Readability and social favourability in autism and among individuals with high autistic traits

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Abstract

Many studies have examined how well autistic people can read the minds of others, and some results imply low capacity and developmental delay in this arena. Nevertheless, recent studies reveal that social challenges in autism arise as a result of a mutual misunderstanding between autistic and non-autistic people, known as the "Double Empathy Problem" (DEP). For example, non-autistic perceivers found it difficult to read autistic targets, and they rated autistic people as less socially favourable than non-autistic targets regardless of whether they were presented with dynamic stimuli or static images, as suggested by the findings of the DEP theory.

The first aim of the current thesis was to investigate whether or not there is a connection between these two phenomena i.e., having a mind that is difficult for non-autistic others to read and being perceived unfavourably for autistic people. The second aim of the thesis was to investigate the influence of autistic people's physical appearance on social favourability judgments by asking perceivers to rate static images, where behavioural cues are largely removed. Finally, we examined how expressiveness, readability, and perceived readability mediate the association between autistic features and social favourability in an effort to explain the reasons for the relationship between readability and social favourability.

To examine this possibility, target videos were developed during social interactions with the researcher. Across different studies, those target videos were presented for non-autistic perceivers to guess what each target was reacting to (‘retrodictive mindreading') and they were

asked to rate each target on a social favourability scale to determine whether or not they like or dislike that particular target.

The findings across the various chapters of this thesis revealed that autistic targets were less readable and less socially favourable (based on measures from non-autistic perceivers) and there was a robust correlation between these phenomena. Moreover, being less readable and being perceived as less socially favourable was also found in individuals with high autistic traits compared to those with lower autistic traits (measured by AQ). Further investigation suggested that this association may not be a direct relationship; instead, the level of autistic traits that a person has may predict both of these variables. The thesis also found support for the perceived expressiveness of targets mediating the relationship between autistic features and social favourability/ likeability, but not the relationship between autistic traits and readability.

Autistic targets were rated as less social favourable based on static images which appears to suggest that aspects of physical appearance contribute to social favourability judgments. However, the connection between readability and social favourability also occurred when the rating of social favourability was based on static images, suggesting that aspects of targets' behaviour may also be apparent even within static images. The findings of this thesis also shed light on the reasons non-autistic perceivers offer for disliking autistic people as they most commonly claimed that their perceptions were based on the target appearing awkward and lacking empathy.

The findings support DEP in which there is a (mis)perception of autistic people by non-autistic people that creates a barrier to autistic people being accepted in a society that is dominated by non-autistic people. As a consequence, society needs to be changed dramatically to ‘fit’ autistic people by the establishment of policies that are designed to accept and integrate them.

List of papers

1. Alkhaldi, R. S., Sheppard, E., & Mitchell, P. (2019). Is there a link between autistic people being perceived unfavorably and having a mind that is difficult to read? *Journal of Autism and Developmental Disorders*. *Chapter 2 in this thesis was based on this manuscript.*
2. Sheppard, E., Mitchell, P. and Alkhaldi, R. (2020). How are Autistic People Perceived? A Reply to Chown, Hughes and Baker-Rogers (2019). *Journal of Autism and Developmental Disorders*, 50(8), pp.3078-3080. *A letter to Editor sent following the arguments in published paper in chapter 2.*
3. Alkhaldi, Rabi Samil, Sheppard, Elizabeth, Burdett, Emily, Mitchell, Peter (2021). "Do neurotypical people like or dislike autistic people?", *Autism in Adulthood*. *Chapter 4 in this thesis partially was based on this manuscript (Brief report).*
4. *Chapter 5 is based on a manuscript submitted to the JAAD .*

List of trainings

1. Received Autism Diagnostic Observation Schedule (ADOS-2).
2. Received The Autism Diagnostic Interview-Revised (ADI-R).
3. Received Autism Diagnostic Observation Schedule -Toddler Module.

List of conferences

1. Oral presentation in review of the Sasson article published 2017, Psychology School Cognition Seminar, 2017.
2. Oral presentation at the Developmental Psychology Section Annual Conference 2018, *Crowne Plaza, Liverpool City Centre.*
3. Attendance at The British Psychological Society Annual Conference 2018, *East Midlands Conference Centre, Nottingham.*
4. Oral presentation in Cognitive Psychology section and Developmental Psychology joint section 2019, *Best Western; Stoke on Trent Moat House*.
5. Poster presentation at the East Midlands Doctoral Network Annual Conference, Derby University, September 2019.
6. Two oral presentations accepted and presented at the International Congress of Psychology, Prague 2021.

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Declaration

I certify that this thesis, presented for examination for MPhil/PhD degree in School of psychology, is solely my own work.

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Rabi Alkhaldi

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Chapter 1: General introduction

1. The history of autism

Asperger was the first medical doctor to name a group of children as 'autistic psychopaths' in 1938, which was many years before Leo Kanner's well-known published paper in 1943 on autism. According to Czech (2018), Asperger published a comprehensive study in 1944 that was submitted to the University of Vienna in 1942 as his postdoctoral thesis, which later drew wide international acclaim in the 1980s. The description of Asperger's "autistic psychopathy'' in 1938 was the first account in the scientific literature to a previously unmentioned, unacknowledged syndrome. Autism has traditionally been defined as a 'deficit'[1] in social interaction and communication and as well as patterns of rigid and repetitive behaviour (American Psychiatric Association, 2013). Autism is conceptualised as a spectrum including a vast range of ability, from those with associated intellectual disability to those who are highly intelligent and able. Notably, Lorna Wing was the first to use the phrase "autism spectrum".

The prevalence of autism means that it affects just over one in every 100 people (Baird et al., 2006), even though the recording of prevalence has increased over time (Matson & Kozlowski, 2011), and in the UK, the number of people classified as autistic is over 700,000 (National Autistic Society, 2021). Research by Matson and Kozlowski (2011) mentions some

[1] For instance, DSM-5 uses deficit-focused language, stating that autism is characterised by "a persistent deficit in social interaction and communication across context, not accounted for by general developmental delays, including deficit in social-emotional reciprocity, non-verbal communicative behaviour used in social interaction and deficit in developing and maintaining relationships".

of the ways in which the increasing diagnosis of autism worldwide can be explained by certain factors, such as greater awareness of autism, the development of diagnostic criteria and the ability to diagnose it far earlier (i.e., the early years of age). Notably, autism is diagnosed more often in boys than in girls, with a reported ratio of approximately 5:1 (Taylor et al., 2013), which could partly reflect the ability of girls to camouflage their social difficulties (Dean et al., 2017; Rynkiewicz et al., 2016). Most research has been conducted on children and young people, while less research has been carried out on adults and older people. (Barnhill, 2007; Pellicano et al., 2014).

Autism has been included as a diagnosable disorder since 1980 in the Diagnostic and Statistical Manual for Mental Disorders (Third Edition). This edition has been followed by a couple of versions of DSM which have attempted to change the diagnostic criteria and to update the assessment manual. The latest version of the DSM (the Fifth Edition) features many changes. In this version, there is no delineation of Asperger's disorder and pervasive developmental disorder; rather, both are placed under the umbrella term 'autism spectrum disorder' (APA, 2013).

The rationale behind this single umbrella and classification is that, although the ability of clinicians to distinguish between autistic and non-autistic children is acceptable, they find it more difficult to distinguish between autistic disorder, Asperger's disorder and pervasive developmental disorder not otherwise specified. Furthermore, it has become apparent that differences between the three conditions have lacked a degree of consistency and are associated

with factors such as language, level of intelligence and the degree of autism (severity), as opposed to the distinct features that relate to each condition. In a further indication of the similarities between the conditions, studies have also indicated that the features of what is sometimes referred to as “high-functioning autism” and Asperger’s disorder are fundamentally comparable (Ozonoff et al., 2000).

Both Asperger and Kanner were medical professionals who believed that autism is a deficit relating to social and communication skills that can be treated and cured by using medical or therapeutic intervention (Mitchell et al., 2021). Czech (2018) argued that Asperger was situated in a historical context when eugenic imperatives (favouring racial eugenics) encouraged the characterization of certain 'defects' in order to isolate individuals affected by those defects from wider society. The adoption of the medical model of autism resulted in many cognitive theories that addressed this problem of socialisation and communication (Rajendran & Mitchell, 2007). For example, according to some research, social and communication differences are linked to cognitive difficulties that can be explained by impaired theory of mind (i.e., autistic people are less likely able to infer the mental state of others; Baron-Cohen et al., 1985).

Hobson (1990) offered a critique of this account: He claims that the theory of mind hypothesis is a‘*non-developmental nonsocial, and restrictively cognitive account . . . an alternative thesis is proposed: A young child’s knowledge about people is grounded in the experience of . . .interpersonal relations* (P114). The social-developmental account of autism, in contrast to the medical model, claims that our development is impacted by the kind of

responses and reactions we encounter on a daily basis. This is a transactional view of development (Mitchell, 2017) in which your actions influence how others perceive you, which influences how they act toward you, which influences how you act, which influences how others perceive you, and so on. Perspectives focusing on autistic deficits have ignored the fact that autistic people live in a society controlled by non-autistic people who are potentially responsible for erecting barriers to inclusion of autistic people[2].

This view shares characteristics with Karmiloff-Smith's neuroconstructivist approach to development (1998), which argue that brain specialisation is not innate, but rather develops as a child interacts with his or her environment. Karmiloff-Smith suggests that interactions between gene, brain, behaviour, and the environment feature in the development of modules (those regions of the brain that are specialised for particular types of processing/tasks) relatively late in development. Developmental conditions are therefore disruptions or changes in the process of typical development, and to have an adequate understanding of these conditions, one needs to consider these processes over time rather than relying on simple "snapshots" of the condition at a particular developmental stage.

According to López (2015), the inability to create a full understanding of autism can be explained in part by a continuous lack of knowledge about how autism develops through time and the significance of socio-cultural elements in this development. López (2015) suggests two major causes for this exclusion. First, the fact that autism has a significant genetic component

[2] 'Autistic people' term used throughout the thesis rather than 'people with autism' because this terminology is preferred by the majority autistic people (Kenny et al., 2016).

has led to a tendency to think of autism as a static disorder with “symptoms” that do not change over time. Second, the dominance of the cognitivist approach to psychology has hindered our understanding of how adverse social may influence the onset of autistic features. In short, the social context in which a person develops is given little weight in studies of autism.

The majority of autism research appears to support the notion that autistic people have difficulty attributing mental states to others, as signalled by facial expressions (Baron-Cohen et al., 1997), voice tone, bodily movements (Rutherford & Baron-Cohen, 2002), sarcasm (Persicke et al., 2013), and social imitations (Baron-Cohen et al., 1999). However, recent research has highlighted how non-autistic people also experience similar difficulties when communicating with autistic people. For example, they have difficulty identifying autistic mental states (Edey et al., 2016), interpreting autistic people’s behaviour (Sheppard et al., 2016), exaggerate autistic egocentricity (Heasman & Gillespie, 2018), and are less likely to desire to engage socially with autistic people (Sasson et al., 2017). While non-autistic people are often considered to be socially adept, these skills may not be practical or successful when engaging with autistic people. There is therefore a bi-directional disconnection affecting communication and understanding between autistic and non-autistic people and is called the "double empathy problem"(DEP) (Milton, 2012).

Understanding autism through "bidirectional interaction" rather than "unidirectional interaction" has resulted in recent studies that consider how autistic and non-autistic people perceive and understand one another. In the following sections, we will first review studies of

theory of mind which have taken the unidirectional approach, then introduce more recent research that has taken a bidirectional approach to test predictions of the DEP.

1.1 Theory of mind 'unidirectional' approach'

The medical model which assumes autism is located within the individual and is the individual's responsibility has naturally led researchers to develop cognitive theories attempting to account for the observed "deficits". A prominent cognitive theory has been put forward in relation to the proposed deficits that autistic people have with social interaction and communication, suggesting that autistic people are less able than non-autistic people to attribute mental states to themselves and others, a capacity sometimes referred to as 'theory of mind' (Carruthers, 2009; Froese et al., 2013; Tager-Flusberg, 2007). In this section of the thesis we will first outline differing approaches to theory of mind before discussing findings in relation to theory of mind within the autistic population.

1.1.1 Theory-theory vs simulation theory

Theory-theory and simulation theory are two established approaches to social cognition (or what is sometimes referred to as "theory of mind"). The basic means of understanding people in Theory-theory and simulation theory is 'mindreading' or mentalizing' — techniques that rely on either theoretical inference from folk psychology (Theory-theory) or (simulation).

1.1.1.1 Theory-theory

Theory-theory claims that children's understanding of the mind develops from natural 'naive' abilities that serve as the foundation for the theories of mind that the child develops (Meltzoff, 1999). Theory-theory constitutes a set of concepts (e.g. beliefs, desires etc.) and

rules that govern how these concepts interact (Apperly, 2008). Although there is debate as to the exact form of these concepts and principles (e.g. whether they are explicitly available to the individual), Theory-theory accounts share the idea that the concepts and principles are a causal theory of how mental states can be used to predict/explain behaviour (Apperly, 2008). Theory-theory states that as a child learns and encounters new things (such as from the environment and other people), he or she continues to build on and alter previous theories (Gopnik & Wellman, 1992). As a consequence, Theory-theory is also known as the 'child scientist' theory because the structure in which theories are formed appears to be scientific in nature: information is gathered, hypotheses are formed and tested, and the theory is then revised if the hypotheses are not supported, ranging from simple to more complex theories.

Many proponents of Theory-theory assume children initially have a conceptual vacuum which prevents them understanding the existence of mind or belief, but that they experience a "radical conceptual shift" around their fourth birthday which equips them with a "theory" of mind. False-belief tasks are used as the regular theory of mind test. In order to gauge a child's understanding that other people can have beliefs about the world that are false, a false-belief task is frequently used in child development research. The false-belief task enables researchers to clearly distinguish between a child's actual belief and awareness of another child's belief that is different from their own (false belief) (Premack& Woodruff,1978). However, the 'conceptual shift' paradigm was extensively challenged in the 1990s when new ways of examining false belief understanding in younger infants revealed that even 15-month-olds were able to pass nonverbal false belief tasks (Onishi & Baillargeon, 2005). This offers a picture of mental state

reasoning that precedes theory-theory. Although Theory-theory often characterises the development of theory of mind as stage-like, the social environment is still acknowledged to play a large part in theory of mind development, as a child who grows up in an enriched and diversified social environment learns skills faster than a child who grows up in a less enriched environment (Gopnik & Wellman, 1994). Hughes and Leekam (2004) emphasised that there could be cultural disparities in children's knowledge of mental states due to the strong influence of environment on theory of mind process.

1.1.1.2 Simulation theory

Simulation theory's primary concept is that theory of mind skill develops when a person can replicate what he or she believes another person's thoughts, feelings, or behaviours could be. According to Perner and Howes (1992), the concept of simulation can be traced to Piaget's perspective-taking theory. “What would I do if I were in that person’s situation?” Gordon (1986) claimed that by answering this question, people can predict the behaviour of others. He claims that simulation necessitates a 'transformation' rather than just a 'transfer,' indicating that when person A simulates person B, person A 'transforms' into person B. Individuals simulate another person by seeking to establish similar mental states in order to portray the other person's mental state (Goldman ,1989). The individual then employs these new representations to produce extra mental states, some of which are attributed to the other person. In essence, Goldman's theory proposes that people impute mental states to others by acting as if they were in their shoes. simulation theory argues that one's ability to 'simulate' others is influenced by one's own social experiences (e.g. Harris, 1992). Despite the fact that there are several versions

of simulation theory, everyone agrees that it is a useful heuristic with predictive and explanatory capabilities.

1.1.1.3 Interaction theory (Second person perspective)

Some studies used static images to make theory of mind inferences (e.g Baron- Cohen et al., 2001), while others used textual stories (Happé et al., 1998) or video vignettes (Turkstra, 2008), all of which provided an observation-based, reflective of a "third-person" understanding of theory of mind (Frith and Frith, 2006; Schilbach et al., 2012). According to Schilbach et al. (2012), social cognition, such as theory of mind, has different motivational impacts and underlying neurological mechanisms when people are socially and emotionally involved with others as opposed to when they are acting as third-person observers. Individuals who communicate with others are able to take active conversational roles, such as starting or reacting to episodes of interaction, rather than simply observing the interaction as a bystander. This full engagement also allows shared aims, intents, and behaviours among the interaction's participants, allowing individuals to make theory of mind inferences based on direct experience.

Theory-theory and simulation theory, the two most popular accounts, have both been criticised for taking a spectatorial approach. This means that these accounts are concerned primarily with instances in which another person is mentioned in the third person form, while neglecting — and failing to adequately represent — situations in which another person is addressed directly in the second person form (Dullstein, 2012). However, authors like Gallagher (2001, 2004, 2005, 2008) and Reddy (2008) did not stop there; they utilized the critique as a platform to propose alternative solutions to simulation theory and Theory-theory.

Unlike Reddy, who labels her concept a second-person perspective, Gallagher's ideas, which he developed over years, became known as interaction theory. Both accounts have the following features in common: They are first and primarily given as alternatives to Theory-theory and simulation theory (e.g. Gallagher 2001, Reddy 2008). Second, by using the second person as a starting point, both explanations are claimed to avoid the so-called first and third person perspectives to other minds (such as how simulation theory attempts to understand others by starting with the individual's mental experiences, or how Theory-theory draws on the beliefs of folk psychology). Hence, the second-person perspective allows a unique type of access to some facts, specifically the mental states of other people (Pauen, 2012), but it often ignores the third-person perspective (Dullstein, 2012).

1.1.2. Theory of mind in autism

Research on theory of mind in autistic populations has, like most theory of mind research, tended to take a third person stance, with studies attempting to investigate whether autistic people are poor at inferring mental states of others from passively observed behaviour. Early research in this area involved comparing the performance of autistic and non-autistic people on tests of false belief. The ability of autistic individuals to understand false belief was investigated by Baron-Cohen et al. (1985) using the Sally-Anne task. In this task, children were told a story about a doll called Sally who places a marble in a basket, then leaves the room. Then, another character, Anne, moved the marble into her box, resulting in Sally holding a false belief about the location of the marble when she returns to the room to look for it. Children in this task were asked “where Sally thinks the Marble is located” or to guess “where Sally will

first look for the marble (i.e., belief question)". The children were also asked two control questions in order to ensure they had understood the task: "where the marble was originally placed (i.e., memory question)" and "where the marble's current location is (i.e., reality question).

In this task, the children would be deemed successful when they understand that Sally has a false belief regarding the marble's location and must point into her basket as that location. The findings from this research revealed that, despite passing the control questions, about 80% of autistic children failed in this task as they were not able to take into account Sally's false belief in predicting where she would initially look for her marble when she returns to the room, while the other group (i.e., with Down Syndrome or children of typical development) were successfully able to do so.

It is worth noting that in this research, although the mental age of those autistic children was higher (over the age of four years) compared to those children with Down's Syndrome and typically developing children, the autistic children failed to pass this task. Hence, those children with Down's Syndrome were able to appreciate the protagonist's false belief, and so the findings of this research have been argued to suggest that autistic children have a specific deficit in using mental states of others to predict their behaviour.

Some concerns were raised based on the validity of Sally and Anne task, as it is not representative of a real social situation (i.e., it is a doll and not human). Moreover, although the ability of autistic children in being able to appreciate the protagonist's false belief was

diminished in the assessment of the Sally-Anne test, other research has found that older children with Asperger syndrome had no such difficulty even exhibiting second order theory of mind skills i.e. "Peter thinks that Jane thinks that..." (Bowler, 1992). Second-order theory of mind tests were created to test one's ability to attribute a belief about the belief of another person (Baron-Cohen, 2000; Perner & Wimmer, 1985). It enables children to understand that someone else understands something about someone or something else (Baron-Cohen et al.,1985). The fact that some autistic children pass such tests appears potentially problematic in relation to claims that theory of mind deficit is core in autism.

Researchers have since responded to these criticisms by developing new, more advanced theory of mind tasks, which they argued are more challenging for older autistic individuals and more representative of the complexities of real-world social interaction (Baron-Cohen, 1989). For instance, they developed a new task called ‘Strange Stories task’ which is more powerful to discriminate between autistic and non-autistic ability. This task increased the complexity of the task by integrating more contextual information of the perspective-taking presentation of the stimuli (Baron-Cohen, 1989). Happé (1994) designed the Strange Stories task’ in which participants watched a sequence of stories about real-life scenarios in which people say things they do not even mean. This task featured 12 scenario types in all, including: lie, white lie, joke, pretend, misunderstanding, convince, appearance/reality, figure of speech, sarcasm; and six control stories that did not entail reading mental states but did involve unforeseeable mechanical events. The participants then responded to the question, "Why was X said?"

Responses are then coded according to whether participants give a mentalistic or physical explanation for their statement. The results revealed that, while all participants performed well on the control stories, autistic people had difficulty justifying why X was said? (They were inaccurate in their recognition of the appropriate mental states).

However, the Strange Stories task is limited to inferring mental states only on a character's appearance or without looking at facial expressions, and it does not fully capture other aspects of a real-life situation. Nonetheless, misconceptions occur in real-life social interactions because people make assumptions about one another and about the knowledge they share. For example, a study has demonstrated that identity can contribute to biases in the perception of self and others (Jones & Nisbett, 1972), and can serve as a significant constraint in the generation of knowledge between people (Gillespie & Cornish, 2010).

More fundamentally, both the Sally and Anne tests, as well as the Strange Stories task are limited since they are based on a one-way assumption that focuses solely on autistic people's difficulties in social interaction and communication, rather than considering the two-way context in which social behaviour occurs. This is limiting and unfair because prior research has shown that even non-autistic people are inaccurate in their assessments of others (Epley, 2014), and struggle to understand how others perceive them (Ickes, 1993; Kenny & Depaulo, 1993). As a consequence, it is not actually a problem affecting autistic people, but it could also affect non-autistic people. Dawson and Mottron (2011) argue that autistic people, like non-autistic people, face challenges on a daily basis and require assistance and support to cope. When

autistic people demonstrate substantial or dramatic strengths, however, they are seen as pathological, resulting in a seemingly insurmountable disadvantage or limitation that non-autistic people do not face.

In conclusion, autism is generally characterised as a difficulty communicating and interacting with others (American Psychiatric Association, 2013). Some tasks, like Sally and Anne, which rely on a third-person perspective while not accurately reflecting real social interaction, were used to test this difficulty. The research establishment has also relied on a medical model that holds that if researchers can classify the limitations of autism, they will be able to find a way to reduce or even cure the condition (Mitchell et al., 2021). As a consequence, the majority of prior research ignored the fact that autistic people live in a society where non-autistic people predominate.

1.2 Double Empathy Problem (DEP) (bidirectional approach)

What is the 'bidirectional approach'? This concept was proposed by Milton, an autistic academic doctor, who stated that the problems with social interaction between autistic and non-autistic people could be caused by a mutual misunderstanding that is not solely attributable to autistic people. The Double Empathy Problem (DEP) describes a "*disjuncture in reciprocity between two differently disposed social actors*" (Milton, 2012, p. 884). In other words, because autistic and non-autistic people experience the world and process information in fundamentally different ways, there may be a mutual misunderstanding (Milton et al., 2018). Autistic and non-autistic people, for example, perceive sensory information in different ways (Marco et al.,

2011). They also process language and social cues differently (Brock et al., 2008; Philip et al., 2010). Hence, DEP assumes that mixing autistic and non-autistic people in social contexts will result in difficult interactions since each group communicates in a different way (Crompton et al., 2020a), and has different kinds of social norms and expectations (Heasman & Gillespie, 2019). It has been suggested that autistic people may have an easier time interacting with other autistic people (Crompton et al., 2020a), although Chown (2014) has emphasised that the DEP does not necessarily imply this.

Milton (2012) suggested that the disjuncture may even be more severe for a non-autistic disposition as it is experienced as unusual, while for autistic people it is a common experience. Milton et al. (2018) further claims that because non-autistic people represent the majority of society, their communication or emphasis is perceived as "typical" and "correct", while autistic people's communication or emphasis is considered as "atypical" and "incorrect". The DEP appears to have something in common with interactionist accounts of theory of mind in that theory of mind is placed within an interaction between two individuals rather than conceived of purely from the perspective of a passive observer. This new way of thinking about autism has spawned a variety of studies including methodologies examining autistic people's expression, first impressions, and interactional activities between autistic and non-autistic people.

1.2.1 The investigation of the double empathy problem

There are currently two main strands of empirical research focusing on the DEP: studies examining the readability of facial expressions/behaviour of autistic and non-autistic people;

and studies that have examined feelings of likeability/rapport between autistic and non-autistic people. Within each of these fields, some researchers have focused on one prediction, such as the notion that non-autistic perceivers will have difficulty reading or interpreting the behaviour of autistic people in comparison with other non-autistic people (e.g. Sheppard et al., 2016). Other researchers have assessed more than one prediction, typically by having autistic and non-autistic targets viewed and rated by both '*autistic and non-autistic perceivers'* (Edey et al., 2016).

1.2.1.1 Studies examining readability of autistic and non-autistic targets

The ability to identify emotions and connect with others may be influenced by one's ability to read, interpret, and anticipate the acts of others (Halberstadt, et al., 2001; Behrends et al., 2012). According to Keating et al. (2021), autistic people move differently than non-autistic people, implying that autistic people behave differently, which might influence social interactions because both sides have distinct characteristics (Edey et al., 2016). According to previous research in real-life encounters, autistic people make facial expressions less frequently and for a shorter period of time, (Czapinski & Bryson, 2003; Loveland et al., 1994; Kasari et al., 1990; Trevisan et al., 2018).

A small number of previous studies have examined the accuracy with which other people (perceivers) can read the facial expressions of autistic people. Macdonald et al. (1989) used posed emotion displays and found that perceivers had a harder time interpreting the emotion displayed by autistic targets than non-autistic targets. Volker et al. (2009) had autistic and non-

autistic children act out various emotions, which were then shown to raters who were asked to identify the expressions. In comparison to non-autistic children, raters found it harder to interpret the emotions shown by autistic children. More recently, Brewer et al. (2016) investigated autistic and non-autistic perceivers' abilities to read emotions produced by autistic and non-autistic targes while they posed basic emotions. The findings showed that autistic people's expression was more difficult to read, independent of the perceivers' diagnostic status.

In contrast, Faso et al. (2015) conducted a study in which emotions of participants were elicited and evoked naturally when they were asked to read narratives of life events. The expressions of autistic people were rated as more intense and less natural than the expressions elicited from non-autistic targets but were identified with greater accuracy. Faso et al. (2015) suggest that autistic people have different facial expressions which differ from those expressions typically produced by non-autistic people. The discrepancy between this and the previously reviewed studies might be due to the fact that Faso et al. used naturally induced emotional displays in addition to posed expressions. These findings show that unique spontaneous productions, rather than a lack of physical capacity to make appropriate facial expressions, may account for disparities in facial expression production.

Research also varies in whether or not autistic people were found to be less expressive than non-autistic individuals. For instance, Beadle-Brown and Whiten (2004) found that autistic children could convey facial expressions in the same way as non-autistic children could. Some research on automatic mimicking also suggests that autistic people can be equally as expressive as non-autistic people. For example, Press et al. (2010) showed autistic and non-

autistic people animated facial expressions, and the results revealed that both groups immediately imitated the emotion in the same circumstances. Grossman et al. (2013) discovered that when autistic people were videotaped presenting stories, non-autistic perceivers assessed them as similarly expressive as non-autistic targets.

In contrast, Stagg et al. (2014) included a task in which autistic and non-autistic children related events from their life. After that, non-autistic people were shown a muted video and asked to rate it on an expressiveness scale. Autistic children were rated as less expressive than non-autistic children. In terms of expressiveness, a meta-analysis by Trevisan et al. (2018) found that autistic people produce facial expressions with the same intensity as non-autistic people. The discrepancy of the findings relating to the expressiveness of autistic people might be based on differences in methodology used in previous research to elicit the expressions of people. In fact, recent research suggests that the natural reactions of autistic targets can be more expressive in comparison with other participants in some circumstances (Faso et al., 2015). Differences in the form of expressiveness might be one of the most important factors that lead non-autistic perceivers to judge autistic people as socially awkward or odd (Edey et al., 2016; Grossman, 2013; Sheppard et al., 2016). This means that autistic people have a different way of expression (because they communicate differently) compared to non-autistic people, which does not mean they are 'not' able to express themselves.

Autistic people might also manage their expressions to hide their autism, something related to 'camouflaging behaviour'. These differences in facial expressions in autistic people do not

necessarily hinder perceiver accuracy, but they may have an impact on interaction quality. According to a review by Keating et al. (2021), autistic people's expression is difficult to interpret by non-autistic people, and non-autistic people's expression is difficult to read by autistic people. Both individuals express themselves differently, but non-autistic perceivers may find autistic expression to be of lower quality.

While the majority of research on readability of autistic people has focused on people's ability to identify emotions from facial expressions of autistic people, two studies have examined whether people are able to read other aspects of the behaviour of autistic people. Edey et al. (2016) asked targets (autistic and non-autistic) to generate geometric shapes in order to make interactions (between the geometric shapes) that represented some mental states such as coaxing, mocking, seducing and surprising. Only the movements of those shapes were recorded (without showing the targets' faces). The video recordings were then shown to perceivers (autistic and non-autistic), who were asked to deduce which emotions were being portrayed. The findings show that non-autistic perceivers were better able to infer the mental states depicted by non-autistic targets than those depicted by autistic targets. The findings also revealed that autistic perceivers had the same difficulty inferring emotions exhibited by autistic targets as non-autistic perceivers, implying that being autistic confers no benefit to an autistic perceiver in understanding the behaviour of an autistic target. The authors conclude that the inner states of autistic people are likely to be more difficult to interpret compared to those of non-autistic people.

Sheppard et al. (2016) developed stimuli based on social interaction when targets (autistic and non-autistic) were presented with one of four scenarios (compliment, joke, story or waiting scenario). Unknowingly, targets were filmed while they reacted to the researcher. Participants were informed that they would be filmed while making particular facial expressions that would be utilised as video stimuli in a later study. Each participant then experienced one of four scenarios, which was enacted by the researcher. The scenarios were created to elicit a variety of responses from the participants. They wanted to generate experiences that would elicit a reaction but would not cause the participant's mood to be significantly disrupted. Scenarios had to be plausible within the setting of an experiment, as it was critical that participants did not guess that the researcher was acting. In the first scenario, as the participant prepared to begin the experiment, the researcher told the participant a short joke. In the second scenario, the researcher kept the participant waiting for 5–8 minutes while doing other irrelevant tasks (e.g., making a phone call, texting on her phone, drinking water). In the third scenario, the researcher told a story about a series of mishaps she had earlier in the day, including missing the bus to university, leaving her phone at home, being caught in the rain without an umbrella, and a flashdrive containing critical work data malfunctioning. In the fourth scenario, the researcher paid the participant some compliments. Later, targets' videos were shown to 'non-autistic perceivers' who were asked to infer which scenario each target had been presented with. The findings showed that non-autistic perceivers were less accurate when reading autistic targets compared to non-autistic targets. It appears that non-autistic perceivers find autistic behaviour more difficult to read compared to non-autistic people.

1.2.1.2 Studies of social favourability and rapport between autistic and non-autistic individuals

Another line of research on the DEP has asked whether autistic targets are perceived unfavourably by non-autistic perceivers. Sasson et al. (2017) developed video clips of autistic and non-autistic targets, who were recorded in a short (60-second) mock audition, in which they were asked to present themselves in a way such that they would be chosen in TV shows. Twenty were autistic and twenty were non-autistic targets. All videos were later presented to non-autistic perceivers who watched the videos and rated (from 0-3) the targets on ten dimensions of social favourability. In doing so, non-autistic perceivers were not informed that some targets were autistic. The findings of the research show that non-autistic perceivers gave ratings that discriminated between autistic and non-autistic targets, such that autistic targets were perceived less favourably. Furthermore, autistic targets were not only perceived negatively on dynamic stimuli, but also when they were shown in static photos (Sasson et al., 2017), suggesting that autistic people's first impression may be influenced by their physical appearance (as behavioural cues would be mostly absent in the static photos).

One might wonder as to how representative this limited perspective is, being that it is extracted from an activity in which autistic people might naturally lack expertise, and in which, as a consequence, they might not be particularly capable. If the activity had been something different such as talking about computers, potentially an arena in which some autistic people are much more confident and comfortable, perceptions may have been less negative. Consequently, perhaps the autistic targets were judged less favourable, not because of their autism, but because they were engaged in an activity in which they appeared neither very

capable nor confident. But it was observed that there was no difference between groups in judgments of favourability when perceivers only had access to a transcript of the content of what autistic people said. This suggests that autistic people were no more uncomfortable as far as the content of dialogue is concerned, and it was aspects of their appearance or manner that were differentiated.

Some research on the DEP has focused on how autistic people interact with other autistic people (Crompton et al., 2020a, 2020b; Heasman & Gillespie, 2019), as well as how they socially perceive other autistic people (DeBrabander et al., 2019; Morrison et al., 2019b). Heasman and Gillespie (2019) recruited thirty members of a charity that supports autistic individuals, who were videotaped while participating in a social activity they loved, notably collaborative video gaming. Within each interaction, mapping the coherence, affect, and symmetry of each conversational turn showed evolving patterns of intersubjectivity. The focus on clusters of consistent and fragmented turns made it possible to identify two distinctive features of neurodivergent intersubjectivity: a generous assumption of common ground that, when understood, led to rapid rapport, but might lead to potentially disruptive effects if not understood. The findings showed a unique aspect of interaction between autistic people, which suggests that, although autistic peers have a different kind of communication style, it does not impede ability to communicate or achieve a common goal. The findings support previous studies on autistic peers' abilities to be motivated and manage interactions with one another (Brownlow et al., 2015; Ryan and Räisänen, 2008).

