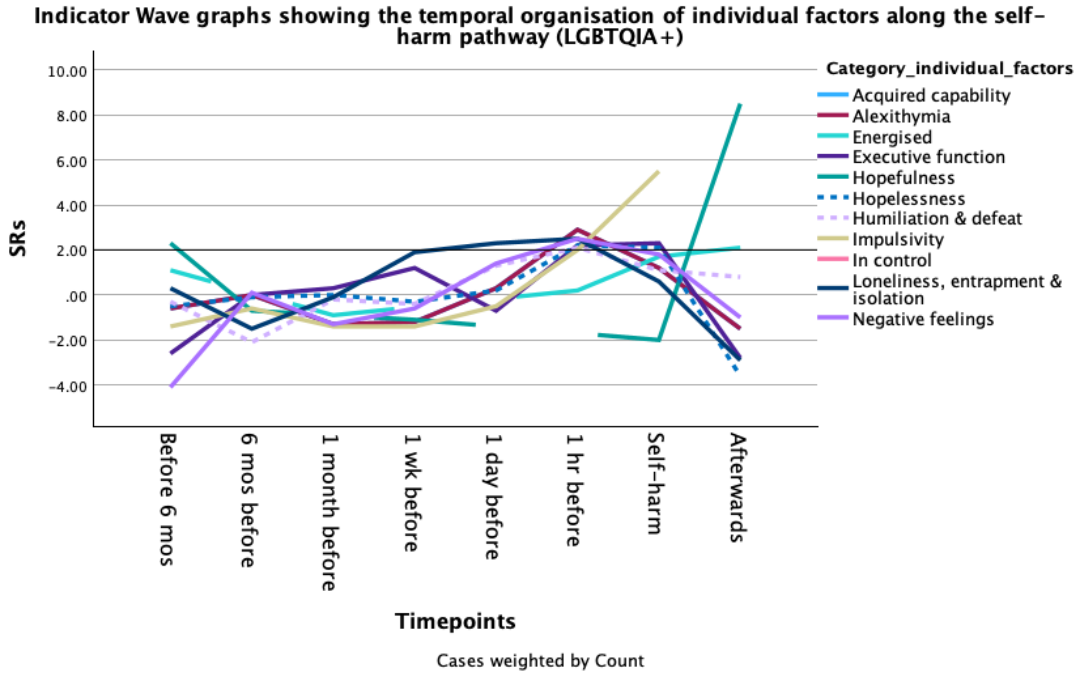


Figure 19.
Indicator Wave graph showing the temporal organisation of ***support-related factors*** *along the* ***cisgender/heterosexual*** *self-harm pathway.*

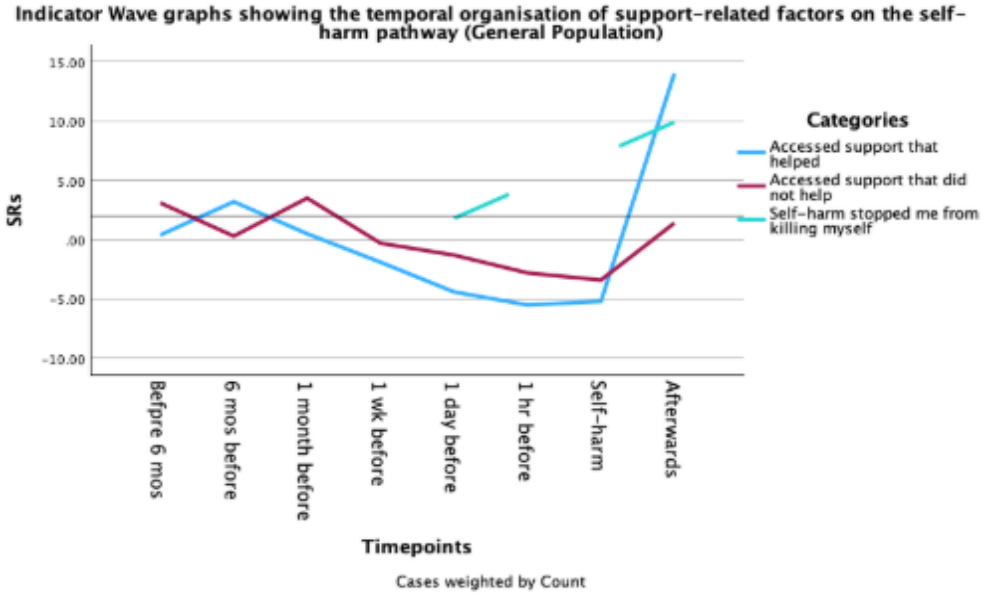


Figure 20.

Indicator Wave graph showing the temporal organisation of ***support-related factors*** *along the* ***LGBTQIA+*** *self-harm pathway*.

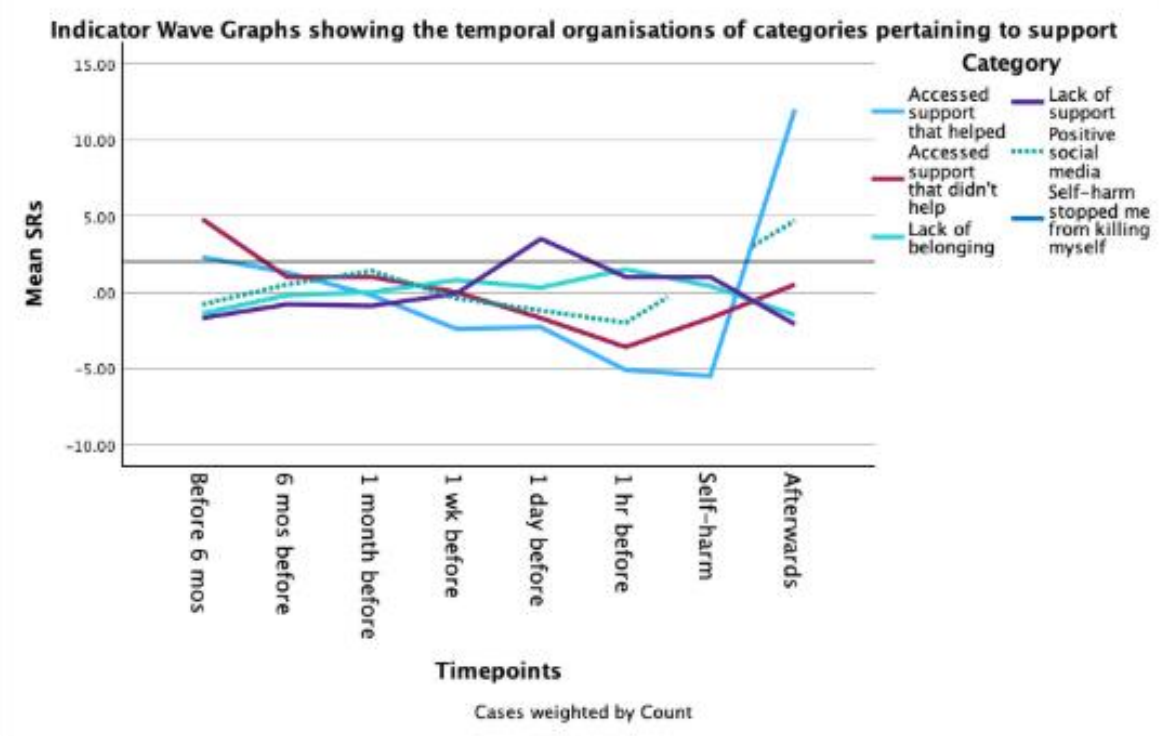
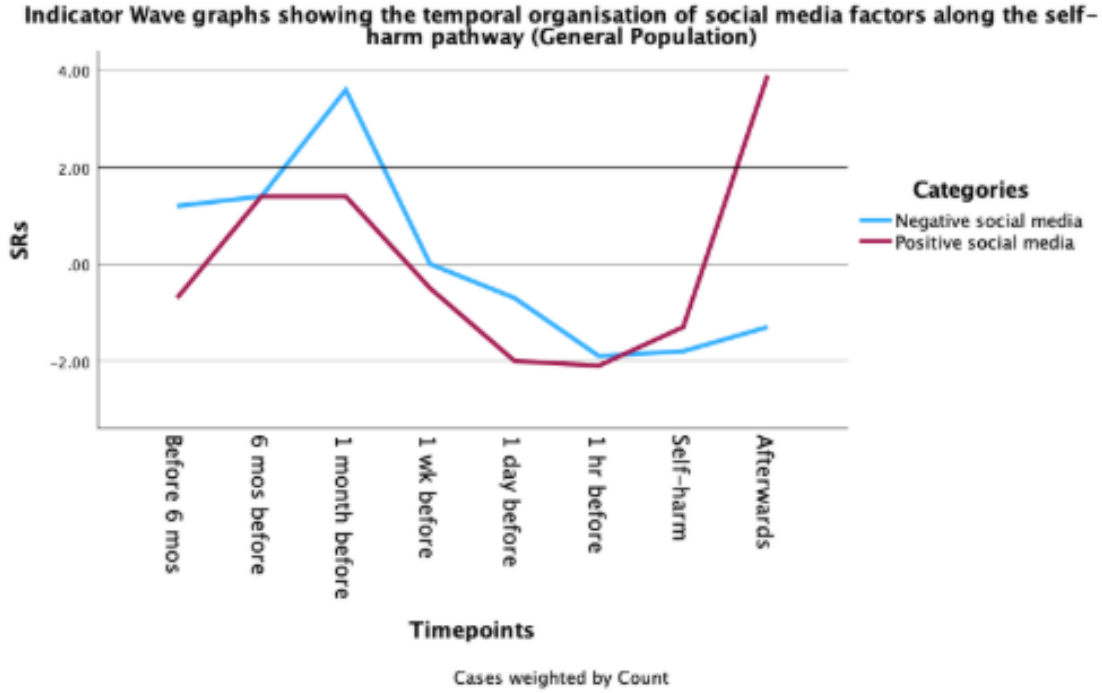


Figure 21.
Indicator Wave graph showing the temporal organisation of ***social media factors*** *along the* ***cisgender/heterosexual*** *self-harm pathway.*



7.4. Discussion

Understanding self-harm requires a nuanced exploration of its antecedents, and consequences, to reveal patterns that challenge simplistic narratives and highlight the temporal complexity of self-harm experiences. This chapter applied the newly developed CaTS-D to explore the temporal structure of self-harm pathways in LGBTQIA+ and cisgender/heterosexual populations and examine whether the data captured supported the Integrated Motivational-Volitional (IMV) model of self-harm and suicidal behaviour (O'Connor, 2011; O'Connor & Kirtley, 2018).

7.4.1. Risk and Protective Factors

7.4.1.1 Exposure

For both groups, '*Exposure*' peaked early in the pathway between six months and one month before self-harm (figures 15 and 16). This suggests that individuals in both groups who were exposed to the self-harm and/or suicide of others, or who accessed self-harm-related material online may be moving towards self-harm. These findings contrast with the IMV model, which posits self-harm exposure is a proximal factor, occurring close to the point of self-harm and be a final tipping point (O'Connor, 2011; O'Connor & Kirtley, 2018). In support of the current findings, a longitudinal study in the US found online self-harm exposure predicted suicidal thoughts and behaviours (STB) a month later (Arendt et al., 2019), suggesting self-harm exposure may not be as proximal to self-harm as the IMV model posits. Interestingly, across the same timepoints, participants in both groups reported accessing support which did not help. This category includes formal/clinical, social, and self-accessed support (e.g., reading a self-help book). Although the current data does not allow for firm conclusions, it is possible that self-harm exposure may encourage some individuals to seek support. If so, it is imperative support is appropriate, accessible, and meaningful. However, currently, there is no research examining whether self-harm exposure encourages support-seeking making this an important avenue for future research.

7.4.1.2. Gender and/or Sexuality-Based Life Events or Social Problems

Interestingly, '*gender and/or sexuality-based negative life events or social problems'* followed a similar pattern across both groups, peaking at the 'before six months' timepoint (figures 15 and 16). For LGBTQIA+ people another peak occurred a month before self-harm, suggesting, understandably, that gender/sexuality-based discrimination or bullying may occur more frequently in LGBTQIA+ people. Indeed, recent evidence supports this disparity. Fish and colleagues (2023) found LGBTQIA+ people experienced higher rates of gender/sexuality-based bullying compared to their cisgender/heterosexual peers. This correlated with increased mental health disparities (e.g., depressive symptoms), suggesting gender/sexuality-based life and social problems are also linked to other self-harm risk factors, as well as being a factor for self-harm. Similarly, '*negative life events or social problems*' follow a similar pattern (figures 15 and 16). For LGBTQIA+ people this again peaks before six months and again a month before self-harm. In the cisgender/heterosexual group, '*gender and/or sexuality-based negative life events or social problems'* peaks before six months but remains above chance until a month prior to self-harm. Cards in this category include experiencing interpersonal problems, being in trouble, having arguments with your social network, being the victim of a crime, being bullied, being physically abused, and experiencing the death (non-suicide) of somebody close. These are well-documented self-harm risk factors (e.g., McMahon et al., 2024; Tham et al., 2020). However, few studies have documented these factors across time or longitudinally (Tham et al., 2024). The present findings therefore extend prior research by showing not only which life events increase self-harm risk, but also when they are most likely to occur, providing insight into meaningful intervention points.

7.4.1.3. Negative Sexual Experiences

The findings regarding '*negative sexual experiences'* provide further support for the Pre-Motivational Phase of the IMV model (i.e., environmental and background factors). The findings show that negative sexual experiences peak for both groups before the six months timepoint, suggesting historic negative sexual experiences are instrumental in the development of self-harm

thoughts and behaviours in both populations (figures 15 and 16). In the current sample, the cisgender/heterosexual group experienced a second peak a month before self-harm. The cisgender/heterosexual group also experienced '*negative sexual experiences*' at higher levels than the LGBTQIA+ group. This is surprising considering the cisgender/heterosexual group consisted largely of cisgender males. Recent evidence from a systematic review found sexual assault prevalence lowest in cisgender males compared to cisgender females and LGBTQIA+ individuals (Dwokin et al., 2021). Similarly, findings from a global trend analysis showed sexual violence in cisgender males is not only lower than cisgender women, but also declining (Borumandia et al., 2020). However, myths and stigma surrounding cisgender male sexual assault act as barriers preventing their disclosing sexual assault and abuse (Hammond et al., 2016; Sivagurunathan et al., 2019; Widanaralalage et al., 2022). Indeed, cisgender males are significantly less likely to disclose sexual abuse than cisgender females (Lev-Wiesel & First, 2018), therefore prevalence is likely to be higher. Possibly, the anonymity CaTS-D provides encourages cisgender males to document negative sexual experiences, abuse, and assaults. Therefore, CaTS-D may be a useful tool to capture future evidence regarding negative sexual experiences of cisgender men, and its impact on self-harm and wider mental health.

7.4.1.4. Substance use

This study suggests '*substance use*' may occur distally only for LGBTQIA+ individuals at 'before six months' (see figure 16). Previous systematic reviews have found that LGB individuals experience elevated rates of substance use compared to heterosexual individuals (King et al., 2008), and substance use is associated with elevated risk of self-harm (Rogers et al., 2020). A recent umbrella review found substance use was one of the ten most frequently identified risk factors for self-harm, and the most significant behavioural risk factor (McEvoy et al., 2023). However, this umbrella review did not focus specifically on LGBTQIA+ populations. Despite this, the current findings, alongside existing evidence, indicates substance abuse, if present, is a key intervenable target in LGBTQIA+ populations. It is important to consider how substance use is defined across studies. For example, whether studies distinguish between 'abuse' or 'use' or

measure the intensity or severity of substance use can influence interpretation (Valencia-Agudo et al., 2018). In the current study, cards within this category included '*being high on drugs'* and '*taking illegal drugs*'. Neither card explicitly relates to substance abuse, nor do they indicate whether behaviour is maladaptive or problematic. Indeed, they may be isolated events for some people. Considering this, future research should examine the relationship between substance use and self-harm in LGBTQIA+ individuals further. Additionally, CaTS/CaTS-D may benefit from additional cards which clearly specify maladaptive, sustained, and isolated substance use to examine the impact of substance use on self-harm. Further qualitative work with individuals with lived experience may help inform these additions and improve the sensitivity of CaTS/CaTS-D.

7.4.1.5. Questioning Gender and/or Sexuality

Unsurprisingly for LGBTQIA+ people '*questioning their gender and/or sexuality*' occurred across multiple timepoints until a month before self-harm (figure 16). Interestingly, in the cisgender/heterosexual group this also occurred higher than chance around six months before (figure 15). This concept has not previously been examined within the IMV framework and highlights an important, novel dimension to understand self-harm pathways**.** The findings presented here indicate questioning one's gender/sexuality may occur at the Pre-Motivational Phase, and act as a background factor.

Furthermore, the data presented here does not identify whether '*questioning'* was a negative or positive experience. For some, '*questioning one's gender and/or sexuality*' may not be a risk factor, and may even have cathartic effects, however, I found no literature which explored this question. As with TGD individuals, questioning people are often under-represented in LGBTQIA+ research (Guz et al., 2021), therefore experiences of '*questioning*' people is poorly understood. Research focused on diverse LGBTQIA+ experiences is recommended by researchers in the field (Williams et al., 2021). Conversely, while '*questioning one's sexuality or gender identity'* can be a health and exploratory process, distress may arise when individuals realise their identity does not align with societal norms or expectations. This misalignment may result in feelings of fear, trepidation, anxiety,

and depression, and individuals may be reluctant to discuss their experiences, especially in environments where acceptance is limited or uncertain. These experiences may contribute to subsequent self-harm. Considering questioning one's identity occurs in both groups, further exploration of this concept is recommended to explore this in both the context of the IMV model, and in relation to self-harm.

7.4.1.6. Negative Feelings

'*Negative feelings'* were consistently selected across all timepoints but only peaked once for each group in the hour before self-harm. For LGBTQIA+ individuals, this occurs an hour prior, and for cisgender/heterosexual group it peaks at the point of self-harm (figures 17 and 18). This pattern suggests an increase in negative affect immediately preceding self-harm which may act as a trigger to self-harm for both groups. Therefore, negative feelings and emotional states present a critical target for intervention (e.g., emotion regulation skills, crisis phone/text lines) as regulating negative feelings during this period may help prevent future self-harm episodes. The '*negative feelings*' category includes feelings of depression, sadness, disgust, and self-hatred suggesting for both groups the time most proximal to self-harm is a moment where feelings of despair are greatest. These findings are in accord with the original CaTS study (Townsend et al., 2016), which found '*negative feelings*' cards peaked proximally to self-harm and align with Motivational-Volitional phase of the IMV model where self-harm ideation and intent begin to form. However, a recent study utilising CaTS to compare self-harm pathways in adolescents and adults reported negative feelings did not reach the notable threshold, except for adults first ever self-harm episode (Lockwood et al. 2023). Possibly, individual cards within this category may individually reach threshold at differing timepoints and future research could examine these to further elucidate these concepts. Future results may align with the IMV model, where depression and sadness are posited as background factors which increase vulnerability to self-harm (O'Connor & Kirtley, 2018).