Crompton et al. (2020a) investigated whether transfer of information between autistic and non-autistic people occurs as well as in same-neurotype dyads. Participants were assigned one of three diffusion chains: autistic to autistic, non-autistic to non-autistic, and mixed participants (autistic and non-autistic); each chain had eight participants. Initially, participants were told a story and were then asked to share the story with the second participant and so on. The findings show that autistic people successfully shared the information with other autistic people; likewise, non-autistic people were able to do the same with other non-autistic people. However, when there was a mixed group, autistic and non-autistic, much less information was successfully shared. Hence, the finding suggests that autistic people might have a unique style of communication that differed compared to non-autistic people, which might be a factor in the failure of the interaction when it occurred between autistic and non-autistic people. Within mixed groups, this was accompanied by a considerable decrease in rapport, as rated by the interaction of participants. Traditional ideas about autistic social deficits are challenged by these findings, instead suggesting that autistic social 'deficits' are best understood as interaction and communicative difficulties that affect autistic and non-autistic persons in both directions, in line with the DEP (Fletcher-Watson & Bird, 2020; Milton, 2012).

Morrison et al. (2019b) also investigated social perceptions of autistic and non-autistic people of their autistic partners than non-autistic partners in real-life interactions. Participants were randomly assigned to one of three dyadic partnerships (autistic-autistic, autistic-non-autistic, and non-autistic-non-autistic), in which they had a 5-minute unstructured conversation

(get to know each other) with an unfamiliar person to assess the quality of social interaction and their impression of their partner. After completing the interaction task, they were asked to rate their partners' characteristics, as well as the quality of the interaction, in terms of whether or not they would like to interact with them again in the future. They were also asked to rate how close they felt to their partner.

The finding of the research showed that autistic people were evaluated less favourably on some traits (more awkward, less attractive, less socially warm) by both autistic and non-autistic partners, even though only non-autistic adults expressed greater interest in future interactions with other non-autistic peers relative to autistic partners. However, autistic people reported feeling closer to their partners than did non-autistic adults, and they were more open to disclose their diagnosis to autistic partners relative to non-autistic participants. Further to that, the findings derived from video stimuli (Sasson et al., 2017) were largely replicated in this 'real-life' study, demonstrating that video stimuli can effectively be used to address social perception in real life (Risko et al., 2012).

Collectively, in some certain studies, non-autistic people have a lack of empathy and understanding of autistic people, much like autistic people have been shown to find it difficult to empathise with non-autistic people. This is despite the fact that autistic people share the same judgments as non-autistic people, i.e. their less favourable perception of another autistic individual. As a result, it seems there is a bidirectional lack of empathy, in line with the double empathy problem (Milton, 2012). This misperception may have an impact on how autistic

people are accepted into a society and perhaps explains why they are dominated by non-autistic people.

1.2.2 Methodological issues around readability

Recent research in DEP has developed quickly and has tried to answer the question '*How accurately are autistic people read by non-autistic people?'* This is an important question, but one that is difficult to answer. It is particularly difficult to evaluate *how accurately* people infer the inner states of anyone, including autistic people. One key issue in research examining the accuracy of mental state recognition is whether people's facial expressions do reliably signal their inner states, although this assumption is often made by researchers in this field. Reisenzein et al. (2013) examined evidence from laboratory research on the consistency of emotion and facial expression in adults. This review identified a high level of consistency between amusement and smiling, as well as a low to moderate level of coherence between other positive emotions and smiling. Surprise and disgust, according to the evidence, are accompanied by "traditional" facial expressions in only a small percentage of occurrences. There is a lack of evidence in the areas of sadness, anger, and fear. Moreover, the review highlights one piece of research suggesting that strong emotion–expression consistency may exist in particular contexts for sadness, but evidence supports weak consistency for anger and fear. The authors concluded that low emotion intensity and facial expression inhibition appear to be insufficient to explain the observed dissociations between emotion and facial expression.

Furthermore, Durán et al. (2017) conducted a meta-analysis to investigate the notion that basic emotion facial configurations occur with instances of particular emotion categories, as

expected. Thirty-seven papers were published that examined how people move their faces when they are exposed to objects or events that elicit emotion. The majority of the research included in the meta-analysis was carried out in a laboratory setting. The results of these experiments were statistically analysed in order to determine the reliability of facial movements as emotional expressions. Except for fear, participants moved their facial muscles in the appropriate configuration more reliably than we would expect by chance in all emotion categories evaluated. However, reliability levels were low, implying that the proposed face configurations are not very consistent.

Durán and Fernández-Dols (2021) conducted three meta-analyses, the first of which looked only at studies that used the Facial Actions Coding System to measure entire expressions (FACS). The findings of this analysis showed that the average size of the co-occurrence effect of the particular emotional state and the associated facial expression was .13. The second meta-analysis included full and partial expressions, as measured by FACS or another technique. The findings showed that the average size of the co-occurrence effect of the facial expression and predicted emotions increased to .23. A third meta-analysis, focused on the correlation between the intensity of the reported emotion and the intensity of the predicted facial expression. The findings of this analysis showed that the average correlation coefficient was .30. The findings overall were that disgust had the highest co-occurrence and correlation, while surprise had the lowest. The research suggests that the six basic emotions, as they are popularly called, do not always coincide with their predicted facial expression.

Barrett et al. (2019) argue that there is no clear evidence to suggest that facial expressions convey emotional states after reviewing many studies on facial expression productions. This review focused on the studies that used basic emotions (anger, disgust, fear, happiness, sadness, and surprise) even though there are more than six emotions indicated in recent research (Keltner et al., 2019). Barrett et al. (2019) addressed the production and perception of facial expressions, and proposed four criteria that must be met for facial expression to be a useful signal of emotional states: (1) reliability (e.g. a person who is angry is expected to show a frown face), (2) specificity (e.g. a frown face is less likely to be expressed when a person is not angry), (3) generalizability (e.g. patterns of reliability and specificity must occur across different studies and for different populations), and (4) validity (e.g. even when facial expression is consistently associated with emotion, it must be demonstrated that the person depicted really experienced the emotional state).

The authors examined these criteria in different studies involving facial expression production such as the movement of people's faces during emotional episodes, and emotion perception (the ability to recognise or decode emotions from facial movements) and in different populations, such as babies and children, and remote communities. The findings of Barrett et al. (2019) suggest that the while emotional states are associated with facial expressions at above chance levels, the correspondence between emotional state and expressions is still low, and there is a lack of evidence supporting the four criteria that need to be met. They argue that facial expressions are more variable and context-specific than the popular view holds. Barrett

and colleagues suggest that future research should focus on how individuals move their faces while expressing emotions and other social information in real-life situations that vary in their psychological, social and physical features - rather than employing posed emotions, or contexts contrived to elicit specific emotional states.

Moving on, a second issue is that even if inner states are reliably reflected in facial expressions, against what standard should we assess such inferences to determine if they are correct? Perhaps we could just ask the individual (the target) about their inner state and then measure if another person's (the perceiver's) inference matches it (Ickes, 2003). The problem is that we would be implicitly assuming that the target knows their own inner state through introspection, and hence that introspection is a reliable source of information, but there are no grounds for this assumption (Wu et al, 2019).

West and Kenny (2011) cite the empathic accuracy approach championed by Ickes as an example of good practice in measuring the accuracy of perceivers in a dyadic reaction. Briefly, in the Ickes et al. (1990) study, the authors' video recorded targets while they are talking about an event, topic or problem. Following that, targets were asked to watch their own video, stopping the tape at those points where they could remember a specific thought or feeling. The researcher then asked the targets to write those thoughts or feelings that had occurred at that specific point in the videotape. In order to assess empathic accuracy, perceivers were asked to view a series of those targets' videos and each video was paused at a specific point which could be identified by a target person on the videotape as that time when they reported a specific

thought or feeling. The perceiver was then asked to write down what they thought the target was thinking or feeling at this moment.

However, as explained above the issue with this method is the reliability of the declaration made by the targets on the content of their inner state. Wu et al. (2019) suggest a few points that would need to be satisfied in order for the Empathic Accuracy task to meet the truth condition:

"If it were the case that (1) the target's mind is transparent in itself - in other words, the target can know what is in their own mind through a process of introspection; (2) the target is sufficiently articulate to be able to translate their inner states into a verbal description and/or adequate vocabulary exists to describe the exact state(s) in question; (3) the target elects to be honest in reporting their inner state"(p.4).

The authors mentioned above have argued that it is difficult to be sure of any of the three abovementioned principles. The authors go on to provide the example that those who have alexithymia often find it difficult to explain their feelings verbally (Grynberg et al., 2012). Hence, there are no reasons to suppose that the truth condition is satisfied when one compares the judgment of the perceiver against the declaration of targets of their mental states (Wu et al., 2019).

The retrodictive inference paradigm addresses a number of these concerns. In order to obtain a range of subtle, dynamic, and natural expressions, participants' (targets') expressions are secretly recorded while they respond to a circumstance or external event. A second group

of participants (perceivers) are then shown their expressions and asked to determine what event or situation the targets were reacting to. Notably, these situations are not designed to elicit specific emotions, but rather to induce some kind of expressive behaviour in the targets, thus rendering the question of whether facial expressions reliably signal inner states less relevant. Moreover, it is not necessary that all targets react in the same way to the same event, because expressions might differ from one target to another, either because they experience differing inner states in the same situation or perhaps even when they are experiencing the same inner state (Mitchell et al., 2021). Thus, people (i.e. the target) react in different ways to specific events which might be moderated by who they are, as well as other factors linked to their feelings, motivations, intentions, attitudes, beliefs, knowledge and personality traits (Flavell et al., 1993). Consequently, a good perceiver who is able to infer accurately is the one who is sensitive to the range of target reactions, which are often subtle, and provoked by an individual event (Wu et al., 2019).

The retrodictive paradigm also satisfies the truth condition as it enables one to determine whether or not the external event has actually occurred, although, at times, this may entail sacrificing asking perceivers an explicit and direct question regarding the target's internal state. In some retrodictive mindreading tasks, the perceivers are invited to infer the signals in the targets' behaviours in order to infer something about what kind of gift the target received (Cassidy et al., 2014, 2015). In other studies, perceivers were asked to infer what each target was viewing (e.g. are they looking at negative or positive images? — Kang et al., 2018; Teoh

et al., 2017), or they were asked whether targets were observed (accompanied) by another person or sitting alone in the testing room (Teoh et al., 2017). The findings of these studies each showed that non-autistic perceivers were systematically accurate in their judgments. It was argued that they were able to read the targets' minds by interpreting signals in their behaviours. As a result, if the perceiver makes a correct inference, it is indeed reasonable to suppose that the event to which the target is reacting is signalled in their behaviour—a signal that the perceiver can interpret.

One caveat linked to the discussion above, is that in a retrodictive mindreading task, perceivers might use signals that appear in the targets' behaviours to make direct inferences of the event in real life (without inferring anything about the target's inner state). Notably, this criticism can be made about many mindreading tasks including classic false belief tasks, not just retrodictive mindreading tasks (''Povinelli's challenge'', Povinelli & Vonk 2003). In order to shed light on this, Kang et al. (2018) conducted a study using EEG, by using a recording of targets who were asked to view a series of facial expressions which caused them to spontaneously mimic these images. Those target videos were presented later for perceivers where in one condition they were asked to classify the target expressions (classification condition), while in another condition, perceivers were asked to infer which emotional expression targets was viewing (retrodiction condition).

The findings showed that perceivers performed accurately in making judgments either when they were asked to classify the expressions or when they were asked to retrodict the target's reactions. However, there was a difference in neural signature between the

classification and retrodiction task implying that different processes were used by perceivers depending on the question they were asked. When perceivers were answering the classification question, they were primarily processing the target's expression, as evidenced by activity in the fusiform face area (Kanwisher & Yovel, 2006). The retrodiction question, on the other hand, produced additional cortical activity associated with processing inner states, particularly in the medial prefrontal cortex and in the left and right temporo-parietal junctions (Schurz et al., 2014). EEG measurements revealed stronger slow-wave activity (N270-400) over the inferior frontal and anterior temporal regions of the right hemisphere in comparison with the classification question (Sabbagh et al., 2004). Hence, the evidence suggests that retrodictive mindreading is more than the classification of target facial expressions.

A further value of the retrodictive procedure is that it not only identifies individual differences between perceivers in the accuracy of inference, but it also identifies individual differences between targets in the readability of signals they emit. Some targets may emit signals that are accurately interpreted by a wide range of perceivers, while some targets emit signals that are rather difficult for perceivers to interpret accurately. Therefore, the procedure lends itself well to studies comparing autistic and non-autistic targets in readability. Notably, the study by Sheppard et al. (2016) used a retrodictive mindreading task to demonstrate that autistic people were less readable by non-autistic others. Relatedly, evidence indicates that targets who differ on the empathy continuum also differ in how easily they are read by others, depending on what they are thinking (Wu & Mitchell, 2019).

It is possible then for the retrodictive mindreading task to enable ranking of targets from the most to least readable (in terms of how accurately perceivers judge what each of them is reacting to)taking into consideration the following: (1) some targets will be significantly readable (at above chance levels), (2) some of them will not readable (around chance levels), and (3) some of them might emit misleading signals that are significantly more difficult to read (below chance levels). A target whose signals mislead perceivers occurs when perceivers are prone to inferring that the target is reacting to something other than what they were actually reacting to (Mitchell et al., 2021; Wu et al., 2019).

To summarise, it has been questioned whether there is a reliable correspondence between facial expressions and inner states (Jack, 2013; Reisenzein et al., 2013; Durán et al., 2017; Durán and Fernández-Dols, 2021; Barrett et al., 2019). Retrodictive mindreading might solve (or at least circumnavigate) the problem, as perceivers are required to make inferences based on targets' behaviour that occurs spontaneously in social interaction, in which the targets are reacting to a real event rather than a given instruction. Perceivers are not asked to infer the targets' inner state directly, and it is not assumed that all targets exposed to the same event will experience the same inner state, nor express this in the same way. The retrodictive mindreading task also satisfies the "truth condition" as the perceivers' judgments can be compared against objective facts known to the researcher. A consequence of this approach is we cannot know for certain whether perceivers actually impute mental states to targets during retrodictive mindreading tasks, or whether they solve them by matching observed behaviour to events

directly. Nevertheless, it is possible to measure targets who range in readability including those who are: (1) significantly readable, (2) those who are unreadable, and (3) those who emit misleading signals (Wu et al., 2019*)*.

1.2.3 Methodological issues around social favourability

Previous research highlighted the limitations of the "third-person" perspective of social phenomena and proposed a "second-person" approach to social cognition research (Wilms et al., 2010; Risko et al., 2012; Schilbach et al., 2012). Social cognition experimental paradigms, according to Risko et al. (2012), provide a continuum between basic, static representations of socially relevant stimuli and genuine live social interaction, or between "reel" and "real" instances of interaction. Static schematic faces, dynamic schematic faces, static photographs of faces, static photographs of people in complex social scenes, dynamic photographs of people in complex social scenes, situations with the potential for real social interaction, and real social interactions are all part of this continuum.

Studies comparing responses to stimuli from various regions of this continuum reveal considerable differences (Risko et al., 2012). For example, Pönkänen et al. (2010) found that imaging research demonstrates that direct gaze dramatically increases brain activity compared to gaze aversion or no gaze, but only when participants view live stimuli rather than still images. Similarly, while the proclivity to stare into another person's eyes exists in a wide range of situations, from schematic faces to dynamic social scenes, the possibility of actual social engagement has a substantial impact on this proclivity (Risko et al., 2012). Those studies on theory of mind mechanisms have relied on "third-person" paradigms, but these findings show how limited those

paradigms can be when addressing social cognition in "first- or second-person" in "real-world" experimental paradigms (Byom, 2013). when addressing social cognition in "first- or second-person" in "real-world" experimental paradigms (Byom, 2013).

In recent decades, researchers have tried to overcome some of the limitations of laboratory-based experiments. The most recurrent theme is that numerous researchers have advocated increased 'ecological validity' in studies. This is developed to ensure they are more comparable and generalisable to the 'real-world,' bridging the gap between the lab and reality (Holleman et al., 2020). The purpose of ecological validity is to apply laboratory results outside of the lab by creating studies that simulate an environment in which the organism grows and behaves (Shamay-Tsoory and Mendelsohn, 2019). However, according Holleman et al. (2020) this statement provides a lot of scope for interpretation of the findings. As a result, it is critical to underline that in order for an experiment to be ecologically valid, it is not essential to create "real life" in the laboratory, but rather to capture the necessary characteristics for the experiment's results to be extrapolated to the phenomena under study. These characteristics vary depending on the issue and should reflect the main characteristics of the phenomena in the actual world (Bucci-Mansilla et al., 2021).

With this in mind, studies examining social favourability of autistic and non-autistic targets have frequently used either “thin-slice” video stimuli or real-world social interactions to demonstrate that autistic people are perceived less socially favourable by non-autistic others (Grossman et al., 2015; Sasson et al, 2017; Morrison et al., 2019b). Nevertheless, the drawback

of using these more naturalistic (and complex) stimuli is that it is often less clear how perceivers are making their judgments. For instance, what cues do people take into account when making social favourability judgments? Potentially, they could rely on what the targets say, aspects of their non-verbal behaviour (such as their prosody or facial expressions) or their physical appearance, amongst other possibilities.

The possibility that perceivers judge social favourability based on physical appearance in these studies is strengthened by previous evidence that has found attractiveness effects on social favourability, with people who are more attractive receiving preferential treatment over those who are less attractive (Zebrowitz & Montepare, 2008). It was also found that people who were attractive tended to be perceived as having more positive characteristics than those deemed to be less attractive (e.g., Heilman & Stopeck, 1985; Langlois et al., 2000), and research found that there may actually be an association between facial attractiveness and attractiveness on other dimensions, in which attractive people earn more money than unattractive people (e.g., Hamermesh & Biddle, 1994). It also found that attractiveness of a face can influence character judgment, partner selection, and job opportunities (Little, 2014). Thus, there is evidence that physical attractiveness may predict people's social favourability.

One technique that can be used by researchers to attempt to clarify the role of these differing cues in social favourability judgments is comparisons of different stimuli types, which are assumed to differ in the presence or absence of the cues in question (Keating & Cook, 2020). For example, comparing judgments based on dynamic “thin slice” videos with static

images of the same targets might yield an indication of the extent to which judgments are based on the person's expressive behaviour as opposed to aspects of their physical appearance.

This was achieved by Sasson et al. (2017), who employed videos and static images extracted from real-life social interactions. The findings revealed that autistic people were rated as less favourable across different types of (traits) or first impression ratings, even when they used diverse stimuli. This appears to suggest that physical appearance rather than behavioural characteristics might be driving the lower social favourability ratings for autistic targets, as behavioural cues should be largely absent in static stimuli. However, while this study measured social favourability in static images, the expressivity of targets was not tested, which could have influenced the rating. It also is worth noting that only three questions were used instead of the entire first impression rating scale in this study, and the 'attractiveness' question was not included. We believe that the physical appearance can play a significant effect in static image rating.

Although the findings of Sasson et al. (2017) imply that autistic targets' perceived social favourability might be influenced by perceptions of physical attractiveness, other research suggests that physical attractiveness judgments based on static images differ from those based on dynamic stimuli (Lander, 2008; Penton-Voak & Chang, 2008; Rubenstein, 2005). For example, Rubenstein (2005) employed dynamic and static images to investigate how others perceive and assess these types of stimuli in order to investigate whether physical attractiveness is influenced by dynamic information. Even though mean attractiveness ratings across two

studies combining static and dynamic faces were similar, the data revealed that dynamic and static faces of the same person were rated differently, suggesting that these slight discrepancies may arise because each kind of stimulus was viewed differently. The findings also revealed that when rating the attractiveness of dynamic faces, emotion perception may be more important than when judging the attractiveness of static faces.

To summarise, different types of stimuli vary in their status of ecological validity. To achieve the highest levels of ecological validity we should aspire to use more complex stimuli including those involving real social interactions. On the other hand, using simpler stimuli allows for greater experimental control and offers the opportunity to isolate specific characteristics or cues that might contribute to performance. For instance, comparisons of judgments from static images and dynamic videos may help determine the role physical attractiveness has in judgments of social favourability. When targets are shown in static images, the findings of Sasson et al. (2017) imply that autistic people are perceived as being less socially favourable, which might suggest that perceivers are relying mainly on physical appearance when judging the other traits from static images. On the other hand, research suggesting that even attractiveness judgments themselves differ for static and dynamic stimuli appears less consistent with this notion.

1.3 Why are autistic people perceived unfavourably? Is it a matter of readability?

The previous sections have described research that provides empirical support for predictions of the DEP, including findings that non-autistic people find it difficult to read

autistic people and findings that autistic people tend to be perceived unfavourably by non-autistic people. While these have been two rather distinct fields of investigation, the possibility arises that these observations may in fact be related. No research has yet discussed this possibility in the case of autism. However, Anders et al. (2016) investigated whether non-autistic perceivers feel more attracted to non-autistic targets they can easily understand, in the sense of being able to infer their emotional states (which presumably has something in common with social favourability). Video recordings of the non-autistic targets were taken from a fMRI (functional magnetic resonance imaging) study where six women were asked to express sadness and fear. They were asked to imagine and submerge themselves into cued emotional situations and to express their feelings to their romantic partners. The videos of these women were then shown to non-autistic perceivers who were asked to guess whether the targets were experiencing sadness or fear (readability). A further screen asked them to rate how confident they were when they had identified the targets' mental state ('How confident are you that she felt fearful/sad?') on a scale from 1–5, with 1 referring to 'I am guessing' and 5 referring to 'I am absolutely confident').

Interpersonal attraction to each target was measured before and after the emotion judgment task. To do this, non-autistic perceivers were asked to make a small image bigger by pressing a button to reach the same size of the picture that corresponded to a subjectively pleasant conversational distance. The number of times the button was pressed was considered a measure

for the approach behaviours towards the targets. After that, perceivers rated each image on three statements relating to their willingness to meet targets using a 7-point scale.

The findings showed that perceivers had a hit rate of approximately 75% in guessing the target's mental state, while confidence ratings correlated with success in guessing target states at around 0.7. In short, non-autistic perceivers were fairly good at guessing target states, though not quite at ceiling.

In the second experiment by Anders et al, a different set of non-autistic perceivers were asked to view the same videos used in the first study while having fMRI scans to better understand the brain activity while watching the target videos. The fMRI scans showed that the reward centre in the non-autistic perceivers' brains lit up more when they were watching targets who were easier to read, and when they felt confident in being able to read their emotions. This study suggests that interaction among people depends on mutual understanding of inner states: when one person can easily understand another's inner state, this contributes to likeability.

The methodology of Anders et al. (2016) can be criticised on several grounds, including the fact that perceivers' actual ability to read the targets was not taken into account, and that the measure of attraction might lack validity. It is also apparent that the expressiveness of targets is not assessed in this study, which is a significant component in how people perceive each other and may have an impact on the correlations between readability and social favourability. Nevertheless, the results appear to demonstrate a link between a readability and

social favourability measure in non-autistic individuals and this raises the possibility that a similar relationship exists for autistic people – and such a relationship might account for group differences on both measures.

1.4 The aims of the thesis

To summarise this chapter, the evidence suggests that autistic people are less readable than non-autistic people (Edey et al., 2016; Sheppard et al., 2016) and autistic people are perceived less favourably than non-autistic people (Sasson et al., 2017) and that when perceivers find it difficult to read targets, they also tend to perceive those targets as unlikeable (Anders et al., 2016). This evidence leads us to question whether there is an association between autistic people being difficult to read and autistic people being perceived unfavourably by non-autistic others.

If readability and social favourability are related in autistic individuals, this might suggest that perceivers judge social favourability based on the target's behaviour. However, Sasson et al.'s (2017) study found that autistic people were judged less favourably based on static images, suggesting physical appearance as opposed to behaviour might impact judgments. Therefore, the research described in the following chapters aimed to understand the contribution of expressive behaviour (as opposed to physical appearance) when judging social favourability.

Also the thesis aimed to model the relationship between readability and social favourability in people that do not have clinical autism but have varying levels of autistic traits as determined by the Autism Spectrum Quotient (AQ). In particular, we aimed to understand

the relationship between autistic traits and social favourability with readability, expressiveness and perceived readability (whether the perceiver thinks that they can read the target) as potential mediators.

To answer all questions, autistic and non-autistic targets were secretly videotaped in various scenarios (conditions) in a real-life scenario and then the resulting videos were presented to various sets of perceivers over in a succession of studies (detailed below). This research sought to record autistic and non-autistic people's real-life behaviour and evaluate readability and social favourability in those autistic people and those with high autistic features.

In **Chapter 2**, the videos of the targets in Sheppard et al. (2016) were used to investigate whether autistic people are perceived as less socially favourable (social favourability) and whether this is associated with them having behaviour that is difficult for others to read (readability). These videos were produced in the context of social interaction with the experimenter. The social favourability scale was adapted from the scales used by Sasson et al. (2017) with some changes, which will be discussed in the chapter.

Chapter 3 investigated whether a connection between readability and social favourability could be identified even when social favourability judgments were based on static images (images extracted from Sheppard et al. (2016), mentioned in **Chapter 2**) and whether or not this association has something to do with the expressive behaviour of the targets or whether this association has nothing to do with expressiveness but rather is because of the general appearance of autistic people.

In **Chapter 4,** the videos of Sheppard et al. (2016) were used again, but videos were played in a loop and in conjunction with a new categorical question 'likeability', along with the social favourability scale. In this task, perceivers were asked to judge targets on a 'like or dislike' categorical question, i.e. '*Do you like this person*? Yes or No?'. They were also asked to judge each target on the social favourability scale used in **Chapter 2**. Finally, they were asked to indicate which of the social favourability scales were most important in judging whether they like or dislike a particular target. The primary aim was to find whether a simple 'likeability' question is equivalent to data derived from the social favourability trait questions (used in Chapters 2 and 3) and to explore which of the social favourability items perceivers think are more important in their judgment of targets.

Chapter 5 attempts to model the relationship between readability, expressiveness, social favourability, and autistic traits, as measured by the Autism Spectrum Quotient (AQ). To do so, a new set of target videos was developed in order to test mediation models of relationships between these aspects of targets. In contrast to previous research (e.g. Sheppard et al., 2016; Sasson et al., 2017), readability and 'subjective readability', social favourability and expressiveness judgments will be made for behaviours produced in four scenarios instead of one. Notably, 'subjective readability' was introduced for this final study as a measure of whether perceivers believe they could read the target and was coded from a seven-point scale, estimated by perceivers across four videos based on the question: 'How readable is this target?*'*.

CHAPTER 2: Is there a link between autistic people being perceived unfavourably and having a mind that is difficult to read?

2. Introduction

Much research has investigated how effectively autistic people read others' minds, and some results suggest poor ability and developmental delay in this arena (Baron-Cohen, 1995). Having difficulty reading others' minds is likely to be socially disadvantageous, for one might struggle to sense how others are feeling, what they are intending to do and what they are trying to communicate, amongst other things. But it could also be socially disadvantageous to have a mind that is difficult for others to read. Milton (2012) theorised that whenever interactants hold differing social norms and expectations (as is often the case for autistic and non-autistic individuals), there is a tendency for a 'disjuncture in reciprocity', or lack of empathy. He referred to this as a 'double empathy problem', where difficulties in social interaction experienced by autistic individuals result from bidirectional failures of autistic and non-autistic interaction partners to read each other's minds. Recent evidence suggests autistic people have minds that are difficult for others (perceivers) to read, including autistic perceivers (Edey et al., 2016) as well as non-autistic perceivers (Sheppard et al., 2016).

Among non-autistic participants, having a mind that is difficult to read is connected with being perceived unfavourably (Anders et al., 2016), which could place one at risk of social exclusion with associated consequences for poor mental health (Mitchell, 2017). Autistic individuals do indeed tend to be perceived unfavourably by non-autistic others (Sasson et al.,

2017) and also have elevated risk of mental health problems compared with the rest of the population (Cassidy & Rodgers, 2017). Bringing all these pieces of circumstantial information together raises the possibility of an association between autistic people being perceived unfavourably by non-autistic people and being difficult to read. The purpose of this article is to report the first empirical investigation into this possibility.

Two recent studies report that people (perceivers) find it difficult to read autistic individuals (targets). The most recent (Edey et al., 2016) used a variant of the classic task devised by Heider and Simmel (1944) with targets invited to manipulate geometrical shapes to enact interpersonal emotions like coaxing, mocking, seducing and surprising. While doing so, the movement of the shapes was video recorded. These recordings were later shown to perceivers tasked with inferring which interpersonal emotion was being enacted on any given occasion. Perceivers (irrespective of whether they were autistic) were more accurate in their inferences when the targets (those generating the movements of the geometric shapes) were non-autistic than autistic. The authors of the study suggested this is a sign that the actions (and therefore the minds) of autistic people are relatively difficult to interpret or read.

A study by Sheppard et al. (2016) offers converging evidence from a task that employed naturalistic stimuli. Targets were greeted by the experimenter on arrival either with a compliment, a joke, a story relating the experimenter's difficult day or the experimenter neglecting the target while making a personal telephone call (following a procedure developed by Pillai et al., 2012). Unknowingly, the targets were video recorded during the greeting

scenario and another group of non-autistic participants who viewed the target videos (perceivers) were tasked with inferring which particular greeting each target was experiencing. Notably, but unknown to perceivers, half the targets were autistic and half were non-autistic. Overall, perceivers were considerably more accurate in inferring the greeting scenario when viewing non-autistic target than when viewing an autistic target (except for the 'joke' scenario); effectively, perceiver accuracy judgments discriminated between autistic and non-autistic targets.

This task is defined as 'retrodictive mindreading' (Gallese & Goldman, 1998; Teoh et al., 2017), where perceivers make an inference of the target's inner state from the signal in the target's observable behaviour. They then make a further inference from the target's behaviour/inferred inner state to the event that caused the target to experience such a state. The perceiver thus makes a proximal inference (the target's inner state) and a distal inference (the event that precipitated the target's inner state). This is how we operationally define mindreading in the current research and in doing so we are not making any assumptions about how perceivers fare in inferring what the target believes as being true of the world and inferring how the target feels (see Poletti et al., 2012, for a review of the complexity of this issue).

Apparently, then, the signal to the target's inner state is not as clear when the target is autistic than when they are not autistic. One might wonder if this is because autistic targets are less expressive than non-autistic targets. Some evidence is consistent with such a possibility (McDonald et al., 1989; Stagg et al., 2014) but a considerable amount of evidence suggests

autistic people are at least as expressive as non-autistic people in many/most contexts (Beadle-Brown & Whiten, 2004; Press et al., 2010; Volker et al., 2009), though the form of expressiveness can be rather different in autism (Faso et al., 2015). Sheppard et al. (2016) sought clarity by asking an independent group of perceivers to rate the videos specifically on the intensity of target expressions. Generally, autistic targets were not less expressive than non-autistic targets and there was no basis for suggesting perceivers were inaccurate in inferring what autistic targets were reacting to *because* autistic targets were inexpressive. Rather, it seems the signal emitted by autistic targets, even though expressive, was more prone to being misinterpreted compared with the signal emitted by non-autistic targets. In short, autistic people are difficult for non-autistic people to read.

Autistic people also tend to be perceived unfavourably by other people. Sasson et al. (2017) video recorded targets while engaging in a short social interaction and these videos were subsequently presented to non-autistic perceivers who had no pre-briefing alerting them to the possibility that some targets were autistic. Perceivers rated the targets on a series of scales relating to social favourability and their ratings effectively discriminated between autistic and non-autistic targets: The former were perceived less socially favourable. A follow-up study supported this basic finding but the results also suggested that disclosing the diagnostic status of targets to perceivers had a discounting effect, such that perceiver ratings became considerably more positive for autistic targets (Sasson & Morrison, 2017).

Anders et al. (2016) examined the relationship between readability and likeability (which presumably has something in common with social favourability) in a study involving non-autistic targets. In the study, perceivers were tasked with inferring whether targets were expressing fear or sadness and their accuracy in this respect correlated with various direct and indirect ratings on whether they liked (were attracted to) the targets. Although target expressions were posed rather than natural, tempering any conclusions about mindreading, the findings nevertheless offer circumstantial evidence to suggest a connection between target readability and likeability.

In summary, the evidence suggests autistic people are less readable than non-autistic people (Edey et al., 2016; Sheppard et al., 2016), that autistic people are perceived less favourably than non-autistic people (Sasson et al., 2017) and that when perceivers find it difficult to read targets, they also tend to perceive those targets as unlikeable (Anders et al., 2016). This evidence leads us to question whether there is an association between autistic people being difficult to read and autistic people being perceived unfavourably by non-autistic others. The purpose of the work presented here was to carry out the first empirical investigation into this possibility.

We re-analysed perceiver ratings archived from Sheppard et al. (2016) to calculate a readability score for each target who served in that study. We then presented these same target videos to a newly recruited group of non-autistic perceivers (in the absence of any briefing that some targets were autistic) who were asked to rate social favourability of each target, using an

adaptation of the scale devised by Sasson et al. (2017). Our focal analysis compared target ratings of readability with target ratings of favourability to test the prediction of a positive correlation.

2.1 Methods

2.1.1Stimuli

The videos used in the study were developed by Sheppard et al. (2016). Target participants were filmed within a testing room as they reacted naturally to the researcher's behaviour in one of four scenarios (joke, waiting, compliment and story), determined at random.

2.1.2 Participants (Targets)

The 40 targets, aged between 13 and 21 (M = 15.4 years) are described in Sheppard et al.(2016). Briefly, they were recruited from educational establishments and were all native speakers of English. Twenty were autistic, as evaluated by mental health professionals according to DSM-IV criteria (American Psychiatric Association 2013). All targets were undertaking basic or advanced level secondary or tertiary education courses. All were male Caucasians and the two groups were matched for chronological age.

2.1.3 Procedure

As described in Sheppard et al. (2016), a Sony DCR-SR60 video camera was placed about 1.7 m directly opposite the target, across the table on a tripod. As each target arrived individually at the testing room, the researcher performed (determined randomly) one of four possible scenarios (compliment, joke, story, waiting) while, the camera surreptitiously recorded the targets' reactions. In the compliment scenario, the researcher paid the target a

series of three compliments. In the joke scenario, the researcher told the target a joke. In the story scenario, the researcher told the target of several mishaps that had occurred earlier that day. In the waiting scenario, the researcher kept the target waiting while doing irrelevant activities such as text messaging. Five targets from each group experienced each scenario. In total, there were 40 edited video clips (one for each target with 5 target clips per scenario for each group) with a mean duration of 7.22s. The video clips were 1080 pixels in width and 720 pixels in height, presented at 25 frames per second without sound (see Pillai et al., 2012, 2014; Sheppard et al., 2016 for details).

2.2 Perceiver phase[3]

2.2.1 Study 1

Thirty-one non-autistic perceivers (10 males and 21 females) aged between 18 and 30 (M = 24.5 years, SD = 1.98) were recruited through the 'participant recruitment system' and advertisements at the University of Nottingham. Although these perceivers were older than the targets on average (as with Sheppard et al, 2016), we assumed their data would still be informative about the association between target readability and favourability at least on a general level.

2.2.1.1Procedures

The procedure for the study was approved by the School of Psychology Ethics committee, University of Nottingham (Ethics approval Number: S964). All 40 target videos were shown to each perceiver on a 15 inch MacBook Air, presented in random order using PsychoPy2

[3] See Appendix 3 (Extra analysis relates to Chapter 2)

version 1.85.2 (Peirce, 2007). Each perceiver (tested individually) viewed each video once only, and after viewing each they rated the target on nine social favourability dimensions on a scale from 1 to 6. Perceivers saw the target video first, then they saw a further screen with all nine questions (these were: willingness to talk to, awkwardness, attractiveness, intelligence, likeability, trustworthiness, dominance/submissiveness, self-esteem and empathy) which appeared in fixed order to avoid confusion from one trial to the next. Perceivers gave their rating to each question on a scale from 1 to 6, and rated questions from 1 to 9 in sequence:

"How much would you like to talk to this person? How awkward is this person? How attractive is this person? How trustworthy is this person? How dominant is this person? How likable is this person? How intelligent is this person? How good is this person's self-esteem? How empathic is this person?"

Questions were adapted from Sasson et al. (2017). Due to possible redundancy, we excluded three of the questions used in the previous research (desire to live near the target, likelihood of hanging out with the target in their free time, level of comfort sitting next to the target), as they correlated highly with 'likelihood of starting a conversation with the target' (which was retained), ranging from .78 to .98. These exclusion gave an opportunity to add two further questions: 'How good is this person's self-esteem?' and 'How empathic is this person?' No indication was given to the perceivers prior to the task that any of the individuals in the videos were autistic. Following completion of the task participants were debriefed and fully informed of the true purpose of the study.

2.2.1.2 Results & Discussion

Perceivers rated each target on nine social favourability scales. We averaged ratings across all perceivers for each of these nine scales and with each target group. Mean ratings appear in Figure 2.1 (See Appendix 4, **Table 0-4** for mean and SD for each item).

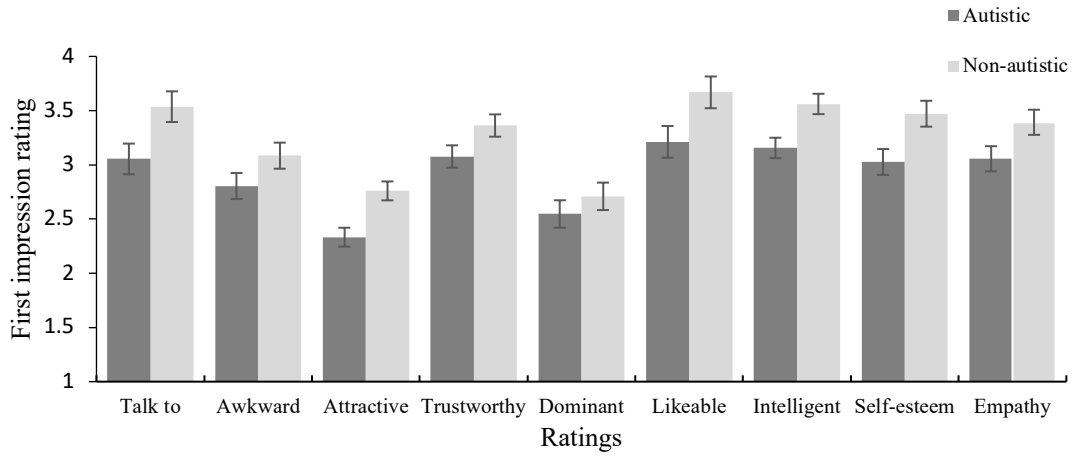


Figure 2.1. Ratings (1-6) by perceivers on nine dimensions of social favourability for autistic and non-autistic targets. Scoring for 'awkwardness' was reversed, such that a high rating was consistent with social favourability. The error bars one standard error of the mean.

Variable	1	2	3	4	5	6	7	8	9
1.Talk to	-	-.89	.79	.94	.69	.97	.86	.91	.96
2. Awkward	-	-	-.76	-.83	-.79	-.86	-.75	-.91	-.87
3. Attractive	-	-	-	.70	.70	.76	.74	.80	.75
4.Trustworthy	-	-	-	-	.58	.96	.87	.83	.97
5. Dominant	-	-	-	-	-	.64	.60	.85	.62
6. Likeable	-	-	-	-	-	-	.85	.88	.96
7. Intelligent	-	-	-	-	-	-	-	.80	.85
8. Self-esteem	-	-	-	-	-	-	-	-	.86
9. Empathy	-	-	-	-	-	-	-	-	-

Table 2-1.Inter-correlations between nine scales of social favourability, all significant at p < .001 (2-tailed).

Bivariate Pearson correlations revealed a strong positive correlation among all nine social favourability factors (**Table 2-1**). 'Awkwardness' correlated negatively with all other

items (r > -0.75, p < .001). Given the high correlations between all measures, a general 'social favourability' variable was derived from the sum of the averages of all nine scales (the reciprocal of the awkwardness item was used). A 2 X 4 repeated measures ANOVA was conducted to assess the associations between group and scenario type on social favourability. A main effect of target group was found, $F(1,30) = 104.14$, $p < .001$, ηp2=0.78, with autistic targets viewed less socially favourable than non-autistic targets. A main effect of scenario was also found, Greenhouse-Geisser corrected due to violation of sphericity, F (1.42, 42.65) = 86.57, $p < .001$, ηp2=0.74. Post-hoc pairwise comparisons were conducted between the four scenario types, with Bonferroni correction: the main effect of scenario was driven by targets in the waiting scenario being rated significantly less socially favourable than those in all other scenarios (p < .001); there were no differences between the other three scenarios in how socially favourable targets were rated.

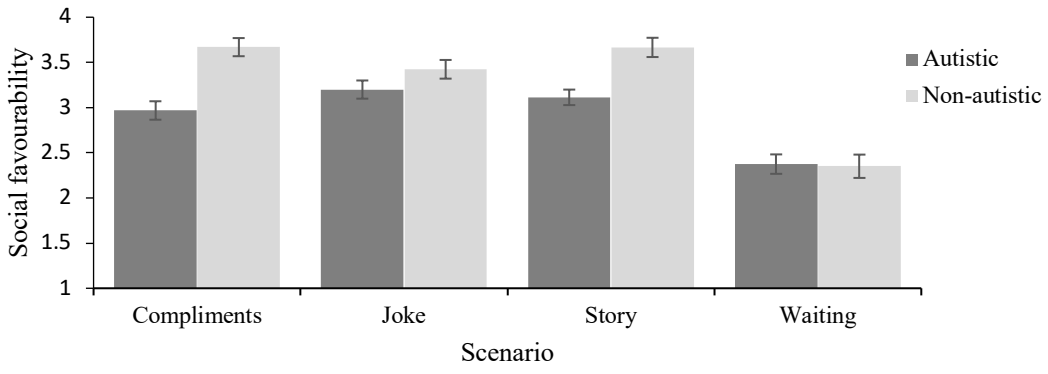


Figure 2.2. Perceivers' ratings of the social favourability of autistic and non-autistic targets who experienced one of the four scenarios. The error bars one standard error of the mean[4].

[4] For the study of the scenario, social favourability was measured using the mean of scores on the nine scales. The social favourability score used in correlations with readability was the sum of the nine scales.

A significant interaction effect (Figure 2.2; See Appendix 4 **Table 0-5** for mean and SD for each condition) between group and scenarios was also found, $F(3,90) = 29.65$, $p < .001$, ηp2=0.50, raising the possibility that perceiver ratings were more positive for one target group over the other, depending on the scenario. To explore this possibility, four post hoc paired-samples *t* tests were employed to compare participant performance across the two target groups for each scenario independently. Autistic targets were perceived less socially favourable than non-autistic targets in the compliment scenario $t(30) = 9.64$, $p < .001$, $d = 1.24$, Joke scenario $t(30) = 4.08$, $p < .001$, $d = 0.39$, and story scenario $t(30) = 8.11$, $p < .001$, $d = 1.03$. However, there was no significant difference in how socially favourable target groups were rated in the waiting scenario, $t(30) = 0.44$, $p = .66$, where both groups were rated rather negatively. Reported *p*-values are following Bonferroni correction. Summing up, it is notable that perceiver ratings of social favourability effectively discriminated between autistic and non-autistic targets, even though perceivers were not given any information that the targets formed two discrete groups according to clinical diagnosis.

Were autistic targets less readable than non-autistic targets? We conducted a confirmatory analysis by repurposing archived readability data from Sheppard et al. (2016) and calculating the number of times each target was judged as responding to the correct scenario. This was converted to a percentage to adduce a mean readability value associated with each target. A 2 X 4 repeated measures ANOVA was conducted on target readability, with the factors target group and greeting scenario. A main effect of target group was found, $F(1,32) = 6.56$, $p = .015$,

ηp2=0.17, confirming that autistic targets were less readable than non-autistic targets. A main effect of scenario was also found, $F(3,32) = 17.467$, $p < .001$, ηp2=0.62, but the interaction term was nonsignificant, $F(3,32) = 1.631$, $p = .202$. Bonferroni corrected pairwise comparisons revealed that readability in the waiting scenario was significantly greater than in the other scenarios, as illustrated in Figure 2.3.

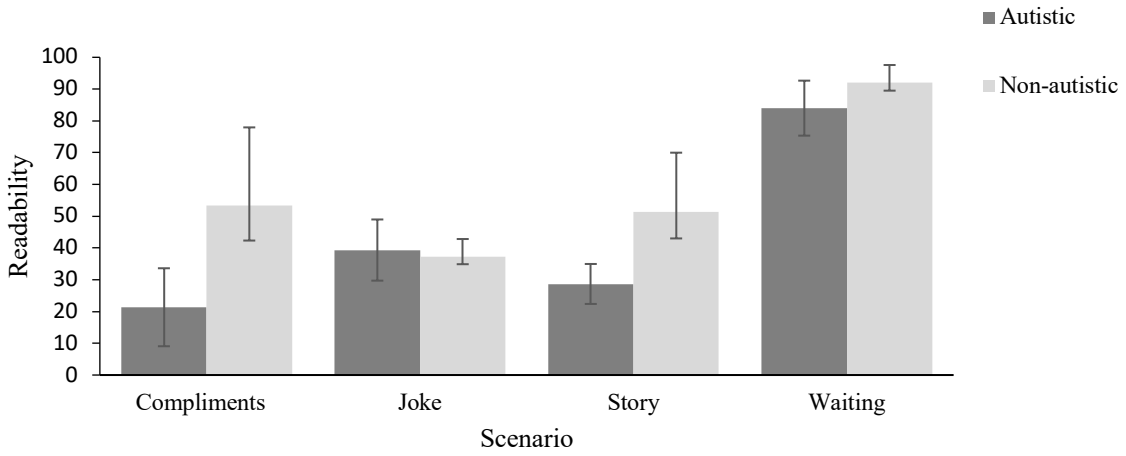


Figure 2.3. perceivers readability of autistic and non-autistic targets. Each target participated in one of four scenarios. The error bar represents one standard error of the mean.

Was the tendency for autistic targets to be perceived less positively associated with their being less readable? To begin to answer this question we conducted a bivariate correlation between target readability and target social favourability across three scenarios (excluding the waiting scenario). The waiting scenario was excluded because this condition yielded high readability perhaps because targets were merely waiting while the experimenter was apparently preoccupied with something else, whereas in the other scenarios the experimenter was actively engaging with the target. Hence, perceivers might easily identify this scenario through a process of elimination. Also, favourability ratings were quite different (much more negative)

than for the other scenarios, irrespective of diagnosis, perhaps because targets appeared disagreeable on being neglected by the experimenter. Based on the remaining three scenarios (i.e. 30 pairs of values), we found a positive relationship between target social favourability and target readability, $r = 0.58$, $p < .001$. When participant group (autistic or non-autistic) was entered as a controlling variable in a partial correlation, the significant relationship between social favourability and readability survived, $r = 0.45$, $p < .01$. It seems the relationship between target social favourability and target readability is not a simple function of autistic targets being unreadable and also being perceived as rather less socially favourable. Perhaps the relation between readability and social favourability is more fundamental in a way that transcends target clinical status. After excluding the waiting scenario, a further analysis was conducted in order to investigate the correlation between readability and social favourability for each group separately. The correlation was significant for the autistic group ($r= 0.47$, $p=.037$) and for the non-autistic group was non-significant *(*$r = 0.43$, $p=.053$); however the r- values were very similar as in the combined analysis.

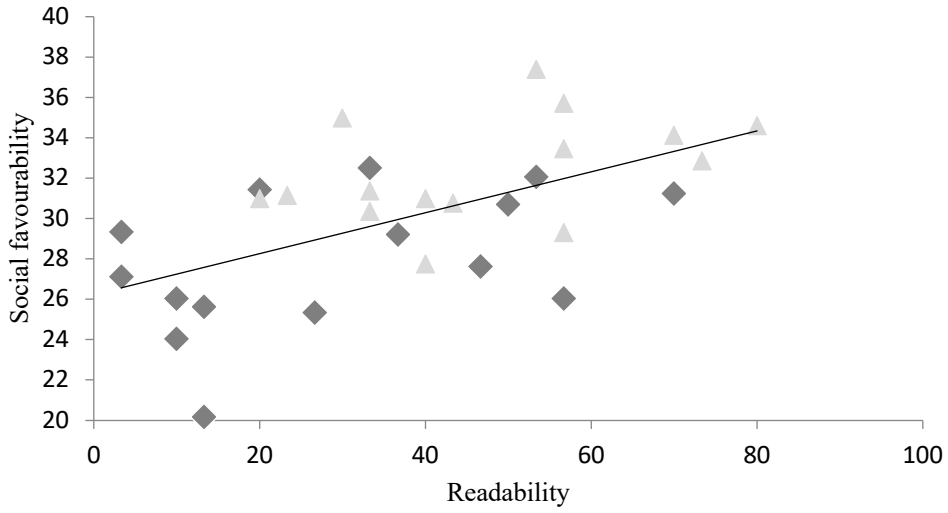


Figure 2.4. The correlation between readability and social favourability across autistic and non-autistic targets (waiting scenario excluded). The diamonds represent autistic targets and triangles represent non-autistic targets.

2.2.2 Study 2

2.2.2.1 Methods

One criticism of Study 1 is that the targets each experienced only one scenario and their behaviour in this scenario was used as the basis for making social favourability judgments about that target. As perceivers were not provided any information about the context of the targets' behaviour their judgments about the target might have been influenced by the scenario rather than based on considerations about the targets' enduring traits. Indeed, the fact that targets universally scored lower in social favourability in the waiting scenario implies that the context in which a target is observed critically influences judgments about their character. While this issue cannot account for group differences as equal numbers of autistic and non-autistic targets experienced each scenario, it could introduce a large amount of noise into the social favourability measurement.

The second study offers a replication but with disclosure to perceivers of the particulars of

the scenario each target was experiencing. Such information might help perceivers to contextualize target behaviour in order to make situation-independent trait judgments, which should reduce noise in mean target favourability data. Accordingly, we might expect the correlation between target readability and favourability to be even stronger than in the first study. We might also find targets in the waiting scenario are no longer rated less favourably than in other scenarios when perceivers can interpret apparently disagreeable target behaviour arising as a product of a disagreeable situation.

2.2.2.2 Participants (perceivers)

Thirty perceivers (3 males and 27 females) aged between 18 and 30 (M = 18.8 years, SD = 1.94) took part; none had participated in Study 1. All were native English speakers.

2.2.2.3 Procedure

Each perceiver viewed the 40 target videos under the same conditions as in the first study and gave ratings according to the same nine questions (social favourability). In this study perceivers were informed which scenario each target was experiencing, and the name of each scenario appeared before each target video for 5 seconds.

2.2.2.4 Results & Discussion

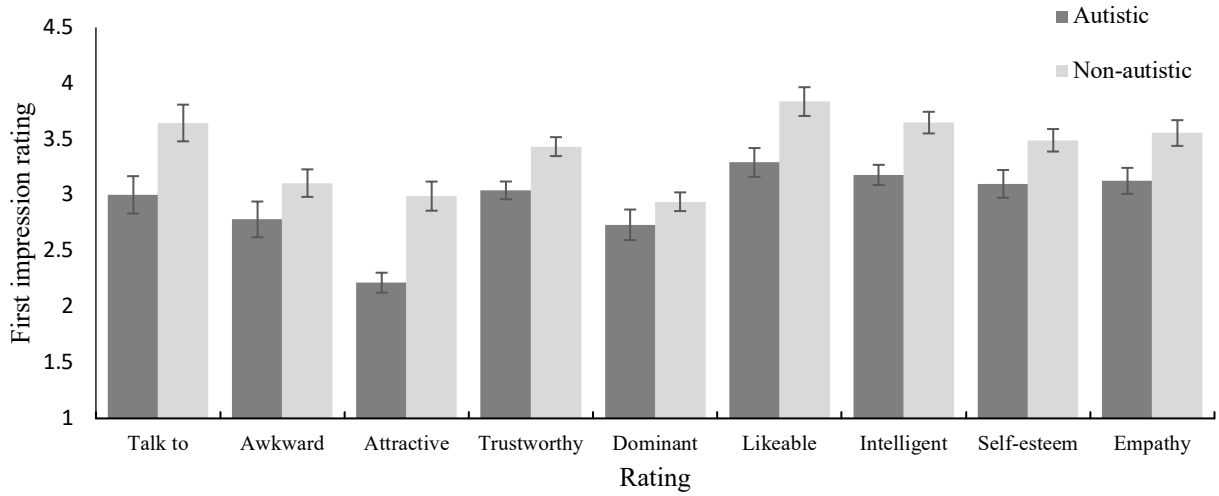


Figure 2.5. Ratings (1-6) by perceivers on nine dimensions of social favourability for autistic and non-autistic targets. Scoring for 'awkwardness' was reversed, such that a high rating was consistent with social favourability. The error bars one standard error of the mean.

Group differences across the nine ratings of social favourability are apparent in Figure 2.5 (See Appendix 4, **Table 0-6** for mean and SD for each item). As with Study 1, a single social favourability variable was created from the ratings and submitted to a two-way repeated measures ANOVA to assess the effects of group and scenario type. A main effect of target group resulted from autistic targets being rated less favourably than non-autistic targets, F (1,29) = 127.94, $p < .001$, ηp2=0.82. A main effect of scenario was also found, F (2.11, 61.2) = 66.80, $p < .001$, ηp2=0.70, Greenhouse-Geisser corrected for violation of sphericity. Post-hoc pairwise comparisons with Bonferroni correction revealed that targets in the waiting scenario were rated significantly less socially favourable than targets in other scenarios ($p <$ .001); there were no differences between the other three scenarios in how socially favourable targets were rated.

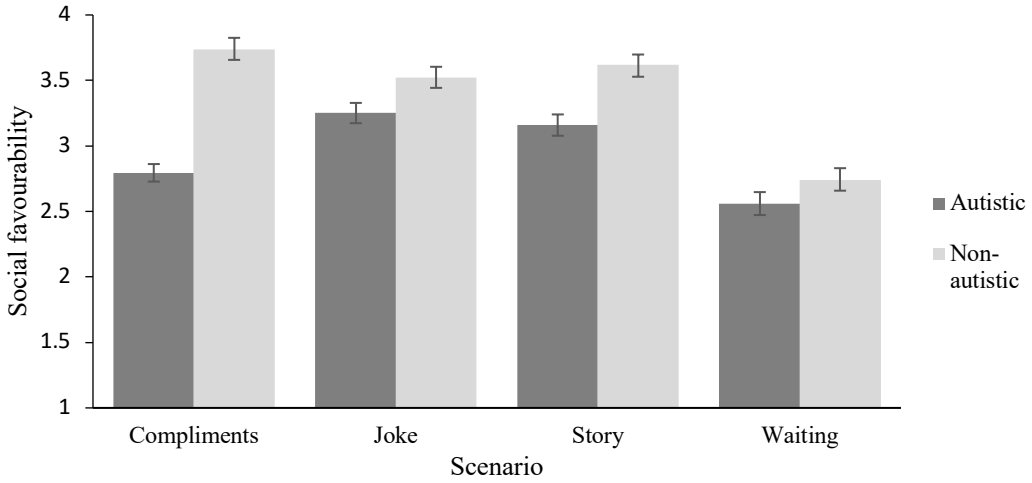


Figure 2.6. Perceivers' ratings of the social favourability of autistic and non-autistic targets who experienced one of the four scenarios. The error bars one standard error of the mean

A significant interaction effect (Figure 2.6, See Appendix 4, **Table 0-7** for mean and SD for each condition) between group and scenarios was also found, $F(3,78.67) = 29.1$, $p < .001$, ηp2=0.50, raising the possibility that ratings were more positive better for one target group over the other, depending on the scenario. To explore this possibility, four post hoc paired-samples *t* tests were employed to compare perceiver ratings across the two target groups for each scenario independently. Autistic targets were rated less socially favourable for the compliment scenario $t(29) = -10.26$, $p < .001$, $d = 2.34$, Joke scenario $t(29) = -4.75$, $p < .001$, $d = 0.64$, story scenario $t(29) = -6.60$, $p < .001$, $d = 0.97$, and waiting scenario, $t(29) = -3.98$, $p < .001$, $d = 0.39$. Reported *p*-values are following Bonferroni correction. To further explore the interaction, repeated measures ANOVAs were conducted to determine whether there was an effect of scenario for each group. For the autistic group, a main effect of scenario was found, $F(2.34,67.86) = 39.39$, $p < .001$, ηp2=0.58, Greenhouse-Geisser corrected. Post-hoc pairwise comparisons indicate that targets were rated less favorably in the compliment and waiting

scenarios compared with all other scenarios, $p < .05$, but there was no difference between the story and joke scenarios, $p = .79$. For the non-autistic group, a main effect of scenario was found, $F(3,87) = 65.90$, $p < .001$, $\eta p2=0.69$. Post-hoc pairwise comparisons showed that targets in the waiting scenario were rated as less socially favourable than those in the other three scenarios, $p < .001$.

A bivariate correlation was conducted between target readability (the same data from Sheppard et al., 2016, also presented in Study 1) and social favourability as rated by perceivers in Study 2. We again excluded the waiting scenario, for the same reasons identified in Study 1. In replication of Study 1, based on 30 pairs of values, a positive relationship emerged between target social favourability and target readability, $r = 0.63$, $p < .001$. A partial correlation controlling for target group (autistic or non-autistic) confirmed that the relationship between social favourability and readability survived, $r = 0.52$, $p = .004$. Hence, it seems the correlation is not driven by autistic targets being unreadable and being perceived unfavourably, while non-autistic targets are readable and also perceived favourably. As with Study 1, the significant relationship transcends clinical status. After excluding the waiting scenario, a further analysis was conducted in order to investigate the correlation between readability and social favourability for each group separately as did in study 1. The correlation was significant for the autistic group, $r = 0.65$, $p=.004$, but not for the non-autistic group, $r = 0.30$, $p=.14$, although the r value was still positive.

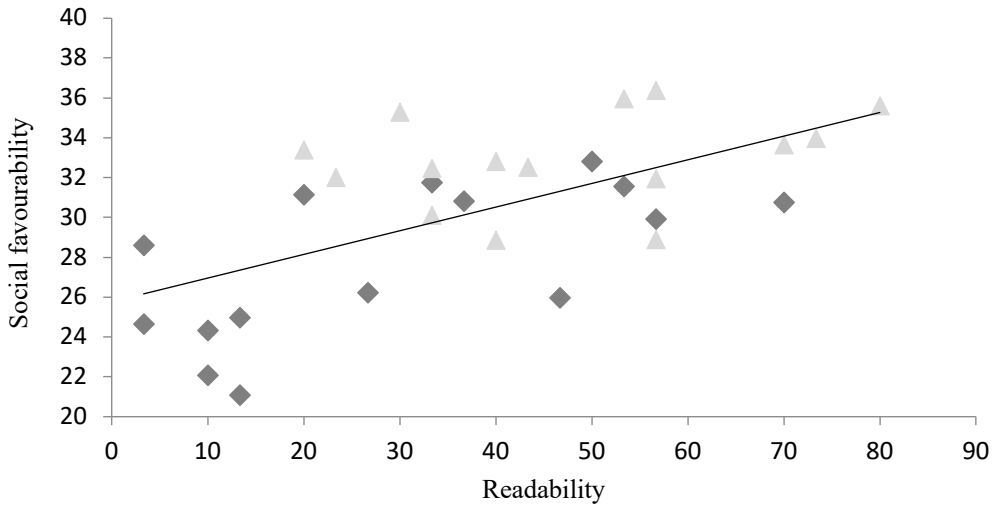


Figure 2.7. The correlation between readability and social favourability across autistic and non-autistic targets (waiting scenario excluded). The diamonds represent autistic targets and triangles represent non-autistic targets.

2.3 General discussion

The results replicate and extend previous research. Notably, the data offer the first empirical demonstration of a link between autistic individuals being difficult to read and being perceived unfavourably by non-autistic others. After reconfiguring data from Sheppard et al. (2016) we confirmed that when the target was the unit of analysis instead of the perceiver, group differences in readability for autistic and non-autistic targets were still apparent. The results also replicate and extend Sasson et al. (2017), demonstrating that non-autistic perceivers rate non-autistic targets more socially favourably than they rate autistic targets. In both studies the difference between groups had a large effect size indicating that these differences are not trivial and may well have meaningful significance in the real world. The rating questions were modified slightly for the current research and the samples of target behavior were rather different compared with Sasson et al. (2017) including reactions to multiple different situations.

The current findings thus extend what Sasson et al. (2017) reported by demonstrating robustness in the face of changes to questions posed to targets and the particulars of the sample of target behaviour.

Nevertheless, perceivers were influenced by the situation targets experienced in how they rated target favourability, which suggests that how the target behaves (which is affected by the situation) and not just how they look, influences perceiver ratings. This was most notable in the waiting scenario where targets appeared disagreeable because the experimenter was behaving rudely and perceivers attributed disagreeable target dispositions on witnessing negative target signals. Even when the scenario was disclosed, perceivers persisted in rating targets negatively in this scenario.

When information about the target's situation was concealed, non-autistic and autistic targets were perceived equally negatively in the waiting scenario. This is a striking finding given that autistic people have been judged more negatively across various other circumstances, including the other scenarios within this study and in previous research (Sasson et al., 2017; Grossman et al., 2013), and demonstrates that there may be circumstances where autistic people are not perceived more negatively than non-autistic people. However, when the situation was disclosed to perceivers, non-autistic targets, whilst still rated rather negatively, were nevertheless rated more positively than autistic targets. It seems situational information had something of a discounting effect in respect of perceived favourability of the behavior of non-autistic targets but not of autistic targets. Perhaps perceivers view more favourably those

individuals who respond in a way they expect in a given situation. If non-autistic targets make more typical reactions to these scenarios (see Sheppard et al., 2016), then this may confer increased favourability, even where the response is a negative one.

Having assigned a readability and global social favourability score to each target, it was then possible to perform a correlation analysis to test the association between these two variables. The results confirmed the presence of such an association, a finding that was replicated across two studies, where the scenario targets were experiencing was concealed from perceivers (Study 1) and where it was disclosed (Study 2). This suggests it made no difference to perceivers' tendency to rate non-autistic targets more favorably than autistic targets whether or not they (perceivers) had some contextual information to assist in explaining target behavior. The association between readability and favourability survived even when clinical diagnosis was partialled out, raising the possibility that the condition of autism is not driving this association. Likewise, the association (r-values) were still positive when correlations were carried out for each target group separately (although in some cases no longer significant, probably due to the reduced power due to the smaller number of data points in these analyses) suggesting that the overall correlation was not the result of inclusion of both groups of targets together in the analysis.

The statistical association between readability and perceived social favourability does not illuminate the direction of causality or whether the association is the product of a mediating variable. At least, though, we are able to eliminate target diagnostic status as such a mediator.

Determining causality is a matter for future research, where larger data sets captured at multiple time points might enable statistical modelling of the directional influence of one variable (e.g. readability) over the other (e.g. favourability).

In anticipation of further research, and to speculate, there are at least two possible explanations which suppose that being unreadable causes one to be perceived unfavourably, a *reward* explanation and a *trait* explanation. Anders et al. (2016) found that perceivers' attraction to a specific target directly correlated with their self-reported confidence that they had correctly identified the target's emotional state. They argue that where an interpersonal encounter is rewarding, the reward will be associated with that particular interactant. In other words, when interacting with an individual we feel we can understand well, this will result in greater reward association with that particular individual, generating greater feelings of interpersonal attraction. In support of this reward interpretation, the researchers found that activation in ventral striatum and mOFC (core areas of the brain's reward system) predicted individual changes in interpersonal attraction. Following this line of argument, a person who is less readable by the majority of the population would consequently be associated with lower reward values, and would be less liked by perceivers from that population.

The trait explanation posits that 'readability' may be directly associated with other personality traits. A person who is difficult to read is, by definition, someone, who is not transparent. Such a person, therefore, might seem unpredictable, untrustworthy and incomprehensible, amongst other things. Given there are strong correlations between

judgments made on the wide variety of social favourability scales used in this study, it seems reasonable to suggest that people may extrapolate from specific personality characteristics associated with being hard to read to other less favourable characteristics. As with other components of favourability, in this study autistic targets were perceived less trustworthy than non-autistic targets – a finding which is consistent with the suggestion offered here. However, Sasson et al. (2017) did not find any difference between autistic and non-autistic targets in ratings of trustworthiness, perhaps because a different kind of scenario was involved. Nevertheless, this might lead us to question whether the association between readability and favourability is driven by perceptions of trustworthiness.

Causality may actually work in the opposite direction such that being perceived less socially favourable could result in an individual being less readable. Perhaps when a target is perceived negatively, the perceiver is less motivated to empathise and consider the target's inner state. This in turn could then result in the target being apparently less readable as perceivers made less effort to interpret or understand that individual's behaviour. This interpretation is consistent with previous research that reports mind reading accuracy improves with motivation (Thomas & Maio, 2008). It is also possible that both effects are present: there could be a bi-directional relationship between a target's readability and social favourability, where each influences the other.

A further possibility is that some other variable mediates the relationship between readability and social favourability. In order for the target's readability to directly influence

how socially favourable they are perceived (either via a reward or trait route), this would require perceivers first to make some kind of judgment about how readable the target they are viewing actually is. This might happen in Study 2, where perceivers were told the situation to which the target is reacting: perceivers may notice a mis-match between a target's behaviour and expected behaviour in that scenario and infer that they are unable to read the target. It is less apparent how perceivers could infer readability in Study 1, where no contextual information was provided. Perhaps the behaviour of some targets is unusual in *any* scenario. This could lead to other people having difficulty inferring what caused the behaviour (in readability studies) and also result in more negative social favourability judgments (in favourability studies). In short, perhaps autistic people behave in a way that is perceived by non-autistic people as being 'out of the ordinary', rendering them unreadable and also causing them to be perceived unfavourably. Here, 'out of the ordinary' is a mediating variable that explains the correlation between unreadability and perceived unfavourability without needing to posit a direct causal link between the two variables.