Contrastingly, research suggests self-disgust mediates the relationship between sexual abuse, depressive symptoms, and subsequent self-harm (Smith et al., 2015). Within the IMV

framework, this suggests disgust may emerge between the Motivational and Volitional phases. Indeed, qualitative evidence supports this, showing self-disgust was salient immediately proximal to self-harm (Mason et al., 2022). However, this finding is limited to cisgender males who attempted suicide and there is a lack of broader evidence on when negative emotions are most salient before self-harm. Distinguishing between distal and more proximal antecedents is theoretically valuable but may be difficult in practice. Many variables (e.g., depression, self-disgust) can function as both distal, long-term and proximal risk factors, depending on timing and context. While such factors may be important at any given point for an individual, CaTS-D (and CaTS) can help researchers identify when they are most salient at the population level, which is particularly valuable for policymaking and intervention development. Individual cards within the 'N*egative feelings*' category may identify additional salient antecedents and would be useful to explore individually in future research.

7.4.1.7. Sleeping Problems

Several factors peaked more proximally to self-harm. Being '*unable to sleep'* peaked a week before self-harm for LGBTQIA+ people and a day before self-harm for the cisgender/heterosexual group (figures 15 and 16). Systematic review evidence found insomnia/being unable to sleep is linked to increased self-harm and STBs and may also be linked to other self-harm antecedents, like depression, emotion dysregulation, and post-traumatic stress disorder (Khazaie et al., 2021; Russell et al., 2019). Possibly, insomnia is a result of self-harm antecedents and acts as a marker to indicate people may be moving towards self-harm. However, currently there is little evidence examining when insomnia occurs prior to self-harm. This is important to explore further to ascertain whether insomnia peaks at certain timepoints which may provide useful indicators of when future self-harm may occur.

7.4.1.8. Humiliation, Defeat, Loneliness, Entrapment and Isolation

For both groups, '*humiliation/defeat'* and '*loneliness, entrapment, and isolation'* occur from between a week before to the point of

self-harm (figures 17 and 18). Within the IMV model, these factors act as moderators between ideation and enaction (O'Connor & Kirtley, 2018). A study using the IMV framework to explore these factors in relation to self-harm found defeat and entrapment distinguished between people who engaged in NSSI from people who attempted suicide (Cleare et al., 2021). Furthermore, a 9-year longitudinal study found loneliness associated with various self-harm and suicide-related outcomes (Shaw et al., 2021). Indeed, McClelland et al. (2021) found loneliness distinguished between people with and without self-harm thoughts and behaviours. While these varied across outcomes, and between cisgender male/females, they suggest addressing these concepts may be key self-harm reduction opportunities. These findings suggest these concepts act as moderators to enaction. However, these studies do not identify when these factors are most important. Indeed, few longitudinal studies have examined humiliation/defeat, shame, and isolation (Angelakis & Gooding, 2020; Pilkington et al., 2021; Sadath et al., 2024). The current study addresses this by enabling documentation of when specific factors are most salient to individuals.

Further, the findings presented here offer further support of the IMV model indicating '*humiliation/defeat*' and '*loneliness, entrapment, and isolation*' become salient moderators in the week preceding self-harm enaction. This timing aligns with the Motivational phase of the IMV model, which posits these experiences drive self-harm and suicide ideation (O'Connor, 2011; O'Connor & Kirtley, 2018). The current findings also identify other emotional states which emerge closer to the point of self-harm. For example, '*alexithymia*' peaks an hour prior to self-harm in both groups (figures 17 and 18). Evidence from a meta-analysis found alexithymia significantly associated with self-harm, but not when this occurs (Norman et al., 2020). The current study expands this by identifying when alexithymia occurs. The findings of the current study support the view that self-harm functions as an affect regulation strategy, helping individuals manage emotions they may not fully understand. However, aside from the current study, there remains a dearth of literature examining where alexithymia intensifies before self-harm. Therefore, little is known about when these concepts are most salient, how they fluctuate across timepoints, or how they may differ across other

populations. The current study addresses this gap in the literature by identifying factors that occur in the week preceding self-harm in cisgender/heterosexual and LGBTQIA+ populations. However, further longitudinal research remains essential to further examine the temporal dynamics of these concepts and their proximity to self-harm.

7.4.1.9. Impulsivity

Some findings in this study identify certain factors precede self-harm which may support the transition between self-harm ideation and enaction, and these findings also offer support for the Volitional phase of the IMV model which posits volitional moderators (e.g., acquired capability, impulsivity) are needed to transition to enaction (O'Connor, 2011; O'Connor & Kirtley, 2018). For both groups, impulsivity peaks at the point of self-harm. This finding is in accord with existing evidence from studies utilising CaTS which identified '*impulsivity*' occurs immediately prior to self-harm (Lockwood et al., 2023; Townsend et al., 2016) (figures 17 and 19). Furthermore, a recent systematic review of longitudinal studies found adolescents with increased impulsivity were at 9% greater risk of self-harm, compared to those with lower impulsivity (He et al., 2025). These findings suggest impulsivity plays a key role in mediating the transition from ideation and enaction and support that impulsivity acts as a volitional moderator (O'Connor & Kirtley, 2018), and interventions focusing on reducing impulsivity and reactionary responses to emotions may benefit people who self-harm (Lockwood et al., 2017).

7.4.1.10. Planned Self-Harm

Interestingly, the current study also found '*planned self-harm*' peaked the day prior to self-harm in both groups (figure 15 and 20), suggesting for some individuals a level of planning occurs fairly proximal to self-harm. Possibly, people are aware they are moving towards self-harm enaction and plan to ensure access to means. However, it is possible people either act impulsively *or* plan their self-harm. Indeed, a study examining the relationship between planned self-harm and impulsivity found approximately 50% of self-harm acts involved planning and a comparable number are impulsive (Rawlings et al., 2015). However, these

concepts may overlap or fluctuate over time. Longitudinal research should further examine the dynamics between planning and impulsivity and whether these concepts occur in isolation, or whether they indeed fluctuate across time. Also, qualitative research may yield important contextual insight into planning and impulsivity and whether these factors are independent or more fluid.

7.4.1.11. Acquired Capability

'*Acquired capability'*, first proposed by Joiner (2005) as a key construct in the pathway from self-harm and suicide ideation to enaction, rises above chance levels for LGBTQIA+ individuals approximately one hour before self-harm (figure 18). Recent qualitative research (Clark et al., 2022) links this elevated acquired capability to experiences of structural stigma, identity invalidation, and the normalisation of suicidal thoughts and behaviours within LGBTQIA+ communities. Clark and colleagues' study involved participants who survived near-fatal SAs and underscores the distinct life experiences of LGBTQIA+ individuals, and how these may contribute to the development of acquired capability. Notably, the CaTS-D tool currently lacks constructs related to stigma or identity invalidation, and these were not highlighted by participants in the earlier PhD interview study (Chapter 4). Future qualitative research may uncover these and other relevant concepts which should be integrated into CaTS-D to ensure it fully captures LGBTQIA+-specific factors.

Importantly, the elevated acquired capability in LGBTQIA+ participants aligns with the ideation-to-enaction transition outlined in the IMV model (O'Connor & Kirtley, 2018), suggesting unique dynamics may be at play. By contrast, acquired capability in the cisgender/ heterosexual sample never exceeded chance, which diverges from both the IMV model (O'Connor & Kirtley, 2018) and existing evidence supporting acquired capabilitys role in the ideation-enaction transition (Bauer et al., 2019; Ammerman et al., 2025; Keffner & Minton, 2024; Willoughby et al., 2015). Some studies suggest acquired capability alone may be insufficient to explain this transition (Burke et al., 2017), as well as the progression from NSSI to SAs (Gratz et al., 2020; Matney et al., 2017). This may reflect a lack of necessary, salient contributory factors in the current cisgender/heterosexual sample. Considering these inconsistencies, further longitudinal

research should explore what facilitates acquired capability, as these factors could represent meaningful, intervenable targets.

7.4.1.12. Hopelessness

Interestingly, in both groups, '*hopelessness*' peaks around the point of self-harm (figures 17 and 18). This contrasts with the IMV model which posits hopelessness as a key antecedent within the Motivational phase (O'Connor, 2011; O'Connor & Kirtley, 2018). The current findings suggest hopelessness may play a dynamic role in the self-harm pathway, potentially intensifying during self-harm or emerging as a consequence. Extant evidence supports the strong association between hopelessness and self-harm at both implicit and explicit levels (Brott & Veilleux, 2023; Gray et al., 2020), and hopelessness is a key predictor of suicide (Tonkuş et al., 2022). Furthermore, recent evidence indicates self-harm may predict future hopelessness (Faura-Garcia et al., 2024), suggesting self-harm may not only be a distress response, but also contribute to worsening psychological states over time. Hopelessness likely stems from various contributing factors (Faura-Garcia et al., 2024; Franklin et al., 2016), and identifying these in clinical settings could lead to practical, effective intervention points which reduce the emergence of hopelessness and subsequent self-harm.

7.4.1.13. Executive Function Difficulties

'*Executive functioning difficulties'* peak for both groups at the point of self-harm and continues for the LGBTQIA+ group afterwards (figures 17 and 18). The latter might be associated with minority stressors or may suggest activities post-self-harm which support the continuation of executive functioning difficulties. Exploring post-self-harm experiences using CaTS-D may provide useful insight into what individuals engage in after self-harm and whether these actions alleviate or exacerbate salient processes and concepts in the lead-up to self-harm. Executive functioning includes cognitive inflexibility, problem solving, decision making, and self-regulation (Cha et al., 2019; Friedman et al., 2016; Mozafari et al., 2022). Within CaTS-D, these are operationalised with concepts including struggling to solve problems or make decisions. The evidence-base regarding where executive function issues occur along the self-harm pathway is unclear. A systematic review of longitudinal studies found it may play a distal role and moderate how participants respond to

therapeutic approaches (Cha et al., 2019). However, in the current study, executive function impairments occur proximally to self-harm.

Possibly, executive functioning concepts within CaTS-D (*'I could not solve a problem I faced'; 'I could not think of anything else to do'; 'I struggled to make decisions'*) are more salient during self-harm, and other executive functioning issues occur earlier in the self-harm pathway. Cultural norms surrounding problem-solving may influence how individuals' experience and respond to self-harm-related factors across studies. For example, the findings of the current study may be unique to the largely White British sample in the current study, as cultural values and coping mechanisms can shape the salience and impact of specific antecedents. Furthermore, CaTS-D items within this category may not sufficiently capture executive functioning difficulties. Future research should consider disaggregating components of executive functioning (e.g., cognitive flexibility, decision-making) to determine their specific timing and roles in the self-harm pathway. These could be explored through validated scales or behavioural tasks, depending on the research context.

7.4.1.14. Negative Social Media

Finally, the cisgender/heterosexual group reported exposure to '*negative social media'* occurred above chance a month prior to self-harm (figure 21). These concepts were added to CaTS/CaTS-D in the qualitative study in this PhD (Chapter 4) and include accessing and receiving potentially harmful social media, being bullied or discriminated against via social media, and feeling social media was negatively impacting one's mental health. A systematic narrative review of social media usage and self-harm identified four key risk factors: heavy social media use; problematic social media use; cyberbullying/victimisation; and deliberate self-harm content exposure (Biernessar et al., 2020) and these largely correlate with cards included in CaTS-D. The review suggested social media use proximal to self-harm may prove useful predicting self-harm. However, while the current study suggests people are accessing social media more distally to self-harm, this may still prove a useful point of intervention. Therefore, problematic social media use should be discussed during intervention. Considering the speed at which social media evolves

(Biernasser et al., 2020), researchers should continue capturing data regarding social media usage to identify whether types of social media, specific interactions, or timepoints are most strongly correlated with self-harm in different populations.

7.4.1.15. During and After Self-Harm

Some factors were only salient during and after self-harm. Both groups reported self-harm provided a sense of '*control*' post-self-harm, and the cisgender/heterosexual group also experienced this during self-harm (figures 17 and 18), highlighting the potentially cathartic function of self-harm. Indeed, a recent meta-synthesis found control was a global motivation underpinning self-harm, particularly relating to an absence of and desire to regain control (Rheinberger et al., 2025). This is important as enabling individuals who self-harm to utilise alternative coping strategies supports their ability to achieve and maintain feelings of control in healthier ways (e.g., seeking social support, physical activity, creative or reflective techniques; Fenton & Kingsley, 2022).

Feelings of '*hopefulness*' peaked after self-harm, and, consistent with Lockwood and colleague's (2023), '*feeling energised*' peaked at the point of self-harm for the LGBTQIA+ group and afterwards for both groups (figures 17 and 18), suggesting that, while not direct risk factors, feeling energised and hopeful may partially explain the emotional relief individuals can derive from self-harm. This may be temporary; however, it may reinforce the emotional relief self-harm elicits and contribute to the maintenance of self-harm behaviours over time. Indeed, qualitative meta-synthesis revealed hope is an essential, multidimensional process and goal and therapeutic practices should foster hope (Haw et al., 2023). Further research to improve understanding of this emotional shift may be important for intervention development and to address the underlying emotional needs self-harm may temporarily fulfil.

Both groups reported self-harm acted as a suicide prevention strategy (figures 19 and 20), suggesting self-harm may be important role in mitigating suicide risk in both groups, and self-harm reduction efforts should consider this to avoid increasing suicide risk. However, this contrasts with extant literature which indicates self-harm is a significant suicide risk factor (Chan et al., 2016; Cheung et al., 2017; Geulayov et al., 2019; Gouveia-Pereira

et al., 2022; Hawton et al., 2015). Possibly, self-harm has short-term cathartic effects or may be unique to the current sample demographic (i.e., largely White British). Considering the large evidence body contradicting this finding, research examining the post-self-harm pathway to further explore this is recommended.

7.4.1.16. Support Networks and Social Media

In terms of support, help-seeking in both groups peaked following self-harm, including formal (clinical), informal (friend, parent/caregiver), and self-sought support (reading self-help materials) (figures 19 and 20). These findings are in accord with previous CaTS studies which found a notable spike post-self-harm in adults (Lockwood et al., 2023). Broader self-harm literature highlights the critical role social support plays across diverse populations (e.g., Abou Seif et al., 2022; Bird et al., 2024; MartÍnez-Rives et al., 2025; Patra et al., 2022) and interventions fostering social support are recommended (Hou et al., 2022). However, in the current study, types of support (e.g., formal, informal) were grouped together, possibly limiting interpretation. Individual forms of support may vary in salience and accessibility across groups, and future research should investigate whether specific types of support are perceived as more helpful. For example, whether clinical support is more effective for cisgender/heterosexual than for LGBTQIA+ individuals, or vice-versa. Additionally, both groups also reported positive social media experiences post-self-harm (figures 20 and 21), possibly reflecting accessing helpful online communities or content. However, the motivations underpinning this engagement is unclear. Considering individuals who self-harm utilise social media for various reasons (Susi et al., 2023). Future research should explore post-self-harm social media/internet use to better understand why people find social media beneficial after self-harm.

7.4.2. Mood Data

Pre- and post-study mood data indicated participants mood significantly decreased during the study (table 15). These findings are not in line with previous studies utilising CaTS or other digital iterations of CaTS (Lockwood et al., 2023; Townsend et al., 2016), nor wider self-harm research (Lockwood et al., 2018). It is

concerning participants reported feeling less positive post-study. However, this may relate to fatigue or boredom having complete a digital study, because they could not recall their pre-study VAS score, or because they lacked immediate social support post-study. Participants who did not complete the post-study VAS were not included in the VAS analysis; therefore, these findings are representative of this sample. Future research could compare VAS scores between in-person and digital participants to identify whether the online nature of the task underpins the significant mood reduction. Notably, mood scores persisted around the midpoint, which may indicate a limited emotional impact, or a stable baseline across participants.

7.5. Strengths and Limitations

Firstly, this study did not capture method, frequency, duration of self-harm, nor age of self-harm onset. Moving forward in my research career, I will ensure to capture these data because these may be important to identify whether certain factors are more salient at different stages of one's self-harm journey. These variables may provide important context for understanding the trajectory of self-harm. For example, other self-harm studies utilising CaTS captured data from participant's first and most recent self-harm episode to compare how pathways may differ at different timepoints (e.g., Lockwood et al., 2023; Townsend et al., 2016). Additionally, different methods of self-harm may be associated with varying levels of medical risk and may influence post-self-harm actions, emotional responses, and any subsequent self-harm episodes. Early age of onset is significantly associated with increased self-harm frequency and suicide attempt risk (Brager-Larsen et al., 2022). Collecting these data would allow researchers to examine whether the duration of self-harm engagement is associated with specific psychological or contextual factors. Consequently, incorporating these variables in future research will enhance the depth and applicability of findings in both research and clinical contexts. These findings also highlight limitations of the current research, and of CaTS-D more broadly. These limitations and avenues for future research will be further discussed in the discussion chapter (Chapter 8).

Secondly, participants in both groups were largely White British, and aged between 18-60-years. This limits the findings to this

population; however, many findings are supported by global literature suggesting some concepts may be key antecedents across cultures (e.g., substance abuse; Barbalat & Liu, 2022). While some factors may occur globally, their expression and consequence may vary depending on cultural and geographical context (Knipe et al., 2022). Consequently, cultural context should be carefully considered in future research and when interpreting findings. Research utilising CaTS-D in different populations will continue expanding our understanding of factors underpinning self-harm. Within the LGBTQIA+ group, participants were largely bisexual cisgender females. This reflects issues I had earlier in my PhD recruiting TGD participants who remain an under-represented population in research, including the studies presented in this PhD thesis, despite the increased risk they experience (Bird et al., 2024; Butler et al., 2019; Williams et al., 2021). Therefore, other groups within the LGBTQIA+ umbrella may have category peaks at other timepoints and should thus be the focus of future research.

7.6. Conclusion

This chapter reports findings from the first study of CaTS-D in a research setting using the novel analysis, IWA, to document and enhance understanding of the temporal dynamics between factors associated with self-harm in cisgender/heterosexual and LGBTQIA+ populations. Using CaTS-D has enabled the description of factors salient to each group leading to and following their most recent self-harm episode. Taken together, overall, these findings support the Integrated Motivational–Volitional (IMV) model which states life events (***Gender/sexuality-based negative life events; Negative life events; Negative sexual experiences; Substance use; Questioning sexuality/gender***) act as distal background factors contributing to self-harm thoughts and behaviours. While both groups reported salient historical life events, cisgender/heterosexual people may experience negative life problems over a longer duration, however future research should examine this further. The current findings also provide support for the Motivational Phase of the IMV model with the factors ***insomnia, humiliation, defeat, loneliness, entrapment, and isolation*** reaching above chance in the week preceding self-harm in both groups. This suggests these factors are important in the transition towards ideation and self-harm. The salient factors

identified here have important clinical implications. If present, these factors may identify an individual is at risk of self-harm within the forthcoming week and intervention efforts may, therefore, be most significant at this time.

Interestingly, the pathway for both groups followed a similar pattern, including when ***questioning one's gender/sexuality*** was most salient. This similarity is notable given the elevated rates of self-harm experienced by LGBTQIA+ individuals compared to cisgender/heterosexual individuals (Kidd et al., 2024; White et al., 2023). The similarity of pathways suggests the increased self-harm risk in LGBTQIA+ individuals may not be fully explained by the factors captured and by CaTS and CaTS-D, including questioning one's gender/sexuality. Possibly, other factors, currently not included within CaTS/CaTS-D, contribute to this disparity. For example, normalised self-harm in LGBTQIA+ populations (Clark et al., 2022), minority stressors (Zachry et al., 2025), or other cultural influences. Research should continue comparing factors in cisgender/heterosexual and LGBTQIA+ populations which may reveal the increased risk and provide additional intervenable targets for LGBTQIA+ people. Examining factors longitudinally (i.e., across a time period) will substantiate temporal and causal relationships between factors for self-harm, and subsequent self-harm (Tham et al., 2024; Valencia-Agudo et al., 2018). The current study addresses this by utilising CaTS-D and IWA to examine temporal relationships between various antecedents and identifies when salient factors occur in cisgender/heterosexual and LGBTQIA+ populations. These, if present, can be useful targets to address during intervention in both groups.

Chapter 8

General Discussion

8.1. Author Positionality Statement

It is important to consider my positionality, particularly in relation to TGD and LGBTQIA+-specific studies. I am a cisgender, heterosexual woman. My understanding of self-harm in TGD and LGTBQIA+ individuals stems from experience with LGBTQIA+ friends who have experienced self-harm, the literature, and from my research. I also have my own history of self-harm. During the analysis and interpretation of all data within this thesis, I acknowledge that my own knowledge, experiences, and assumptions underpin the research. Throughout my PhD, I regularly journalled to enable reflection of my research practices and processes. I debriefed regularly with my supervisory team, members of the SHRG, and other researchers and PhD students which enabled me to identify and manage how my background may have influenced my work and its outcomes.

8.2 Overview of Key Aims, Findings and Contribution to Literature and Theory

The overall purpose of this thesis was to develop a digital version of the CaTS research tool and utilise it to examine self-harm pathways in cisgender/heterosexual and LGBTQIA+ populations and identify key intervenable target. This thesis presents the first examination of implicit attitudes (Chapter 2) toward suicidal/self-harm thoughts and behaviours (STBs) in TGD individuals, followed by a comprehensive analysis of self-harm risk and protective factors in TGD individuals (Chapter 3), who represent an under-researched but disproportionally affected population in self-harm literature. These studies initially aimed to support the ongoing development of CaTS to ensure it is TGD-appropriate. Recruitment difficulties (discussed in Chapter 4) resulted in widening recruitment to LGBTQIA+ and cisgender/heterosexual populations for the remaining PhD studies. However, the findings contribute to the updating of the existing CaTS to ensure it contains meaningful concepts not relevant at CaTS' initial inception (Chapter 4), including ensuring CaTS contained factors and concepts which sufficiently and meaningfully capture LGBTQIA+ self-harm. Alongside these studies, a digital CaTS (CaTS-

D) was developed (Chapter 5), and pilot tested (Chapter 6) to ensure usability and accessibility. These findings were reviewed and resulting changes incorporated into CaTS-D for its primary use in a research setting (Chapter 7), which addresses the key aim of this thesis by examining and identifying salient risk and protective factors in cisgender/heterosexual and LGBTQIA+ populations. Table 22 presents an overview of thesis studies and their key findings and novel contributions to the literature which are reported in the corresponding empirical chapters within this thesis.

Table 22.

Summary of study design and empirical findings of each study chapter

Chapter number	Study design	Novel findings & contributions
2	Secondary regression analyses	-This was the first study to examine implicit SSTBs attitudes in TGD individuals, and which compared TGD implicit responses to cisgender individuals -TGD individuals experienced increased SI and suicide planning compared to cisgender participants. -TGD and cisgender female SA rates were comparably elevated compared to cisgender males -Compared to both cisgender males & females, TGD individuals expressed significantly stronger implicit bias to self-harm, suicide, & death constructs - TGD individuals exhibited higher explicit associations with SSTB constructs and reported higher rates of depression compared to either cisgender group

		-Findings indicate TGD individuals automatically and more easily identify themselves with SSTB constructs -The higher levels of implicit and explicit SSTB and death constructs observed may partly explain the elevated SSTBs rates experienced by TGD individuals -Implicit measures may prove important in clinical settings, but they do not capture or identify intervenable targets (e.g., environmental, social factors) -Utilising implicit and explicit measures/tools concurrently is likely to be most useful in identifying and understanding SSTB risk and factors salient to a population or individual within clinical settings
3	Systematic review of 78 studies	-No systematic review examined risk &/or protective factors for TGD self-harm – important to enhance understanding & ensure interventions are appropriate & meaningful to this high-risk group -Three protective factors were identified: social/family support; connectedness (esp. to parents & adults); school safety

		-Six risk factors were identified: younger age, being assigned female at birth, physical & sexual abuse, drug & alcohol use, depression or depressive symptomology, & gender-minority stressors (especially discrimination & victimisation) -Significant heterogeneity of factors examined across studies & few studies focused on TGD-specific factors – difficult to synthesise existing data. Research should seek to reduce the heterogeneity and examine TGD-specific factors. -TGD individuals experience unique pathway to self-harm which requires further examination to enhance understanding
4	Co-developing the CaTS-E: thematic analysis of content updates for the Card Sort Task for Self-Harm (CaTS) with people with lived self-harm experiences	-This study identified important amendments and additions to CaTS to ensure CaTS remains a sensitive, meaningful, inclusive and appropriate research tool, suitable for use in a diverse population. -Important additions: • 'I don't feel comfortable in my body' • 'I felt I did not fit in' • 'I found support/a community online' • 'Social media/online content was negatively impacting my mental health' • 'I was bullied on social media'

		• 'I was discriminated against on social media' • 'I had an upsetting sexual experience' • 'I was sexually abused/assaulted' • 'I was bullied because of my sexuality or gender identity' • 'I was discriminated against because of my sexuality or gender identity' • 'I was questioning my sexuality or gender identity' • 'Self-harm gave me a feeling of control' • 'Before 6-months' timecard -Key amendments: • Update terminology (e.g., change 'boyfriend/girlfriend' to 'partner') • Highlight sexual violence trigger warnings • Capture neurodiversity data
6	A pilot study and feasibility test of CaTS-D	-Pilot and feasibility testing is an essential part of digital tool development - This pilot study aimed to establish the feasibility and usability of CaTS-D and assess any impact on participants' mood. -Questions based the System Usability Scale (SUS; Kruzan et al., 2022) evaluated the overall usability and acceptability of CaTS-D

	-A visual analogue scale (VAS) examined pre- and post-study mood to assess whether using CaTS-D in a research setting impacted mood -Findings from the SUS indicate CaTS-D is easy to use and participants should complete the task competently and efficiently without support -VAS data showed a slight, but non-significant, mood decrease, suggesting CaTS-D utilisation does not have negative impact on participant mood -Brief qualitative feedback suggested: • Instructions should explicitly highlight which self-harm episode (i.e., first ever, most recent) should be considered by participants taking part in the study • Ensure instructions clearly explain 'I self-harmed' is a timepoint which can be selected if cards are relevant to the point of self-harm • To explicitly state all timepoints (including 'I self-harmed') can be selected if necessary.
Examining temporal pathways to self-harm in	-Prior research focused on isolated factors

cisgender/heterosexual & LGBTQIA+ populations using CaTS-D	-Longitudinal research is time-consuming and results are delayed by follow-up period lengths CaTS-D was developed to enable rapid data collection and allow multiple self-harm factors to be examined across a timeline within significantly shorter time periods than traditional longitudinal studies -This study is the primary study utilising CaTS-D in a research setting and aimed to examine whether the data captured by CaTS-D supports the IMV model and to explore new insights into the temporal structure of self-harm pathways in both LGBTQIA+ and cisgender /heterosexual populations -Overall, pathways between both groups were similar and offered empirical support for the IMV across groups

Together, this thesis adds value to the field of self-harm research in cisgender/heterosexual and LGBTQIA+ individuals and offers important outcomes which can inform evidence-based interventions for individuals in cisgender/heterosexual, LGBTQIA+, and TGD communities. Furthermore, the findings offer support across stages of the IMV model theoretical model. These are discussed further in this chapter.

8.3. Study Summaries, Research Limitations, and Researcher Reflexivity

This section provides a brief overview of each study's aims and primary findings. I will also discuss the limitations of each study, and my own practice-based limitations and how they may have impacted the research and interpretations.

8.3.1 Investigating Whether TGD Individuals Have Greater Positive Implicit and Explicit Attitudes to STB Constructs Compared to Cisgender Individuals (Chapter 2)

Chapter 2 used secondary data from Project Implicit Health (PIH) to examine whether positive implicit attitudes are greater in TGD individuals compared to cisgender females which may partially explain increased rates of suicidal thoughts and behaviours STBs in TGD individuals (Mann et al., 2019; Ross-Reed et al., 2019) (Chapter 2). Implicit measures (e.g., IAT) may be useful in clinical settings to identify STB risk (Sohn et al., 2021), without relying on potentially problematic self-report measures (e.g., withheld information; under-estimation of risk due to fear or stigma; Glenn et al., 2017; MacDonald et al., 2019). Indeed, stronger implicit self-harm attitudes have been observed in psychiatric in-patients (Scheunemann et al., 2020; Steele et al., 2024; Tello et al., 2019).

Chapter 2 was the first study which combined implicit (IAT) and explicit measures in a large sample (*n*=7607; cisgender males *n*=1933; cisgender females *n*=5217; TGD *n*=457) to assess implicit and explicit attitudes to STB constructs, addressing self-report limitations. Across all four implicit measures (cutting, suicide, death, brief death), TGD participants showed significantly higher implicit associations with death- and self-injury-related constructs compared to cisgender females. In line with extant literature, TGD participants reported significantly higher levels of depression, and

endorsed lifetime self-harm, SI, and desire to die at higher odds compared to cisgender females (Butler et al.,2019; Kirakosian et al., 2022; Thoma et al., 2019; Whittle et al., 2024; Witcomb et al. 2019).

Chapter 2 presents important, novel findings demonstrating that TGD individuals have stronger automatic associations across all four STB constructs (cutting, suicide, death, brief death) compared to cisgender females, which may explain the well-evidenced disproportionately high rates of STBs in TGD individuals (e.g., Butler et al., 2019; Thoma et al., 2019). The findings of Chapter 2 highlight the importance of targeted meaningful interventions to reduce STBs in TGD populations and suggest implicit measures may be an important avenue to effectively and objectively identify risk in TGD individuals in both research and clinical settings. This identification is especially important considering the limitations of explicit, self-report measures (e.g., withholding, over- or under-estimating contributory factors; Glenn et al., 2017; Gratz et al., 2016; MacDonald et al., 2019). However, also considering the wider psychosocial context underpinning STBs remains important. Therefore, explicit measures remain essential for capturing person-centred experiences and factors which influence and underpin self-harm and for identifying important intervenable clinical targets (Whittle et al., 2024). Chapter 3 builds on this by identifying key risk and protective factors experienced by TGD individuals, highlighting the dual-process approach necessary for identifying risk and understanding behaviour (e.g., Cha et al., 2016; Kurdi et al., 2018).

8.3.1.1. Study Limitations

Several study limitations warrant consideration. The sample was largely White, female, and based in the USA, limiting generalisability across other cultures and demographics. Future research should continue exploring implicit self-harm/suicide/ death associations in more diverse populations. Additionally, the cross-sectional design restricts predictive validity (Glenn et al., 2016), and longitudinal studies should examine how implicit attitudes relate to future self-harm behaviours (Glenn et al., 2017; Knowles & Townsend, 2012). For example, stronger and more recent implicit associations have been linked to more severe SA

(Glenn et al., 2017), and meta-analysis findings indicate higher Death-IAT scores in individuals with SA history (Sohn et al., 2021). Another study's Death-IAT scores predict short-term SAs, though effect sizes were small and inconsistent across settings indicating IAT scores should be viewed as a supplemental, not standalone, predictor (Meissner et al. 2019). Moreover, the current data were captured online (as in other IAT studies), introducing variability in participant environment and potential distractions. This may not affect gender differences found, or it may impact the reliability of measured attitudes. Controlled settings may improve measurement validity but would reduce sample size and scalability, so caution should be applied.

There are also limitations to implicit measures. Stimuli such as '*dead', 'suicide'*, 'or '*pain*' may be interpreted differently depending on individual or cultural context. For example, a high IAT score may reflect personal bereavement rather than increased personal risk. For example, Axt and colleagues (2021) found no significant difference in IAT outcomes from positive or negative stimuli across large samples, though these stimuli were not self-harm specific. The current study (Chapter 2) used image-based stimuli, but no research has examined whether these yield inconsistent results compared to neutral or positive images. Jaroszewski et al. (2020) found first-person suicide images elicited different responses based on participants' STB history, suggesting lived experience and stimulus type may affect IAT measurement validity.

Additionally, terms like "*pain*" may evoke physical rather than emotional associations. Indeed, Hussey and De Houwer (2018) argue category labels may drive IAT effects rather than stimuli. Finally, implicit tests do not capture intervenable risk factors such as social problems (Davey et al., 2015), substance use (Quarshie et al., 2020), or TGD-specific risks like discrimination and gender dysphoria (Butler et al., 2019; Quarshie et al., 2020). Since self-harm is context-bound (Meissner et al., 2019), combining implicit and explicit measures may better identify salient risk factors, particularly for TGD individuals (Kurdi et al., 2019). Directions for future research are discussed in section 8.3.

8.3.1.2. Practice-Related Limitations

Although this chapter is the first within this thesis, its inclusion was not part of my original PhD research project. During supervision, one of my supervisors discussed their involvement with Project Implicit and that there was opportunity to incorporate TGD-related data into my thesis, using this secondary dataset. I only gained access to the data towards the end of my PhD; therefore, I was limited by time with what I could analyse. Project Implicit-Health is a large data set, and when I was performing the analysis, it became clear there were multiple research questions which could be addressed using the dataset. However, these were beyond the scope of my PhD, particularly considering the limited time I had remaining.

This was also the first time I had cleaned and analysed a large dataset. My supervisor was very supportive in guiding me through this process, though in hindsight, I would have preferred longer to develop skills to work with such a large dataset more independently. However, the experience has given me skills and confidence to work with large datasets in the future, and a desire to further develop large data analysis skills using more complex methods. I do feel, however, that Chapter 2 enhances my thesis and I am glad I could incorporate it into my work.

8.3.2 Risk and Protective Factors for Self-Harm in Transgender and Gender-Diverse Populations: A Systematic Rreview (Chapter 3)

Previous reviews examining TGD self-harm focused on prevalence rates (e.g., Marshall et al., 2018), without systematically identifying key targets for intervention. Chapter 3 addresses this gap by presenting the first systematic review which examined both risk and protective factors among TGD individuals. Following PRISMA guidelines, 78 studies (*n*= 322,144; 16 countries) were analysed and included for review. The review found significant heterogeneity in factors examined making synthesising literature challenging. However, Chapter 3 identified six important risk factors (younger age, being assigned female at birth, substance use (illicit drugs/alcohol), sexual and physical assault, depressive symptomology, and gender minority stressors (victimisation,

discrimination)) and three key protective factors (social support, connectedness, and school safety) in the TGD self-harm pathway.

Other TGD-specific protective factors may include chosen name use, having gender identity-congruent documentation, and residing in places with gender protective policies. If present, these findings provide important, intervenable targets. This systematic review demonstrates that TGD individuals experience a unique, complex self-harm pathway which needs robust longitudinal research to further elucidate TGD-specific self-harm factors, and ensure intervention is appropriate and meaningful. To my knowledge, Chapter 4 is the first review to systematically synthesise risk and protective factors for self-harm in TGD populations, and the findings provide a foundation for targeted prevention and intervention strategies.

8.3.2.1. Study Limitations

Several limitations should be considered when interpreting these findings. Most tools used within included studies were not validated in TGD-populations, meaning tools may not sufficiently capture TGD experiences. This lack of validation may mean the TGD self-harm pathway is not properly understood, and interventions may place focus on less meaningful factors. Therefore, researchers are recommended to develop and validate tools and measures specifically for TGD-populations to ensure meaningful evaluations and research. Further, researchers and policymakers should consider this limitation in published studies when making evidence-based recommendations or when developing interventions, and ensure future tools are co-developed with TGD individuals to enhance meaningfulness and relevance (King et al., 2020). Next, the heterogeneity of study findings meant meta-analysis was not possible, limiting the ability to draw conclusions. Also, most studies examined general factors, therefore recommendations largely related to these factors, not TGD-specific factors. These factors prevent the formation of a more robust evidence-base and highlights a gap in the literature of the unique antecedents in the TGD self-harm pathway. This also limits the key factors identified by the review and subsequent recommendations for practice. Currently, recommendations are based on the general factors identified, which risks leading to

future interventions which may not be appropriate for TGD individuals, and may be ineffective or even harmful.