The possibility that behaviour is perceived as being 'out of the ordinary' leads to suggestions for future research into why autistic people are difficult to read; and at least two rival explanations are worth considering. One possibility raised here is that the behaviour of autistic people is rather different from that of non-autistic people irrespective of context, as would be the case if autistic people had flattened affect and thus were inexpressive such that the signal in their behaviour was weakened. However, we already know this is not true of the

targets who served in this study (Sheppard et al, 2016) – at least in some scenarios, autistic targets were just as expressive as non-autistic targets. Still, autistic targets, although expressive, might exhibit stereotyped behaviour in any scenario that does not encapsulate a signal that is easy to read. Another possibility is that autistic people emit a variety of signals but ones that are misleading, for example, frowning on hearing a joke or appearing bored on hearing a person relate the story of their difficult day.

In future research, if each target experiences a variety of scenarios, it will be possible to determine if autistic people emit the same stereotyped response to all scenarios. If they do so, this would lend support to the suggestion that autistic people behave in a way that is 'out of the ordinary' in social contexts. In this case, we would expect perceiver judgments to be around chance level or at best only slightly above chance level. In contrast, if autistic participants emit misleading signals, then perceivers will make systematic errors, in which case accuracy in inferring the scenario will not be at chance level but will be significantly below chance level.

If being unreadable is associated with being rated socially unfavourable, as suggested by our findings, it could in turn have very negative consequences for the development of autistic individuals. This follows if being perceived unfavourably is a barrier to inclusion in the social world, where autistic people, who are in the population minority, instead are condemned to isolation. The social arena provides the experiences essential to understanding how other people behave, think and feel. In being excluded from such experiences, autistic

people are trapped in a 'vicious circle,' lagging further and further behind in their developing understanding of the psychology of other people, making it ever more difficult for them to be accepted and included (Mitchell, 2017). This undesirable effect could well be a risk to quality of life, especially poor mental health, among autistic people (Cassidy & Rodgers, 2017). In short, perhaps it is timely to heed the words of Karmiloff-Smith (1998) that development itself is key to understanding developmental disorders, a view amplified by López (2015) specifically in relation to understanding how autism changes over the lifespan, connected with the critical role of social context in these changes.

CHAPTER 3: Is there a link between having a mind that is difficult to read and being perceived unfavourably based on a static image?

3. Introduction

The evidence of previous research highlights that autistic people are misperceived quite broadly, both in how their behaviour is interpreted (with misunderstanding) (Edey et al., 2016; Sheppard et al., 2016) and in how it is evaluated (negatively) (Sasson et al., 2017). The findings reported in Chapter 2 indicate there is a correlation between how readable targets are and how they are socially perceived by others. As a target's readability is a function of their expressive behaviour, it follows that social favourability judgments are also influenced by a target's expressive behaviour (in Chapter 2 Discussion we articulate some of the possible bases of this relationship).

However, negative impressions of autistic people also occur even when perceivers are shown a static image of the target. This was found by Sasson et al. (2017) who investigated whether autistic targets were perceived more negatively than non-autistic targets; perceivers viewed static images that were taken when the targets were responding to a brief set of open-ended casual questions (e.g. "Have you seen any good movies recently?"). A total of 12 autistic adult (2 female; 10 male) and 16 non-autistic adults (7 female; 9 male) served as targets. Ten images of each target were presented to perceivers who were asked: (1) "How socially awkward is this person?" (2) "How approachable is this person?" (3) "Would I see myself being friends with this person?"

The findings of the Sasson et al. (2017) study showed that autistic targets were rated less favourably than non-autistic targets, even across different questions, despite the fact that perceivers only viewed static images. As expressive behaviour is much diminished in static photos, this suggests that it might be something to do with the appearance of the target as opposed to the behaviour/expressions that informs perceivers' judgments of social favourability. Indeed, previous evidence also suggests that physical attractiveness has an effect on social favourability, with people who are more attractive receiving preferential treatment over those who are less attractive (Zebrowitz & Montepare, 2008). It was also found that attractive people were perceived to have more positive characteristics than those deemed to be less attractive (e.g., Heilman & Stopeck, 1985; Langlois et al., 2000), and that there is a link between facial attractiveness of people and other non-appearance based metrics of attractiveness, with attractive people earning more money than unattractive people (Hamermesh & Biddle, 1994). Hence, there is evidence that attractiveness can predict social favourability.

Furthermore, some research has found that autistic people have distinctive facial features that potentially could influence how they are perceived by others. For example, Ozgen et al. (2010) compared the physical features of 224 autistic children to 224 non-autistic children who were age and gender matched in pairs. They identified 48 characteristics in autistic children that are more common than in the non-autistic group, such as deeply set eyes, and thin upper lips.

However, the snapshots of the targets captured them as they were engaged in behaviour (Sasson et al.,2017), and while the images were static, they may nevertheless have given a clear indication of behaviour. For example, it could be assumed that the images depicted targets with expressive faces, and not with neutral expressions. Hence, it can be argued that the images that were taken from the social interaction event probably still held signals of behaviours. Hence it is inconclusive as to whether perceivers were making their judgments based on behavioural signals or appearance even with static images.

One way to further examine the role of expressive behaviour in social favourability judgments is to use static images of targets, which are deliberately selected by pre-testing to identify those that are more or less expressive. If social favourability judgments (and the correlation with readability) are grounded in expressive behaviour, the study predicts that the association between readability and social favourability would be diminished when using static images, but especially when the images are less expressive.

To summarise, the findings reported in Chapter 2 argued that autistic people were perceived as being less socially favourable because it is more difficult for others to read their expressions. An alternative explanation is that social favourability judgments are made simply on the basis of the target's general appearance. To examine this argument, this study aims to compare high and low expressivity images which were extracted from the target stimuli archive (Sheppard et al, 2016), determined by perceiver ratings on levels of expressivity. It is predicted that if it is the expressive behaviour is driving the relationship between readability and social

favourability, one would expect differences between autistic and non-autistic targets to diminished or be absent for low expressivity images, and moreover, one would expect the correlation between social favourability and readability to reduce/disappear in this context.

3.1 Stimuli development (static images)

The static images used in this study were extracted from the video clips reported in Chapter 2, which were taken from the archive created by Sheppard et al. (2016). Forty video clips (20 autistic people and 20 non-autistic people) were developed when participants were filmed within a testing room as they reacted naturally to the researcher's behaviour in one of four scenarios: joke, waiting, compliment and story. Allocation to the scenarios was done in an unbiased alternating fashion.

80 static images were extracted (2 images for each of the 40 target videos) using *i Movie software, version 10.1.6.* The images were 1006 pixels in width and 570 pixels in height. Because images extracted from the videos that were already edited at the point when targets were most expressive, it was difficult to find 'neutral' images. Therefore, the researcher extracted one image from the beginning of the video and other images were extracted at a later point, based on the researcher's subjective judgment at this stage (the researcher used his own judgment in order to choose more and less expressive images).

Subsequently, all 80 static images were presented to 14 non-autistic perceivers, who were asked to '*judge*' each image in on a 7-point scale of expressivity (ranging from 1 = 'not at all expressive' up to 7='extremely expressive') as a way of validating the researcher's subjective

judgment. All images were presented randomly in the *Psychopy2 application version 1.85*, which displayed each image for 5 seconds. The aim of this process was to correct any subjectivity of the researcher that may have occurred during image selection. The purpose of this stage was also to classify the chosen images; images that received the highest rating of expressivity would be classified as 'more expressive' and images that received the lowest rating of expressivity would be classified as 'less expressive'.

3.1.1 Results of judged expressivity

The researcher extracted two images from each target video, which yielded 80 images in total (given that there were 40 targets). Each of the two images were coded according to the expressivity value that they received from perceivers. This yielded 40 images which represented 'more expressive images' and 40 images which represented 'less expressive images. A paired samples *t* test was conducted for image type (more and less expressive images) as rated by perceivers. The analysis identified a significant difference between more expressive images (M= 4.40, SD= 1.14) and less expressive images (M=3.35, SD 1.67), t (39) =3.71, p=001, d=0.73.

3.2 Perceivers phase

The following sections detail how different image types ('more expressive' and 'less expressive') were presented to different groups of non-autistic perceivers, who were asked to rate each image on the social favourability scale used in Chapter 2.

3.2.1 Study 1: "more expressive" images

Thirty perceivers (5 males and 25 females) aged between 18 and 30 (M = 20.1 years, SD = 3.24) were recruited through the 'participant recruitment system' and advertisements at the University of Nottingham.

3.2.1.1 Stimuli

The more expressive images were used as stimuli in this study.

3.2.1.2 Procedure

The procedure for this study was approved by the School of Psychology Ethics committee, University of Nottingham (Ethics approval Number: S964). All 40 images were shown to each perceiver on a 15-inch MacBook Air, for 5 seconds each, and were presented at random using *PsychoPy2 version 1.85.2* (Peirce, 2007). Each perceiver was tested individually, and viewed each facial expression only once. After viewing each image, they rated it on nine social favourability dimensions, as described in Chapter 2, each on a scale from 1 to 6.

Perceivers saw the facial expression first, and then saw a further screen with all nine questions (willingness to talk to, awkwardness, attractiveness, intelligence, likeability, trustworthiness, dominance/submissiveness, self-esteem and empathy) appearing in a fixed order to avoid confusion from one trial to the next. Perceivers gave their rating to each question on a scale from 1 to 6, and rated questions from 1 to 9 in sequence: "How much would you like to talk to this person? How awkward is this person? How attractive is this person? How trustworthy is this person? How dominant is this person? How likable is this person? How intelligent is this person? How good is this person's self-esteem? How empathic is this

person?" No indication was given to the perceivers prior to the task that any of the individuals in the images were autistic. Following completion of the task, participants were debriefed and fully informed of the true purpose of the study.

3.2.1.3 Results and discussion

The aim of this study was to investigate whether autistic targets are perceived to be less socially favourable than non-autistic targets when ratings of favourability are based on more expressive static images. Perceivers rated each 'more expressive image' on nine social favourability scales. Ratings were averaged across all perceivers for each of these nine scales and within each target group. Mean ratings appear in Figure 3.1 (See Appendix 4, **Table 0-8** for mean and SD for each item).

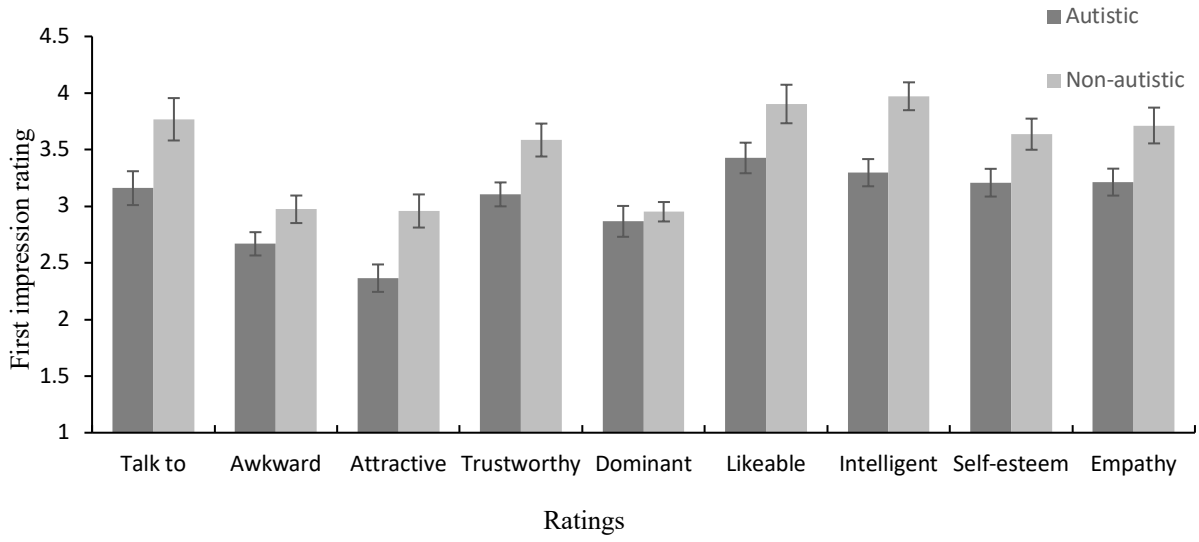


Figure 3.1. Ratings (1-6) by perceivers on nine dimensions of social favourability for autistic and non-autistic targets. Scoring for 'awkwardness' was reversed, such that a high rating was consistent with social favourability. The error bars represent the standard error of the mean.

Variable	1	2	3	4	5	6	7	8	9
1.Talk to	-	-.65	.82	.94	.27	.98	.71	.82	.95
2. Awkward	-	-	-.77	-.49	-.71	-.64	-.33	-.85	-.61
3. Attractive	-	-	-	.72	.55	.79	.61	.87	.75
4.Trustworthy	-	-	-	-	.13	.94	.81	.70	.96
5. Dominant	-	-	-	-	-	.27	.07	.69	.23
6. Likeable	-	-	-	-	-	-	.68	.81	.96
7. Intelligent	-	-	-	-	-	-	-	.56	.72
8. Self-esteem	-	-	-	-	-	-	-	-	.75
9. Empathy	-	-	-	-	-	-	-	-	-

Table 3-1. Inter-correlations between nine scales of social favourability, all significant at p < .05 (2-tailed) except dominant, which did not correlate with some other items p>05.

Bivariate Pearson correlations revealed a strong positive correlation among all nine social favourability factors $p<.05$, but 'dominant' was not correlated with "talk to", "trustworthy", "likeable", "intelligent" or "empathy" $p>.05$ (**Table 3-1**). 'Awkwardness' correlated negatively with all other items $p < .05$. Given the high correlations between the measures, a general 'social favourability' variable was derived from the sum of the averages of all nine scales (the reciprocal of the 'awkwardness' item was used). This was justified given the high correlations between measures, supported by the very high Cronbach's alpha of .88, indicating the strong internal reliability of the nine scales. Hence, it is possible to sum of the average of all nine scale to create one variable as was done in Chapter 2.

A 2 X 4 repeated measures ANOVA was conducted to assess the associations between groups and scenarios on the social favourability composite variable. A main effect of target group was found, $F(1,29) = 132.55$, $p < .001$, $\eta p2=0.82$, with autistic targets viewed less socially favourable than non-autistic targets. A main effect of each scenario was also found, with Greenhouse-Geisser correction due to violation of sphericity, $F(2.05,59.55) = 78.26$, $p <$

.001, ηp2=0.73. Post-hoc pairwise comparisons were conducted between the four scenario types, with a Bonferroni correction: the main effect of each scenario was driven by targets in the waiting scenario being rated significantly less socially favourable than those in all other scenarios ($p < .001$); there were no differences between the other three scenarios in how socially favourable targets were rated (See Appendix 4, **Table 0-9** for mean and SD for each condition).

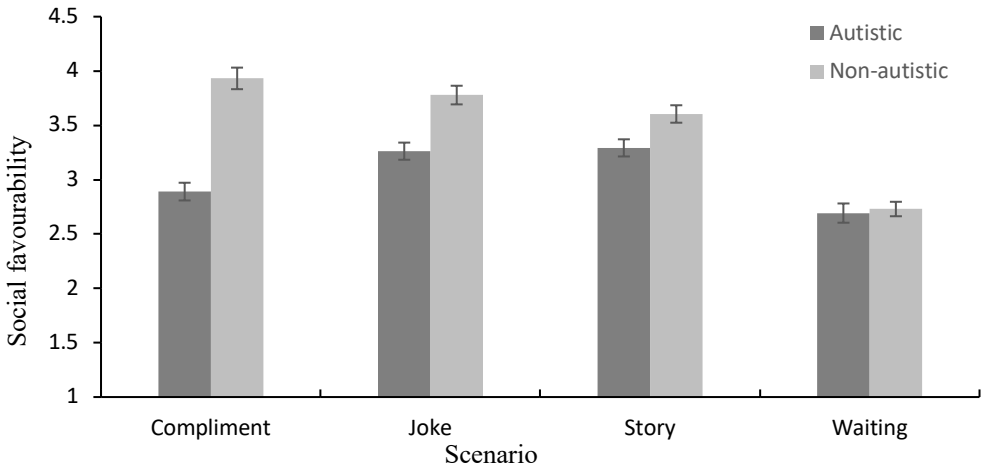


Figure 3.2. Perceivers' ratings of the social favourability of autistic and non-autistic targets who experienced one of the four scenarios. The error bars one standard error of the mean

A significant interaction effect (Figure 3.2) between groups and scenarios was also found, F (3,87) = 39.64, $p < .001$, ηp2=0.58, raising the possibility that perceiver ratings were more positive for one target group than the other, depending on the scenario. To explore this possibility further, four post-hoc paired-samples t tests were employed to compare participant performance across the two target groups for each scenario independently. Autistic targets were perceived less socially favourable than non-autistic targets in the compliment scenario t (29) =-11.40, $p < .001$, d = 2.07, joke scenario t (29) = -8.23, $p < .001$, d = 1.14, and story

scenario t (29) = -5.37, $p < .001$, d = 0.70. However, there was no significant difference between how socially favourable target groups were rated in the waiting scenario, t (29) = -0.54, p = .59, where both groups were rated relatively negatively. Reported p-values incorporate Bonferroni correction. In sum, it is notable that perceiver ratings of social favourability effectively discriminated between autistic and non-autistic targets in these more expressive static images, despite perceivers being given no indication that the targets formed two discrete groups according to clinical diagnosis.

A bivariate correlation was conducted between target readability (the same data from Sheppard et al., 2016 - see Chapter 2) and social favourability, as rated by perceivers using the static images (Figure 3.3). The waiting scenario was excluded for the same reasons identified in previous studies (Chapter 2). There was a positive relationship between target social favourability and target readability, r = 0.54, p = .002. A partial correlation, controlling for the target group (autistic or non-autistic), confirmed that the relationship between social favourability and readability survived, r = *0.*40, p = .033. Hence, it seems this correlation is not driven by the two target groups forming two distinct clusters located at either end of the regression line. After excluding the waiting scenario, a further analysis was conducted in order to investigate the correlation between readability and social favourability for each group separately. The correlation appeared for the autistic group, r = 0.52, p=.02, not for the non-autistic group, r = 0.22*,* p=.21.

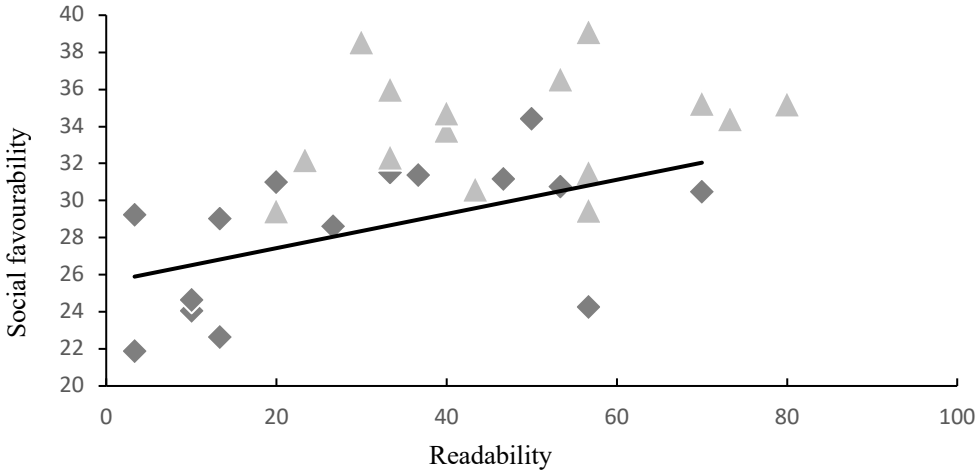


Figure 3.3. The correlation between readability and social favourability across autistic and non-autistic targets (waiting scenario excluded). The diamonds represent autistic targets and triangles represent non-autistic targets.

3.2.2 Study 2: "less expressive" images

Thirty perceivers (9 males and 21 females) aged between 18 and 30 (*M* = 24 years, *SD* = 4.16) took part in this study; none had participated in Study 1.

3.2.2.1 Stimuli

This study used the "less expressive" images to investigate whether autistic people are rated as unfavourable even when the targets appear as less expressive.

3.2.2.2 Procedure

Each perceiver viewed 40 images under the same conditions as the first study, and gave ratings using the same nine scales of social favourability.

3.2.2.3 Results and discussion

Perceivers rated each image on nine social favourability scales. Ratings were averaged across all perceivers for each of the nine scales and with each target group. Mean ratings appear in Figure 3.4 (See Appendix 4, **Table 0-10** for mean and SD for each item).

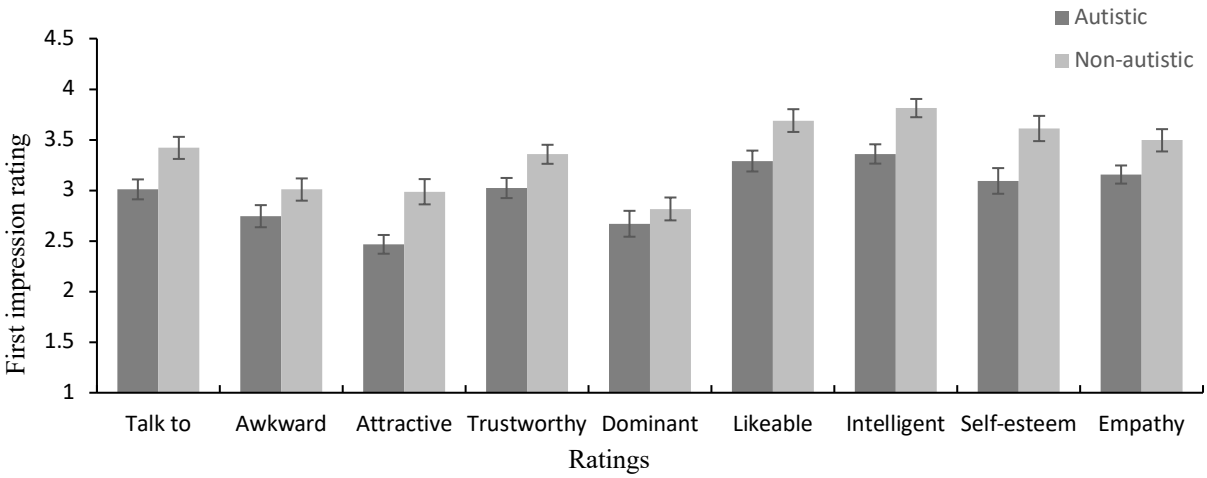


Figure 3.4. Ratings (1-6) by perceivers on nine dimensions of social favourability for autistic and non-autistic targets. Scoring for 'awkwardness' was reversed, such that a high rating was consistent with social favourability. The error bars represent the standard error of the mean.

A 2 X 4 repeated measures ANOVA was conducted to assess the effects of groups and scenarios on social favourability ratings. A main effect of the target group was found, F (1,29) = 82.77, $p < .001$, ηp2=0.74 with autistic targets being viewed less socially favourable than non-autistic targets. A main effect of each scenario was also found, F (3,87) = 53.62, $p < .001$, ηp2=0.65. Post-hoc pairwise comparisons were conducted between the four scenario types, with Bonferroni correction: the main effect of each scenario was driven by targets in the waiting scenario being rated significantly less socially favourable than those in all other scenarios ($p < .001$); there were no differences between the other three scenarios in how

socially favourable targets were rated (See Appendix 4, **Table 0-11** for mean and SD for each condition).

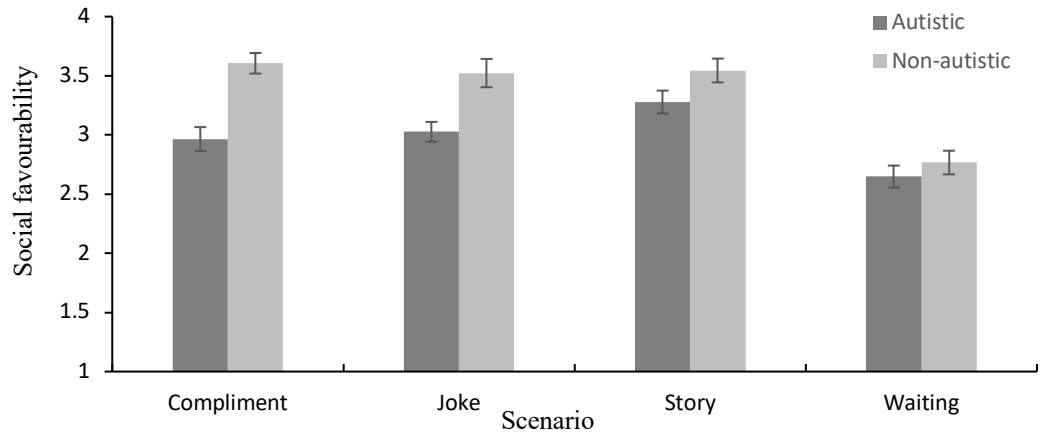


Figure 3.5. Perceivers' ratings of the social favourability of autistic and non-autistic targets. Each target participated in one of four scenarios. The error bars represent one standard error of the mean.

A significant interaction effect (Figure 3.5) between groups and scenarios was also found, F (3,87) = 11.98, $p < .001$, ηp2=0.29, raising the possibility that perceiver ratings were more positive for one target group than the other, depending on the scenario. To explore this possibility, four post-hoc paired-samples t tests were employed to compare participant performance across the two target groups for each scenario independently. Autistic targets were perceived less socially favourable than non-autistic targets in the compliment scenario t (29) =-7.44, $p < .001$, d = 1.22, joke scenario t (29) = -5.95, $p < .001$, d = 1.06, and story scenario t(29) = -6.04, $p < .001$, d = 0.47. However, there was no significant difference between how socially favourable target groups were rated in the waiting scenario, t (29) = -1.82, p = .08, where both groups were rated rather negatively. Reported p-values follow a Bonferroni correction. In summary, although perceivers were not given an indication that some targets

were autistic, they were effectively able to discriminate between autistic and non-autistic targets, even in less expressive static images.

A bivariate correlation was conducted between target readability (the same data from Sheppard et al., 2016, also presented in Study 1) and social favourability as rated by perceivers based on the static images and converted to one variable from sum of the nine scales of social favourability (Figure 3.6). The waiting scenario was excluded, for the same reasons identified in previous studies (Chapter 2). We found a positive relationship between target social favourability and target readability, $r = 0.40$, $p = .03$. A partial correlation controlling for target group (autistic or non-autistic) was, $r = 0.20$, $p = .31$. Hence, the correlation does not remain significant when the group is partialled out. After excluding the waiting scenario, a further analysis was conducted in order to investigate the correlation between readability and social favourability for each group separately. The correlation was not significant for the autistic group, $r = 0.32$, $p=.11$, or for the non-autistic group, $r = 0.02$, $p=.94$.

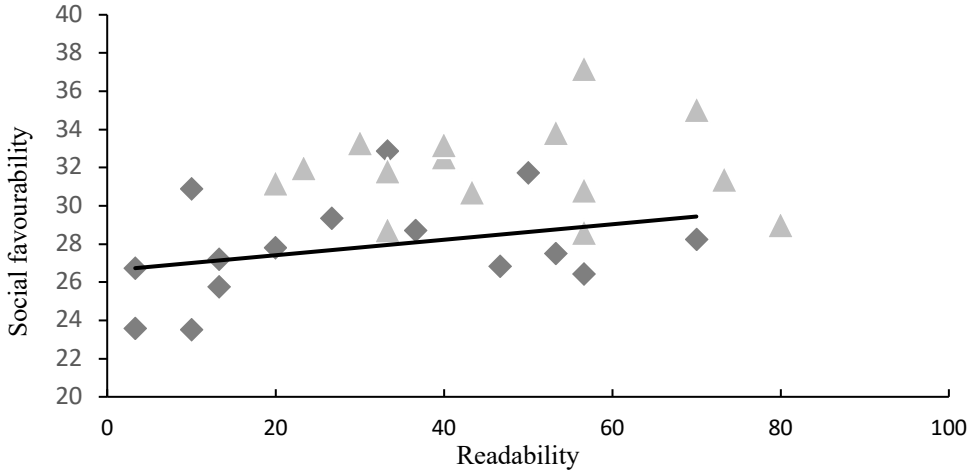


Figure 3.6.The correlation between readability and social favourability across autistic and non-autistic targets (waiting scenario excluded). Diamonds represent autistic targets and triangles represent non-autistic targets.

3.3 General discussion

When reporting the previous findings in Chapter 2, it was interpreted that the association between readability and social favourability was due to the target's expressions/behaviour. However, it is plausible that social favourability judgments might rely more on the physical appearance of the targets. Hence, the aim of the research was to explore the role that expressive behaviour plays in target social favourability judgments. The study used two types of static images, which were assumed to dramatically reduce the amount of expressive behvaiour available to perceivers compared with the use of dynamic videos. Moreover, the two types of image varied in their level of expressiveness (as judged by others). The findings revealed that autistic people were judged to be less favourable by non-autistic perceivers across the two studies (when they appear 'more expressive' and 'less expressive'), showing that this effect is robust across a range of methodologies and stimuli. As in Chapter 2, the effect sizes for these

group differences were large implying that scale of the differences were not trivial. The findings also have shown that perceivers rated those individuals in the waiting scenario lower than those individuals in other scenarios.

The findings here replicate those of Sasson et al. (2017), who found that autistic people were perceived as less favourable, even when the rating of favourability was based on static images. However, similar to the first study here, Sasson et al.'s. (2017) static images were taken from videos of social interactions so may still have contained many cues to expressive behaviour, rendering it unclear the extent to which judgments were based on behaviour versus appearance alone. In study 2 images were used that were pre-judged to be less expressive yet the same effect still occurred, in which perceivers discriminated between autistic and non-autistic people. This might suggest that perceiver judgments of social favourability are founded on appearance as opposed to expressive behaviour.

However, the findings from the correlations with readability suggest that other explanations might be warranted. It was possible to take the readability values for each target from previous research (Sheppard et al., 2016) as was done in Chapter 2, in order to determine whether or not there was a connection between the current ratings of social favourability based on static images in each study. The findings have shown that the connection between readability and social favourability was apparent across both studies (for both groups and for each group separately). This is surprising as one would expect the correlation to disappear – at least within Study 2 – if judgments were based only on appearance. One possible interpretation

of this is that perhaps even the less expressive images were somewhat expressive. Consistent with this, is the evidence from the waiting scenario where both target groups were perceived less socially favourable when compared to other scenarios across both studies. This implies that participants were still making judgments based on behavioural cues to some degree for the static images.

Nevertheless, the ratings of social favourability decreased slightly in study 2 (‘less expressive’ images), suggesting that social favourability may be linked to how expressive a target is even within static photos. Moreover, the connection was slightly diminished in study 2, suggesting that manipulations of expressivity of the targets may have had some impact on the association between readability and social favourability. By extrapolation, this raises the possibility that perceivers may not be unable to discriminate between target groups and the correlation between readability and social favourability might disappear if images were completely expressionless.

However, in reality creating face stimuli that are devoid of any expression may be impossible. Studies have shown that non-expressive faces can convey meaning through their expression. For example, Lee et al. (2008) found that in some situations, "neutral" faces tended to be rated as negative. This calls into question whether faces are ever perceived as truly “neutral” as apparently the absence of any expression tends to be perceived rather negatively. Moreover, Albohn & Adams, (2020) examined whether earlier expressive information stays on a face in the form of emotion residue, and whether this effect alters trait assessments despite

overt attempts to portray a neutral appearance. The findings of three studies, posing neutral displays retained emotion residue from a prior expression. The impressions created by these normally "neutral" displays were strongly influenced by this residue. All in all it is unlikely to be practically possible to create totally neutral face stimuli.

The studies are consistent with physical appearance having a significant impact on how people perceive others, particularly when they are less expressive. However, this has only been inferred rather indirectly from the fact that autistic participants were still rated less favourably when behavioural cues were reduced as much as possible. Future research could investigate the impact of physical attractiveness more directly by asking a group of perceivers to specifically rate each target on physical attractiveness and then determining the extent to which rated physical attractiveness predicts judgments on the other trait dimensions. Although in this study we did ask perceivers to rate the targets on “attractiveness”, we did not specify that they should judge physical attractiveness alone, so it is not clear whether the high correlations between attractiveness and the other trait judgments are due to impact of physical attractiveness or due to perceivers considering general attractiveness to be about more than just physical appearance. It might also be beneficial to directly compare judgments of physical attractiveness from inexpressive photographs and video clips, to help understand the extent to which physical attractiveness judgments may be impacted by dynamic (behavioural) information.

CHAPTER 4: Do non-autistic people “like” or “dislike” autistic people?

4. Introduction

How autistic people integrate into society depends not just on their proclivity or ability to engage with others but also on the degree to which they are welcomed and accepted by other (mostly non-autistic) members of society. That is, good integration does not solely rest with the individual in their effort proactively to reach out but also rests with wider society to be receptive and open. Whether or not society acts in this way will depend on how they perceive the individual: Is the individual someone who is favoured and indeed liked by those in society? This is a pertinent question concern in light of recent evidence that suggests non-autistic individuals perceive autistic individuals unfavourably (The findings in Chapter 2; Sasson et al., 2017). In this context, the purpose of the current research is to investigate how autistic people are perceived by a sample of non-autistic individuals, to test the prediction that some are categorically disliked by a proportion of the non-autistic individuals. We will also test the prediction, following the findings in Chapter 2 that being categorically disliked by others is associated with emitting signals that are difficult for others to interpret (which could be taken as a sign of having a mind that is hard to read). A further aim will be to begin to shed light on factors that could explain why non-autistic people have negative perceptions of autistic individuals. The new knowledge generated by the research will potentially help us consider what steps (if any) can or should be taken to facilitate autistic people’s integration into society.