Third, there was variation in self-harm outcome measures, this reflects challenges within the self-harm field (Papadima, 2019) and reduces comparability across studies. Further, it highlights the lack of consistency and consensus on how self-harm outcomes are conceptualised and measured. Standardised and inclusive measures would improve reliability and allow for more meaningful interpretations. Next, exclusion criteria (e.g., English-language) limits generalisability, though there were several non-Western-based studies included. However, the overall generalisability is limited. Further, the lack of data regarding transition status or gender identity (e.g., some studies did not specify if participants were transgender female, male, non-binary etc.), limiting understanding of differences and nuance between gender identities which may be important for tailored interventions. Finally, most studies were cross-sectional, preventing causal conclusions. Cross-sectional studies capture data from a single timepoint but cannot identify temporal ordering or rule out potentially confounding factors. This limits the strength of conclusions about underlying causal mechanisms (Asiamah et al., 2021) and highlights the need for longitudinal and case-control studies to examine the temporal TGD self-harm pathway. Without these, the field may fail to develop or be able to identify meaningful targets. Directions for future research are discussed in section 8.3.

8.3.2.2. Practice-Related Limitations

I enjoyed the systematic review process, and gained valuable insight into TGD self-harm, and other issues they face. Because I am not part of the TGD (or indeed the LGBTQIA+) community, my knowledge was limited to the experiences of others (friends, media personalities etc.), and developing understanding of issues faced by TGD individuals was eye-opening, and, on a personal and empirical level, highlighted the need for research which underpins support across multiple aspects of TGD lived experiences. The process also highlighted other issues in the field (i.e., those listed above in section 8.3.2.1.). Some of these were addressed in my PhD, such as examining temporal pathways to self-harm. I was disappointed that recruitment difficulties meant I could not focus

further on TGD people as the heighted risk they experienced and factors underpinning it warrant further research and policies which engender support for this marginalised group.

The heterogeneity of study findings meant I could not perform a meta-analysis. Moving forward, I want to address this and perform meta-analyses, both to strengthen the evidence-base and to further develop my methodological research skills. This was also the first piece of work I completed; therefore, I had ample to time revisit the chapter to ensure it represented the data and my research abilities and was pleased it was my first first-author academic publication. Finally, the publication process allowed me to develop writing skills by adhering to the word count while retaining the meaningfulness and depth of interpretation.

8.3.3. Co-Developing the CaTS-D: Thematic Analysis of Content Updates for the Card Sort Task for Self-Harm (CaTS) with People with Lived Self-Harm Experiences (Chapter 4)

The original CaTS was developed to examine temporal dynamics between multiple self-harm factors, addressing a limitation of prior research which examined factors in isolation (Stanford et al., 2018; Townsend et al., 2016). CaTS enables researchers to identify sequential patterns and significant transitions in the self-harm pathway, offering insight into how co-occurring factors may interact across time. Since CaTS' inception novel factors may have emerged which were not relevant previously. Therefore, updating and amending CaTS is essential to ensure it remains a useful and meaningful research tool. Additionally, there is increasing awareness that LGBTQIA+ individuals are at increased self-harm risk compared to their cisgender-heterosexual peers (Zhang et al., 2021; Liu et al., 2019), though many measures and tools used to investigate LGBTQIA+ self-harm may not adequately capture their experiences (King et al., 2020). Ensuring CaTS contains appropriate and meaningful concepts is essential for its use in research settings with LGBTQIA+ and cisgender/heterosexual populations.

Chapter 4 presents the first systematic updates to the CaTS, co-developed with individuals with lived self-harm experience using Personal and Public Involvement (PPI). Co-developing research

tools and interventions using PPI is recommended by researchers in the mental health field (Veldmeijr et a., 2023) and is essential to ensure amendments and updates are meaningful and reflect current lived experiences. During qualitative one-on-one interviews participants were asked questions about additions or amendments to CaTS. Thematic analysis resulted in the development of 12 new cards (including '*I had an upsetting sexual experience', 'Self-harm gave me a feeling of control', 'I was questioning my sexuality or gender identity*'), 1 additional timepoint ('*Before 6-months*'), and key linguistic updates to card wording (e.g., replaced '*girlfriend/boyfriend*' with '*partner*'). Chapter 4 makes a novel and significant contribution to the self-harm literature by being the first study to systematically update CaTS using lived experience and PPI to enhance the inclusivity and meaningfulness of CaTS and ensures it remains a useful research tool for diverse populations.

The additional concepts identified by Chapter 4 are supported by the literature. For example, social media can protect against and increase self-harm risk. Online experiences often mirror those found offline and may amplify vulnerability. This is particularly significant considering the high global prevalence of social media/internet usage globally (Meng et al., 2022; Statista, 2025). Recent prevalence figures from Statista (2025) show approximately 4.7billion (59%) individuals globally use social media. A recent umbrella review found social media/internet influences has positive and negative effects on self-harm and may interact with other self-harm factors identified during Chapter 4 (e.g., body image issues) (Marchant et al., 2021).

Further, a narrative review discusses how social media/internet usage has positive and negative impacts on wider public health (Kanchan & Gaidhane, 2023). By situating existing insights alongside the novel qualitative context provided by Chapter 4, it becomes clear that different forms of online/social media interaction likely make independent contributions to self-harm risk. Adding social media/online concepts to CaTS ensures both standalone and interaction effects are captured. By integrating these insights and the novel qualitative content from Chapter 4 into CaTS, we ensure CaTS remains an inclusive, robust, meaningful research tool. Chapter 4 also demonstrates the flexibility of CaTS, including how CaTS can be easily adapted to

other, diverse, at-risk populations, and may be adapted to examine other behaviours (e.g., disordered eating, alcohol/drug abuse).

8.3.3.1 Timeline Additions to CaTS

Chapter 4 makes a novel and important contribution by identifying that '*Before 6-months*' is an essential extension to the CaTS timeline, marking the first time CaTS has been adapted to capture historic, pre-motivational factors important to their self-harm journey. Participants discussed how self-harm can develop early in life and documenting childhood and earlier experiences is important to understand one's self-harm pathway. Adding a 'Before 6-months' card aligns with the IMV model's Pre-Motivational (or background) phase where historic or background life events occur distally to self-harm and act as triggers which increase vulnerability to self-harm (O'Connor, 2011; O'Connor & Kirtley, 2018). This significant addition identified during Chapter 4 ensures CaTS can capture important historic factors, enhance its research and clinical relevance, and allow future studies applying CaTS/CaTS-D to further test the IMV model.

8.3.3.2. Study Limitations

Despite targeted recruitment, TGD individuals are under-represented in this study, an issue echoed by other researchers (e.g., Williams et al., 2021). Therefore, TGD-specific factors may not have been identified. This mirrors limitations of Chapter 2, meaning while CaTS has become more inclusive, it may not sufficiently capture the TGD pathway and recommendations based on research applying this iteration of CaTS in TGD populations should be interpreted with caution. Next, participants ages (21-29-years) and race (White British) limits the generalisability of findings. Previous research identified age-related differences in self-harm antecedents (Lockwood et al., 2023), suggesting a broader age representation may identify unique or consistent factors across age groups. Similarly, caution should be applied in CaTS studies with non-White British samples. Self-harm factors unique to other nationalities and races may not be captured in the current iteration. Finally, the sample is non-clinical, and cards within CaTS may not apply to a clinical population. Currently, CaTS has not been applied in a clinical

setting, therefore caution should be exercised when considering findings from CaTS applications in clinical settings or making clinical recommendations based on its use. Directions for future research are discussed in section 8.3.

8.3.3.3. Practice-Related Limitations

Aside from a single undergraduate project many years ago, this was the first qualitative research I have undertaken. I sought guidance from my supervisors regarding the interview schedule and practiced with them, which helped me guide the participant interviews well. During and after the interviews I felt I conducted good interviews and was pleased with the data captured. During transcription, this continued, however it was clear I need to allow participants time to think and respond. After a question, I often reiterated the question, and I believe this was because I expected a more immediate response. During transcription, I reflected on this, and transcribing for another researcher in a Research Assistant role gave me additional insight into a 'better practice' interview. In future, I will further develop this skill, and allow participants time to think and respond to interview questions. That said, I was careful not to lead participants and was pleased I captured data that was representative of their views. During transcription, I identified areas where I could have asked additional probing questions which may have contributed further to the subsequently developed themes and feel giving myself time to think and respond during interviews will enhance my ability to consider whether further probing is necessary. However, overall, I did ask probing questions and gleaned valuable additional data.

8.3.4 Co-Developing the CaTS-D: a Pilot Study of the Card Sort Task for Self-Harm (CaTS) with People with Lived Self-Harm Experiences (Chapter 6)

In-person research applying the original Card Sort Task for Self-Harm (CaTS) was time-consuming and restricted participant access. To address these limitations, I developed CaTS-Digital (CaTS-D), a novel digital adaptation of CaTS. A previous digital iteration (Lockwood et al., 2023) was utilised, but this version was no longer accessible. However, the Lockwood and colleagues study demonstrated that a digital version could capture larger

datasets and would be a useful research tool. The development of CaTS-D is documented in Chapter 5 which outlines the multiple iterations leading to the final version of CaTS-D. Documenting the development process as a standalone chapter represents many years of development and collaboration which resulted in a novel, usable digital research tool. Chapter 6 presents the first time CaTS has been made available in an accessible digital web-app format, significantly increasing accessibility, efficiency, and scalability for both researchers and participants. The development of CaTS-D enhances self-harm research methodology, enables wider participation, and remote data collection, thus enhancing research applications.

Chapter 6 presents the pilot testing of the novel CaTS-D, an essential step in its development. This study examined CaTS-D's feasibility, usability, and impact on participant mood prior to wider application in research settings. Participants (*n* = 13) completed CaTS-D online and subsequently rated its usability using an adapted System Usability Scale (SUS). SUS scores were high, indicating CaTS-D is consistent, intuitive, well-integrated, and not unnecessarily complex to complete remotely. Participants also reported confidence using the tool. Mood scales (VAS) showed a slight post-task mood decrease, which approached statistical significance (p=.15). However, this trend aligns with findings from Chapter 7, where a significant post-task mood reduction was observed, indicating a directional effect across applications and represents an important aspect of future research to continue monitoring the impact of taking part in CaTS-D-based research.

Findings from Chapter 6 indicate CaTS-D is a feasible and user-friendly tool suitable for remote self-harm research, enabling recruitment from hard-to-reach populations and mitigating limitations of in-person methods. Given the ubiquity of digital device use (Smith et al., 2021) and the growing demand for online research tools (Luxton et al., 2021), CaTS-D offers researchers a novel application to capture large scale data than using in-person methods, while supporting efficient data management.

8.3.4.1. Study Limitations

Several limitations should be considered when interpreting findings from Chapter 6. First, most participants (~70%) were White British, which limits generalisability and caution should be applied in CaTS studies with non-White British samples as user outcomes and experiences may differ across cultures. For example, usability results may differ, and CaTS-D may not be as usable in other cultures and populations, and further validation is needed to ensure acceptability across other diverse populations. Further, while VAS mood results suggest participants' mood is unaffected by utilising CaTS-D, the sample size may indicate a marginal or trending effects, suggesting a potential reduction in participant mood which warrants further examination. Further research with a larger sample would clarify whether this trend represents a meaningful mood change. Directions for future research are discussed in section 8.3.

The development of CaTS-D (discussed in Chapter 5) was a long process and I had no previous experience developing web-apps. Naturally, this was a barrier and resulted in many setbacks and false starts before IG and I began developing the final CaTS-D application. If I had existing web-app development skills, this process would have been much quicker and smoother, however I am proud that we were able to develop a usable application and feel the results of Chapter 7 demonstrate its usefulness.

8.3.4.2. Practice-Related Limitations

During supervisions, we discussed manipulating aspects of CaTS-D to identify whether this manipulation affected retention, drop-out, or time spent on each card. For example, the colour of a card or the font. I rebutted this by highlighting the qualitative nature of the task, and how much time a person spent on a card likely relates to them considering whether the card is relevant to them, and when, compared to someone who quickly surmises the card is irrelevant. Further, cards may elicit memories and feelings. This will differ between participants as they reflect on relevant and non-relevant cards and applies to the total time spent on the entire task. CaTS/CaTS-D asks people to complete an emotionally heavy task and consider personal events. The task is designed for this purpose. While there is a statistical element to the study, it is

more a mixed-methods approach and inferential statistics are not performed in the way one would typically understand, therefore time spent is not as significant as a task which measures response times (i.e., the IAT). While these discussions did not result in changes to CaTS-D, they encouraged me to think deeply about how people might interact with CaTS-D.

8.3.5. Examining Temporal Pathways to Self-Harm in Cisgender/Heterosexual and LGBTQIA+ Populations using the Novel Card Sort Task for Self-Harm-Digital (CaTS-D) (Chapter 7)

Findings from Chapters 4 and 6 informed the development of CaTS-D to the point where it was usable to apply in research settings. This study (Chapter 7) presents findings from the first application of CaTS-D in a research setting following pilot phases. The study examined self-harm pathways in cisgender/ heterosexual and LGBTQIA+ populations. The study also examined whether the IMV model provides a useful framework to understand the temporal self-harm pathway. Participants (*n*=118; cisgender/heterosexual n=68; LGBTQIA+ n=50) aged between 18-60-years completed CaTS-D remotely, and Indicator Wave Analysis (IWA) identified when factors were salient in both cisgender/heterosexual and LGBTQIA+ populations.

Overall, the findings support the IMV model with both groups experiencing similar distal (Pre-Motivational), transitional (Motivational), and proximal (Volitional) factors. However, Chapter 7 presents some novel contributions beyond support of the IMV model. First, self-harm '*exposure*' occurred earlier in this study (between 6-months and 1-month before self-harm) than the IMV model posits (where exposure occurs proximally to self-harm facilitating the transition from ideation to enaction). The earlier timing of '*exposure*' challenges the assumptions posited by the IMV model and suggests the model's temporal framework may need modifying, though additional research should explore the situational position of exposure further.

Second, '*alexithymia*' and '*executive function*' occurred proximal to self-harm but are not explicitly included within the IMV model. Furthermore, '*negative feelings*' occurred at self-harm for the cisgender/heterosexual population, 1-hour before for LGBTQIA+ people, and '*acquired capability*' is only proximal in the LGBTQIA+

group (1-hour before). These findings represent important differences around how self-harm develops, and how the IMV model may operate across different populations. Finally, '*insomnia*' occurred in both groups (1-day before in cisgender/heterosexual population; 1-week before in LGBTQIA+ group). Insomnia is not currently captured within the IMV model but has empirical links to self-harm and may contribute to other self-harm factors (e.g., depression, emotion dysregulation, post-traumatic stress disorder; Khazaie et al., 2021; Russell et al., 2019). However, I found no research examining *when* insomnia occurs prior to self-harm. Chapter 7 provides a valuable and novel contribution of when insomnia peaks in different groups which provides a useful indicator of when subsequent self-harm may occur, and it may be important to expand the IMV model to incorporate insomnia. A synthesis of the findings of this study is presented in tabular format (table 23) to aide direct comparison between study findings and the IMV model.

8.3.5.1. Study and Practice-Based Limitations

Key variables were not captured (e.g., method, frequency, duration, age of onset), which may be important for understanding how self-harm evolves. Further research applying CaTS/CaTS-D may identify key factors unique to these factors which may have important clinical implications. Indeed, prior CaTS studies demonstrated the value of comparing participants' first and most recent episodes to explore temporal shifts in self-harm pathways (Lockwood et al., 2023; Townsend et al., 2016). Moreover, different methods of self-harm carry varying medical risks and may influence emotional responses, subsequent behaviours, and clinical outcomes. Notably, early onset of self-harm is significantly linked to higher frequency and increased SA risk (Brager-Larsen et al., 2022). Capturing these data would allow for deeper analysis of how duration and method interact with psychological and contextual factors, enriching both research and clinical applications and may identify which factors are more salient at different stages of an individual's self-harm journey.

This was the first larger data set I analysed and was grateful to be involved in analysing and writing a CaTS publication earlier in my PhD (Lockwood et al., 2023). This provided me opportunity to perform IWA with other researchers in the Self-Harm Research

Group, so I could learn in a supportive environment and was invaluable when I came to analyse this chapter. Considering the novelty of CaTS , there was a lot of trial and error when deciding how best to present the data: from SPSS graphs, to presenting the narrative. For example, having so many categories rendered the IWA graphs unreadable, so there were multiple attempts to figure out how to present them meaningfully. While this was time-consuming, I gained valuable experience during the process and am confident utilising this method and analysis in future. Similarly, my knowledge and skills of SPSS increased during this process which gave me more confidence handling and interpreting data.