The key research leading up to our inquiry measured the expressed willingness of non-autistic people to interact with autistic individuals after seeing them in a brief video clip (Sasson et al., 2017). Participants (targets) were videoed while doing a short (60-second) mock audition. Half of them were autistic and half were non-autistic. Subsequently, a further group of participants (perceivers) watched the videos and rated (from 0-3) the targets on ten dimensions of social favourability. In doing so, even though perceivers were not informed that some targets were autistic, their ratings effectively nevertheless discriminated between autistic and non-autistic targets. Specifically, perceivers rated non-autistic targets more favourably, indicting stronger willingness to interact with the non-autistic than with the autistic targets.

The tendency for non-autistic perceivers to rate autistic targets less favourably is robust across different groups of perceivers experiencing different kinds of briefing (e.g., Sasson & Morrison, 2019), across different samples of target behaviour (e.g., Morrison et al., 2019b), across different rating scales and across different question wordings (The findings in Chapter 2; Belcher et al., 2021). These social favourability ratings of autistic people are largely accounted for by stigma-related beliefs on the part of non-autistic observers (Morrison et al., 2019a) as opposed to social skills (or other characteristics) of autistic people themselves (Morrison et al., 2020).

Moreover, favourability ratings by perceivers are associated with the readability of signals emanating from targets. Specifically, targets whose behaviour is rather easy to interpret tend to be rated more favourably by perceivers, while targets whose behaviour is hard to interpret

tend to be rated less favourably by perceivers (see findings in Chapter 2). Although this association is transdiagnostic (meaning that it maintains independently of whether targets are or are not diagnosed with autism), one possible explanation is that because the behaviour of autistic targets is difficult for non-autistic perceivers to interpret, non-autistic perceivers are likely to give unfavourable ratings to autistic targets. Hence, autistic people are misperceived quite broadly, both in how their behaviour is interpreted (with misunderstanding) and how it is evaluated (negatively).

In addition to being associated with the readability of a target's behaviour, social favourability ratings are also known to be influenced by the target's physical attractiveness. Physical attractiveness has been found to impact liking of romantic partners (Walster et al., 1966) as well as within numerous other settings (e.g., Horai et al., 1974; Adams, 1977). In Chapter 3 we attempted to examine the role of physical attractiveness in liking of autistic and non-autistic targets by utilising static photograph stimuli where behavioural cues should be largely absent. However, the results were ambiguous: while the differences between autistic and non-autistic targets in social favourability remained supporting the possibility that physical attractiveness was driving social favourability judgments, the correlations between social favourability and readability also were retained. This suggests that even with photographs some behavioural cues (associated with readability) must have remained. Consequently, it would be useful to further examine the basis for participants' liking judgments of autistic targets.

The purpose of the current research is to investigate the scope of negative perceptions of autistic people. Specifically, if autistic people are evaluated unfavourably by non-autistic people only to a mild degree, then perceivers might not go as far as to judge categorically that they dislike those targets who (unknown to the perceivers) have been diagnosed with autism. Considering it is possible to grade targets slightly more or less positively by a matter of degree, it does not necessarily follow that perceivers would categorically dislike autistic targets: They could still 'like' the targets they have graded as being slightly less favourable. There is good reason, therefore, to test the prediction that autistic targets, more often than non-autistic targets, will be judged categorically as unlikeable, as this is a prediction that in principle is open to falsification. Yet being actually disliked by others could have very different— and more negative—consequences than being viewed positively but less favourably than others. Previous research has suggested that liking and disliking have differential effects on observed behaviour (Jordan, 1965). Hence asking participants to make a fixed choice between liking and disliking could yield different information than using a scaled evaluation of liking alone.

If it should be the case that autistic targets are liked by significantly fewer non-autistic perceivers than are non-autistic targets, then it will be informative to investigate the correlation between the number of likes a target attracts across perceivers and the mean favourability ratings targets receive. This will illuminate whether relatively low favourability ratings from perceivers are tantamount to judgments that perceivers dislike the target. In addition, we will investigate which social favourability factors tend to be selected by perceivers in coming to

their judgment that they dislike the target. Finally, the study presents an opportunity to investigate the correlation between target likeability and readability. Do targets who receive 'likes' from relatively few perceivers tend to be the same targets whose behaviour is difficult for perceivers to read? We already know that the readability of signals in target behaviour is related with how favourably they are viewed by perceivers (See the findings reported in Chapter 2). If that relationship is robust, then it will also be apparent when perceivers are making categorical judgments of whether or not they like the target.

4.1 Method

4.1.1Stimulus Development

The videos used in the study were developed by Sheppard et al. (2016). Target participants were filmed in a room as they reacted naturally to the researcher's behaviour in one of four greeting scenarios (joke, waiting, compliment and story), determined at random. Procedures, including details of how videos were edited, have been detailed previously (Sheppard et al., 2016).

4.1.2 Participants (Targets)

The 40 targets, aged between 13 and 21 (M = 15.4 years) are described in Sheppard et al. (2016). Briefly, they were recruited from educational establishments and all were native English speakers. Twenty were autistic, as evaluated by mental health professionals according to DSM-IV criteria (American Psychiatric Association, 2013). All targets were undertaking basic or advanced level secondary or tertiary education courses. All were male Caucasians and the two groups were matched for chronological age.

4.2 Study 1

4.2.1 Participants (perceivers)

Thirty perceivers (5 males and 25 females) aged between 18 and 27 (M = 19.57 years, SD = 2.42) were recruited through the 'participant recruitment system' and advertisements at the University of Nottingham.

4.2.2 Procedures

The procedure was approved by the School of Psychology Ethics committee, University of Nottingham (Ethics approval Number: S964). All 40 target videos were shown to each perceiver using Qualtrics survey software, presented in a random order. Each perceiver (tested individually) viewed each video once only, played on a loop until the perceiver had finished responding. Perceivers rated each target on a likeability question "Do you like/ dislike this person?" by clicking one of two options (like or dislike) and then they were asked to rate each target on nine social favourability dimensions on a scale from 1 (low) to 6 (high), which appeared in fixed order to avoid confusion from one trial to the next (see Chapter 2; Sasson et al., 2017). These were: "How much would you like to talk to this person? How awkward is this person? How attractive is this person? How trustworthy is this person? How dominant is this person? How likable is this person? How intelligent is this person? How good is this person's self-esteem? How empathic is this person?" In the same screen perceivers were asked to indicate which of the nine items were most important in making a decision on whether they like/ dislike the person. Participants could check as many boxes as they felt appropriate and were not asked to give any indication of the relevant importance of the items they checked.

Following completion of the task participants were debriefed and fully informed of the true purpose of the study.

4.2.3 Data handling

The researcher analyzed the data using SPSS version 26. All perceivers made judgments about all targets and there were no missing values. To determine the degree to which non-autistic individuals like autistic people, the researcher counted likes (out of 30) which each target received from the 30 perceivers. Number of likes was then subjected to a 2 X 4 analysis of variance, with within-participants factors of target group (autistic or non-autistic) and greeting scenario (compliment, joke, story, or waiting). These were followed up by Bonferroni corrected pairwise comparisons and *post hoc t*-tests (with Bonferroni corrected alpha level of 0.0125, to allow for multiple comparisons). The social favourability index was the average rating across the nine social favourability scales for each target, as rated by the 30 perceivers (previous research in Chapter 2 has established that the nine scales are underpinned by a single factor). The study used correlations to examine the relationship between number of likes and social favourability. It also calculated frequency counts for perceivers endorsing each of the social favourability items as justifications for liking/disliking targets for each study. All other analysis relates to social favourability and readability is typically the same as did in previous Chapters.

4.2.4 Results & Discussion

To determine if non-autistic people categorically dislike autistic people, we counted likes (out of 30) that each target received from the 30 perceivers (Figure 4.1). A 2 X 4 ANOVA was

conducted on target likeability, with the factors target group (autistic or non-autistic) and greeting scenario (compliment, joke, story or waiting). A main effect of target group was found, $F(1,29) = 38.88$, $p < 0.001$, ηp2=0.57, with autistic targets ($M = 15.37$, $SD = 1.35$) receiving fewer likes than non-autistic targets ($M = 21.68$, $SD = 0.97$). A main effect of scenario also was found, $F(3,87) = 110.04$, $p < 0.001$, ηp2=0.79. Post-hoc pairwise comparisons were conducted between the four scenario types based on frequency of likes, with Bonferroni correction: the main effect of scenario was driven by targets in the waiting scenario being categorized significantly less likeable than those in all other scenarios, $p<.001$ (See Appendix 4,**Table 0-12** for mean and SD for each item).

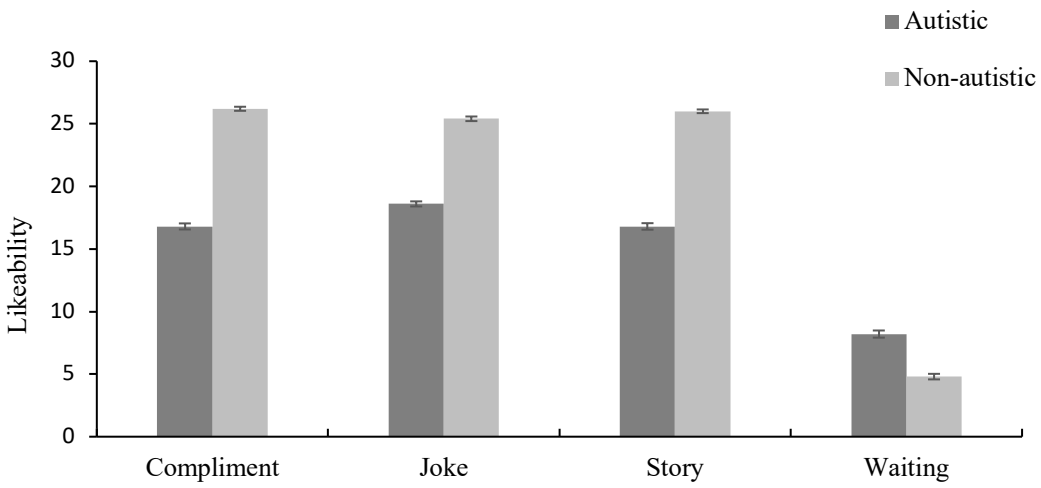


Figure 4.1. Number of 'likes' (out of 30) received by autistic and non-autistic targets. Each target participated in one of four scenarios. The error bars represent one standard error of the mean.

A significant interaction effect between group and scenario was also found, $F(3,87) = 27.38$, $p < 0.001$, ηp2=0.49, raising the possibility that perceiver ratings were more positive for one target group than the other, depending on the scenario. To explore this possibility, four post hoc paired-samples *t* tests were employed to compare participant performance across the

two target groups for each scenario independently. Autistic targets received fewer likes from perceivers compared with non-autistic targets in the compliment scenario, t(29) = -5.63, $p <$ 0.001, $d = 1.03$, Joke scenario, $t(29) = -8.93$, $p < 0.001$, $d = 1.63$, and story scenario $t(29) = -5.96$, $p < 0.001$, $d = 1.09$. However, there was no significant difference between target groups in the waiting scenario, $t(29) = 2.48$, $p = 0.02$, $d = 0.45$, where both groups received equally few 'likes', although there was a trend towards autistic targets being preferred in this scenario. Reported *p*-values are following Bonferroni correction.

Having established in previous research (See Chapter 2) that the nine social favourability scales relate to a single underlying factor, we averaged perceiver ratings across these scales. Figure 4.2 summarizes the relevant data, taking into account the target group (autistic or non-autistic) and the greeting scenarios experienced by targets. A 2 X 4 repeated measures ANOVA assessed the associations between group and scenario in relation to perceiver ratings of social favourability. A main effect of target group was found, $F(1,29) = 56.64$, $p < .001$, $\eta p2=0.66$, with autistic targets viewed less favourable than non-autistic targets. A main effect of scenario was also found, Greenhouse-Geisser corrected due to violation of sphericity, $F(2.20,64.05) =112.95$, $p < .001$, $\eta p2=0.80$. Post-hoc pairwise comparisons were conducted between the four scenario types, with Bonferroni correction: the main effect of scenario was driven by targets in the waiting scenario being rated significantly less socially favourable than those in all other scenarios ($p < .001$); there were no differences between the other three scenarios in how

socially favourable targets were rated (See Appendix 4, **Table 0-13** for mean and SD for each condition).

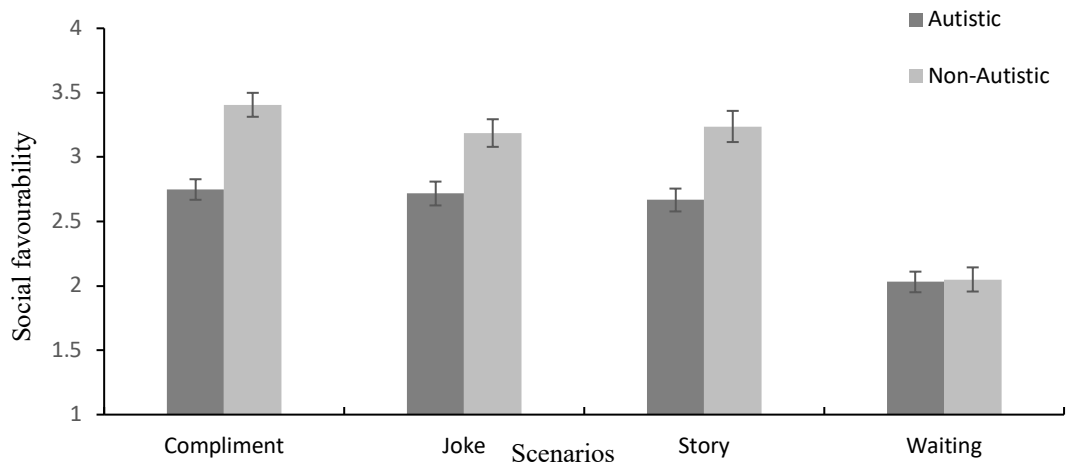


Figure 4.2. Perceivers' ratings of the social favourability of autistic and non-autistic targets. Each target participated in one of four scenarios. The error bars represent one standard error of the mean.

A significant interaction effect between group and scenarios was also found, $F(2.23,64.59) = 18.12$, $p<001$, $\eta p2=0.39$. To explore this, four post hoc paired-samples *t* tests were employed to compare participant performance across the two target groups for each scenario independently. Autistic targets were perceived less socially favourable than non-autistic targets in the compliment scenario $t(29) = -7.58$, $p < .001$, $d = 1.39$, Joke scenario $t(29) = -6.49$, $p < .001$, $d = 0.87$, and story scenario $t(29) = -5.40$, $p < .001$, $d = 0.96$. However, there was no significant difference in how socially favourable target groups were rated in the waiting scenario, $t(29) = -0.39$, $p = .70$, where both groups were rated rather negatively. Reported *p*-values are following Bonferroni correction.



Figure 4.3. The frequency count of social favourability items selected by perceivers when justifying their categorical judgment that they like/dislike the target, irrespective of target clinical status.

Why are non-autistic perceivers more likely to judge they categorically dislike targets when they are autistic compared to when they are non-autistic? To answer this question, we asked perceivers to indicate which of the nine social favourability items were most important in deciding whether they liked/disliked each target. Figure 4.3 shows the frequency counts for the two target groups combined, irrespective of whether the perceiver categorically judged they liked or disliked the target. Figure 4.4 shows the frequency count classified according to target status (autistic or non-autistic) and whether the perceiver categorically judged that they liked or disliked the target. The most common reason selected by non-autistic perceivers when judging autistic targets negatively related to the perceived awkwardness of the target, the second most common reason related to a desire not to talk to the target, the third related to the target appearing unlikeable (which might be a tautology) and the fourth related to the target's perceived ability (or lack of ability) to empathize. These justifications also appear as the top four when target groups and positive/negative judgments are combined (Figure 4.3).

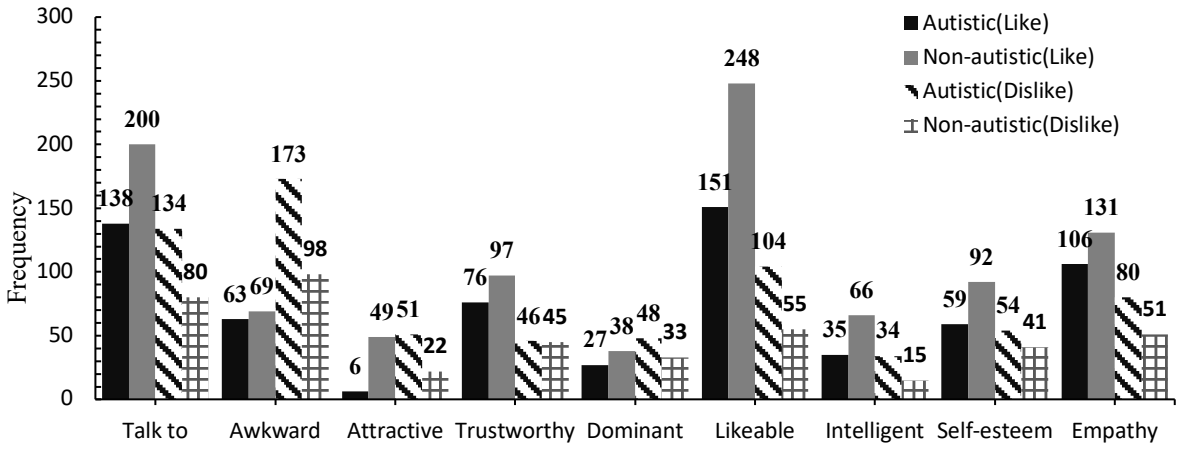


Figure 4.4. The frequency count of social favourability items selected by perceivers when justifying their categorical judgment that they liked or disliked autistic and non-autistic targets.

Is there a correlation between ratings of likeability and social favourability? We predict a strong relationship between these two variables and it is illuminating to know just how closely they are related, as in one case perceivers are invited to make a categorical judgment while in the other they are invited to make a graded rating. In principle, perceivers could conceivably rate autistic targets slightly less positively than they rate non-autistic targets by a matter of a (small) degree, while categorically judging autistic targets positively. However, if it should become apparent that graded judgments of social favourability correlate very closely with categorical judgments of likeability, then such graded judgments could assume considerable importance – they would effectively raise the possibility that a rather mild negative rating of a target is a basis for perceivers to judge that they categorically dislike the target.

In order to perform a correlation between likeability and social favourability, we created two variables, one as an index of likeability and one as an index of social favourability. The likeability index was composed of one value associated with each target. These values

represented the number of perceivers (out of 30) who judged categorically that they liked the target. The social favourability index was the average rating across the nine social favourability scales for each target, as rated by 30 perceivers. As stated above, we assume it is legitimate to reduce the nine social favourability scales to a singular variable, as previous research has established that the nine scales are underpinned by a single factor (See Chapter 2). There was indeed an extremely strong correlation between social favourability and likeability, $r = 0.94$, $p<001$, see Figure 4.5. Hence, when perceivers make a graded judgment about aspects of social favourability, this is informative as to whether the target will categorically be liked/disliked by a proportion of the perceivers.

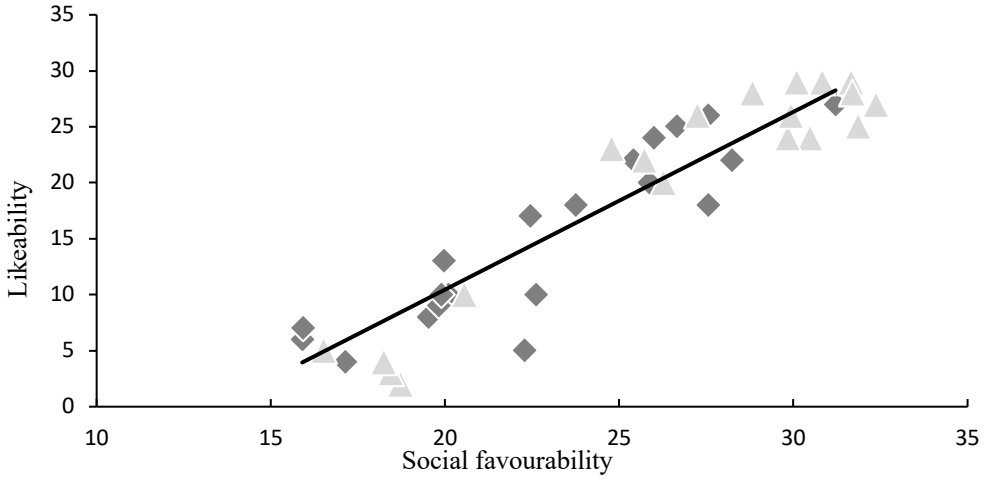


Figure 4.5. Correlation between likeability and social favourability across autistic and non-autistic targets. The diamonds represent autistic targets and triangles represent non-autistic targets.

In replication of the findings reported in Chapter 2, but using likeability rather than social favourability as a variable, we identified the correlation between target likeability (the number of times each target received a categorical 'like' from perceivers, out of 30) and target readability (using values extracted from data archived by Sheppard et al, 2016, following the

procedure reported in Chapter 2): $r = 0.57$, $p = .001$ (Figure 4.6). Here, the 'waiting scenario' was excluded for reasons stated previously (see Chapter 2). When target group (autistic or non-autistic) was entered as a controlling variable in a partial correlation, the significant relationship between social favourability and readability survived, $r = 0.44$, $p = .02$. After excluding the waiting scenario, a further analysis was conducted in order to investigate the correlation between readability and social favourability for each group separately. The significant correlation appeared for the autistic group, $r = 0.49$, $p = .03$, but not for the non-autistic group, $r = 0.41$, $p = .065$.

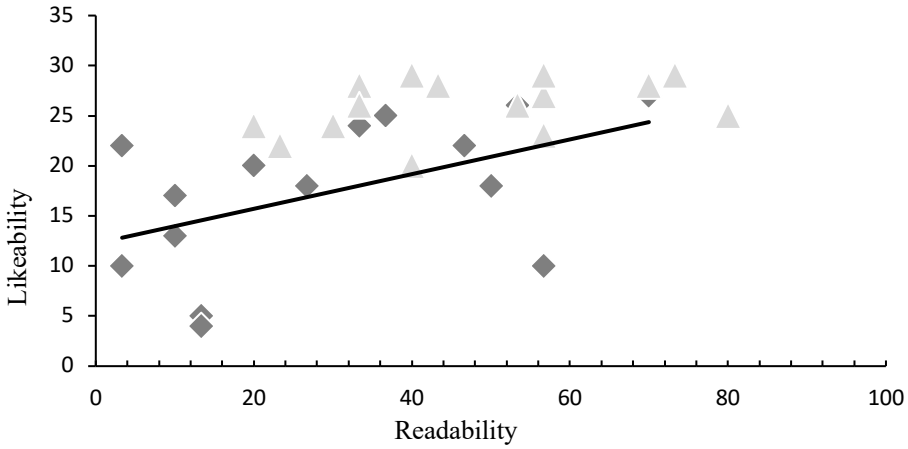


Figure 4.6. Correlation between readability and Likeability across autistic and non-autistic targets (waiting scenario excluded). The diamonds represent autistic targets and triangles represent non-autistic targets.

4.3 Study 2

Following the logic of Chapter 2, the second study offers a replication but with disclosure to perceivers of the particulars of the scenario each target was experiencing. Knowing what the target was reacting to might help perceivers decide which aspects of the targets's behaviour

were due to the situation and which are more reflective of an underlying trait. In theory, this should reduce noise in the measurement of social favourability.

4.3.1 Participants (perceivers)

Thirty perceivers (3 males and 27 females) aged between 18 and 20 (M = 18.73 years, SD = 1.14) took part; none had participated in Study 1. All were native English speakers.

4.3.2 Procedure

Each perceiver viewed the 40 target videos under the same conditions as in the first study, except they were informed which scenario each target was experiencing, and the name of each scenario appeared at the top of the screen as each video was displayed.

4.3.3 Results and Discussion

To determine if non-autistic people categorically dislike autistic people, we counted likes (out of 30) that each target received from perceivers (Figure 4.7). A 2 X 4 ANOVA was conducted on target likeability, with the factors target group and scenario. A main effect of target group was found, $F(1,29) = .27.64$, $p < .001$, $\eta p2 = 0.49$, suggesting that autistic targets received fewer 'likes' (M=17.15, SD=1.11) than non-autistic targets (M=21.30, SD=0.11). A main effect of scenario also was found, $F(3,87) = .37.81$, $p < .001$, $\eta p2 = 0.57$. Post-hoc pairwise comparisons were conducted between the four scenario types based on frequency of likes, with Bonferroni correction: the main effect of scenario was driven by targets in the waiting scenario being categorized significantly less likeable than those in all other scenarios, p=.001 (see Appendix 4, **Table 0-14** for mean and SD for each item).

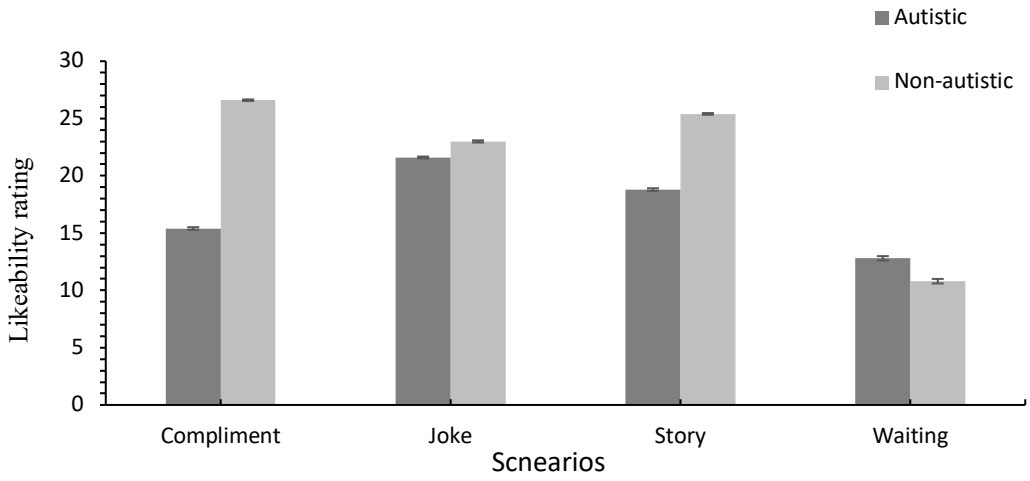


Figure 4.7. Number of 'likes' (out of 30) received by autistic and non-autistic targets. Each target participated in one of four scenarios. The error bars represent one standard error of the mean.

A significant interaction effect between group and scenario was also found, $F(3,87) = 19.25$, $p < .001$, $\eta p2 = 0.40$. raising the possibility that perceiver ratings were more positive for one target group than the other, depending on the scenario. To explore this possibility, four post hoc paired-samples *t* tests were employed to compare participant performance across the two target groups for each scenario independently. Autistic targets received fewer likes from perceivers compared with non-autistic targets in the compliment scenario, $t(29) = -8.35$, $p < .001$, $d = 2.08$, and story scenario $t(29) = -4.85$, $p < .001$, $d = 0.24$. However, there was no significant difference between target groups in joke scenario $t(29) = -1.27$, $p = .21$, and waiting scenario, $t(29) = 1.04$, $p = .31$. Reported *p*-values are following Bonferroni correction.

Figure 4.8 summarizes the averaged social favourability ratings received by targets, taking into account the target group (Autistic or Non-autistic) and the type of greeting scenario experienced by the targets. A 2 X 4 repeated measure ANOVA identified a main effect of target group, $F(1,29) = 61.10$ $p < .001$, $\eta p2 = 0.68$, with autistic targets viewed less favourable than non-autistic targets. A main effect of scenario was also found, Greenhouse-Geisser corrected due to violation of sphericity, $F(2.15, 62.27) = 56.69$, $p < .001$, $\eta p2 = 0.66$. Post-hoc pairwise

comparisons were conducted between the four scenario types, with Bonferroni correction: the main effect of scenario was driven by targets in the waiting scenario being rated significantly less socially favourable than those in all other scenarios ($p < .001$); there were no differences between the other three scenarios in how socially favourable targets were rated (See Appendix 4, **Table 0-15** for mean and SD for each item).

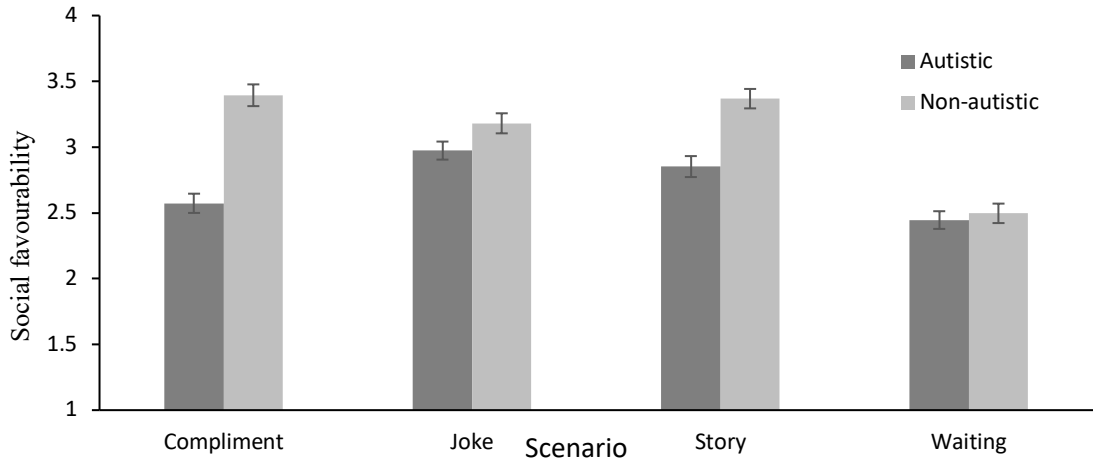


Figure 4.8. Perceivers' ratings of the social favourability of autistic and non-autistic targets. Each target participated in one of four scenarios. The error bars represent one standard error of the mean.

A significant interaction effect between target group and scenarios was found, F (2.86, 82.93) =29.68, p<001, ηp2=0.51, indicating that one group was rated more positively than another group, depending on the scenario. To explore this, four post hoc paired-samples *t* tests were employed to compare participant performance across the two target groups for each scenario independently. Autistic targets were perceived less socially favourable than non-autistic targets in the compliment scenario t(29) = -9.65, p < .001, $d = 1.93$, Joke scenario t(29) = -3.04, p < .001, $d = 0.53$, and story scenario (29) = -6.57, p < .001, $d = 1.21$. However, there was no significant difference in how socially favourable target groups were rated in the waiting scenario, t(29) = -0.16, p = .87, where both groups were rated rather negatively. Reported *p*-values are following Bonferroni correction.

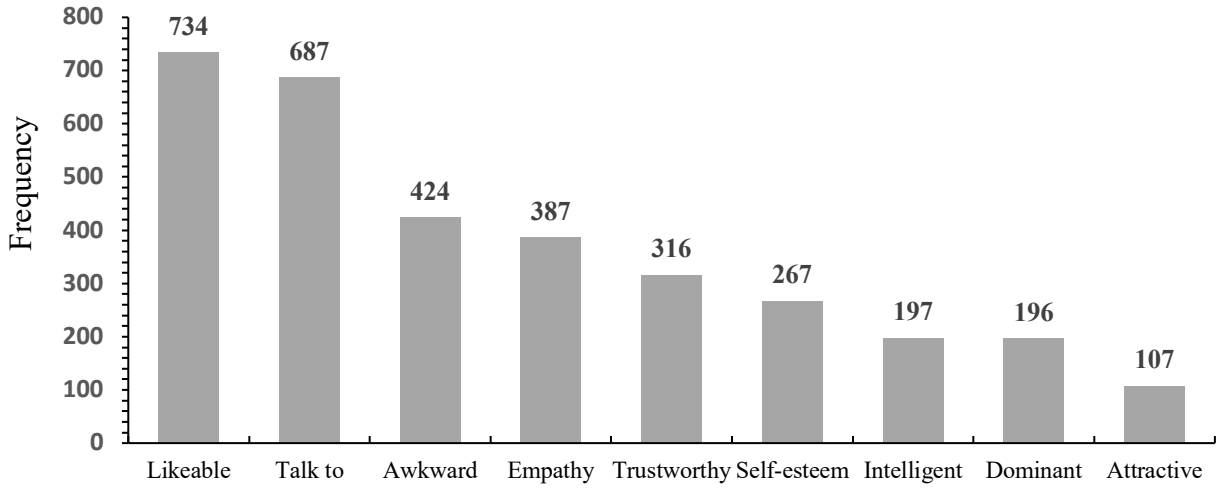


Figure 4.9. The frequency count of social favourability items by perceivers when justifying their categorical judgment that they like/dislike the target, irrespective of target clinical status.

As with Study 1, perceivers justified their categorical *judgments* of whether they liked or disliked each target by checking items from the social favourability scales (Figures 4.9 & 4.10). In replication of Study 1, the most common reasons selected by non-autistic perceivers when judging autistic targets negatively (Figure 4.10) related to the perceived awkwardness of the target (rank = third), the desire not to talk to the target (rank = first), the target appearing unlikeable (rank = second) and the target's perceived ability (or lack of ability) to empathize (rank = fourth). These justifications also appear as the top four when target groups and positive/negative judgments are combined (Figure 4.9).

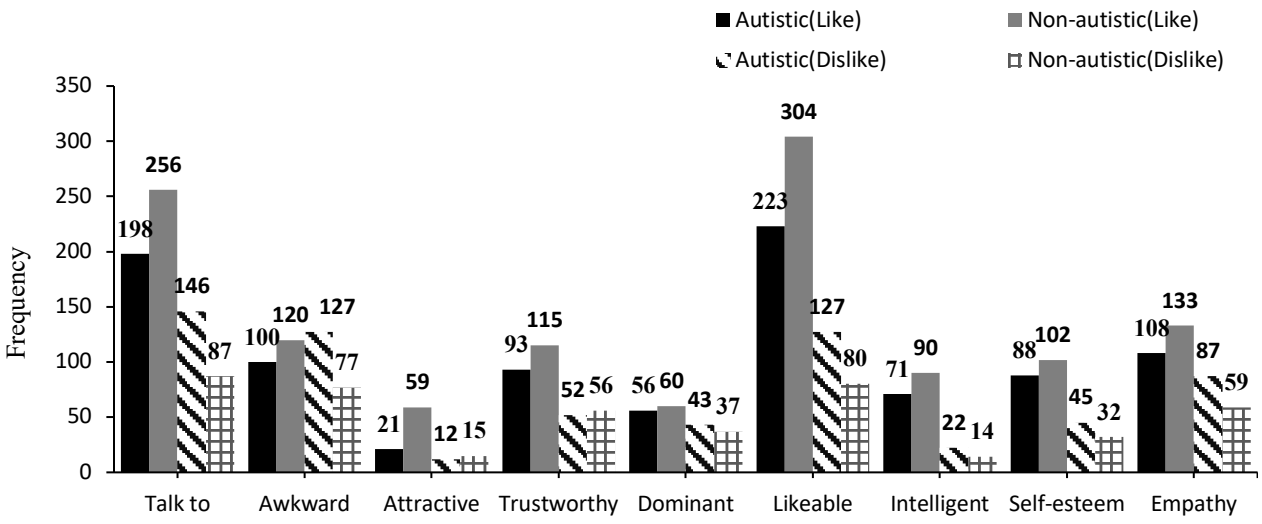


Figure 4.10. The frequency count of social favourability items selected by perceivers when justifying their categorical judgment that they liked or disliked autistic and non-autistic targets.

Is there a correlation between ratings of likeability and social favourability when scenarios were disclosed? In replication of Study 1, there was an extremely strong correlation between social favourability and likeability, $r=0.85$, $p<001$, see Figure 4.11. Apparently, when perceivers make a graded judgment about aspects of social favourability, this is informative as to whether the target will be categorically liked/disliked by a proportion of the perceivers.

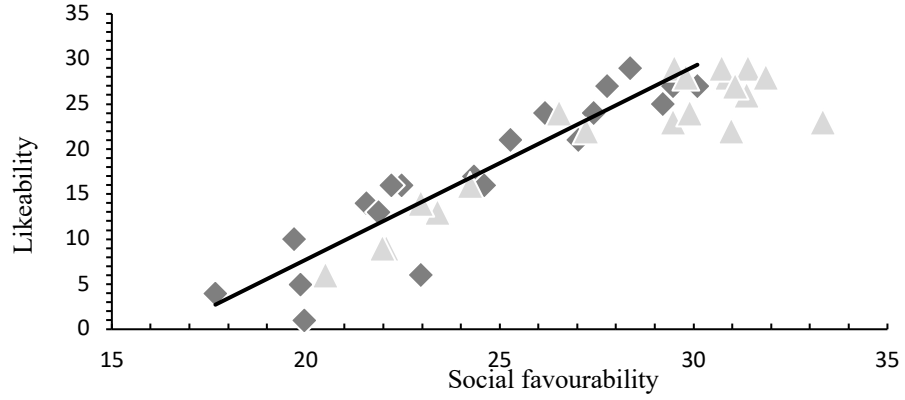


Figure 4.11. Correlation between likeability and social favourability across autistic and non-autistic targets. The diamonds represent autistic targets and triangles represent non-autistic targets.

In further replication of Study 1, there was a significant correlation between target likeability (categorical ratings by perceivers) and target readability, r = 0.66, p = .001 (Figure 4.12) 'waiting scenario' excluded for reasons stated previously). When target group (autistic or non-autistic) was entered as a controlling variable in a partial correlation, the significant relationship between social favourability and readability remained significant, r = 0.59, p = .001. After excluding the waiting scenario, a further analysis was conducted in order to investigate the correlation between readability and social favourability for each group separately. The correlation was significant for the autistic group, r = 0.71, p=.002, but not for the non-autistic group, r = 0.39, p=.073.

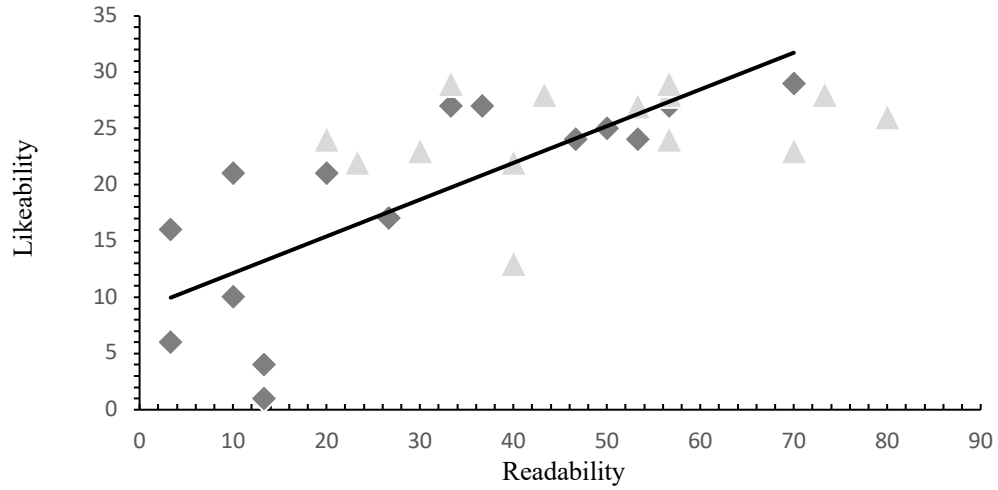


Figure 4.12. Correlation between readability and Likeability across autistic and non-autistic targets (waiting scenario excluded). The diamonds represent autistic targets and triangles represent non-autistic targets.

4.4 General Discussion

The findings replicate those of previous research and extend knowledge by informing us for the first time that non-autistic people are liable to judge that they categorically dislike

individuals who are autistic. This was true across scenarios aside from targets who were kept waiting, for whom both groups had a high tendency to be disliked, perhaps because they made overtly disagreeable reactions in this context. In replication of previous research (Sasson et al., 2017; the findings reported in Chapter 2), after watching a thin slice of behaviour captured in just a few seconds of video, non-autistic perceivers gave lower ratings of social favourability on average when viewing autistic targets than when viewing non-autistic targets. As in the preceding chapters, the effect sizes for these group comparisons were large, implying that the magnitude of this difference is meaningful. Presumably, the judgments were not due to any explicit prejudice against autistic individuals, as diagnosis was not disclosed; indeed, previous research (Sasson & Morrison, 2019) suggests that knowing that some targets are autistic is likely to have a discounting effect such that non-autistic perceivers give higher ratings of social favourability. Also, in replication of previous research (the findings reported in Chapter 2), how perceivers socially evaluated targets (positive or negative) correlated with how accurately (a different group of) perceivers interpreted signals in targets' behaviour: Targets who were rather easy to interpret tended to be evaluated positively by non-autistic perceivers while targets who were rather difficult to interpret tended to be evaluated negatively. Although this association maintained independently of the diagnostic classification of targets, a preponderance of autistic targets were nevertheless difficult for non-autistic perceivers to interpret and they were also evaluated negatively.

The findings of the current study take us into new territory by further illuminating the nature of non-autistic perceivers' negative evaluations of autistic targets. Specifically, perceivers were significantly more likely to judge categorically that they disliked the target when viewing an autistic individual than when viewing a non-autistic individual. This is a noteworthy finding in the sense that past research, showing that autistic targets were rated less positively than non-autistic targets by a matter of a small degree on social favourability scales, does not by this very fact imply that non-autistic perceivers would judge they categorically dislike autistic targets. And yet the new findings report here reveal a very strong association between being rated rather less socially favourable and being categorically disliked by non-autistic perceivers. These findings are noteworthy for two reasons. First, they suggest that a single likeability question may be sufficient to measure non-autistic people's first impressions of autistic and non-autistic targets. Second, they show that in some cases, non-autistic adults' judgments of lower social favourability are tantamount to judging that they dislike the person. This is important in that negative consequences (e.g., social exclusion, peer rejection, or bullying) may be particularly likely where an individual is actually disliked.

Because there is such a strong association between how targets are rated in social favourability and how many perceivers 'liked' (or 'disliked') them, it is informative to know which elements of social favourability perceivers felt were relevant to their judgment that they liked/disliked the target. In both studies, many perceivers selected a desire not to talk with the target which conceptually this is more likely to be a consequence of disliking the target as

opposed to a reason for disliking them, and many perceivers selected likeability, which arguably is merely a tautology. In addition, though, many perceivers also selected 'awkwardness' and '(lack of) ability to empathise.' Both of these could be quite revealing as possible traits in autism that are perceived unfavourably by non-autistic perceivers that leads to a feeling that the target is unlikeable.

This raises the question why these particular traits are considered to be so important when making decisions about liking/disliking a person. Indeed, it is rather striking that whether or not a person was awkward was deemed to be more important than whether the person was trustworthy, when arguably liking an untrustworthy person could lead to far more serious negative consequences than someone who is awkward. Future research could further explore why non-autistic individuals find (social) awkwardness aversive, and whether autistic people believe that awkwardness is less important when making likeability judgments. Previous research has found that although autistic people rate other autistic people more negatively than non-autistic individuals on various traits (including as more awkward), they expressed greater interest in making social connections with them (DeBrabander et al., 2019). This suggests that perceiving someone as awkward might not have the same social consequences for autistic people. Heasman and Milton (2019) argue that awkwardness may actually be viewed positively by some autistic people (himself included), emphasizing the relativistic nature of these impressions. This is consistent with the double empathy framework of autism (Milton, 2012) which proposes that apparent social disability in autism arises from mutual failures in

reciprocity and intersubjectivity between autistic and non-autistic people (who each have differing minds, perceptions, and experiences) as opposed to a ‘‘deficit’’ within autistic people.

The finding that ‘‘ability to empathize’’ was also deemed important to liking judgments appears consistent with the long-held view that autistic people lack empathy (Baron-Cohen & Wheelwright, 2004; Jones et al., 2010). However, this is a harmful misconception arising from limitations in the methodology and terminology used in previous research (Fletcher-Watson, Bird, 2020; Nicolaidis et al., 2018). While the current research does not shed any light on this matter, it does suggest that autistic people are perceived as lacking empathy and that this is associated with their being less liked. Notably 'attractiveness' was rarely cited as a reason for disliking targets, including autistic targets. This might suggest that perceivers do not believe they took physical appearance into consideration when making their judgments, although it is not possible to know whether perceivers interpreted this item as referring to physical attractiveness only.

It is important to acknowledge that participants’ claims about which factors they took into account when deciding whether they liked the target are subjective in nature. Perceivers may not be aware of what information influenced their judgments and could have been affected by unconscious biases. Or perceivers may not have been honest about the basis for which they made their decisions. Therefore, we cannot know for certain which traits perceivers really did rely on to make their judgments. Future research could probe participants further by asking them to verbally justify their judgments or talk through their decision-making process as they

view the videos. However, although this would yield richer information about what participants think they are taking into account when making their judgments, it would not circumnavigate the issue of subjectivity.

These findings raise the possibility that non-autistic people's (mis)perception of autistic individuals creates a barrier to autistic people being accepted in a society dominated by non-autistic people. In view of this, what steps can be taken to facilitate integration? In the past, researchers documented ways in which autistic people are different from the non-autistic majority and then sought to intervene with some treatment or therapy to render autistic people more similar to non-autistic people (Medavarapu et al., 2019). It is not always entirely clear whether the aim was to benefit autistic people by helping them to fit into society or whether the aim was to benefit the non-autistic majority by eliminating the need to adjust to diversity. However, diversity is not intrinsically a bad thing and one might argue that society would be enriched by embracing diversity. If so, then it could be worth considering what steps might be taken to enlighten the non-autistic majority about autism with the aim of reducing misperception, thus promoting tolerance and understanding. Indeed, Milton's (2012) double empathy account places responsibility at least partly on the non-autistic majority to adjust to the autistic minority.

What are the prospects of society (or the non-autistic majority) being receptive to the diversity imperative? After all, it could be that the non-autistic majority are devoid of any sympathy for the plight of autistic individuals. However, there is some evidence that challenges

such a pessimistic view. In the study of Sasson and Morrison (2019), when perceivers rated the social favourability of targets (some of whom were autistic), disclosing the diagnosis of targets had a dramatic discounting effect. Specifically, perceivers' rating became much more positive in relation to certain targets when informed they were autistic. The discounting effect of diagnostic disclosure was much stronger for autistic targets than for schizophrenic targets, suggesting that perceivers have a particular willingness to understand and accept autism. Contact and experience with autism, and even vicarious contact also appears to improve attitudes towards autistic individuals, at least in some circumstances (e.g., Engel & Sheppard, 2019; Sasson & Morrison, 2019). Hence, there is good reason to be optimistic that the non-autistic majority are open to diversity, especially where autism is concerned.

CHAPTER 5: Expressivity, readability, and autistic traits – exploring relationships between factors implicated in negative social perceptions of autistic people

5. Introduction

Many researchers have examined how well autistic people can read others' minds, with some findings indicating an apparent difficulty in this area (e.g., Baron-Cohen, 1995; Cassidy et al., 2015; Pillai et al., 2014). However, until very recently, previous research has largely ignored the question of how non-autistic people perceive autistic people, a question that relates to the Double Empathy Problem (DEP; Milton, 2012). Consistent with the DEP, research indicates that autistic people tend to be more difficult for non-autistic perceivers to read, by comparison with non-autistic individuals (Edey et al., 2016; Sheppard et al., 2016). Autistic people also tend to be rated less socially favorably by non-autistic perceivers, by comparison with other non-autistic people (e.g., Sasson et al., 2017), across different samples of target behaviour (e.g., Morrison et al., 2019), across different rating scales, and across different question wordings (see Chapter 2 and Belcher et al., 2021).

Past research (e.g., Anders et al., 2016) suggests that these two phenomena may be associated. Anders et al. (2016) established that non-autistic perceivers found other individuals (targets) more attractive (i.e., likeable), when they felt that they (the perceivers) were more accurate at reading their expressions. The study involved non-autistic perceivers who were asked to read the facial expressions of non-autistic targets (all female) who were expressing either sadness or fear. It was found that when perceivers felt they had correctly read the target's

mental states they were also attracted to (i.e., liked) that particular target. Anders et al. (2016) concluded that an individual who is less readable by others will be perceived as being less likeable. However, as this study focused only on perceived readability (rather than taking an objective measure, e.g., based on classification accuracy), the possibility remains that the effect was driven by a 'halo'-type effect (Nisbett & Wilson, 1977), whereby targets perceived as more attractive were simply perceived as being more readable, despite not actually being so.

Nevertheless, based on the findings of Anders et al. (2016), we questioned (in Chapter 2) whether there is also an association between being less readable and being viewed as less socially favourable (by non-autistic others) for autistic targets. They utilised natural videos of autistic and non-autistic targets taken from an earlier study by Sheppard et al. (2016) which had demonstrated that non-autistic perceivers were poorer at reading autistic targets. In the videos, targets reacted to one of four scripted event scenarios enacted by the researcher, such as telling a joke or paying the target some compliments. Non-autistic perceivers found it harder to guess which scenario the autistic targets responded to than the non-autistic targets, consistent with them being less readable. Using a methodology similar to Sasson et al. (2017), we found (in Chapter 2) that not only were the same autistic targets perceived as less socially favourable but there was a correlation between readability and social favourability. The correlation held even when controlling statistically for diagnostic status, implying a transdiagnostic effect.

While the findings of Chapter 2 are consistent with the possibility of an association between readability and social favourability, there were a number of limitations of the study, affecting the conclusions that could be drawn. First, in the videos taken from Sheppard et al.

(2016), each target only experienced one of four scenarios, and this was used as the basis for readability measurements. While this was not an issue in the original study (which focused on perceiver accuracy rather than characteristics of the target), it meant that measurements of target readability and social favourability were contaminated by scenario, making it challenging to compare scores for targets who did not happen to experience the same scenario. Secondly, it was not clear why the relationship emerged between readability and social favourability or indeed whether there is a direct causal relationship between these two variables. Anders et al. (2016) put forward a "reward" explanation for their findings, arguing that when a perceiver feels that they have accurately read the target, this creates a positive association towards that particular target, resulting in a feeling of liking. However, in relation to the findings of Chapter 2, other explanations are possible, as acknowledged by the authors. For instance, it could be that perceivers are less motivated to read targets who are less socially favourable such that lower readability is actually a consequence of lower social favourability as opposed to the reverse. Alternatively, it could be that some third variable impacts both readability and social favourability leading to an apparent association between the two.

A third variable that could plausibly impact both the readability and social favourability of a target is how expressive the target is in their behaviour. If a target is less expressive in their behaviour, then we can assume that they produce a weaker "signal" to be read, making it likely that perceivers would find it more difficult to interpret their behaviour. A less expressive target might also be perceived as less 'open', more secretive, or more introverted – and introverts also tend to be perceived less socially favourably (Riggio & Friedman, 1986). Hence

expressiveness might independently predict both readability and social favourability of targets, without there being any direct relationship between the two.

Some evidence suggests that autistic people are less expressive than non-autistic people, although findings are mixed. Apparently, autistic people produce facial expressions less frequently and for shorter duration than non-autistic people (e.g., Kasari et al., 1990; Loveland et al., 1994; Sekiguchi et al., 2003). A meta-analysis by Trevisan et al. (2018) revealed that autistic people are less likely to share facial expressions with others and tend not to imitate the expressions of faces or face-like stimuli. Elsewhere, however, autistic people are reported to be as expressive as non-autistic people during automatic imitation (Beadle-Brown & Whiten, 2004; Oberman et al., 2009; Press et al., 2010), and while retelling stories (e.g., Grossman & Tager-Flusberg, 2012). In addition, when the expression is based on real social interaction, autistic people are rated just as expressive as non-autistic people in different scenarios (e.g., Faso et al., 2015; Grossman et al., 2015; Macdonald et al., 1989; Sheppard et al., 2016). Therefore, the role of expressiveness in relation to readability and social favourability requires further investigation.

The research outlined in this paper aimed to model the relationship between readability and social favourability, overcoming some of the limitations of previous research in this area. Readability and social favourability of targets was measured over a range of scenarios, enabling a more comprehensive measure of each construct and allowing direct comparability between targets. Both actual readability (as in Sheppard et al., 2016) and subjective impressions of readability (as in Anders et al., 2016) were measured, allowing us to determine the relationship

between and contribution of each to social favourability scores. The perceived expressiveness of each target was also measured to explore the possibility that expressiveness might impact both readability and social favourability, or even account for any observed relationship between the two. Finally, we examined the impact of levels of autistic traits on all variables in the model (rather than autism diagnosis). In addition to allowing a larger sample of targets, this enabled us to determine whether those who have higher levels of autistic traits but no autism diagnosis may nevertheless face some of the challenges that diagnosed autistic people face.

We report a mediation analysis designed to examine the pattern of relationships between each of these factors to elucidate the mechanisms by which autistic traits may ultimately impact likeability and perceived social favourability. The study examines the a priori model displayed in Figure 5.1, which hypothesises that those high in autistic traits (i.e., with higher AQ scores) may be perceived less socially favourably because of three putative mediating factors—expressiveness, actual readability, and perceived readability.

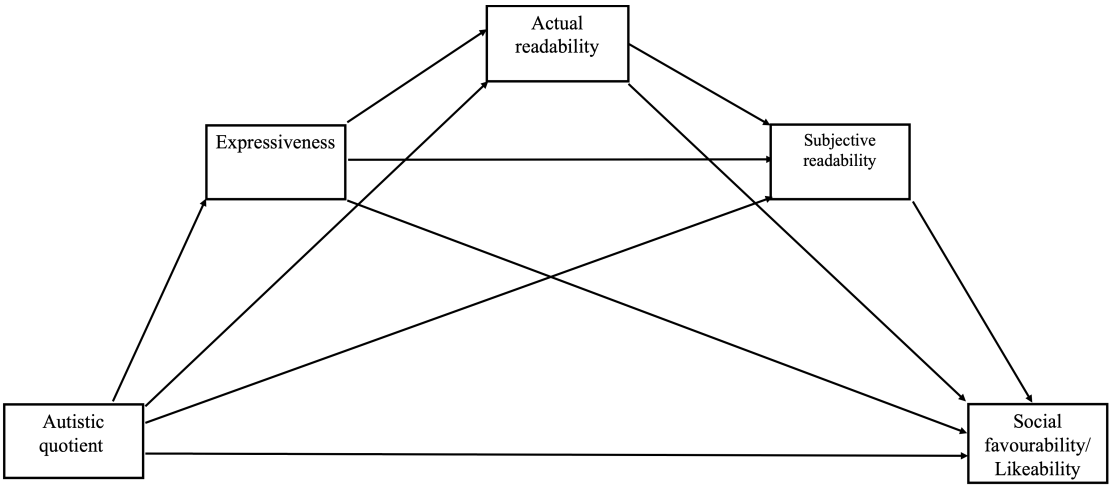


Figure 5.1. Mediation model positing predictor variables and outcome variables.

5.1 Methods[5]

The entire procedure was approved by the Ethics Committee, School of Psychology, University of Nottingham (Ethics approval number: S1178R). There was no community involvement in the reported study.

5.1.1 Stimulus development

In this stage we created video stimuli to be used in the main experiment. The participants (hitherto referred to as "targets") were secretly video recorded when they were responding to four different aspects of the researcher's behaviour. Further details appear below.

5.1.2 Participants (Targets)

A total of 60 targets were recruited (33 males and 27 females). Six males and three females disclosed that they had been formally diagnosed by a clinician as being autistic. Participants were recruited using the 'participant recruitment system' at the University of Nottingham, supplemented with advertisements at the University of Nottingham campuses. The majority of targets were White British (54), while there were 3 Black British, 2 Asian (one from China and another one from Malaysia) and one Brazilian. Specific information on socio-economic status was not recorded; however, all participants were University students. The researcher administered Wechsler Abbreviated Scales of Intelligence (Weschler, 1999) and details appear in **Table 5-1**. All participants completed the 50-item Autism Spectrum Quotient (AQ; Baron-Cohen et al., 2001) as a measure of autistic traits. The AQ variable was checked for normality.

[5] See the appendix 1(Pilot study A) for assessing a type of stimuli before the one used in this chapter .

The Shapiro-Wilk tests showed no evidence of deviation from normality (W(60)=.97, *p*=.16), indicating that the AQ score was normally distributed and that parametric tests could be utilized.

	Targets (N=60)
Category	Mean ± SD. (Range)
Age (Years)	19.48±1.68 (18-26)
Full-scale IQ	104.55±4.70 (92-115)
AQ	22.52± 9.22 (7- 46)

Table 5-1. Targets' characteristics.

5.1.3 Materials and apparatus

A room within the School of Psychology was used (See Figure 5.2). A Panasonic HC-W580 Camcorder (2.51 MP, FHD, Wi-Fi, 3-inch LCD) on a tripod was placed approximately 1.2m directly opposite the target's seating position, across the table. The camera was positioned so that the participant's face, neck, shoulders, and chest could be seen.



Figure 5.2. Layout of the testing room for targets.

5.1.4 Procedure

Each target arrived individually at the testing room and was asked if it would be okay to switch on the camera later to film them when it was time to do the main task of problem solving. In reality though, the camera was turned on before targets entered the room. Targets were asked to read the information sheet, which included, "The aim of this experiment is to investigate how people perform a taxing activity. You will be given a problem-solving task. When the time comes, I will switch on this camera to record how you tackle the problems". After the target sat down, the researcher provided the context (*the story scenario*); ***"Before we start, let me tell you a little bit about myself: I'm Rabi and I obtained my undergraduate degree from a school of education in Saudi Arabia, and then I was sent to the UK to study for my Masters and PhD. It is a great opportunity for me but the big problem I face is that it is very difficult to communicate with people because I use English as a second language and I'm from a different culture. Sometimes I feel quite isolated and lonely – it's difficult to make friends here"***.

Subsequently the researcher said ***"OK, let's start the task and I will turn the camera on."*** Then the target tackled the WASI, ending with Block Design. When he or she finished, the researcher pretended to switch off the camera and said (negative feedback scenario): ***"I can see you found this task (Block Design) really difficult. You took quite some time to complete the puzzles; most of the other participants performed this task much more quickly."*** The researcher paused for a few seconds, looking down and said (gift scenario): ***"Anyway, I very much appreciate your time and participation. As an extra 'thank you' I'd like to offer you a***

gift. I have something in this bag I wish to offer you." After offering the gift, the researcher paused for a few seconds looking at the target and said (debriefing scenario[6]): ***"You have been recorded by the camera for the whole time since you entered this room and the camera is still recording; now, I am going to switch off the camera."***

Targets were then fully debriefed about the true purpose of the study (i.e. to capture their natural expressions while interacting with the researcher and what their videos would be used for. All targets consented to the use of their videos. This phase of the study took approximately 40 minutes for each target, and participants were compensated with an inconvenience allowance or given course credit. Screenshots of the researcher enacting each scenario appear in Figure 5.3.

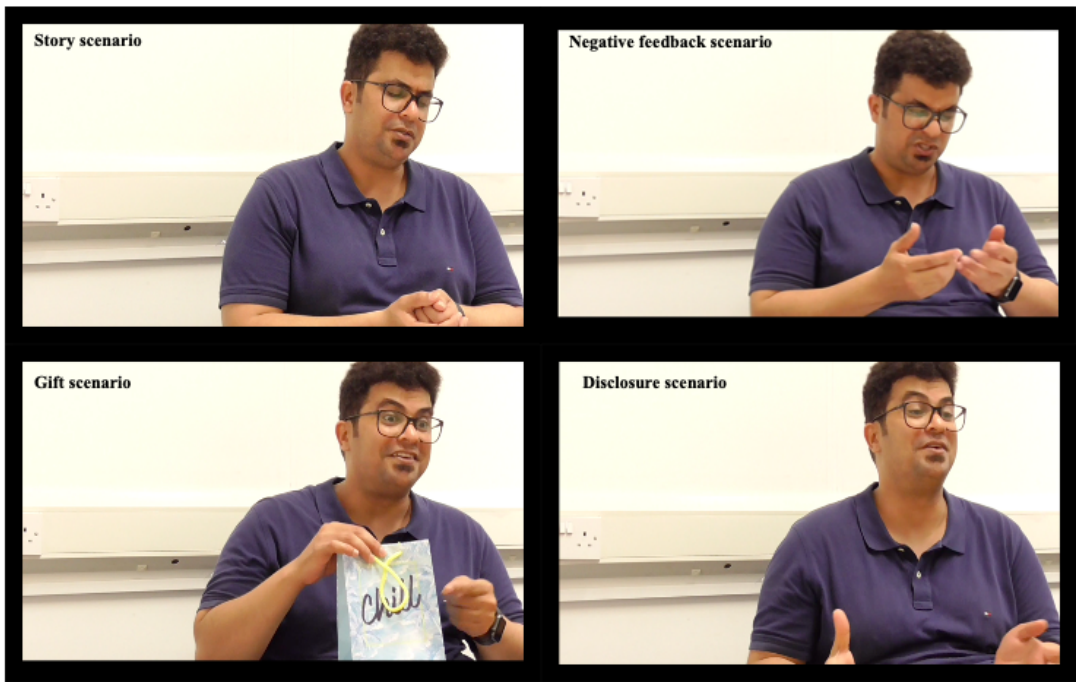


Figure 5.3. Sample screenshots of scenario enactment video clips.

[6] We called this the 'disclosure scenario' when carrying out the study but have amended this to 'debriefing scenario' to avoid confusion with the term 'diagnostic disclosure'.

5.1.5 Video Editing[7]

The face and upper body of each target was visible in the videos. Video recordings were edited with I-Movie software following methods developed in previous research (Pillai et al., 2012; 2014; and Sheppard et al., 2016). The researcher used a set of criteria to edit the video recordings to ensure objective selection of video excerpts across the target groups. The aim was to generate video clips for each scenario capturing the timeframe when the targets were likely to be most expressive. The recordings for the *story scenario* were edited from the point where the researcher said, "…. because I use English as …" to "… it's difficult to make friends here". *The negative feedback scenario* was captured from the point when the researcher gave the target negative feedback on the block design task saying "I can see you found this task (block design) really difficult…" to "…most of the other participants performed much more quickly". *The gift scenario* was edited from the point when the researcher raised the gift bag from the floor and presented it to the target, saying, "I'd like to offer you a gift…" to "…I wish to offer you..." *The debriefing scenario* was edited from the point where the researcher said, "you have been recorded…" to "…and the camera is still recording." This resulted in a total of 240 edited video clips. The dimensions of the video clips were 1920 pixels in width and 1080 pixels in height, presented at 25 frames per second. As in the studies of Pillai et al. (2012; 2014) and Sheppard et al. (2016), target vocalizations (i.e., the auditory component of footage) were muted.

[7] See Appendix 1 (Pilot study B) for testing the stimuli and criteria for editing.

Different scenarios were used here in comparison to previous research (Sheppard et al., 2016), for two reasons. Primarily, we needed to employ scenarios that the researcher could deliver comfortably, convincingly, and in sequence, especially given that (unlike previous research) each target would experience all of the scenarios. Some of the scenarios used in the previous study did not appear to work convincingly when delivered in sequence e.g. telling the target a joke, then complaining about having had a bad day. In addition, the use of different scenarios afforded the opportunity to establish whether variability in readability would emerge in a novel set of situations rather than being idiosyncratic to the scenarios chosen by Sheppard et al. (2016).

5.2 Perceiver phase

For each target there were four videos displaying their reactions to each scenario (listening to the experimenter's story, receiving negative feedback, receiving a gift, and the debrief). The four scenarios generated by each target were presented simultaneously, playing on a loop, one in each quadrant of the screen. The videos were shown to different sets of non-autistic perceivers across three independent studies (readability study, expressiveness study and social favourability study) as detailed in the following sections. The reason for obtaining these ratings from different groups of perceivers is to avoid a 'carry-over effects' as participants' might be influenced in their performance in one task by their performance in the previous tasks. Given the correlational nature of key analyses, this issue could not be fully solved by counterbalancing.

5.2.1 Study 1: Readability

The aim of this study was to examine whether those targets who have high autistic traits are less readable (actually less readable and/or perceived to be less readable).

5.2.1.1Participants

Forty-six non-autistic perceivers (31 females and 15 males) aged between 18 and 27 (M = 20.96 years, SD = 3.07), were recruited through the 'participant recruitment system' and through advertisements at the University of Nottingham.

5.2.1.2 Procedures

Videos from all 60 targets were shown to each perceiver on a 21.5-inch iMac, with each target presented in random order using PsychoPy3 version 3.2.5 (Peirce, 2007). Each perceiver (tested individually) viewed video clips of people experiencing the four scenarios (listening to the experimenter's story, receiving negative feedback, receiving a gift and the debrief scenario). On each screen, the perceiver viewed four videos of the same target (one for their reaction to each scenario), all played in a loop randomly. The four scenario names were listed beside each video and perceivers were instructed to decide which scenario the target was experiencing in each video (see Figure 5.4). They were instructed not to use a given scenario name for more than one video. As all four videos appeared on the screen simultaneously, participants were able to label the videos in any order they chose, could directly compare videos, and could alter their decisions at any point while they remained on that particular screen. After applying labels to each of the four videos, perceivers were able to press the <next> button to go to the next screen which presented the same videos with a single question "How

readable is this person?" (This was expressed on a scale of 1- 7, where 1 = not readable and 7 = highly readable.) Participants answered this question by clicking the appropriate number from 1 to 7 based on their opinion.