Table 23.
Summary of findings within the IMV framework

Timeline Points	Factor/Category	Timing Detail from CaTS Study	IMV Phase	Comparison with the IMV model
Early–Mid Pathway (6mos-1 month before)	Exposure	Peaks early (6–1-months before); both groups	Volitional Phase	Occurred earlier than IMV model posits
	Accessed support that did not help	Peaks early (6–1m before); both groups	Not specified within the IMV	Neutral — possible early consequence of exposure, potential pre-motivational factor
	Negative life events/social problems	Before 6 months; both groups; LGBTQIA+ peaks again at 1 month before	Pre-Motivational or Motivational Phase	Early timing supports IMV model; Pre-Motivational and Motivational Phase
	Questioning gender/sexuality	Cis-het: 6-mos before	Not explicitly included, could be Pre-Motivational factor	Potential expansion of model to incorporate LGBTQIA+-specific factors/phases

		LGBTQIA+: between 6-mos & 1 month before		
	Negative social media	Cis-het only.: 1 month before	May act as a Pre-Motivational and/or Motivational trigger	Borderline support — timing somewhat consistent (e.g., social problems in Motivational Phase may be online)
Motivational-Volitional Phase (1 week – 1 hour before)	Negative feelings (e.g., depression, disgust, self-hatred)	LGBTQIA+: 1 hour before; Cis-het.: at self-harm	Motivational phase — ideation/intent forming	IMV model supported, however proximal timing suggests possible volitional moderator
	Humiliation & Defeat; Loneliness, entrapment & isolation	1 week before to the point of self-harm for both groups	Motivational moderators shaping the pathway to ideation/intent development	IMV model supported
Proximal factors - Volitional Phase (from 1 day before)				
	Alexithymia	Peaks 1 hour before in both groups	Not explicitly included	Possible expansion to IMV model to recognise spikes in alexithymia in volitional phase (**research needed**)

	Insomnia	LGBTQIA+: 1 week before; Cis-het.: 1 day before	Not currently specified	Strong empirical links to self-harm – possible expansion to IMV model to recognise sleep disruptions as a volitional factor (**research needed**)
	Planned self-harm	Day before for both groups	Volitional moderator	IMV model supported
	Impulsivity	At the point of self-harm	Volitional moderator	IMV model supported
	Hopelessness	At the point of self-harm	Motivational to volitional transitional factors	IMV model supported
	Executive functioning	At point of self-harm for both groups; persists after self-harm in LGBTQIA+ individuals	Not explicitly included; may moderate transition	Possible expansion to include (**research needed**)
	Acquired capability	LGBTQIA+: 1 hour before	Volitional moderator	IMV model supported in LGBTQIA+ group
After Self-Harm	In control	Post-self-harm for both groups; cis-het also report during self-harm	Post self-harm events are not central to IMV; fits affect regulation	N/A

	Feeling energised	LGBTQIA+: at point of self-harm; For both groups after self-harm	Post self-harm events not central to IMV model; fits affect regulation	N/A
	Support accessed	After self-harm	IMV model: outside pre-enaction scope	N/A
	Positive social media experiences	After self-harm for both groups	Post self-harm events not central to IMV model	N/A

8.3.5.2. Are Self-Harm Pathways Different in Cisgender/Heterosexual and LGBTQIA+ Populations?

A key aim of this PhD thesis was to utilise the novel CaTS-D to examine self-harm pathways in LGBTQIA+ and cisgender/ heterosexual populations, with the aim of identifying key intervenable targets in both groups. Given that LGBTQIA+ populations experience disproportionately higher rates of self-harm compared to cisgender/heterosexual populations (Butler et al., 2019; Kidd et al., 2024), and experience both group-specific and general risk factors (e.g., stigma, depression; Bird et al., 2024; Williams et al., 2021), it is likely their self-harm pathways include distinct features which differentiate them from those of cisgender/heterosexual populations. By utilising the novel CaTS-D in its first application, I was able to systematically compare LGBTQIA+ and cisgender/heterosexual self-harm pathways using a robust, digital methodology. Interestingly, findings from Chapter 7 revealed cisgender/heterosexual and LGBTQIA+ self-harm pathways were almost identical, indicating both groups experience similar antecedents across similar timepoints prior to self-harm enaction. Identifying this was made possible by the initial application of CaTS-D and has important implications for policymakers and intervention development: it indicates that broad, population-level prevention strategies are likely to be effective across diverse groups, while leaving room for tailored support which consider the unique factors and lived experiences of LGBTQIA+ individuals.

The findings from Chapter 7 offer novel insight by mapping the temporal proximity of volitional factors with greater specificity than previous research, and by identifying potential factors not currently incorporated in the IMV model. Consequently, Chapter 7 not only supports core aspects of the IMV model but suggests possible refinements which could strengthen its explanatory and predictive qualities. See table 24 for details of possible refinements to the IMV model. Chapter 7 is the first application of CaTS-D cisgender/heterosexual and LGBTQIA+ populations and contributes important new findings to the literature by extending current understanding of risk and protective factors for self-harm in cisgender/heterosexual populations. In particular, where key factors occur along a timeline which aids intervention strategies. By situating these factors within a temporal framework, Chapter 7

highlights critical windows for prevention and opportunities for targeted, meaningful support at different stages of vulnerability for cisgender/heterosexual and LGBTQIA+ populations.

Table 24.
Refinements identified by Chapter 7 which may enhance the Integrated Motivational-Volitional Model (IMV) of Self-Harm and Suicidal Behaviour

Factor	Temporal position in Chapter 7	Phase in IMV model
Exposure	6- to 1-month prior	Proximal to self-harm
Alexithymia	1-hour prior	Not currently included
Executive function	At self-harm	Not currently included
Insomnia	1-week to 1-day prior	Not currently included

8.4. Future research directions

While this PhD thesis advances our understanding of factors and antecedents underpinning self-harm risk in TGD, LGBTQIA+, and cisgender/heterosexual populations, several important questions remain that warrant further investigation. Considering the diverse methodologies utilised across this thesis, these are discussed by chapter.

8.4.1. A Large-Scale Examination of Implicit and Explicit Self Harm Bias: Using secondary data from Project Implicit Health (PIH) to explore attitudinal differences across transgender and cisgender people (Chapter 2)

Building on findings from Chapter 2, several avenues for future research are suggested. First, researchers should examine whether implicit measures complement explicit constructs within the IMV framework by capturing cognitive risk factors for STBs in TGD populations, that may not be elicited through explicit self-report measures. Second, capturing implicit attitudes in controlled settings may reduce potential distractor effects on participant responses and improve data quality. However, this approach may limit sample size and scalability, and ultimately, the generalisability of findings. Third, future research should replicate Axt and colleague's work, including the self-harm-related image- and word-based stimuli used in Chapter 2. This would help

identify whether different stimuli (death, suicide, and/or self-harm) produce inconsistent measurements and clarify the influence of category labels versus specific stimuli on implicit responses. Finally, while implicit measures (e.g., the IAT) show potential for identifying hopelessness (Gray et al., 2020), future research should focus on underlying antecedents and contributors to hopelessness, which may offer a more effective intervention target.

8.4.2. Risk and Protective Factors for Self-Harm Thoughts and Behaviours in Transgender and Gender Diverse People: A Systematic Review (Chapter 3)

Findings from the systematic review highlighted important directions for future research. Recommendations for future research are informed by limitations of included studies. For example, most studies examined general, rather than TGD-specific, factors meaning the impact and prevalence of TGD-specific factors is unclear. Second, future research to reduce the homogeneity of researched factors is necessary to provide a stronger picture of factors impacting the TGD self-harm pathway. Many included studies did not control for confounding variables. Therefore, future research controlling for covariates will ensure their effects are properly understood and accounted for (Pourhoseingholi et al., 2012).

Second, 62 studies omitted to justify their sample size. Including a power analysis would improve the quality of future studies. Third, across studies, differences in how age groups were reported made it difficult to identify whether TGD individuals are at increased risk across particular ages. Future research should report age-related data to evidence whether certain age-groups are at particular risk. Fourth, most studies were cross-sectional; therefore, causation cannot be determined. Future research should consider designing studies which examine causal, longitudinal, and temporal relationships between factors and self-harm outcomes. Fifth, while social and/or family support and connectedness, were identified as key protective factors against TGD self-harm, future research should examine how different types of support and connectedness may vary in their protection effects. Finally, there was significant heterogeneity of examined factors across all 78 studies, making meta-analysis impossible.

Future research should reduce this heterogeneity by investigating lesser-researched factors, especially TGD-specific factors. This will identify other key factors for TGD self-harm alongside further elucidation of factors identified in this review chapter.

8.4.3. Co-Developing the CaTS-D: Thematic Analysis of Content Updates for the Card Sort Task for Self-Harm (CaTS) with People with Lived Self-Harm Experiences (Chapter 4)

Chapter 4 identified key amendments and additions to CaTS, however there were limitations which future research should address. First, participants discussed how some factors occurred online and in-person (e.g., bullying, discrimination) and how this dual occurrence may increase risk. Future research should examine whether this duality is present in other factors, and whether further additions to explore duality are necessary. Second, TGD individuals were under-represented in the LGBTQIA+ sample. Future research with TGD individuals may identify TGD-specific factors which would ensure CaTS is meaningful and appropriate to a more diverse LGBTQIA+ population.

While the focus of this study was to capture cisgender/ heterosexual and LGBTQIA+ updates, similar research with other minority and high-risk groups would identify further updates to increase the meaningfulness and inclusivity of CaTS beyond LGBTQIA+ and cisgender/heterosexual populations. Similarly, other nationalities may experience unique cultural factors. Researchers should seek to co-produce bespoke versions of CaTS for use in other countries and cultures, with factors identified through similar qualitative methodologies. Also, as our understanding of self-harm evolves, performing similar research to continue updating CaTS will ensure it remains a meaningful research tool. Indeed, the findings presented here demonstrate the flexibility of CaTS and the ease with which it can be adapted to suit different research needs.

8.4.4. Co-Developing the CaTS-D: A Pilot Study of the Card Sort Task-Digital for Self-Harm (CaTS) with People with Lived Self-Harm Experiences (Chapter 6)

Chapter 6 demonstrated that CaTS-D is a feasible, user-friendly digital research tool. However, several directions for future

research were identified. First, further feasibility testing with larger and more diverse samples, including participants from other countries, is recommended. Second, the small sample size limits the interpretability of VAS mood data and future research should aim to confirm whether the sample was too small (low power) to detect an effect and provide further evidence of the effects of completing CaTS-D in research. Finally, as CaTS-D develops (i.e., if concepts are added for use in different populations) it may be necessary to further pilot test CaTS-D to assess feasibility and impact on mood to ensure it remains a useful research tool across diverse populations.

8.4.5. Examining Temporal Pathways to Self-Harm in Cisgender/Heterosexual and LGBTQIA+ Populations Using the Novel Card Sort Task for Self-Harm-Digital (CaTS-D) (Chapter 7)

Finally, Chapter 7 offers novel insight into the temporal dynamics of self-harm antecedents, but several limitations were identified. First, while the study offered support for much of the IMV model, some self-harm constructs occurred at times not outlined by, or are not currently considered, within the IMV model. These are discussed in section 8.3.2. and outlined in Table 22, but to recap, '*exposure*', '*alexithymia'* and '*executive functioning*' were all salient factors across LGBTQIA+ and cisgender/heterosexual populations. Other research also suggests '*exposure*' may occur earlier than the IMV model posits (Arendt et al., 2019), highlighting a need for research to further examine the temporal position of exposure in both groups. Neither alexithymia nor executive functioning are considered within the IMV framework. Considering the findings of Chapter 7 and wider literature supporting their role in the pathway to self-harm (Friedman et al., 2016; Mozafari et al., 2022; Norman et al., 2020), and evidence that executive function may play a distal role (Cha et al., 2019) these concepts may be important additions to the IMV framework which future research should examine.

In LGBTQIA+ people, substance use was salient before 6-months. A recent umbrella review also found substance use was a significant risk factor (McEvoy et al., 2023). However, neither this review nor the current study examined whether substance usage was maladaptive, recreational, or a coping mechanism. Consequently, exploring substance usage is an important avenue

for future research, and may inform targeted intervention and prevention strategies.

The '*negative feelings*' category was a proximal factor for both groups, offering support for the IMV model. However, previous CaTS studies have mixed findings regarding the salience of this category in young adults, older adults, and looked-after young people (e.g., Lockwood et al., 2023; Townsend et al., 2016). Further research is recommended to explore whether individual cards within this category reach salience at different timepoints, and in different groups. Both groups reported positive social media experiences post-self-harm, possibly reflecting access to helpful online communities or content. However, this remains unclear and future research should examine post-self-harm social media/internet use to identify why people find social media beneficial after self-harm, and whether further support or postvention avenues may be beneficial.

Finally, neither method, frequency, duration of self-harm, nor age of self-harm onset were captured. These variables may provide important context for understanding the trajectory and continuation of self-harm (e.g., Lockwood et al., 2023; Townsend et al., 2016). Capturing this data in future research will enhance the applicability of findings in research and clinical context. Participants were largely White British, limiting findings to this population. However, global evidence suggests multiple antecedents may be cross-cultural (e.g., substance use; Barbalat & Liu, 2022). However, factors are likely to have different context between cultures (Knipe et al., 2022). Considering this, research applying CaTS-D in different cultural contexts is recommended, whilst keeping in mind recommendations from Chapter 4 which suggest developing a version of the CaTS appropriate for the target population. Similarly, within the LGBTQIA+ group, TGD individuals were under-represented, echoing challenges experienced by other researchers (e.g., Williams et al., 2021), and future research should focus to TGD populations to address this deficit.

Advancements in implicit measurement tools (e.g., the IAT) and CaTS/CaTS-D hold significant promise for self-harm research. Future studies should explore how these tools can be refined and amended further, and within the IMV framework, to capture

nuanced risk factors, particularly in LGBTQIA+, TGD, and other high-risk populations. Other groups within the LGBTQIA+ umbrella may experience category peaks across other timepoints and these should be examined further to identify key antecedents across identities in this high-risk group.

8.4.5.1. After Self-Harm

Both groups reported self-harm provided a sense of control highlighting the potentially cathartic function of self-harm. This aligns with a recent meta-synthesis which identified control as a global self-harm motivation, especially in response to perceived loss (Rheinberger et al., 2025). Future research should explore alternative strategies which support individuals to achieve or maintain feelings of control without self-harming. Additionally, feeling energised peaked at the point of self-harm for the LGBTQIA+ group and after self-harm for both groups, suggesting that feeling energised may contribute to the emotional relief individuals can derive from self-harm. While this not a direct risk factor, this warrants further investigation into the mechanisms underpinning self-harm.

Both groups accessed various support post-self-harm, including formal (clinical), informal, and self-sought (e.g., reading self-help materials) support. Future studies should investigate whether specific types of support are perceived as more helpful across populations. For example, whether clinical support is more effective for cisgender/heterosexual individuals than LGBTQIA+ individuals, or vice-versa. Both groups reported positive social media experience, possibly reflecting access to helpful online communities/content. However, this remains unclear and future research should examine how, why, and which online platforms may offer effect post-self-harm support.

Notably, LGBTQIA+ individuals reported self-harm acted as a suicide prevention strategy. This contrasts existing literature which indicates self-harm is a significant suicide risk factor (Chan et al., 2016; Cheung et al., 2017; Geulayov et al., 2019; Gouveia-Pereira et al., 2022; Hawton et al., 2015). This contradiction highlights the need to examine the post-self-harm pathway, particularly in LGBTQIA+ individuals, to clarify whether self-harm serves as a protective or risk enhancing factor across timepoints.

8.4.6. Comparing Differences Between CaTS-D and In-Person CaTS

Possibly, data captured through CaTS-D differs meaningfully from data collected using the original paper-based, in-person CaTS. One potential source of divergence lies in the cognitive processes and potential social influences involved. During in-person research, participants receive verbal guidance on how to complete the CaTS, non-verbal cues, and have opportunity for clarification from researchers. Although researchers do not influence the content of the timeline, their presence may shape how participants reflect on emotions, thoughts, and the sequencing of events. This scaffolding may enhance understanding and reduce misinterpretation. Contrastingly, remote completion of CaTS-D may encourage greater honesty by allowing participants more time to think, feel less pressure, and potentially produce more carefully considered responses. Future within-person studies could directly compare responses from both applications, assessing whether the same individuals produce comparable timelines across formats. Post-task qualitative interviews would further help to clarify perceived differences in experience, engagement, accuracy, depth of reported experiences, and completion. Similar interviews have been used by researchers to examine participants' engagement with other digital mental health applications (e.g., Kolovson et al., 2020).

Differences may also emerge in how timelines are structured across formats. Remote digital tasks can sometimes increase missing data if participants disengage or rush through the task (Blatte & Schaffner, 2026; Olbrich et al., 2025). Future within-person studies should assess whether CaTS-D yields timelines equivalent in structure and content to the in-person version. However, researchers should remain mindful that some variation may reflect day-to-day differences in mood or recall rather than differences attributable to administration mode. These may be addressed by capturing pre- and post-completion mood, fatigue and stress levels, and current distraction level (Hickman et al., 2024; Quiram et al., 2025), though some variation is likely unavoidable (Festa, 2025).

Finally, further research could examine broader practical and accessibility implications. For instance, CaTS-D may improve access for individuals who are unable or reluctant to attend in-person sessions or who find it difficult to disclose sensitive information face-to-face. Conversely, some participants may prefer guided, in-person completion, and others may struggle with digital literacy. It will also be important to determine whether both methods identify similar temporal patterns, while ensuring they are conceptually equivalent.

8.4.7. Evaluating the Impact of CaTS-D Completion on Participant Mood and Wellbeing

Results from the VAS mood ratings in Chapters 6 and 7 suggest a potential negative impact associated with completing CaTS-D in remote/digital research. In Chapter 6, the small sample size limits the interpretability of mood data. However, the similarity of results across both studies indicates a consistent directional effect across both applications. These observations raise several important considerations for future work involving both CaTS-based applications. First, continued collection of pre- and post-study mood data is essential to monitor the emotional impact of participating in CaTS-based research, regardless of application. Second, future studies should directly compare mood changes between in-person and remote/online participants to determine whether the online nature of the task contributes to mood reduction. Finally, incorporating qualitative methods, such as follow-up interviews, would help clarify whether, why, and how completing CaTS-D remotely affects participants' mood and wellbeing. Such interviews could identify specific features of CaTS-D that influence emotional responses and inform refinements to CaTS-D which would improve participant experience and reduce the likelihood of mood reduction.

Importantly, qualitative interviews add value by explaining *why* mood changes occur. While pre- and post-study VAS ratings highlight changes in mood, they cannot identify cause, emotional meaning, or relevance to individual wellbeing. Follow-up qualitative interviews would enable participants to provide context behind their VAS responses and identify specific elements which impact their emotional state (e.g., recall demands,

interface features, remote participant etc.) and differentiate between isolated discomfort or fatigue from more meaningful negative affect. This understanding would determine whether mood changes are related to the CaTS-D format and application, task content, or external factors. This insight is essential for ethical implication and for data-informed refinements to future CaTS-D iterations which enhance participant experiences.

8.4.8. Recruitment Strategies to Improve Representation of Transgender and Gender-Diverse People

As discussed in Chapter 4 (page 240), early in my PhD I encountered numerous, significant issues recruiting TGD people, the focus of my original PhD research. This led me to changing the focus of my PhD from TGD people to LGTBTQIA+ and cisgender/heterosexual people. I engaged with TGD charities, however; Covid-19-related restrictions meant I was unable to develop these relationships sufficiently to result in any engagement with my earlier studies. This was disappointing personally, but even more disappointing because it meant I was unable to meaningfully enhance our understanding of self-harm in TGD people. Consequently, I include here suggested strategies based on my PhD experiences and reflections to improve representation of TGD people in future research.

While my own efforts were hampered, fostering relationships with community groups will likely improve recruitment by mitigating potential barriers to research experienced by TGD people, including mistrust, lack of awareness of opportunities, and perceptions of being objectified (Chaplin et al., 2018; Owen-Smith et al., 2016). Therefore, developing relationships with TGD community groups is essential to increase awareness of participation opportunities and build trust. This is particularly important for qualitative research where researcher-participant relationships are essential to enhance rapport and, subsequently, the richness and quality of data (Chaplin et al., 2018). However, it is important this is not tokenistic. From discussions with TGD people on a more personal level, TGD people are likely to be cautious and may believe a researcher is engaging for their own benefit. Engendering genuine relationships is likely to be beneficial, because intent is genuine.