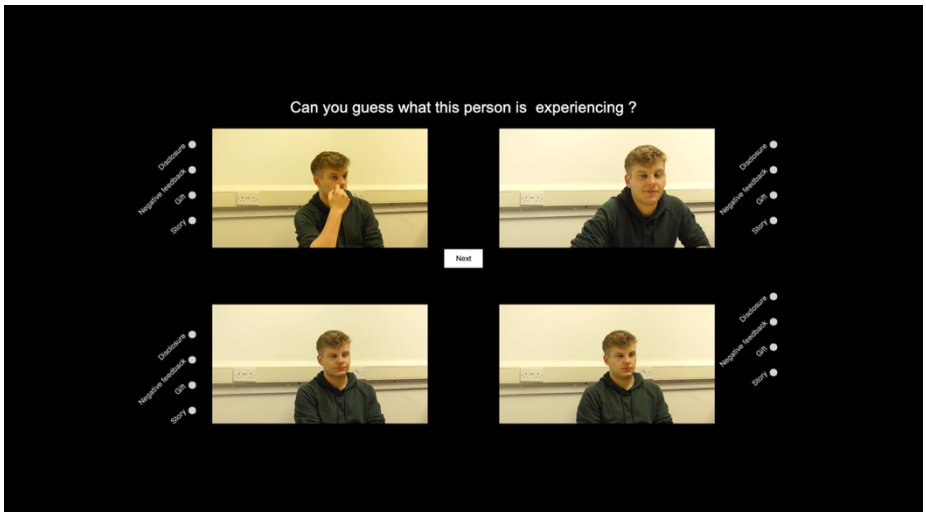


Figure 5.4. Screenshot of PsychPy3 as presented to the perceivers — showing a target as they experienced each of the four scenarios.

5.2.2 Study 2: Expressivity

The aim of this study was to explore whether people who have high autistic traits are perceived to be less expressive when compared to people who have low autistic traits.

5.2.2.1 Participants

Thirty newly recruited non-autistic perceivers (19 females and 11 males) aged between 18 and 24 (M = 19.42 years, SD = 1.94), were recruited through the 'participant recruitment system' and advertisements at the University of Nottingham.

5.5.2.2 Procedure

All four videos appeared on the screen simultaneously and were repeated on a loop, as described above; perceivers were not told anything about the scenarios that targets were

reacting to. Perceivers were asked to rate targets on how 'expressive' they were on a 7-point scale from 1-7 (where 1 is 'not expressive' and 7 is 'highly expressive'). As perceivers made a single judgment for each target, they could take into account information from all four videos when making this judgment. Perceivers responded to the question appearing in the middle of the screen while the target videos remained visible.

5.2.3 Study 3: Social Favourability

This study explored whether people who have high autistic traits are perceived less socially favourable or likeable when compared to people who have low autistic traits.

5.2.3.1 Participants

Thirty newly recruited, non-autistic perceivers (18 females and 12 males) aged between 18 and 27 (M = 20.96 years, SD = 3.07), were recruited through the 'participant recruitment system' and advertisements at the University of Nottingham.

5.2.3.2 Procedure

The procedure, stimulus presentation and response mode were all identical to the readability phase and the expressivity phase (see Figure 5.4), but in this case perceivers rated each target on a 6-point scale from 1-6 (where 1 was low and 6 was high) in response to on-screen questions presented in a fixed order: How awkward is this person? How trustworthy is this person? How empathic is this person? How good is this person's self-esteem? A final question requested an overall opinion: Do you like this person; Yes or No? All questions appeared on-screen one after another and the target videos remained on screen while the perceivers answered the questions listed above. Perceivers were prompted to press the 'next'

button to proceed to the next question until they had completed all questions for each target (see Figure 5.5).

Only five questions were used in this study to rate social favourability instead of the nine questions used previously (see Chapter 4) as previous research has revealed high correlations between such questions. The five questions were selected based on pilot work in which perceivers judged which of the nine social favourability items were most important in deciding whether they liked or disliked each target (see Chapter 4).



Figure 5.5.Screenshot of PsychPy3, as presented to perceivers – showing a target as they experienced the four scenarios, with example social favourability question and rating scale.

5.3 Results

5.3.1Data Handling

A number of dependent variables were extracted from the data as defined in **Table 5-2**.

Dependent Variable	Item Definition
Actual target readability (ActRead)	The mean proportion of hits across all four scenarios (across all perceivers) associated with each target. Chance is defined as .25.
Subjective readability (SubRead)	The mean subjective readability was given as a rating out of 7 when perceivers were asked to judge, overall, "How readable is the target?"

Target expressiveness (Exprs)	The mean target expressivity rating associated with each target, as rated out of 7.
Target social favourability (SocFav)	The sum of the averaged rating of four items: awkwardness (reverse-scored), trustworthiness, empathy and self-esteem.[8]
Target likeability (CatLik)	Number of "likes" that each target received across all perceivers based on a categorical rating.

Table 5-2. Definitions of each variable.

The rating of 'social favourability' was extracted from the sum of the averaged ratings of all four scales (awkwardness [reverse-scored], trustworthiness, empathy, and self-esteem), and all four items were found to correlate highly with one another (see **Table 5-3**). This was supported by a high Cronbach's alpha of .75, indicating a strong internal reliability of the four scales.

First impression item	1	2	3	4
1. Awkward	-	.62	.72	.93
2.Trustworthy	-	-	.92	.50
3. Empathy	-	-	-	.60
4. Self-esteem	-	-	-	-

Table 5-3. Inter-correlations between the nine scales of social favourability; all significant at p < .001 (2-tailed).

5.3.2 Preliminary analyses

A key aim of this study was to investigate whether people with high autistic traits are perceived unfavourably, or as less likeable, because they have a mind that is difficult to read (by non-autistic perceivers)—and whether this is driven by reduced target expressivity. Before

[8] When analysing social favourability using the mean rather than the sum of the averages, the result is the same.

proceeding to examine the specific pattern of relationships between key variables hypothesised to impact social favourability, initial analyses were conducted to assess the correlations among all variables. Here, we report results of both zero-order and partial correlations, controlling for the effect of autism diagnostic status of targets as a covariate (9 targets were diagnosed with autism). All correlation coefficients (Pearson's *r*) are reported in **Table 5- 4**.

Variable	1. ActRead	2.SubRead	3. SocFav	4. CatLik	5. Exprs	6.AQ	7.Autism diagnosis
1. ActRead	-	r =.51***	*r* =.30*	*r* =.33*	*r* =.28*	-.43**	-.27*
Partial	-	r =.50***	*r* =.32*	*r* =.32*	*r* =.31*	-.35**	-
2.SubRead	-	-	*r* =.75***	*r* =.78***	*r* =.86***	*-.46***	*-.10*
Partial	-	-	*r* =.75***	*r* =.78***	*r* =.87***	*-.50***	-
3.SocFav	-	-	-	r =.82***	*r* =.80***	*-.38**	*.02*
Partial	-	-	-	r =.82***	r =.80***	-.47***	-
4.CatLik	-	-	-	-	r =.80***	-.29*	-.07
Partial	-	-	-	-	r =.80***	-.30*	-
5.Express	-	-	-	-	-	-.34**	.05
Partial	-	-	-	-	-	-.45***	-
6.AQ	-	-	-	-	-	-	.57***
Partial	-	-	-	-	-	-	-

Table 5-4. Inter-correlations between all key variables (first one zero order), and partial correlation of target group (correlation is significant at the *0 .05, **0.01, ***0 .001 level).

Including all targets in the analysis**,** actual target readability correlated positively with subjective readability rating. In addition, actual readability significantly correlated positively with social favourability and likeability, although to a much lesser extent than did subjective readability. Further, categorical liking was strongly associated with social favourability. Rated

expressivity also correlated significantly and positively with all other variables. AQ scores, on the other hand correlated significantly and negatively with all variables, such that higher AQ scorers had lower actual readability, were rated as less expressive, less readable and perceived as less socially favourable and likeable. To determine whether the observed relationships held irrespective of a diagnosis of autism, the same analyses were conducted while controlling for autism diagnostic status of participants as a covariate. Findings were substantially the same as zero-order correlations, with significant positive relationships observed between expressivity, actual target readability, subjective readability, social favourability, and likeability, while AQ scores correlated negatively with all these variables.

5.3.3 Mediation Analysis

Mediation analysis was conducted using PROCESS macro for SPSS (Hayes, 2012; 2013), using model number 6. This model was selected to assess the effect of AQ on social favourability and likeability (in separate models) with three putative mediating factors, organised according to a hypothesised directional pathway of effect through these mediators—i.e., autistic traits may impact expressiveness, which may impact actual readability, which may in turn impact perceived readability, and then social favourability and/or likeability. Effects were calculated for each of 10,000 bootstrapped samples. The aim of this analysis was to examine the pattern of relationships evident in the framework of our hypothetical model (shown in Figure 5.1). Specifically, we hypothesised that autistic traits (as measured with AQ), may influence perceived expressivity, actual and subjective readability, and social favourability, as judged by perceivers—both directly or indirectly, via other mediating factors.

Regarding order of mediators in the model, we reasoned that readability may be influenced by expressivity, but not vice versa, and that subjective readability may be affected by actual readability, insofar as the perceivers are able to sense that they could read the target's mind, but not vice versa.

All values for each variable were converted to proportions ranging from 0-1: readability (hits divided by number of responses), subjective readability (standardised by subtracting 1 from the value and then dividing by 6 i.e., (x-1)/6), expressiveness (standardised by subtracting 1 from the value and then dividing by 6 i.e., (x-1)/6), social favourability (standardised by subtracting 4 from the value and then dividing by 20), likeability (standardised by dividing by 30, which was the number of perceivers), and AQ scores divided by 50.

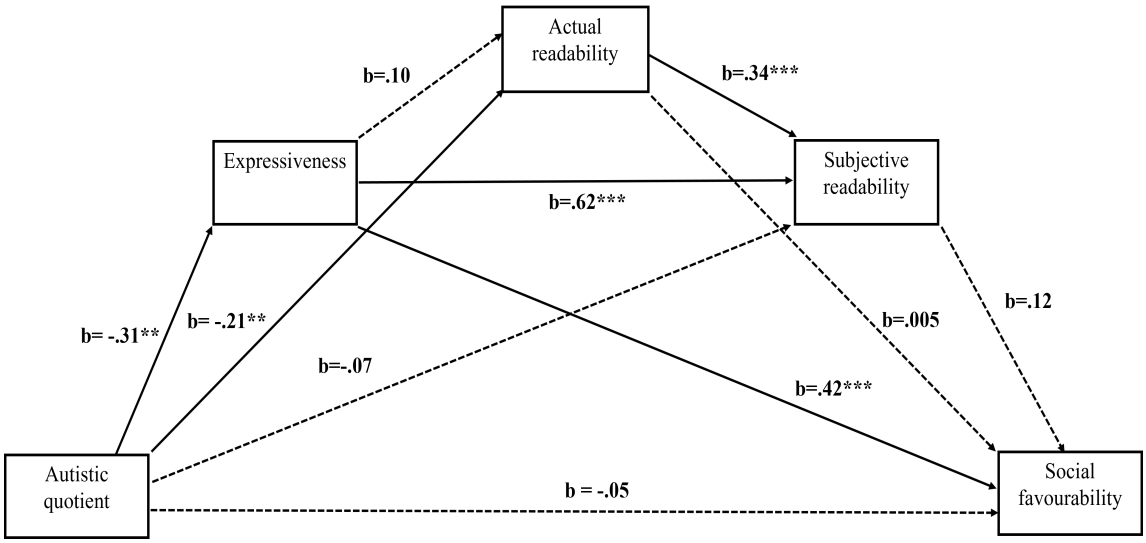


Figure 5.6. Regression coefficients are shown with an asterisk if significant. Solid and dotted lines indicate significant and non-significant effects, respectively (α<.05) *p<.05, **p<.01, ***p<.001.

Figure 5.6 shows the pattern of effects from AQ to the outcome variable of social favourability, via the three putative mediator variables. The total effect of AQ on social favourability was significant, b = -.22, p=.003 [-.37, -.08]. The direct effect of AQ on expressiveness was found to be significant, t (58) = -2.73, p = .008, with this predictor accounting for 11% of the sample variance (R^2= .11). Upon actual readability, the direct effect of AQ was found to be significant, t(57) = -3.03, p =.004, but the effect of expressiveness was nonsignificant, t(57) = 1.24, p= .22, with these two predictors accounting for 21% of the sample variance (R^2= .21). Upon estimated (i.e., subjectively perceived) readability, the direct effect of AQ was found to be non-significant, t(56) = -1.53, p =.13, while the effects of expressiveness, t(56) = 12.50, p < .001, and actual readability, t(56) = 4.03, p < .001, were both significant, with these three predictors accounting for 82% of the sample variance (R^2= .82). Upon the outcome variable of social favourability, the direct effects of AQ t(55) = -.96, p =.34, actual readability, t(55) =.05, p = .96, and subjective readability t(55) = .82, p =.42, were each found to be nonsignificant; however, the effect of expressiveness was significant, t(55) = 3.90, p < .001. Together, these four predictors accounted for 66% of the sample variance (R^2= .66).

The indirect effects of autistic quotient score (AQ) on social favourability were as follows: Through expressiveness, (-.31) (.42) = -.130, 95% CIs [−.26, -.03] (significant); through actual readability, (-.21) (.005) = -.001, 95% CIs [-.04, .03] (nonsignificant); through subjective readability, (-.07) (.12) = -.008, 95% CIs [-.04, .009] (nonsignificant); through expressiveness and actual readability, (-.31) (.10) (.005) = -.000, 95% CIs [-.007, .008] (nonsignificant);

through expressiveness and subjective readability, (-.31) (.62) (.12) = -.023, 95% CIs [-.09, .03] (nonsignificant); through actual and subjective readability, (-.21) (.34) (.12) = -.009, 95% CIs [-.03, .009] (nonsignificant). Through expressiveness and both readabilities, (-.31) (.10) (.34) (.12) = -.001, 95% CIs [-.006, .003] (nonsignificant).

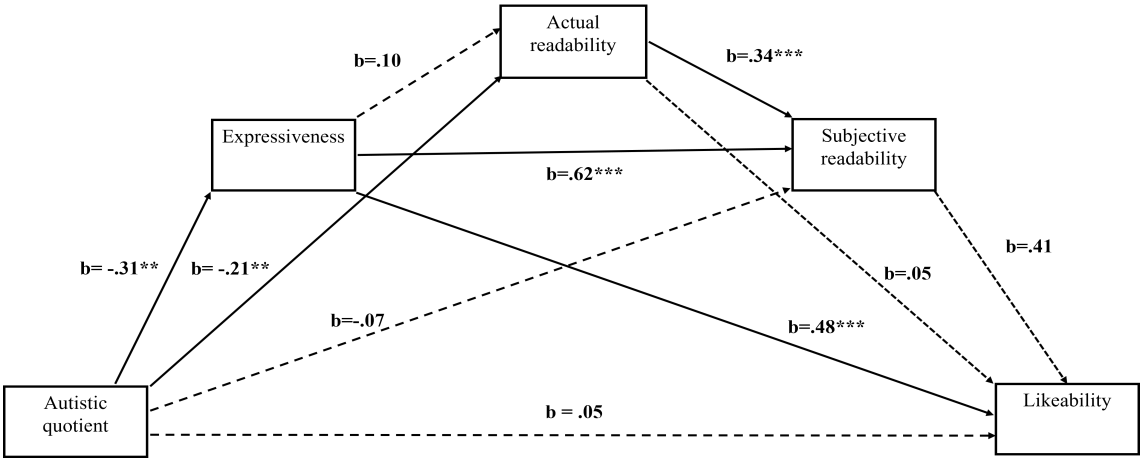


Figure 5.7. Regression coefficients are shown with an asterisk if significant. Solid and dotted lines indicate significant and nonsignificant effects, respectively (α<.05) *p<.05. **p<01 ***p<.001.

Figure 5.7 shows the pattern of effects from autistic AQ to the outcome variable of likeability, including via the three putative mediator variables. The total effect of AQ on likeability was significant, *b* = -.25, *p*=.026 [-.47, -.03]. The direct effects upon likeability of AQ *t*(55) =.65, *p* = .52, actual readability *t*(55) =.31, *p* = .76, and subjective readability, *t*(55) =1.93, *p* = .059, were found not to be significant, whereas expressiveness, *t*(56) = 3.09, *p* =.003, was found to be significant, with these four predictors accounting for 67% of the sample variance (R^2= .67).The indirect effects of AQ on likeability were as follows: Through expressiveness, (-.31) (.48) = -.146, 95% CIs [-.32, -.03] (significant); through actual readability, (-21) (.05) = -.010, 95% CIs [-.08, .05] (nonsignificant); through subjective readability, (-.07) (.41) = -.03, 95% CIs [-.09, .002] (non-significant); through expressiveness

and actual readability, (-31) (.10) (.05) = -.001, 95% CIs [-.02, .01] (nonsignificant); through expressiveness and subjective readability, (-.31) (.62) (.41) = -.08, 95% CIs [-.19, -.001] (significant); through both readabilities, (-.21) (.34) (.41) = -.03, 95% CIs [-.07, -.001] (significant); through expressiveness and both readabilities, (-.31) (.10) (.34) (.41)= -.004, 95% CIs [-.01, .003] (nonsignificant).

5.4 General discussion

The current study aimed to model the relationship between autistic traits, expressiveness, readability, social favourability and likeability of the targets. We hypothesised that the level of autistic traits of the target would impact on target social favourability and likeability, potentially directly, but also via the three potential mediating factors of expressiveness, actual readability and subjective readability. First, we comment on the simple relationships between the variables, then we discuss the findings of the mediation models, before considering the implications and limitations of the research.

In line with the findings in chapter 2, simple correlations revealed associations between readability (subjective and actual) and social favourability and likeability—this relationship maintained for both forms of readability, it was notably higher for subjective readability than objectively measured (i.e., 'actual') readability. Moreover, the level of autistic traits of the target (as measured by the AQ) correlated negatively with all other variables, such that individuals with higher autistic traits were less readable across different scenarios, were rated less expressive and less readable, and were also perceived as both less socially favourable and less likeable than individuals with lower autistic traits. Notably, these relationships were

preserved when the diagnostic status of targets (nine of whom reported having a formal autism diagnosis) was accounted for as a covariate, suggesting that the correlations with autistic traits were not purely driven by the inclusion of autistic targets within the sample. Instead, they align with findings of Anders et al. (2016) and Chapter 2, both of which suggest that readability and social favourability are associated transdiagnostically.

Our two mediation models tested potential mediators of the relationship between autistic traits as predictor, and two outcome variables, respectively: social favourability (the average of the four trait scale judgments) and likeability (the number of "like" judgments the target received based on the dichotomous question "Do you like this person?"). As the findings for the two models differed slightly, we will discuss each in turn.

For social favourability, the model was significant but there was no evidence of a direct effect of autistic traits on social favourability; however, the indirect effect of autistic traits via expressiveness was significant, consistent with full mediation of the effect. Evidence was not found for the impact of autistic traits on social favourability being significantly mediated by the two readability variables (i.e., actual and perceived), either independently or in combination. However, some further relationships were observed. There was a direct effect of autistic traits on actual readability, and both actual readability and expressiveness impacted subjective readability.

Taken together these findings seem to suggest that autistic traits impact perception of a target in two ways. Firstly, autistic traits impact how expressive the target is (or at least how expressive they appear to be), and in turn, when perceivers are asked to make judgments about

the social favourability of a target, then expressiveness appears to be a key cue that informs these judgments. This is in line with previous research that has found that people who are more expressive are rated as both more extraverted and as more attractive (Riggio & Friedman, 1986). Secondly, autistic traits directly impact how readable a target is. The fact that this relationship was unrelated to expressiveness is consistent with findings of Sheppard et al. (2016) who reported that autistic targets were less readable but not necessarily less expressive. Sheppard et al. argued that this may indicate that autistic people behave in a way that is no less expressive but that is qualitatively different from non-autistic people, and harder for non-autistic people to interpret. The present study does find clear evidence for significantly lower expressivity of those with high autistic traits, though notably the relationship between expressivity and autism diagnosis was (non-significantly) in the opposite direction. While the sample size did not yield enough statistical power to draw any strong conclusions, the discrepancy in social characteristics between those rated high in autistic traits and those actually diagnosed with autism may prove a valuable avenue of future research.

Overall, the findings did not offer any evidence to suggest a direct relationship between readability and social favourability; rather, the relationship (as indicated by correlation) is predominantly explained by covariance with other related factors. Finally, it can be observed that both expressiveness and actual readability independently contribute to subjective judgments of readability—each of these acting as a mediator for AQ score, suggesting a dual pathway of effect from autistic traits to perceived readability. These findings suggest that to some extent perceivers do have a sense of whether they were able to correctly read the targets,

but that their judgments are also influenced by how expressive the target seemed regardless of whether the perceiver had correctly read them. Notably, the findings also contrast with Anders et al. (2016) in that subjective readability did not directly relate to social favourability. This may come down to the present study's explicit inclusion of expressivity in the explanatory model.

Slightly different findings were observed in relation to the outcome variable of likeability. Again, the overall model was significant, but the direct effect of autistic traits on likeability was not significant, consistent with full mediation. However, in this model there were three significant mediation pathways. Firstly, expressiveness was also a significant mediator of the relationship between autistic traits and likeability, suggesting that targets with higher autistic traits are less expressive and that this directly impacts perceivers' judgments of whether or not they like that target. Secondly, autistic traits impacted likeability via expressiveness and subjective readability, and thirdly, via actual readability and subjective readability. Thus, consistent with Anders et al. (2016), this model implies that perceivers are more likely to judge that they like a target if they *felt* that target was readable—though note that the direct effect here approached significance (p=.059). As in the previous model, both expressiveness and actual readability influenced subjective readability independently with no direct relationship between expressiveness and actual readability. Overall, the fact that there was a significant mediation pathway involving actual readability suggests that readability and likeability are related insofar as perceivers are aware when they have correctly read the target and this impacts their likeability judgments.

The question arises as to why findings differed for the two models given that previous research (and indeed this study) has found strong correlations between social favourability measures and likeability (Chapter 4). Social favourability scores were created by combining mean scores on various rating scales of traits whereas likeability scores reflect the answer to a forced-choice question about whether or not the perceiver likes the target. Consequently, likeability is potentially a more direct measure of the perceivers' own feelings about the target while social favourability judgments could be influenced by how the perceiver thinks people in general would view the target. If this is the case, it might help to explain why subjective impressions of readability impact likeability more strongly than social favourability. Nevertheless, just because certain mediation pathways were significant in one model and not the other, it does not follow that relationships were substantially different – only that they met criteria for significance in one model and not the other.

Before considering the implications of this research we will discuss a few limitations. The current research aimed to overcome limitations of Chapter 2 by taking social perception measures of actual and subjective readability, expressiveness, social favourability, and likeability across multiple samples of behaviour for each target. For each of these measures the perceivers viewed the various samples of the target's behaviour simultaneously played in a loop on a single screen, as this ensured that all measures were based on the same stimuli presented in the same way. While we have argued that this should lead to more accurate and robust indices of judgments like social favourability, for the readability measure it allowed perceivers to directly compare the same target's reactions to the four different scenarios,

possibly allowing for them to use processes of elimination to identify the correct scenarios. Therefore, actual readability scores might have been artificially elevated due to such strategies. While this might be the case, this study was more concerned with relative levels of readability between targets than absolute levels. As this method yielded a range of target readabilities, it is unlikely that this issue impacted the core findings of the study.

Another limitation is that expressiveness, readability, and social favourability judgments were made by different groups of perceivers. This was by design, as we wanted to examine whether relationships would occur when these constructs were measured independently (as in Chapter 2), to eliminate the possibility of carry-over effects between the different ratings tasks if these were carried out by the same perceiver. Nevertheless, Anders et al. (2016) measured attraction and subjective readability with the same perceivers and reported a direct contingency between trials where the perceiver felt they had read the target correctly and attraction, which could not be assessed in our research. Therefore, it would be beneficial to carry out a study where the same perceivers provide both readability and social favourability measures. We might expect to observe even stronger relationships between the variables in such a study.

It is also worth pointing out that we did not measure all variables that might conceivably influence social favourability or likeability judgments in this study. This was because our aim was to focus on the links between expressiveness, readability and social favourability, rather than to create an all-encompassing model of social favourability. Nevertheless, future studies could potentially measure further variables that also impact social favourability. For example,

past research shows that the physical appearance of targets may have an impact on how people are perceived (e.g., Hamermesh & Biddle, 1994; Heilman & Stopeck, 1985; Zebrowitz & Montepare, 2008) and the fact that autistic people are rated less favourably even based on photographs (where we can assume that expressive behaviour is less apparent) suggests physical appearance may be a factor in social judgments of autistic people too (Sasson et al., 2017).

Finally, it is important to emphasise that this study examined individuals with varying levels of autistic traits, and only a minority of the targets (9/60) stated that they had a diagnosis of autism. While the correlations between variables did not substantially change when controlling for autism diagnosis as a covariate, we cannot draw any strong conclusions about autistic people from this study (cf. Sasson et al., 2022). A similar study would need to be carried out with a much larger sample of autistic targets to determine whether the relationships observed in our sample here exist in a clinically diagnosed sample.

Nonetheless, the findings of this study provide new knowledge in that those with high autistic traits, regardless of diagnostic status, appear to face similar challenges as autistic people, as they are more difficult for the non-autistic majority to read and are also perceived less socially favourably. Previous research shows that autistic people experience increased likelihood of poor mental health, such as depression and anxiety (Cassidy & Rodgers, 2017), and we have argued that this might in part be a consequence of being misperceived, or perceived negatively by members of wider society (Mitchell et al., 2021). The research reported

here suggests that people high in autistic traits might be susceptible to similar negative outcomes as those diagnosed with autism. If this is the case then interventions at the level of society should not merely be based around educating society about autism (and misperceptions thereof) but also at promoting a wider tolerance of diversity regardless of diagnostic status.

CHAPTER 6: General Discussion

6. Research Overview

Autism has traditionally been conceptualised and defined as a core deficit that impacts on how autistic people communicate and interact with the world (American Psychiatric Association, 2013). This definition however, may have been driven by the pioneers of autism, who subscribed to a medical model; namely, Hans Asperger and Leo Kanner, who discovered autism and in turn, hoped to find a treatment and cure for it (Mitchell et al., 2021). Autistic people range from those with concurrent intellectual disability to those who are highly intelligent and able; this may be one of the contributory factors that plays a part in the difficulty associated with its diagnosis.

Autism has largely been explained by some cognitive theories such as theory of mind (e.g., Chown, 2014; Pellicano & Houting, 2021). This theory has only focused on a deficit in autistic people and has historically been guided by prevailing medical views (Mitchell et al., 2021). In support, Baron-Cohen et al. (1985) used the Sally and Anne task to test the theory of mind in autism, and found that autistic children have a delay in this area, although some autistic children were able to pass this task. Autistic people also perform more poorly on so-called advanced theory of mind tasks such as the Strange Stories task, leading researchers to suggest that difficulties in theory of mind persist throughout the lifespan for autistic people.

Recent research, on the other side, argues that the theory of mind only considers one component of social interaction. Milton (2012), for example, claims that non-autistic people face the same lack of empathy as autistic people, a phenomenon known as the double empathy problem (DEP). This new perspective on autism has produced a number of studies, including approaches for assessing autistic people's expressiveness (readability), first impressions (social favourability), and autistic-non-autistic interactional behaviours. This theory is significant because it considers the perspectives of autistic people rather than conducting research outside of the autistic zone (Pellicano & Houting, 2021).

The findings of some certain studies in DEP showed that non-autistic people have a lack of empathy and understanding of autistic people (Sheppard et al.,2016; Edey et al., 2016), they were also perceived as less socially favourable in compared to non-autistic people across various studies (e.g., Sasson et al., 2017).

First, research in DEP investigated how readable autistic people are (Sheppard e al., 2016) by test the ability of 'non-autistic people' to read autistic people using a "retrodiction mindreading task" (Gallese & Goldman, 1998). The findings of Sheppard et al. (2016) suggest that non-autistic perceivers were less accurate at reading autistic targets compared with when they viewed non-autistic targets. In the retrodictive task, perceivers are asked to make inferences based on targets' spontaneous behaviours in social interaction, in which the targets are reacting to an actual event rather than a given instruction.

Second, in relation to social favourability, Sasson et al. (2017) also developed stimuli of autistic and non-autistic targets based on real life interactions. The findings showed that autistic

targets were perceived as less socially favourable compared to non-autistic targets based on short videos. Autistic people were also perceived as less favourable even in static images (Sasson et al., 2017). Why, even in a static image, are autistic people perceived as less socially favourable? Is it something to do with the targets' appearance or something to do with their expressive behaviours that determines social favourability?

If autistic people are rated as being less readable (Sheppard et al., 2016) and less socially favourable (Sasson et al., 2017), one would wonder if there is a link between readability and social favourability. In support of this, Anders et al. (2016) found that people who are easy to read are also perceived as more likeable, suggesting a link in the general population. This evidence leads us to the main aim of our thesis: to examine whether there is an association between autistic people being difficult to read and autistic people being perceived unfavourably by non-autistic others.

People's physical appearance, and attractiveness in particular, may have a role in determining social favourability, particularly when judgments are based on static images (e.g., Heilman & Stopeck, 1985; Zebrowitz & Montepare, 2008). People may focus on the attractiveness of the face rather than their behaviour when there is less information regarding facial expression, which could explain Sasson et al.'s findings (2017). Therefore, a second aim of the thesis was to explore the role of physical appearance in social favourability judgments of autistic people.

Finally, we attempted to further clarify reasons for the relationship between readability and social fvaourability by examining how readability, perceived readability and expressivity

mediate the relationship between autistic traits and social favourability. In the following sections we discuss headline findings in relation to each of these aims in turn.

6.1 Is there an association between autistic people being difficult to read and being perceived as less favourable?

Across all four chapters in this thesis (7 studies in total), an association was found between readability and social favourability, indicated by strong correlations between these two measures at the level of the target. Three of these chapters (Chapters 2, 3 and 4) utilised the stimuli, or modified versions of the stimuli, from Sheppard et al. (2016). While readability scores were taken from archived data of Sheppard et al. (2016), in each study social favourability was measured afresh based on responses of a new set of perceivers on each occasion. The correlation between readability and social favourability remained robust across all sets of perceivers, even with modifications to the stimuli (use of photos as opposed to videos, Chapter 3) and modifications to the precise ratings procedure (use of a categorical dichotomous rating rather than scales ratings, Chapter 4).

Analyses showed that the association remained when diagnostic status was partialled out, and when the analysis was carried out separately for each group (although sometimes it was no longer significant, probably due to loss of power), implying that the relationship might be transdiagnostic and does not appear to be merely the result of the inclusion of two groups (autistic and non-autistic) within the correlation. In Chapters 2 and 4, the impact of understanding the context of the targets' behaviour was also investigated as perceivers were not told about the name of the scenarios (concealed scenario) in one study, while in a second

study, they were told what scenario each target experienced (disclosed scenario). Nevertheless, the association between readability and social favourability appeared in both conditions regardless of the provision of contextual information.

While the results of the studies reported in Chapters 2-4 suggest that the association between readability and social favourability is quite robust, the readability data were identical in each study so it remained possible that the association might be in some way idiosyncratic to that particular set of targets/measure of readability. Consequently, in Chapter 5 a new set of stimuli were created using new scenarios and a fresh set of targets (as well as a modified methodology). Despite all of these modifications, simple correlations did replicate the findings of the earlier chapters, notably that readability and social favourability were positively correlated within the target population tested. Thus, in relation to the first aim of this thesis, the research strongly supports the notion that there is an association between measured readability and social favourability, both in autistic and non-autistic populations.

As highlighted in the discussion of Chapter 2, we have to be very careful in interpreting the causality of such a relationship. We outline a number of hypothetical ways in which the observed association between readability and social favourability might arise. Firstly, being less readable might cause one to be perceived unfavourably (the explanation proposed by Anders et al., 2016). This possibility could be explained in at least two ways: a *reward* explanation and a *trait* explanation. In the reward explanation, the idea is that people like the feeling that they can successfully read the person and hence find the person more attractive. In

support of this, Anders et al. (2016) found that people who are easy to read are also perceived as more favourable, and non-autistic perceivers' accuracy was associated with their self-reported confidence. In turn, the trait explanation posits that readability might be associated directly with other personality traits in which a person who is difficult to read is assumed to be one who is not transparent or perhaps even untrustworthy in some way (a kind of "halo" effect).

This causality might work in a different way, such that being perceived as unfavourable causes one to be less readable. For example, when a target is perceived as being less favourable, perceivers are then less motivated to empathise with or pay attention to the target's inner state. This might result in the target being less readable because perceivers make less effort to understand that target's behaviours. This possibility is supported by previous research which reports that mind reading accuracy improves with perceivers' motivation (Thomas & Maio, 2008).

Finally, readability and social favourability might only be indirectly related via some third variable that influences both features. In chapter 2, we speculated that this third variable might be a tendency for the target to behave unusually. This would perhaps make it difficult for perceivers to interpret the cause of behaviour (in the readability study), and this may have resulted in them being perceived negatively (in social favourability studies). However, in Chapter 5 (in response to the third aim of the thesis, see more below) we attempted to start to examine the possible causal relations between variables implicated in negative social perceptions of autistic people.

6.2 Is it atypical expressive behaviour or appearance that results in lower ratings of social favourability in autistic targets?

We attempted to investigate the role of physical appearance in social favourability judgments in Chapter 3. Based on the association between readability and social favourability we have suggested that it is something about the autistic target's expressive behaviour that is leading them to be judged less socially favourably by non-autistic others. However, previous research suggests that physical attractiveness also strongly influences social favourability ratings on other traits (Hamermesh & Biddle, 1994; Heilman & Stopeck, 1985; Zebrowitz & Montepare, 2008) suggesting raising the possibility that physical appearance might also contribute to the lower social favourability ratings of autistic targets. To investigate this possibility, 'more' and 'less' expressive images were extracted from archived videos from the Sheppard et al. (2016) study. These more expressive and less expressive images were then presented to different groups of non-autistic perceivers across two studies respectively, who were asked to rate each image on the social favourability scale. The study predicted that if it is the expressive behaviour driving the effect, one would expect to see differences in social favourability between autistic and non-autistic targets diminish or be absent for low expressivity images. Moreover, one would expect the correlation between social favourability and readability to reduce/disappear in this context.