Developing relationships with TGD researchers who utilise networks to facilitate recruitment may also increase participation. Existing literature highlights the need for TGD voices in TGD-focused research (Chaplin et al., 2018). However, it is also important for cisgender researchers to reflect and consider their reason for undertaking TGD-focused research. Considering perceptions of objectification act as a barrier to research for TGD people (Chaplin et al., 2018), this is an important moral consideration. Personally, I did not (and still do not) want my research to be tokenistic and solely to enhance my own career. At the beginning of my PhD, I immersed myself in TGD literature because I am not a member of that community and recognised how this might impact my role as a researcher. I read widely to enhance understanding and learnt TGD people were greatly marginalised, under-researched, and at elevated risk (e.g., Ghorbanian et al., 2022). This deeper understanding, along with personal interactions with TGD people, inspired a commitment to undertake TGD-focused research with the principal aim of improving understanding and benefitting this high-risk group, not to provide shallow, self-serving studies which do not relate well to TGD experiences. I recommend cisgender researchers reflect on why they are engaging in TGD-focused research, and how their own identity may influence the design of studies and interpretation of data throughout their career. I also recommend regular reading to ensure your knowledge of relevant TGD literature remains high.

Implementing these recruitment strategies will support the development of larger, more diverse, and more representative TGD samples in future research. Improved engagement utilising community and professional partnerships will allow future studies to capture variation within TGD communities (e.g., across gender identities (Ghorbanian et al., 2022), age, transition status), thus enabling more meaningful, granular analyses. These recruitment approaches will help ensure future research avoids the problems I faced in my PhD, but instead produces rich, nuanced, informed, and meaningful insight into TGD experiences.

8.5. Clinical Implications

The findings of this thesis have several important clinical implications for the assessment and management of self-risk across multiple diverse groups. The following recommendations may inform clinical guidelines and practice for working with TGD, LGBTQIA+, and cisgender/heterosexual populations.

1. The findings presented in Chapter 2 suggest TGD individuals implicitly and explicitly associate themselves with concepts of self-harm, suicide, and death significantly more than cisgender individuals. This may help explain why TGD individuals experience elevated rates of self-harm (Ross-Reed et al., 2019; Thoma et al., 2019).

    1. **Clinical guideline: Elevated implicit and explicit self-harm associations in TGD individuals highlight the need for tailored risk assessments**

2. This thesis identified important risk and protective factors for self-harm in TGD populations. These provide context to findings from Chapter 2 and offer key intervenable targets.

    1. **Clinical guideline: These factors should be assessed for during self-harm risk assessment and considered immediate intervention targets, if present.**

3. Findings from Chapter 7 identify key proximal factors (e.g., negative feelings, hopelessness, impulsivity, executive functioning difficulties, alexithymia, insomnia) which peak shortly before self-harm in LGBTQIA+ and cisgender/heterosexual populations.

    1. **Clinical Guideline: Clinicians should assess for these factors and consider them immediate intervention targets, if present.**

4. Findings from Chapter 7 identify key differences between LGBTQIA+ and cisgender/heterosexual populations (e.g., acquired capability, insomnia), highlighting the need for tailored assessment and intervention strategies.

    1. **Clinical Guideline: Clinicians should utilise identity and population-specific screening tools and interventions.**

5. Findings from Chapter 7 identified key factors across LGBTQIA+ and cisgender/heterosexual populations: insomnia, substance use, emotion regulation difficulties, alexithymia.

    1. **Clinical Guidelines: Clinicians should screen for these factors and incorporate them into appropriate intervention (e.g., DBT, CBT), or refer individuals to appropriate bespoke services (e.g., CBT-Insomnia).**

6. Findings from Chapters 3 and 7 identified key protective factors. For TGD people, social support and connectedness are protective, and for the cisgender/heterosexual population, social support is salient proximal to self-harm.

    1. **Clinical Guidelines: Individuals should be encouraged and supported to utilise social networks. Signposting to appropriate organisations (e.g., local/online support networks, charities) may be important to support this.**

7. CaTS-D is a feasible, adaptable, digital research tool, suitable to capture and examine self-harm pathways in diverse populations.

    1. **Clinical Guideline: Integrating digital tools to capture real-time or retrospective self-harm pathways may be useful in clinical settings.**

8.6. Cross-study limitations

Across studies, several shared methodological and conceptual limitations consistently emerge. First, TGD individuals are under-represented across studies. This is in line with recruitment issues earlier in the PhD, and experiences of other researchers (e.g., Williams et al., 2021) highlighting the need for further research in this high-risk group. Also, it highlights the need to foster relationships with organisations which can support recruitment in high-risk groups. Second, most participants were White (particularly in the primary data chapters), limiting generalisability. Research which further tests the IMV model, and research to expand the applicability of CaTS and CaTS-D in other populations is necessary. In Chapters 6 and 7, results from the mood scale (Visual analogue scale; VAS) suggests people's moods may decrease post-study. This is concerning, particularly considering people will take part remotely and possibly alone. Further research to explore the impact of CaTS-D is necessary, with possible refinements and further pilot testing to reassess the impact on participant mood.

8.7. Conclusion

Extant literature shows self-harm is the result of complex, temporal dynamics between multiple factors (Richardson et al., 2024). Indeed, the IMV model provides a theoretical framework which considers the impact of multiple, temporal factors (O'Connor et al., 2011; O'Connor et. al., 2018). However, this temporal pathway is poorly understood, and therefore the predictive value of risk assessments is limited (Dhingra et al., 2015; Fox et al., 2015). Possibly, because of this, interventions may focus on factors not salient or important to those at risk or be delivered at times not appropriate.

The overall aim of this PhD was to explore LGBTQIA+ and cisgender/heterosexual self-harm pathways utilising the newly developed CaTS-D and consider findings within the IMV framework. The findings show both CaTS-D and the IMV framework are useful to capture and explain the complex, temporal dynamics between multiple factors for self-harm in LGBTQIA+ and cisgender/heterosexual populations. Further, both CaTS/CaTS-D and the IMV model may also be useful to explore self-harm in other populations. However, future research should

identify whether further additions/amendments to CaTS/CaTS-D are necessary to ensure it is meaningful to other high-risk populations (e.g., people of colour; Rojas-Velasquez et al., 2020). Further, it is likely CaTS/CaTS-D will need further amendments as our understanding of self-harm develops.

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10. Appendices

Appendix 1: DASS Depression scale used in Chapter 2:

D1: I couldn't seem to experience any positive feeling at all
D2: I found it difficult to work up the initiative to do things
D3: I felt that I had nothing to look forward to
D4: I felt down-hearted and blue
D5: I was unable to become enthusiastic about anything
D6: I felt I wasn't worth much as a person
D7: I felt that life was meaningless
(1: did not apply to me at all; 2: applied to me to some degree, or some of the time; 3: applied to me to a considerable degree, or a good part of time; 4: applied to me very much, or most of the time)

Appendix 2: Full breakdown of country of residence captured by Project Implicit-Health (Chapter 2)

United States
Afghanistan
Albania
Algeria
Andorra
Angola
Antigua & Deps
Argentina
Armenia
Australia
Austria
Azerbaijan
Bahamas
Bahrain
Bangladesh
Barbados
Belarus
Belgium
Belize
Benin
Bhutan
Bolivia
Bosnia Herzegovina

Botswana
Brazil
Brunei
Bulgaria
Burkina
Burundi
Cambodia
Cameroon
Canada
Cape Verde
Central African Rep
Chad
Chile
China
Colombia
Comoros
Congo
Congo Dem Rep
Costa Rica
Croatia
Cuba
Cyprus
Czech Republic
Denmark
Djibouti
Dominica
Dominican Republic
East Timor
Ecuador
Egypt
El Salvador
Equatorial Guinea
Eritrea
Estonia
Ethiopia
Fiji
Finland
France
Gabon
Gambia
Georgia
Germany

Ghana
Greece
Grenada
Guatemala
Guinea
Guinea Bissau
Guyana
Haiti
Honduras
Hungary
Iceland
India
Indonesia
Iran
Iraq
Ireland Republic
Israel
Italy
Ivory Coast
Jamaica
Japan
Jordan
Kazakhstan
Kenya
Kiribati
Korea North
Korea South
Kosovo
Kuwait
Kyrgyzstan
Laos
Latvia
Lebanon
Lesotho
Liberia
Libya
Liechtenstein
Lithuania
Luxembourg
Macedonia
Madagascar
Malawi

Malaysia
Maldives
Mali
Malta
Marshall Islands
Mauritania
Mauritius
Mexico
Micronesia
Moldova
Monaco
Mongolia
Montenegro
Morocco
Mozambique
Myanmar
Namibia
Nauru
Nepal
Netherlands
New Zealand
Nicaragua
Niger
Nigeria
Norway
Oman
Pakistan
Palau
Panama
Papua New Guinea
Paraguay
Peru
Philippines
Poland
Portugal
Qatar
Romania
Russian Federation
Rwanda
St Kitts & Nevis
St Lucia
St. Vincent & Grenadines

Samoa
San Marino
Sao Tome & Principe
Saudi Arabia
Senegal
Serbia
Seychelles
Sierra Leone
Singapore
Slovakia
Slovenia
Solomon Islands
Somalia
South Africa
Spain
Sri Lanka
Sudan
Suriname
Swaziland
Sweden
Switzerland
Syria
Taiwan
Tajikistan
Tanzania
Thailand
Togo
Tonga
Trinidad & Tobago
Tunisia
Turkey
Turkmenistan
Tuvalu
Uganda
Ukraine
United Arab Emirates
United Kingdom
United States
Uruguay
Uzbekistan
Vanuatu
Vatican City

Venezuela
Vietnam
Yemen
Zambia
Zimbabwe

Appendix 3: Full search strategy (Chapter 3)

(“self harm*” OR “self-harm” OR “non suicidal self injur*” OR “nonsuicidal self-injur*” OR “non-suicidal self-injur*” OR NSSI OR “self injur*” OR “self-injur*” OR “self cut*” OR “self-cut*” OR “self destruct*” OR “self-destruct*” OR “deliberate self harm” OR deliberate self-harm” OR DSH OR “self-mutilat*” OR “self mutilate*” OR “self inflicted injur*” OR “self-inflicted injur*” OR overdos* OR “suicide attempt*” OR “attempted suicid*” OR parasuicide* OR para-suicid*” OR “para suicid*“) AND. (transgender OR trans* OR “gender divers*” OR “non binary” OR “non-binary” OR “non-binary AND gender” OR “gender nonconforming” OR “gender non-conforming” OR “gender-queer” OR “gender queer” OR “gender fluid” OR “gender-fluid” OR “bi-gender” OR “gender creative” OR “gender neutral” OR transw* OR trans* OR “gender minorit*” OR “gender dysphoria” OR LGBT*)

Appendix 4: Terms within the TGD umbrella (Chapter 3)

Gender fluid, trans, transgender, non-binary, two-spirit, omnigender, pangender, ambigender, agender, bigender, gender questioning, and gender queer. Please note this list is not exhaustive.

Appendix 5. List of excluded papers and reasons for exclusion (Chapter 3)

Author/s & date	Title	Reason/s for exclusion
Abramovich et al. (2020)	Assessment of Health Conditions and Health Service Use Among Transgender Patients in Canada	Did not investigate factors for self-harm (not relevant)
Albuquerque et al. (2018)	Association between violence and drug consumption with suicide in lesbians, gays, bisexuals, transvestites, and transsexuals: cross-sectional study	Data not extractable
Angoff et al. (2021)	Intersecting identities and Nonsuicidal Self-Injury Among Youth	Not relevant
Atteberry et al. (2021)	Differential Experiences of Mental Health Among Transgender and Gender-Diverse Youth in Colorado	Not relevant
Bailey et al. (2014)	Suicide risk in the UK trans population and the role of gender	Design or analysis (qualitative analysis)

	transition in decreasing suicidal ideation and suicide attempt	
Barnett et al. (2019)	Anti-LGBT victimization, fear of violence at school, and suicide risk among adolescents	Subpopulation not extractable (LGBT)
Beckwith et al. (2019)	Psychiatric Epidemiology of Trans & nonbinary adult patients at an urban health center	Design or analysis (suicide measured under 'psychiatrc acuity' with other mental health outcomes)
Berona et al. (2020)	Predicting suicidal behavior among lesbian, gay, bisexual, and transgender youth receiving psychiatric emergency services	Subpopulation not extractable (LGBT)
Berona et al. (2021)	Predicting the Transition From Suicidal Ideation to Suicide Attempt Among Sexual and Gender Minority Youths	Subpopulation not extractable (LGBT)
Butler et al. (2019)	Self-harm prevalence and ideation in a community sample of cis, trans and other youth	Not relevant (examined prevalence rates)

Clark et al. (2023)	The role of sleep duration in suicide risk among sexual and gender minority adolescents	Subpopulation not extractable (Sexual & Gender Minority)
Cramer et al. (2020)	Preferences in information processing, marginalized identity, and non-monogamy-Understanding factors in suicide-related behavior among members of the alternative sexuality community	Subpopulation not extractable
de Bolger et al. (2014)	Australian Trans Men: Developmental, Sexuality, and Mental Health	Design or analysis
Del Rio-Gonzale et al. (2021)	Sexual Orientation and Gender Identity Change Efforts and Suicide Morbidity among Gender Minority Adults in Colombia	Design (prevalence and comparison between groups)
Drakeford (2018)	Correctional Policy and Attempted Suicide Among Transgender Individuals	Examined TGD inmates

Erlangsen et al. (2023)	Transgender Identity and Suicide Attempts and Mortality in Denmark	Not relevant (examined mortality, not factors)
Freese et al. (2017)	Distinct Coping Profiles Are Associated with Mental Health Differences in Transgender and Gender Nonconforming Adults	Not relevant (Coping styles and NSSI)
Fulginiti et al. (2021)	Sexual Minority Stress, Mental Health Symptoms, and Suicidality among LGBTQ Youth Accessing Crisis Services	Subpopulation not extractable (LGBTQ)
Gibbs & Goldbach (2015)	Religious Conflict, Sexual Identity, and Suicidal Behaviors among LGBT Young Adults	Subpopulation not extractable (LGBT)
Green et al. (2021)	Association of Sexual Orientation Acceptance with Reduced Suicide Attempts among Lesbian, Gay, Bisexual, Transgender, Queer and Questioning Youth	Manuscript not available, accessible, or author/s did not respond

Gnan et al. (2019)	General and LGBTQ-specific factors associated with mental health and suicide risk among LGBTQ students	Not relevant (didn't measures factors specifically for self-harm)
Green et al. (2021)	Cumulative minority stress and suicide risk among LGBTQ Youth	Subpopulation not extractable (LGBTQ)
Hatchel et al. (2019)	Predictors of Suicidal Ideation and Attempts among LGBTQ Adolescents: The Roles of Help-Seeking Beliefs, Peer Victimization, Depressive Symptoms, and Drug Use	Subpopulation not extractable (LGBTQ)
Hatchel et al. (2019)	Peer victimization and suicidality among LGBTQ youth: the roles of school belonging, self-compassion, and parental support	Subpopulation not extractable (LGBTQ)
Hershner et al. (2021)	Associations Between Transgender Identity, Sleep, Mental Health and Suicidality Among a North American Cohort of College Students	Not relevant (prevalence of variables between trans and cis people, and between US and Canadian students)
House et al. (2011)	Interpersonal Trauma and Discriminatory Events as Predictors	Subpopulation not extractable (LGBT)

	of Suicidal and Nonsuicidal Self-Injury in Gay, Lesbian, Bisexual, and Transgender Persons	
Jadva et al. (2021)	Predictors of self-harm and suicide in LGBT Youth: The role of gender, socio-economic status, bullying and school experience	Subpopulation not extractable (LGBT)
Kaniuka et al. (2019)	Stigma and suicide risk among the LGBTQ population: Are anxiety and depression to blame and can connectedness to the LGBTQ community help?	Subpopulation not extractable (LGBTQ)
Klein et al. (2023)	The Mediating Role of Family Acceptance and Conflict on Suicidality among Sexual and Gender Minority Youth	Subpopulation not extractable (LGBTQ)
Knutson et al. (2021)	Profiles of Distress and Self-Harm Among LGBTQ+ Transitional Youth in a Rural State	Subpopulation not extractable (LGBTQ+)
Lee et al. (2023)	Gender Identity Change Efforts Are Associated with Depression, Panic	Manuscript not available, accessible, or author/s did not respond

	Disorder, and Suicide Attempts in South Korean Transgender Adults	
Lee et al. (2021)	Transgender Adult's Public Bathroom-Related Stressors and their Association with Depressive Symptoms: A Nationwide Cross-Sectional Study in South Korea	Manuscript not available, accessible, or author/s did not respond
Liu et al. (2012)	Suicidal Ideation and Self-Harm in Lesbian, Gay, Bisexual, and Transgender Youth	Subpopulation not extractable (LGBT)
Lytle et al. (2018)	Suicidal and Help-Seeking Behaviors Among Youth in Online Lesbian, Gay, Bisexual, Transgender, Queer, and Questioning Social Network	Subpopulation not extractable (LGBTQQ)
McDermott et al. (2017)	The social determinants of lesbian, gay, bisexual, and transgender youth suicidality in England: a mixed methods study	Subpopulation not extractable (LGBT)
McGraw et al. (2023)	Stigma and negative mental health outcomes in sexual/gender minority youth in Utah	Subpopulation not extractable (LGBT)

McGraw et al. (2021)	Family, Faith, and Suicidal Thoughts and Behaviors (STB) Among LGBT Youth in Utah	Manuscript not available, accessible, or author/s did not respond
Mereish et al. (2014)	Interrelationships between LGBT-Based Victimization, suicide and Substance Use Problems in a Diverse Sample of Sexual and Gender Minority Men and Women	Subpopulation not extractable (LGBT)
Moallef et al. (2022)	The relationship between sexual and gender stigma and suicide attempt and ideation among LGBTQI+ populations in Thailand: findings from a national survey	Subpopulation not extractable (LGBTQI)
Morris & Galupo (2019)	"Attempting to Dull the Dysphoria": Nonsuicidal Self-Injury Among Transgender Individuals	Design (quantitative data from mixed methods is not relevant)
Patten et al. (2022)	Circumstances of Suicide Among Lesbian, Gay, Bisexual, and Transgender Individuals	Data from other sources (not individual – police, etc. after death)
Skerrett et a l. (2014)	Suicides among lesbian, gay, bisexual, and transgender	Subpopulation not extractable (LGBT)

	populations in Australia: An analysis of the Queensland Suicide Register	
Smith et al. (2019)	Longitudinal Predictors of Self-Injurious Thoughts and Behaviors in Sexual and Gender Minority Adolescents	Subpopulation not extractable (LGBT)
Speer et al. (2022)	An Intersectional Modeling of Risk for Nonsuicidal Self-Injury Among LGBTQ Adolescents	Subpopulation not extractable (LGBT)
Spivey, L. A., & Prinstein (2019)	A Preliminary Examination of the Association between Gender Nonconformity and Suicidal Thoughts and Behaviors	Subtractable population not identifiable (not clear which results pertain to GNC youth)
Srivastava et al. (2021)	Differential Risks for Suicidality and Mental Health Among Transgender, Nonbinary, and Cisgender Sexual Minority Youth Accessing Crisis Services	Not relevant (No measure of risk factor/self-harm outcome significance)
Turban et al. (2021)	Timing of Social Transition for Transgender and Gender Diverse	Not relevant (Measured differences between age groups of TGD people)

	Youth, K-12 Harassment, and Adult Mental Health Outcomes	
Ugeto et al. (2022)	Differences in suicidality and psychological symptoms between sexual and gender minority youth	Subpopulation not extractable (sexual & gender minority)
Vanbronkhorst et al. (2021)	Suicidality among Psychiatrically Hospitalized Lesbian, Gay, Bisexual, Transgender, Queer and/or Questioning Youth: Risk and Protective Factors	Manuscript not available, accessible, or author/s did not respond
Wang et al. (2021)	Methods of attempted suicide and risk factors in LGBTQ+ youth	Subpopulation not extractable (LGBTQ+)
Wang et al. (2021)	Suicide attempts among Taiwanese lesbian, gay, bisexual and transgender adults during the 2018 Taiwan referendum on same-sex issues	Subpopulation not extractable (LGBT)
Watson & Tatnell (2022)	Resilience and non-suicidal self-injury in LGBTQIA+	Subpopulation not extractable (LGBTQIA+)
Watts et al. (2023)	Transgender and gender expansive emerging adults: the moderating	Not relevant (not measuring factors for suicide or self-harm)

	role of thwarted belongingness on mental health	
White et al. (2023)	Psychological distress, self-harm and suicide attempts in gender minority compared with cisgender adolescents in the UK	Not relevant (did not measure factors against self-harm specifically)

Appendix 6: A copy of the Wellbeing Plan (Chapter 4)

Participant Wellbeing Plan: Safeguarding and Managing Distress
Adapted suicide safety plan to address self-harm, suicide ideation, and suicidal behaviours: Participant views of the Novel Card Sort Task for Self-Harm (CaTS): An interview study

Objective:

To ensure participants are supported appropriately by the research team during the study. This includes participants experiencing distress regards their own self-harm, or the self-harm of others and researcher concerns regards the safety of participants, particularly those who disclose they are at risk.

Delivered by:

PhD researcher and research study team, including a researcher experienced in researching self-harm.

One-one interview sessions:

The study will recruit participants to attend one interview session to discuss the novel card sort task for self-harm (CaTS). Participants will be asked to consider factors relating to self-harm which may affect participant wellbeing and cause distress. This may occur at any point in the study, including afterwards. Considering this, it is important to ensure participant safety as best we can. Sessions may be online or in-person. The delivery will impact how the research team are able to identify possible distress in participants, so it is important the research team pay attention to non-visual signs of distress. A Wellbeing Plan must be completed by all participants before the interview.

Distress:

All expressions of distress or other safeguarding issues should, and will, be taken seriously by the research team.
Distress can be expressed in many ways, including, but not limited to:

- Direct statements detailing distress
- Difficulty controlling emotions
- Difficulty controlling anger/temper
- Angry or hostile outbursts
- Yelling/shouting, or aggressing comments
- Mood swings
- Erratic or irritable behaviour
- Anxiety
- More withdrawn or animated than usual
- Expressions of hopelessness or worthlessness
- Crying or tearfulness
- Excessive demands or dependent behaviours
- Restlessness, including shakiness, tremors, fidgets, pacing
- Deteriorated physical appearance or hygiene

- Fatigue or exhaustion
- Discussing or experiencing changes in sleep
- Noticeable changes in weight, or stating changes in appetite
- Frequent or chronic illnesses
- Changes in body language
- Changes in communication style, including tone of voice, or increase/decrease in dialogue, and using more emotional or negative language
- Concentration difficulties
- Difficulties relaxing

Wellbeing Guidance:

The research team takes guidance from the safeguarding practices of partner organisations regarding Wellbeing plans for participants. Guidance to ensure participants wellbeing is detailed her:

- Ensure all participants complete a Wellbeing Plan (Appendix 1) prior to the session
- Encourage participants to make someone close to them aware they are taking part in the study, and they may need to call on that person
- If online, the address where the participant is taking part in the study from will be taken in case of medical

emergency (this is included in the Wellbeing Plan, appendix 1)

- Participants' GP and an 'emergency contact' details will be taken in case the research team is required to contact them (Wellbeing Plan, appendix 1)
- Follow-up with each participant after 24-hours to check in on them
    - If a participant does show or state distress, the researcher will be sensitive and empathetic
    - The researcher will identify if the person can call a trusted person (friend, family, or a healthcare professional) and encourage them to do so. If necessary, or requested by the participant, the researcher will call the nominated person
    - The researcher will ask if the participant wishes to have a further follow-up call the following day
    - If the researcher feels the person has an imminent plan, or is at immediate risk, they will ascertain the whereabouts of the participant and inform them they will call an ambulance
- During the study, researchers will periodically ask if anybody wants to take a break and remind participants the break-out room is available if needed
- Researchers will consider their phrasing of sentences during each session. For example, phrasing something more positively may reduce distress (I.e., "I know you are being asked to consider concepts around self-harm and this may be distressing. We really appreciate you taking time to discuss the relevance of these concepts")
- Advise participants to avoid alcohol as this may make the situation and/or their feelings feel worse
- Participants will be advised to contact friends, family, or other support person if necessary
- Participants will be provided with general and trans-specific organisations that can provide further support:
    - Self-Injury Support: 0808 800 8088 www.selfinjurysupport.org.uk
    - Harmless: www.harmless.org.uk
    - Samaritans: 116 123

- LGBT Hero: 0300 330 0630 www.lgbthero.org.uk
- NHS: dial **111** if not an emergency; dial **999** in an emergency; Visit A&E or another NHS urgent care in an emergency
- Nottingham City Crisis Resolution and Home Treatment Team

CRHT City
Highbury Hospital
Bulwell
Nottinghamshire
NG6 9DR
Tel: 0300 300 0065

- If a participant indicates or suggests they are at risk of self-harm, researchers have a duty of care to take immediate and appropriate action. In this instance, the principal investigator will be informed immediately
  - The research team will listen without judgment to what the person has to say and avoid making assumptions
  - Information should be documented in the participants own words on the **Serious Adverse Events** form (Appendix 2. Held by research team). The event should be documented and sent to the PhD research supervisor, Ellen Townsend, within 24-hours
  - If the participant is at immediate risk, or in need of immediate medical attention, action should be taken to ensure their safety and wellbeing. This may involve calling an ambulance to the address given as the current whereabouts of the participant

Participant confidentiality can be broken if one of the research team believed a participant, or someone else, is at risk of self-harm or harm. Researchers may contact emergency services, the participants GP, or emergency contact to ensure participant safety. These will be collected in the Wellbeing Plan prior to each session. Participants will also be directed to the support services listed above.

As a participant, you will be asked to give your views on the existing, novel card sort task for self-harm (CaTS). You will also be

asked for advice to refine CaTS from a trans* perspective. This will ensure CaTS is appropriate and meaningful to successfully capture the self-harm pathway experienced by trans people.
The study will involve you looking at CaTS and known factors for self-harm so you will think or hear about potentially difficult or distressing topics. Participant safety and wellbeing is paramount to our research team. We want to remind participants to prioritise their safety and wellbeing. This involves participants only contributing in ways they feel comfortable with, and that will not negatively impact their safety and wellbeing. In line with similar studies, all participants will complete a Wellbeing Plan. The Wellbeing Plan will help us safely manage any distressing situations should they arise.
Participants will be asked to complete the Wellbeing Plan below prior to the interview session. The Plan should be completed at a time you can think clearly about what you will find helpful. A copy of the Wellbeing Plan will be stored on password protected computer. Participants can share a copy of the Wellbeing Plan with a trusted person if they wish.
Your name and contact details will be kept separately from research data.

Your name:
Contact name:
e.Mail address:
Please provide a contact number which can be used to provide a follow-up call 24-hours after the study. This is to ensure your wellbeing:

The sessions will take place online (via Zoom).

Do you have access to a computer or device and reliable internet to allow you to take part?

The results from this interview study may be published in academic journals and conference proceedings. It would be helpful to understand a little more about you, so that a summary of group participants can be gathered. You will not be personally identified.

Your age:

Your gender identity: cis female / cis male / trans female / trans male / non-binary / gender fluid / other (please specify)
Your sexuality:
Your ethnicity:
Your pseudonym: (This may be used in the research paper for anonymity purposes)

How would we, the research team, know you are becoming distressed or finding the interview difficult or challenging?
What key signs should we be aware of? Some people may become quiet or agitated and feel they need to leave the interview for a while.

How can we best support you if you do begin to feel distressed, or begin to find the interview challenging?

What would you like us to do? For example, if you would like to head to a manned break-out room how you would like to let us know you need to take a break? Or, if you would like to leave the interview would you like a member of the research team to get in touch soon as possible to check in with you?

Are there any adjustment we could make so you find participating in the interview easier for you?
For example, would you like to know ahead of time key questions we will ask during the sessions? Or would you like the option of writing your responses?
What do you plan to do after the interview study? It can be helpful to plan to do something you enjoy doing after taking part in research sessions. This could be on your own or with a trusted person.

What support do you have? It can sometimes be helpful to think about the support you already have and who you might be able to talk to if you find things difficult, or you want to think about something else. This could be a partner, friend, relative, or a professional.

Contact details of a trusted person.
Please complete the sections below with details of a trusted person, or people, that we could contact if we are concerned you may be finding things difficult. We will only contact them if we are

worried about your safety, and we will always try and discuss this with you first. These details will be deleted two weeks after the interview.
(Please confirm with your **trusted person/s** they are happy for you to share their details with us.)
Their name:
Their relationship to you:
Their phone number:
Their email address:
Their name:
Their relationship to you:
Their phone number:
Their email address:
Your GP details:
Practice name:
Phone number:
Phone number:
Dr/GP name:
Sharing your wellbeing plan
Would you like us to share a copy of your wellbeing plan with a trusted person? Yes/No
(Please confirm with the person beforehand that we can contact them in order to share this information)
If yes, please tell us:
Their name:
Their relationship to you:
Their phone number:
Their email address:

In case of emergency, we need the address from where you will be taking part in the study, if online:
Address:
Postcode

Appendix 7. Interview schedule (Chapter 4)

Q1: Can you please tell me your initial thoughts on the CaTS?
Q2: Can you think of any concepts or cards that are missing, and should be included?
Q3: Do you think any cards should be removed from the CaTS?
Q3: Can you think of any cards which may need changing or amending?

Q4: Do you have any final thoughts or comments about the CaTS?

Appendix 8. Additional supporting quotes from Chapter 4

(Terminology updates):

Pandora:
"…there's, 'I discussed self- harm in a forum on the Internet' that's, that's on there, but I don't think that's as relevant now. I think that could be updated because I don't think I don't think people really use forums they use, they might be in like a Facebook group or something, or or Reddit channel and where they, you know, discuss these things instead. So...it's still relevant, but it I think the...format and which, which it's discussed could be updated..."
"…I don't think people really use forums anymore... they're quite an outdated concept, but they exist, don't they? AND "Yeah...just be like a social media influencer, you know, instead of a Blogger, you know?"

Belle:
"...I think forums does happen, but maybe not so much. I think we're like platforms, social media platforms"
Jo:
"...I think you could just keep it broad like on like, 'support online' because I think that captures a range of different services or communities."

CH:
"Could be one like about Twitter instead of about forums? 'Cause I know there are like self-harm groups on Twitter and like groups for other like disorders and stuff."

SM4: Additional quotes (Terminology updates regarding the terminology 'boyfriend/girlfriend'):

Bronwyn:
"I think there's one set of cards that said something like 'I had an argument with my boyfriend/ girlfriend', which obviously if your partner is nonbinary or you identify in a different way, that could be something that maybe could be improved...just 'partner' works."

Selma:
"...There's just one thing I ... wrote down. I also wrote down, I think one was something about boyfriend and girlfriends...I think maybe for clarity's sake, just like partner. Yeah, like less words."

Capturing neurodiversity data:

Bronwyn:
"So, where I've been like ohh, this isn't completely clear for someone who might be really autistic then that could be something that's like I can't get past this card because I don't know what it means. UM …and that's not to say that the cards should change, but if there was a preamble or certain card that was like 'I have this form of neurodiversity", this is why I've interpreted it this way."

"...Yeah. I just wonder if it's maybe like a logging thing rather than a card thing of like, if you're gonna get some demographics beforehand, can they just type in or like click a button that says like, Yep, this neurodiversity…I don't know if the app would have this, but if there's anything that like, they want to explain the context in their own words a bit more. I found with like friends like me...people tend to want to say "by the way I have this sort of neurodiversity." So, they want to kind of explain why they're saying things in a certain way."

"...I feel like if I went through all of this and I'm looking at all the cards by the end of it, I'd be like, 'I don't know if I've got different experience'. I feel like it's probably been captured and maybe I do. It's just I won't have the capacity at that moment to be like, ohh yeah, actually this one very specific feeling was missing and that was key."

"Like, tell us about yourself…because I, I feel like if I went through all of this and I'm looking at all the cards by the end of it, I'd be like, 'I don't know if I've got different experience'. I feel like it's probably been captured and maybe I do. It's just I won't have the capacity at that moment to be like, ohh yeah, actually this one very specific feeling was missing and that was key."

NE:

"I would also say there's a lot of a lot more studies now about how neurodiversity is sort of linked to queerness. So, I think, yeah, angling some more things or just having drop-down boxes for some of those cards where you can specifically say, oh, it's because of sort of, I'm autistic or I have ADHD or something like that...that will help..."

'Before 6-months' timepoint

NE:
"I think that, yeah, just having like an extra one that's something to do with before six months, but not like a specific 'a year before' because...it might be something that occurred way earlier in childhood, but yeah...that would help if it was something 'before six months'..."

Emily:
"Yeah...you've got, yeah, things like things like 'I was raped', 'I was a victim of crime' like that. They're factors why people self-harm but could have been like way before six months? Yeah, and it's almost like, snowballed. So yeah, I definitely think a card or even a few cards like 'before six months' would make a lot of sense..."

CH:
"…I know that lots of people suffer with self-harm for, like, years, so maybe it should start like a year back or like two years plus, like have more options…I wrote to maybe include like a 'one year before; and like a 'two years plus'…but, like, a 'before' box would work as well…"

'I did not feel comfortable in my body'

Coral:
"...I think with social media, I guess you've got that whole thing around like, you know, comparing yourself to others, I guess that's quite a big thing. It's like kind of body dysmorphia. Kind of, yeah, it can definitely be a factor"

-

'I felt I did not fit in'

Bronwyn:
"…I felt as though I couldn't care about myself because my identity wasn't accepted. I can't talk to anyone because I feel like they can't relate to who I am. I can't be my authentic self. Those sorts of prevalent experiences that we know happen within the community and everyone who's LGBTQ+ has a story about that in some capacity."

Jo:
"Yeah, I think also maybe a feeling accepted or, or feeling not accepted, or, erm, kind of not fitting in with people. I think that can be relevant for a few different characteristics like culture as well…"

'I found support/a community on social media' and 'Social media/online content was negatively impacting my mental health'

Belle:
'"..I think social media and self-harm definitely needs to be looked into cause...it's the extremes of what they're posting about, like we have the good content are people talking about their journey and getting better and giving tips. But you have also the other side that like fuels people wanting to self-harm more because they're seeing it."

Artemis:
"…there could be sort of just a generic 'I felt like social media was impacting my mental health'…it would mean different things to different people, but it would be kind of a useful catch all, you know, with sort of whether that's doing scrolling or kind of looking at people on Instagram or sort of feeling kind of bad about yourself…"

'I had an upsetting sexual experience' and 'I was sexually abused or assaulted'

Belle:
"...then, I did think there was like it's there's 'I was raped' as a card, but not necessarily, like 'I was assaulted or sexually assaulted' like, rape definitely is one of the cards that needs to be there, but I also think you know it doesn't necessarily need to lead

all the way to rape. It can be other things that do you feel that way...the language there, like some people just aren't ready to, to class it or label it [as rape], and that's fine, but it is still like an experience you wanna like, understand and see coming through with the cards when people are using it."

Coral:
"...it goes on to saying 'I was raped', but I don't think there's a way that there could be an extra one about sexual abuse. Some people might experience sexual abuse without being raped, so they might not know how to include that, for example, but…Maybe just a bit more specific..."

'I was bullied because of my sexuality or gender identity' and 'I was discriminated against because of my sexuality or gender identity'

Coral:
"...I guess some people can experience discrimination due to their sexuality and gender, I think that's in like maybe another event as well that could cause, like, trouble."

SM12: Additional quotes 'I was questioning my sexuality or gender identity'

Coral:
"...some people...but kind of like gender dysphoria or struggling with sexuality in general could be one, for example, that I know…I have lived experience with that, so I think maybe that, for example..."

Appendix 9: Cards developed to pilot test V.02 of CaTS-D (Taking an exam)

Afterwards (6):

1. Feedback was critical and beneficial
2. I was able to use the feedback to reflect on my exam performance
3. I self-reflected on my study and revision methods and sought to improve it for future exams
4. The feedback was not beneficial or was too vague

5. I was not able to use the feedback to reflect on my exam performance
6. I did not self-reflect on my study and revision methods

Services & Support (21):

1. I sought help from support services to cope with stress before the exam and found it helpful
2. I sought help from support services to cope with stress before the exam and didn't find it helpful
3. I did not seek help from support services to cope with stress before the exam
4. I sought help from friends to cope with stress before the exam and found it helpful
5. I sought help from friends to cope with stress before the exam and didn't find it helpful
6. I did not seek help from friends to cope with stress before the exam
7. I sought help from family to cope with stress before the exam and found it helpful
8. I sought help from family to cope with stress before the exam and didn't find it helpful
9. I did not seek help from family to cope with stress before the exam
10. I sought help from student/library services to improve my revision techniques and it was helpful
11. I sought help from student/library services to improve my revision techniques and it wasn't helpful
12. I did not seek help from student/library services to improve my revision techniques
13. I required and was given special compensation during the exam (i.e., more time, quiet room etc.) which helped
14. I required and was given special compensation during the exam (i.e., more time, quiet room etc.) that did not help
15. I sought revision advice from other students which helped
16. I sought revision advice from other students which didn't help
17. I didn't seek revision advice from other students
18. I regularly engaged in self-reflective practice

19. I did not regularly engage in self-reflective practice
20. I asked my parents for support and guidance
21. I didn't ask my parents for support and guidance

Feelings (25):

1. I felt stressed about the exam
2. I felt stressed about revision
3. I did not feel stressed about the exam
4. I did not feel stressed about the exam
5. I felt I was going to do badly in the exam
6. I felt I did not do enough revision
7. I felt I had done sufficient revision
8. I felt I had no control over the outcome of the exam
9. I felt I had control over the outcome of the exam
10. I felt depressed because of the exam
11. I felt anxious about the exam
12. I did not feel anxious about the exam
13. I did not feel depressed about the exam
14. I felt confident about the exam
15. I did not feel confident about the exam
16. I felt overwhelmed
17. I did not feel overwhelmed
18. The available revision resources from university were satisfactory
19. The available revision resources from university were unsatisfactory
20. Online revision resources were satisfactory
21. Online revision resources were unsatisfactory
22. I was satisfied with myself after the exam
23. I was not satisfied with myself after the exam
24. I was satisfied with support from tutors/lecturers
25. I was not satisfied with support from tutors/lecturers

Events (25):

1. I created a revision plan or timetable
2. I planned 'down time' into my revision plan or timetable
3. I regularly drank alcohol to excess, and this negatively impacted my exam revision

4. I frequently put revision off to do other things (i.e., go for lunch, watch TV)
5. I did not create a revision plan
6. I joined a study group and found it helpful
7. I joined a study group but did not find it helpful
8. I did not join a study group
9. I amended my revision plan due to advice or self-reflective practice
10. I practiced my exam technique (i.e., did practice exams)
11. I did not practice my exam technique (i.e., did not do practice exams)
12. I procrastinated during revision
13. I experienced a health or personal issue that significantly impacted my ability to revise
14. I revised almost every day
15. I revised for around 2 hours a day
16. I revised for around 4 hours a day
17. I revised for 6+ hours a day
18. I paced myself when revising
19. I did not pace myself when revising
20. I 'crammed' revision
21. I began revising for the exam
22. I took regular study breaks when revising
23. I did not take regular study breaks when revising
24. I had an adequate study area
25. I did not have an adequate study area

Thoughts (12):

1. I did not know how to start revising
2. I was uncertain whether I was revising properly
3. I was worried I was revising the wrong things
4. I was confident I was revising the right things
5. I worried I would forget things during the exam
6. I was confident I would remember things during the exams
7. I wish I had created a revision plan
8. I wish I had stuck to my revision plan
9. I wish I had sought help to guide my revision
10. My revision targets were not realistic
11. My revision targets were realistic
12. I thought I was revising properly

Behaviours (17):

1. I adhered to a revision plan
2. I used time management techniques (i.e., Pomodoro) and they were beneficial
3. I used time management techniques (i.e., Pomodoro) and they weren't beneficial
4. I did not use time management techniques (i.e., Pomodoro)
5. I created but did not adhere to a revision plan
6. I maintained a good sleep schedule
7. I drank fluids regularly (non-alcoholic)
8. I ate regular meals
9. I did not sleep well or regularly
10. I missed meals frequently
11. I did not drink enough (non-alcoholic)
12. I was easily distracted from revising
13. I went to bed early and slept well the night before
14. I stayed up late the night before and did not get enough sleep
15. I prepared my bag the night before the exam
16. I did not prepare my bag the night before the exam
17. I drank excessive alcohol the night before the exam

Appendix 10: Systems Usability Scale (SUS) used during pilot testing in Chapter 6

1. **Were the instructions easy to follow?**
    a. **Yes**
    b. **No. If no, please give brief feedback (insert free text box, maybe 150 words?)**
2. **Did the instructions make completing the task easy?**
    a. **Yes**
    b. **No. If no, please give brief feedback (insert free-text box, again maybe 150 words)**
3. **What device did you perform the task on?**
    a. **Smartphone**
    b. **Tablet**
    c. **Desktop computer**

4. **How easy did you find performing the task on your device? (1-5 point scale)**
    a. **1 = Very Easy**
    b. **2 = Somewhat Easy**
    c. **3 = Neither easy nor difficult**
    d. **4 = Somewhat difficult**
    e. **5 = Very difficult**
5. **Is the wording on the cards easy to read?**
    a. **1 = Very Easy**
    b. **2 = Somewhat Easy**
    c. **3 = Neither easy nor difficult**
    d. **4 = Somewhat difficult**
    e. **5 = Very difficult**
6. **Are the cards visually appealing?**
    a. **Yes**
    b. **No, if no please give brief feedback (insert free text box)**

We need participants to be able to select one response only.

The following 10 questions will all have the same 5-pt Likert scale as show under the 1st question. This doesn't have to look exactly like the scale below. We only need participants to be able to select one response only:

7. **I think that I would like to use this web-app frequently.**

Strongly disagree **Strongly agree**

1	**2**	**3**	**4**	**5**

8. **I found the web-app unnecessarily complex.**
9. **I thought the web-app was easy to use.**
10. **I think that I would need the support of a technical person to be able to use this web-app.**
11. **I found the various functions in this web-app were well integrated.**
12. **I thought there was too much inconsistency in this web-app.**
13. **I would imagine that most people would learn to use this web-app very quickly.**

14. **I found the web-app very difficult to use.**
15. **I felt very confident using the web-app.**
16. **I needed to learn a lot of things before I could get going with this web-app.**

Appendix 11: Copy of instructions used in the pilot study (Chapter 6) and full CaTS-D study (Chapter 7)

Help us develop an app version of a self-harm research tool (CaTS-D) – a co-design opportunity for people with lived self-harm experience

Online participant information and consent

We invite you to take part in this online study which examines factors which may lead to self-harm. This study is open for participants aged 18 and over, who reside in the UK, and have a history of self-harm (self-injury or -poisoning regardless of suicidal intent). You can complete the study on a smartphone, tablet, or laptop/desktop. The study will take approximately 20-minutes.

Participation is completely voluntary, and you can leave the study at any time by closing the browser. The study data is completely anonymous and will be stored securely on a University of Nottingham Azure server during recruitment. Once data is analysed, the original files will be deleted. You will be given a unique ID at the beginning of the study, take note of this as you will need it if you want to withdraw your data. You can withdraw your data up to one week after taking part by emailing Katherine.bird@nottingham.ac.uk.

In the pilot study (Chapter 6), the following text appeared:
You will receive £10 Amazon voucher as renumeration for your time. Please contact Katherine.bird@nottingham.ac.uk to receive your voucher.

In the main CaTS-D study (Chapter 7), the above text did not appear. All participants were paid via Prolific (£4.50) and were informed of this in the Prolific recruitment process.

The following text then appeared in both versions:

Risk of Harm:

The study asks you to think about your last self-harm episode and whether factors occurred at specific times before your last self-harm episode. The study presents cards with factors on them, and some of these explicitly mention physical and sexual violence, abuse, and suicide. The cards are presented randomly, so please consider your current wellbeing and whether you feel able to take part in the study. If you are in distress, contact a trusted person or appropriate organisation. Contact your trusted person ahead of time to ensure they are available during your participation in the study.

Call 999 if you are in immediate crisis.

Here are some support organisations:

- Harmless (harmless.org.uk) 0115 880 0280
- Text SHOUT to 85258 for free
- Text support or freecall The Samaritans 116 123
- LGBT Hero (www.lgbthero.org.uk) 0300 330 0630

These will be provided again at the end of the study.

How to complete the task:

- Please think about the **last time** you self-harmed.
- You will be presented with a card with a self-harm factor on it.
- If the card is relevant to your last self-harm episode, select **all** relevant timepoints the card relates to.
- You can select all timepoints if relevant to your self-harm.
- If the card relates to what was happening or what you were feeling when you self-harmed, you can also select 'I self-harmed'.
- If the card is not relevant, select 'not applicable'.
- Press 'next' when you are ready.
- You will work through each card in the same way until the task is complete.

This should take about 20-minutes.

Consent:

The research team declare no conflicts of interest with regards to this study or publications which may arise from this study.

Ethical approval was granted by The Ethics Committee at the School of Psychology, University of Nottingham (Approval code:

S1543R). This study was funded by a grant from Mental Health Research UK. To confirm you have read and understood the above information, please click the 'Begin Study' button to provide informed consent ('Begin study' button here):
Begin Study

Data Privacy
Our survey is 100% anonymous and we do not collect personally identifiable information
What are my data rights?
Under General Data Protection Regulations (GDPR), you have the right to access and delete any data collected on this survey.
We will store your data anonymously and confidentially on University of Nottingham servers. If you wish to withdraw your data, please email katherine.bird@nottingham.ac.uk and quote this unique identifying number:
UDEHOT55
I am happy to continue

A little about you
We collect a little non-personally identifiable information to allow us to better analyse our data and provide insight and focus for potential future treatments. This information is optional.

When did you last self-harm?
Select...
Age
Select...
Race/Ethnicity
Select…
Gender
Select…
Assigned sex at birth
Select…
Sexuality
Select…
Marital status
Select…
Neurodiversity Conditions
Select…
Education
Select…

Employment
Select...
Household Income
Select...
Continue

Your wellbeing
Because this study requires you to think about your self-harm, we want to ensure participants are supported during the study. Before you can begin, please rate your current mood on the scale below by selecting a number between 1-10.
Before you begin, please rate your current mood on the scale below
😢
1 2 3 4 5 6 7 8 9 10
😀
What do you plan to do after the study?
It can be helpful to plan to do something you enjoy doing after taking part in research sessions. This could be on your own or with a trusted person.
Please check this box to confirm you have written down your plan.
Please write down the contact details of a trusted person.
Ensure you also have their details to hand so you can easily contact them during or after the study should you feel any distress or concern. (Please note, we will not save this information)
Please check this box to confirm you have written down the details of a trusted person.
Continue

Instructions
You will be shown a single card at a time as you navigate the task. Please read the card and select the answer(s) best suited to the statement on the card. Types of answers are described below:
Timeline Cards
Think about your most recent episode if self-harm. To complete CaTS-D, you will be presented with a card. This card will have a self-harm factor on it (e.g., “I felt depressed and sad”). Underneath will be 8 timepoints (before 6-months; 6-months before; 1-month before; 1-week before; 1-day before; 1-hour before; I self-harmed; afterwards). Think about the factor on the

card and whether it is relevant to your most recent self-harm episode. If it is relevant, select all timepoints relevant to that card. There is a 'not applicable' button if the card is not relevant to your most recent self-harm episode.

Yes and No Cards
Read the statement on these cards and select 'Yes' if you agree with the statement or 'No' if you disagree with the statement. Choose 'not applicable' if the statement does not relate to you. The 'After I self-harmed' cards relate to what happened after your most recent episode of self-harm. Select yes, no, or not applicable.

Move to the next card

After selecting all relevant timepoints or 'not applicable', press the 'next' button to take you to the next slide. You will work through all cards this way. After you complete CaTS-D you will be asked some questions about the task, cards, concepts, and user experience.
Continue

Appendix 12. Frequencies of all cards used, by group (Chapter 7)

Card	Cisgender/ heterosexual	LGBTQIA+
I am insensitive to pain	29	55
I could not solve a problem I faced	147	181
I could not tell anyone how I was feeling	143	206
I could not think of anything else to do	78	125
I could not trust anyone	109	113
I depended on a caregiver for help and support	19	51
I did it on impulse without planning	55	81
I did not feel comfortable in my body	109	176
I did not know what I was feeling	86	154
I did other things to hurt myself (starved myself, drank too much)	88	136
I discussed self-harm on social media or the internet	26	23
I felt abandoned	126	147

I felt defeated	156	180
I felt depressed and sad	200	227
I felt disgusting	132	164
I felt energized	23	35
I felt exhausted	173	187
I felt hopeful about the future	42	35
I felt humiliated	84	96
I felt I could change for the better in future	40	50
I felt I could not change for the better in future	122	171
I felt I could not escape from feelings or situations	188	217
I felt I did not fit in	148	177
I felt I would not be able to change myself in the future	140	191
I felt ignored	123	161
I felt like a burden on people	185	173
I felt like I did not belong	171	191
I felt numb	134	170
I felt rejected	127	151
I felt trapped	181	193
I felt very anxious	176	211
I felt very hopeless about the future	188	190
I felt worthless	183	233
I found support/a community on social media	42	62
I got into trouble at home	21	27
I got involved with a gang	0	1
I got into trouble at school/work	13	27
I got into trouble with the police	6	5
I had a problem at school	26	36
I had a problem at work	36	39
I had access to the means to hurt myself	182	251
I had an argument with my friend	24	26
I had an argument with my parent/caregiver	38	24
I had an argument with my partner	41	51
I had an upsetting sexual experience	12	38
I had unprotected sex	11	43

I hated myself	213	191
I isolated myself from others	146	155
I knew someone who was self-harming	45	66
I moved to a different home	11	14
I moved to a different school	4	6
I phoned a helpline which did not help	8	29
I phoned a helpline which helped	13	32
I planned it carefully	29	52
I read a self-help book - it did not help	9	12
I read a self-help book - it helped	32	39
I read about self-harm on the internet	58	68
I received help and support from a user-led service (e.g., Harmless)	13	14
I received no support from caregivers	30	30
I received therapy which did not help	30	26
I received therapy which helped	39	55
I saw my GP which did not help	28	30
I saw my GP which helped	33	26
I struggled to make decisions	139	188
I talked to a friend which did not help	35	46
I talked to a friend which helped	63	65
I talked to a social worker which did not help	8	4
I talked to a social worker which helped	5	12
I talked to a teacher which did not help	1	4
I talked to a teacher which helped	3	3
I talked to my caregiver which did not help	13	24
I talked to my caregiver which helped	13	41
I thought about being badly treated as a young child	39	48
I trusted a caregiver	48	83
I wanted to die	122	129
I wanted to kill myself	124	113
I was a victim of a crime	41	25
I was angry	131	159
I was being abused mentally	76	88
I was being abused physically	20	24
I was bullied	33	64

I was bullied because of my sexuality or gender identity	3	50
I was bullied on social media	6	26
I was discriminated against because of my sexuality or gender identity	1	40
I was discriminated against on social media	12	31
I was drinking alcohol	66	79
I was drunk	50	23
I was having nightmares	79	106
I was having problems in a close relationship	104	96
I was high on drugs	14	25
I was not able to sleep	125	156
I was not afraid of death	86	109
I was questioning my sexuality or gender identity	1	74
I was raped	3	15
I was rejected by my parents	13	50
I was sexually assaulted or abused	13	29
I was taken into foster care	1	2
I was taken into a residential care home	1	3
I was taking illegal drugs	14	41
I was very agitated and restless	145	139
I went to counselling which did not help	24	17
I went to counselling which helped	37	22
Lots of people I knew were doing it	18	29
No one listened to me or took me seriously	107	111
Social media/online content was negatively impacting my mental health	48	83
Someone close to me died	31	24
Someone close to me left	34	34
Someone I knew killed themselves	13	15
Someone listened to me and took me seriously	72	66
The mental pain was unbearable	129	175
There was no one to turn to for help	124	109
A+E staff were friendly and understanding	16	28

A+E staff were not friendly and understanding	4	6
I felt better after self-harm	16	28
I felt worse after self-harm	38	58
I went to hospital for overdose or self-injury	0	28
Self-harm gave me a feeling of control	28	34
Self-harm stopped me from killing myself	27	36

Appendix 13: Copy of debrief information used in the pilot (Chapter 6) and full CaTS-D study (Chapter 7)

How did it go?

You have now completed the card sort task. Thank you for taking part. Did the cards cover all factors relevant to your last self-harm episode, if not then select no and please type a description and relevant timeline here.

Yes/No

[Participants viewed images of cure kittens and rabbits here].

Now you have completed CaTS-D, please rate your current mood on the scale below.

😢
1 2 3 4 5 6 7 8 9 10
😀
Continue

Thank You
Thank you for taking part in this study. We hope taking part in this study has not upset you. Previous research shows recalling happy memories and viewing pictures of cute animals can improve mood after taking part in research.

In the pilot study (Chapter 6), the following text appeared:
The purpose of this study was to pilot test Cats-D. Results from this pilot study will guide the development of CaTS-D to ensure it is user-friendly and suitable to capture large data in future studies. Results will also ensure the cards within CaTS-D are

meaningful and appropriate to capture self-harm experiences. Please email katherine.bird@nottingham.ac.uk to receive your £10 Amazon voucher.

In the first full application of CaTS-D (Chapter 7), the following text appeared:

The purpose of this study was to identify key risk and protective factors which lead to self-harm. Identifying which factors result in self-harm and when the occur is important because they may be useful during intervention. The results of this study will also identify whether certain people (i.e., age, gender identity, ethnicity) are affected by specific events, behaviours, or feelings. This is important to provide appropriate support to people at risk of self-harm.

The following information was then included in both studies:

Here is your personal identifier:

UDEHOT55 (example)

Email and quote this number if you wish to withdraw your data or if you have any questions or concerns about this study, please contact **katherine.bird@nottingham.ac.uk**

If you feel distressed as a result of taking part in this study, please contact your trusted person or a support organisation.

Call 999 if you are in immediate crisis.

- Samaritans: 116 123. https://www.samaritans.org/
- Self-Injury Support: 0808 800 8088. www.selfinjurysupport.org.uk
- Allsorts Youth Project: 01273 72110 https://www.allsortsyouth.org.uk/
- Harmless: www.harmless.org.uk
- Suicide Prevention UK: 0800 689 5652. www.spuk.org.uk

If you would like to be informed of future studies, please email katherine.bird@nottingham.ac.uk, you will be added to our email list and be emailed about future self-harm studies. You are under no obligation to do this or take part in future studies. This is simply to make you aware of studies you may wish to take part in at your discretion.