Autistic people were perceived less socially favourably than non-autistic people regardless of whether more or less expressive images were used. While this appears to be in line with their judgments being based on physical appearance rather than expressive behaviour, this

interpretation is weakened by the fact that there was still a correlation between readability (based on videos rating) and social favourability (based on still images). If participants were really judging social favourability only based on appearance in the static images, then social favourability should not correlate with readability (as it is harder to see how readability could be influenced by physical appearance). In light of this, we suggested that potentially our attempted manipulation of expressivity simply did not work very well and that in fact, the images extracted still reflected aspects of the targets' expressive behaviour. If this is the case, then the research reported here does not conclusively answer the question as to how physical appearance contributes to the social favourability judgements about autistic targets.

6.3 How do autistic traits, expressivity and readability combine to impact social favourability?

The findings reported in Chapter 2 led to the third aim of the thesis, which was addressed in Chapter 5. We aimed to model the relationships between readability and social favourability of targets taking into account autistic traits, expressiveness, and perceived readability. We hypothesised that the level of autistic traits of the target would be associated with target social favourability (and likeability) via three potential mediating factors of expressiveness, actual readability and subjective readability. As the findings of this study were outlined in detail in Chapter 5, only a brief summary will be presented here followed by discussion of some of the key findings.

Targets reacted to the experimenter in four different scenarios (when they were told a story, received negative feedback, received a gift, when it was disclosed that the camera was still

recording them). These videos were presented to different non-autistic perceivers in three different studies (readability, expressivity and social favourability). In study 1 (readability), perceivers were asked to guess what each target was reacting to in order to assess 'actual readability', and then they were also asked to grade each target on how readable they felt each target is on a-7-point scale which was referred to as 'subjective readability'. In study 2 (expressiveness study), a different group of perceivers were asked to rate each target on how expressive they were on a-7-point scale across four videos. In study 3 (social favourability), a different group of perceivers were asked to rate each target on a social favourability questions (only four questions were used – awkward, trustworthy, self-esteem and empathy) as well as a dichotomous judgment about whether or not they liked the target.

As compared to people with lower autistic traits, people with higher autistic traits were less readable across scenarios, were rated as less expressive and readable, and were also perceived as less socially favourable or likeable. The two mediation models (for outcomes of social favourability and likeability respectively) were significant. In both cases the indirect effect of autistic traits via expressiveness was significant. In both models. actual readability was directly influenced by autistic traits, and both actual readability and expressiveness influenced subjective readability. Further mediation pathways were found in relation to likeability only. Firstly, autistic traits influenced likeability through expressiveness and subjective readability, and second, through actual and subjective readability. Interestingly these results match those of a recent study that examined expressiveness, readability and social

favourability in a non-autistic sample (Kavanagh et al., 2022). That study also found no direct relationship between expressiveness and actual readability, but relationships between readability and social favourability and expressiveness and social favourability. Thus, these findings appear to be rather robust.

As the results of this study were discussed extensively within Chapter 5, the interpretations will not be repeated here, but we will reflect on some of the key findings that may be worthy of further exploration. Firstly, the results suggest that expressiveness (or at least subjective impressions of expressiveness) is highly important for social favourability/likeability, but is perhaps surprisingly less relevant to readability. That more expressive people are more liked is not a new finding in relation to the general population, although it is in relation to autism. Indeed, there is considerable existing evidence that expressive people are liked better than less expressive people (Friedman et al., 1988; Halberstadt, 1984; Larrance & Zuckerman, 1981). This raises the question as to what exactly expressiveness is. In this thesis, expressiveness was assessed by simply asking raters their subjective judgment of how expressive the target appeared to be with an assumption that perceivers would naturally understand or make sense of such an instruction. Previous research has tended to assume that expressiveness refers to "emotional expressiveness" – which has been further defined as the ability to accurately nonverbally communicate what one is feeling (Riggio & Riggio, 2002). However, such research also has found that ratings of expressiveness by observers do not correlate with attempts to measure emotional expressiveness accuracy more behaviourally e.g. by measuring accuracy of perceivers' judgments of posed or elicited facial expressions of emotion from the

target (Riggio et al., 1985). This suggests that rated expressiveness may not be the same theoretical construct as facial emotion accuracy measures pertaining to the target, which makes intuitive sense as rated expressiveness may encompass more aspects of non-verbal behaviour than just emotion production. In future research it would be interesting to examine what aspects of nonverbal behaviour are taken into account when perceivers judge expressiveness.

The fact that expressiveness did not directly impact on readability in either study is intriguing, although broadly consistent with the findings of Sheppard et al. (2016). Overall, they seem to suggest that a person could be expressive without being particularly readable. Being expressive appears to relate to the intensity of behaviour while being readable is about the match of behaviour to the particular context. Apparently these features may not be highly related – not in autistic people and perhaps not in the population more generally. Future research could explore this phenomenon further with larger samples to understand, if not expressivity, what kind of factors (aside from autistic traits) do impact the readability of an individual.

A second key outcome of this study was that the findings of the second model implied that readability and likeability are linked in the sense that perceivers are aware when they have correctly read the target, which influences their likeability judgements. While this finding is somewhat tempered by failure to find the same effect in relation to the social favourability outcome measure, we can still interpret them as offering partial support to the theory put forward by Anders et al. (2016) - namely that feeling as though one has read a target (regardless of the reality) appears to impact on feelings of liking. Notably the current study cannot

differentiate between the "reward" and "trait" explanations for this association. In other words, it could be that it is the positive feeling associated with believing one has read the target that drives the effect, or it could be that one assumes that an apparently readable person has other positive traits. Further study would be needed to attempt to tease apart these explanations.

Finally although the current study found substantial evidence for people with high autistic features having significantly reduced expressivity, lower readability (actual and subjective), and lower social favourability, aside from actual readability, these measures did not correlate with autism diagnosis. In this thesis the sample size was insufficient to draw any solid conclusions, as there were only nine participants who revealed having an autism diagnosis which could well account for the lack of association. Nevertheless, the disparity in social characteristics (if any) between those who scored high on autistic traits and those who were really diagnosed with autism could be a promising area for future research.

6.4 Practical & Theoretical Implications

6.4.1 Methodological Implications

While the studies reported in this thesis primarily utilised tasks that have been established in previous research, some modifications were made that provide potentially useful methodological insights. In Chapter 4, a new judgment measure was used based on the single categorical question *'Do you like/dislike this person?'* which was then implemented again in Chapter 5. The findings reported in Chapter 4 and 5 indicated a strong correlation between likeability (obtained from a single question) and the social favourability scale. This result is

important because it suggests the effectiveness of the question in terms of it being able to discriminate between groups (autistic /non-autistic) so it could be used to obtain an impression about an individual. This may be of use to future researchers who wish to understand further the first impressions of autistic people as it would cut down the participant time for this particular measure quite considerably compared with using a multidimensional scale. As a slight caveat we know from Chapter 5 that the mediation model slightly differed when using likeability rather than social favourability as the outcome variable suggesting they may reflect somewhat different but highly similar constructs.

In Chapter 5 the retrodictive methodology was adapted in various novel ways. Targets experienced not one but four scenarios and then the videos of their reactions to all four were shown at the same time to perceivers. As the studies in Chapter 5 utilised targets varying in autistic traits rather than diagnosed autistic and non-autistic groups, we cannot directly compare between the methodologies for validation purposes. Nevertheless, the findings did follow the pattern predicted by previous studies that used single video with autistic targets, namely that those higher in autistic traits were less readable. Therefore, this appears to support the notion that the methodology used in Chapter 5 can offer a valid measure of the readability of the target.

This design may have helped perceivers to respond correctly as they were able to compare the targets' behaviour in different scenarios (with the knowledge that one video matched each scenario) and they could modify their responses as many times as they wished with unlimited

time to watch the videos, before moving to the next screen. Nevertheless, perceivers' performance was not at ceiling and a range of readabilities was still yielded by the methodology. An advantage of this approach is that perceivers have more knowledge when viewing each situation, because each target is unique and it could be difficult to make judgments about their behaviour from one isolated situation. Finally, the method enabled us to maintain consistency between the viewing conditions for each task in Chapter 5. For instance, viewing a range of target behaviour may enable perceivers to make better-informed, more reliable judgments of social favourability (and expressiveness), potentially less contaminated by the specifics of the situation in which the target happened to be observed.

6.4.2 Theory of mind versus double empathy problem

The current findings in this thesis confirmed that non-autistic perceivers rated autistic targets as less socially favourable and that they have difficulty in interpreting the behaviours of autistic individuals, both of which are consistent with predictions of the DEP (Milton, 2012) and cannot be accounted for by a theory of mind deficit (Baron-Cohen et al., 1985). The difficulty that perceivers had in terms of their misperceptions regarding autistic people was also extended to those individuals with high autistic features, as these individuals were less readable and were perceived as less socially favourable. This finding provides a contribution to the field of DEP, which suggests there is a need to dramatically change policy so that autism can achieve a better fit with these changes in society. This includes some of the key elements of society such as schools, universities, health care, etc., as this can help to promote/raise

awareness and a greater understanding about individuals who behave or react differently in certain situations.

6.4.3 How do societal barriers prevent autistic people from being integrated?

Society is dominated by non-autistic people, which gives rise to social barriers that might knowingly or unknowingly hinder autistic people from being fully integrated. The findings of the current research have highlighted an important issue, which is that autistic people are perceived unfavourably and are even sometimes disliked by non-autistic perceivers and they also tend to have behaviour which is difficult to read. Thus non-autistic people's perceptions and misperceptions of autistic people could be a barrier to social integration for autistic people.

It is worth noting though that this observation does not mean that non-autistic people reject autistic people or resist interacting with them; rather, it may be the case that outwardly this apparent barrier or reluctance to interact with autistic individuals is due more to a lack of knowledge which causes misunderstanding. Evidence for this can be found in previous research, such as that of Sasson and Morrison (2019), who found that the rating of social favourability was increased when the diagnosis of targets was disclosed to perceivers. Furthermore, in the same research, Sasson and Morrison (2019) found that the discounting effect of diagnostic disclosure contributed dramatically toward non-autistic people rating autistic people more favourably than those who were schizophrenic in the same study. It also appears that improving the knowledge of autism and reducing stigma surrounding it is one of the keys for acceptance and inclusion (e.g. Sasson and Morrison, 2019; DeBrabander et al.,

2019). Hence, it could be inferred that individuals with a knowledge and understanding of autistic behaviour may be able to more willingly accept and perceive autistic behaviour positively.

Based on some of the issues that have been raised and discussed in this thesis, it has become clearer why autistic people hide their autism from others as the role of society and non-autistic people play a role in how autism is perceived. For autistic individuals, disclosure of diagnosis might be difficult and trigger possible negative consequences. Previous research suggests that autistic people do not prefer to disclose their autism at their places of work because they believe that this might have negative consequences, while in contrast, some have experienced positive changes at their work when they disclosed their autism to their supervisors (Romualdez et al., 2021). The findings of Romualdez et al. (2021) support López's (2014) suggestion that autistic people should be prepared for work by being provided with some training that might go some way toward addressing some of the issues or difficulties they face in this context. Receiving training in this area might help reduce some of the societal barriers relating for example to the employers' lack of understanding of autism and the lack of adjustment made in the workplace for it to be fit for autistic people (López et al., 2021). In a similar vein, it could be assumed that once people have contact and experience with autistic people, their knowledge will improve which will reflect positively on their attitudes towards them.

Based on all of the above, there is initial evidence that the non-autistic majority are open to diversity, particularly where autism is concerned. Moreover, adapting the environment to be more inclusive for autistic people needs more work and collaboration among countries to establish policies in this regard. It would be helpful to raise awareness that focuses on accepting autistic people rather than becoming fixated on the difficulties of autism itself, because autistic individuals live in a society dominated by non-autistic people. Hence, it is worth remembering that when building up any type of intervention programme, one needs to consider the fact that the difficulty between autistic and no-autistic individuals is a mutual misunderstanding rather than a specific-autistic difficulty; this ought to reduce misunderstanding and promote greater tolerance.

6.5 Limitations of and direction of future research

There are a number of limitations of the current research. In Chapters 2, 3, 4 and 5, the rating of readability and social favourability was based on different groups of perceivers. The reason for doing this was that perceivers might be able to understand the aim of the studies when they judged the scenarios (readability) and social favourability at the same time. Nevertheless, it would be informative for future research to involve the same perceivers for rating readability and social favourability. This could potentially generate clearer evidence of the link between readability and social favourability on a perceiver-by-perceiver basis, as Anders et al. (2016) established in their study, as opposed to data that is based on averages across multiple perceivers. It should be stressed though, that the findings of the current research were robust across different studies.

Another limitation was that the targets were all male in Chapters 2, 3 and 4. As males are reportedly five times more likely to be diagnosed as autistic than females (perhaps because females tend to be under-diagnosed), it is not surprising then to see that males constitute the majority of the participants, and are therefore overrepresented in the autism literature (Taylor et al., 2013). However, future research should consider including autistic females in the research, in terms of considering whether autistic females have minds that are difficult to read and are perceived less socially favourable, just as is the case for males. This aspect is important particularly as previous research has indicated that autistic females are able to more easily camouflage their social differences compared to autistic males (Dean et al., 2017; Rynkiewicz et al., 2016).

In Chapters 3 and 4 all targets were male, while the perceivers were mainly female. It is therefore not clear whether the findings extend to other gender permutations of targets and perceivers. Moreover, in the same chapters, the total sample size for perceivers was relatively small, although not dissimilar to some of the previous studies on similar topics. A replication with a larger sample would be useful for more reliable findings, but note that the sample in Chapter 5 for the readability study was relatively large.

In Chapter 3, the findings for the less expressive images indicated that the images were still somewhat 'expressive', due to evidence from the waiting scenario that both targets (autistic and non-autistic) were perceived as less socially favourable in this scenario compared to other scenarios. For future studies, it would be useful to have expressionless images to assess whether

perceivers are able to discriminate between the two groups. It was predicted in the present study that perceivers would not discriminate between autistic and non-autistic people, because the findings in Chapter 3 show that, when less expressive images were used, the social favourability ratings decreased slightly. Nevertheless, it might be difficult to capture images that are totally expressionless so careful consideration of the contexts such images could be captured would be needed.

In Chapter 4 (and in fact in all chapters), no social desirability measure was included. This allows for the possibility that perceivers exaggerated their liking of the targets, or rated them more positively on the various traits than they otherwise would. Although this might affect absolute levels of liking, it is important to note that it could not explain the difference in likes received by autistic and non-autistic targets.

Another limitation of the research is that we did not include any measures of camouflaging behaviour in any of the studies. This refers to behaviours strategically used by autistic individuals to appear non-autistic to others (Hull et al., 2017, 2019). In certain settings, this could have a positive impact for autistic individuals as it may help them 'fit in' to non-autistic society and avoid social isolation. On the other hand, faced with a different situation, or an unfamiliar environment they are not prepared for, they may struggle to socialise (Attwood, 2006). Hence, the phenomenon of camouflaging could go some way toward explaining why the expressions of an autistic individual (in some cases), are perceived as less natural or more intense (Faso et al., 2015) and why sometimes autistic individuals may appear more expressive

or less expressive when compared to non-autistic individuals, In future research it would be valuable to examine how camouflaging impacts on these findings, including in relation to readability, perhaps by administering a self-reported camouflaging measure to the targets during the research.

Finally, no autistic perceivers were included in any of the studies. This is because the aim of the present research was to shed light on the relationship between readability and social favourability specifically within non-autistic perceivers. However, an interesting extension of the current research might be to examine whether the same relationships hold for autistic perceivers. In relation to social favourability, previous studies have found that autistic perceivers were mixed on how they perceived autistic peers. While they rated autistic peers less favourably (DeBrabander et al., 2019; Grossman et al., 2019), it is possible that they still might be less inclined to judge that they actually disliked other autistic people - but no study has yet been carried out to address this. In turn, autistic perceivers were able to interact with autistic peers successfully (Heasman and Gillespie, 2019; Crompton et al., 2020a) and they were more willing to interact with autistic peers in the future (DeBrabander et al., 2019; Morrison et al., 2020b) suggesting that in some ways autistic people perceive autistic others more positively. With regards to readability, to date there is no research that has investigated how well autistic perceivers can read autistic targets using the paradigm in this thesis. Some previous research employing posed expressions (Brewer et al., 2016) found autistic people did not show an advantage in reading autistic expressions, but these findings might be a

consequence of the artificial nature of the stimuli. Hence, more time and work is needed to explore these questions thoroughly.

6.6 Conclusion

The medical model assumes that autism is located within the individual and is the responsibility of the individual. In contrast, DEP assumes autism is at least partly a product of the nature of relatedness between autistic and non-autistic individuals, in terms of how the condition presents itself and how it develops is a shared responsibility. This supports the notion that the mis (perception) between autistic and non-autistic people creates a barrier to autistic people being accepted in a society dominated by non-autistic people.

The current work in the thesis supported the DEP suggested by Milton (2012) and addressed whether or not autistic people and those who have high autistic features are perceived as being less socially favourable because they are less readable by non-autistic perceivers. The findings have shown that autistic people have a mind (i.e. behaviours) that is difficult to read and are perceived as less socially favourable by non-autistic people. Additionally, the link between readability and social favourability was consistent even when the rating of social favourability was based on static images. Notably, the findings highlighted another important aspect in that it is not only autistic people with diagnoses, but those individuals who have high autistic features, who were less readable and perceived as less favourable/likable.

One of the most important contributions of the present thesis is the development of a new scale for social favourability. This single question was able to produce similar findings to the

first impression scale of Sasson et al. (2017). Furthermore, the findings highlight that the role of autistic traits on social favourability and likeability which mediated by expressiveness of people. The findings reported in the current thesis suggest that if a person who have high autistic traits is les expressive, that particular person will be perceived less positively and it will be difficult for others to understand his/her mind. A person who have low autistic traits would be easy to read is also seen by perceivers as readable, which might then affect the perceiver's judgement of likability for the target.

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Supplementary Material

Appendix 1(Pilot study A)

1.1 Stimulus Development

22 undergraduate and postgraduate British and Japanese students (7 Japanese male, 5 Japanese female, 5 British males, 5 British females, mean age= 20.91 years old) were recruited as target participants. Targets were asked to think about a time when they felt a certain emotion as specified by a cue word (happy, grateful, angry, and sad). Each emotional cue word was displayed for 15 seconds and the order was randomised. If targets did not wish to recall an event relating to a specific cue word, they could press the spacebar to proceed to the following cue word. As each cue word was displayed, target expressions were recorded surreptitiously by the laptop webcam. In order to capture a natural and spontaneous expression, targets were told they were participating in a memory test in which they would later be asked to recall the event they had been thinking about. After the study, targets were debriefed and asked if they consented for their videos to be used. If they did not consent, the videos were destroyed immediately. The cue words were presented using PsychoPy v1.83.

As 22 target participants viewed 4 cue words each, there was a total of 88 individual videos of targets thinking about a specific event on cue.

1.2 Testing phase

1.2.1 Participants (perceivers)

Thirty-two non-autistic perceiver participants (31 females and 1male) aged between 18 to 30 (Mean = 18.75 years, SD = 1.06) were recruited through the RPS system, all perceivers were native English speakers.

1.2.2 Procedure

Each perceiver was shown 64 muted videos, four from each of the 16 targets, with order of presentation randomized in PsychoPy2 (Peirce, 2007). Each video was shown only once. All target videos were shown on a 15-inch MacBook Air. Perceivers were asked to select their chosen answer from four emoticons, which were displayed after each video clip without time constraint. They could make their choice by clicking one of the emoticons using the mouse (See screenshots of PsychoPy2 application from 0.1-0.3 below).



Figure 0.1. Screenshot showing instructions given to perceivers.

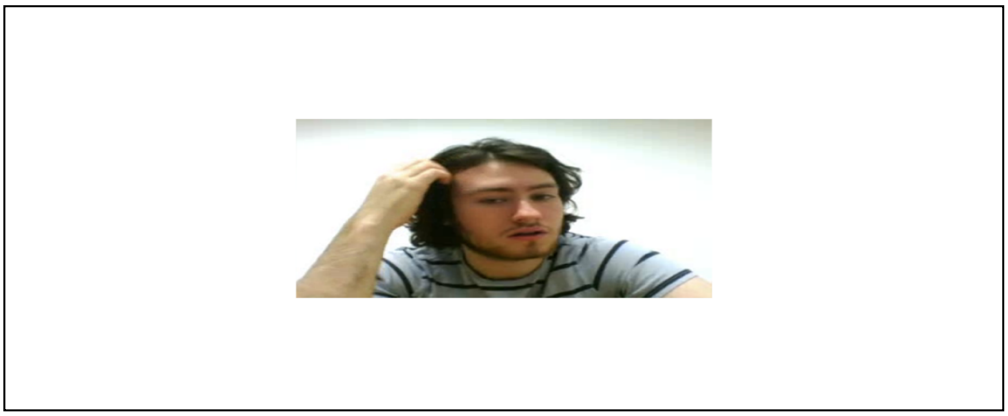


Figure 0.2. Screenshot showing still taken from target video, viewed before selection from the four emoticons.

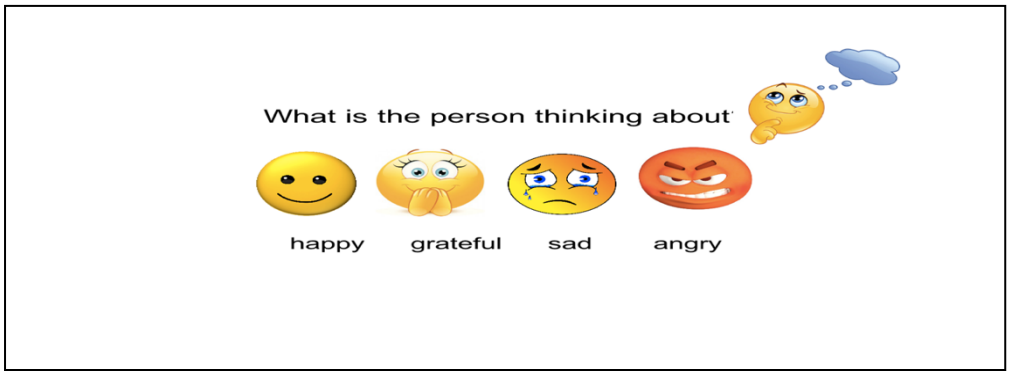


Figure 0.3. Screenshot showing the four emoticon response options.

Following completion of the task perceivers were debriefed and fully informed of the true purpose of the study. The procedure for the study was subjected to ethical review and approval was obtained from the School of Psychology Ethics committee, University of Nottingham (Ethics approval Number: 897).

The primary aim of the research was to determine if perceivers were systematically accurate in inferring what targets were thinking. Additionally, we investigated an 'own race effect', with the expectation that British perceivers would be more accurate when viewing British targets than when viewing Japanese targets. If perceivers are systematically accurate and if there is an 'own race effect' then we would be encouraged to use the procedure with

autistic targets to determine how readable they are and whether they are more easily read by autistic perceivers than by non-autistic perceivers.

Results and discussion

PsychoPy software produced an output data file which was converted into Microsoft Excel for each perceiver, containing their response from the task. From these files, four matrices per perceiver for each group (British and Japanese targets) and 4 target cue words were derived (one matrix for each emotion, happy, grateful, sad, and angry), detailing the number of hits (e.g., choosing happy when the target had indeed expressed a happy emotion), false alarms (e.g., choosing happy when the target had expressed something other than a happy emotion), misses (e.g., choosing sad when the target had actually expressed a happy emotion), and correct rejections (e.g., choosing something other than happy when the target had indeed expressed something other than a happy emotion). These matrices were used to calculate four d-prime values for each perceiver across two groups. This resulted in 128 d-prime values for each group (4 emotions x 32 perceivers) in total (See figure 0.4). This forms a normally distributed set of data that is suitable for analysis using parametric statistical tests (Pillai et al., 2012, 2014). The d-prime values were automatically calculated using a pre-developed Excel algorithm and gave an indication of successful performance, correcting for any bias in choosing particular response options. This was achieved by comparing the normalized scale of hits against normalized false alarms for each perceiver for each kind of target expression.

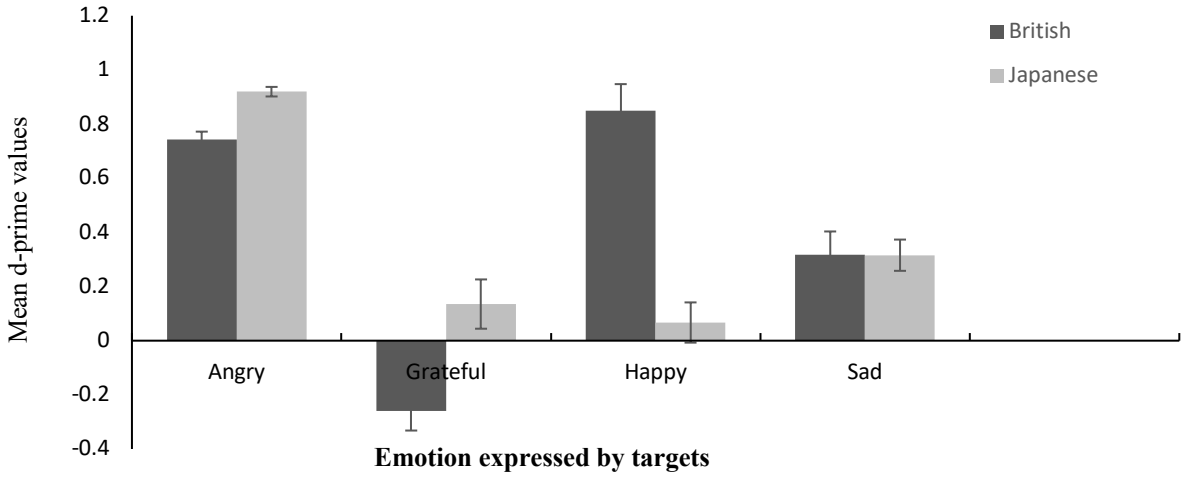


Figure 0.4. Means (and Standard Error) of d-prime values that represent perceivers' ability to determine which emoticon (Angry, Grateful, happy, Sad) in two target groups (British and Japanese). Error bars show the standard error of the mean.

A 2 X 4 repeated measures ANOVA identified a main effect associated with cue word, F (3, 93) =.29, p<.001 that was qualified by a significant interaction (Figure 0.18) between target group and cue word, F (2.27,70.42) =.34, p<.001. This raises the possibility that perceiver ratings were more positive for one target group over the other, depending on the cue word. To explore this possibility, four post hoc paired-samples t tests were employed to compare perceivers' performance across the two target groups for each cue independently. Perceivers were more accurate in detecting that Japanese targets compared with British targets were thinking of something that made them feel angry and grateful, t (31) =-3.73, p=.01 and t (31) =-3.19, p=.003, respectively. But perceivers were more accurate in detecting that British targets compared with Japanese targets were thinking of something that made them feel happy, t (31) =5.17, p<.001. Perceivers were equally accurate for both target groups when targets were cued to think of something sad.

A further analysis was conducted at the level of the target, to identify a readability value for each target. We counted the number for hits for each target, where chance is defined at 32. That is, each perceiver made 4 judgments about each target and since there were 32 perceivers, thus, 128 judgments were made in total across all perceivers about each target. Hence, given that each judgment is associated with .25 probability of success, chance is 32 hits for each target. We assessed whether one target group was more readable than the other on average but found that the means for the two target groups were identical (See Figure 0.5 below).

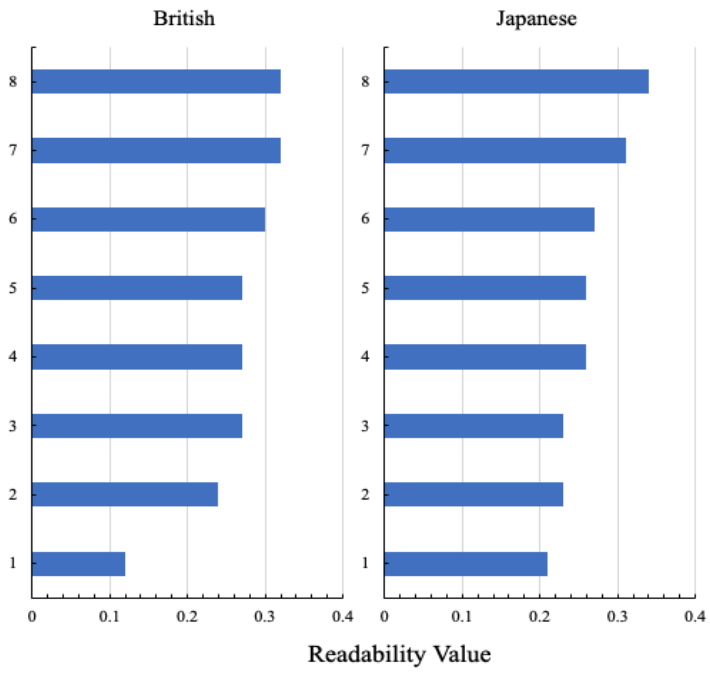


Figure 0.5. Readability of targets value for British and Japanese target, sorted from smallest to largest value.

Appendix 2(Pilot study B)

2.1 Target phase

2.2Perceivers phase (procedure)

Fourteen perceivers were asked to guess what each target was reacting to according to the scenarios previously mentioned above by presenting the four screens on one screen. The aim of this study was to measure whether: (1) editing criteria was fit, (2) readability value was quite high, (3) to test the new way of presenting four scenarios on the screen, and; (4) to test two questions after each target; how readable is this person? – how confident are you that you understand this person's behaviour? All videos were shown to each perceiver on a 21.5-inch iMac, with videos associated with each target presented in random order using PsychoPy3 version 3.2.5 (Peirce 2007).

2.3 Results

The results of pilot study showed that the readability in (Figure 0.6 below) was varied with the lowest value at 0.38 while the highest value was 0.70 which indicated the videos were of a good quality. Perceivers were asked to rate each target on two questions and the findings showed a strong correlation between these questions (r=87, p<001). Hence, it was appropriate, according to these results, to replicate the same procedure with the addition of one question for estimated readability, "How readable is this person"?

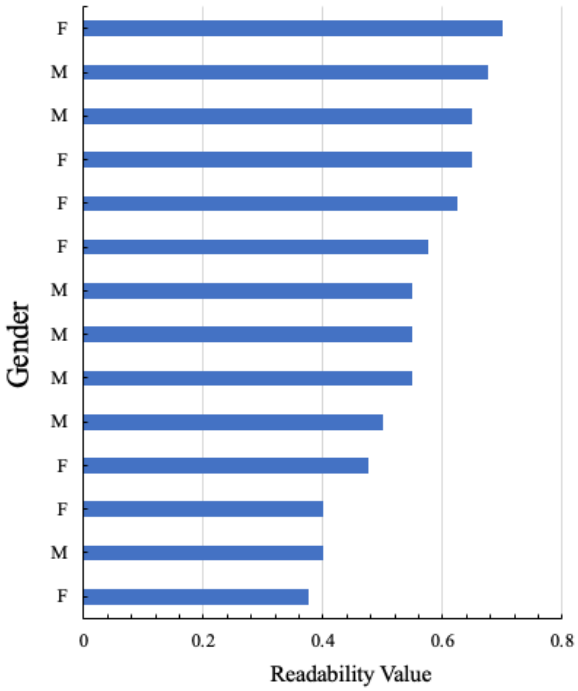


Figure 0.6. Readability of targets' value for Male and Female (arranged from smallest to largest value).

Appendix 3 (Extra analysis relates Chapter 2)

The way we determined the previous correlation values in **Table 2-1 (see Chapter 2)** was by averaging each target across all perceivers. However, in this extra analysis we created a correlation matrix for each perceiver across 40 videos and then averaged all 36 correlations across all perceivers. The previous correlation found in **Table 2-1** was conservative for two reasons. The first reason is that it involves fewer data points and is therefore low powered. The second reason is that it avoids common method variance, which arises when the analysis is based on the same person (perceiver) rating across nine scales. Presumably, they will be motivated to rate consistently according to a concept that they believe relates these nine scales (idiosyncratic behaviour).

In **Table 0-1** below, we created a correlation matrix for each perceiver representing correlations between each of their nine likeability ratings across the videos. This yielded 36 correlation values per perceiver. We then calculated the mean correlation coefficient for each correlation by averaging across the 31 perceivers. The total number of correlations was 1,116, i.e. 1,116 R-values and associated p-values.

Variable	1	2	3	4	5	6	7	8	9
1.Talk to	-	-0.38	0.53	0.57	0.32	0.70	0.47	0.46	0.59
2. Awkward	-	-	-0.27	-0.23	-0.35	-0.34	-0.21	-0.41	-0.27
3. Attractive	-	-	-	0.42	0.37	0.51	0.40	0.42	0.44
4.Trustworthy	-	-	-	-	0.24	0.62	0.53	0.32	0.59
5. Dominant	-	-	-	-	-	0.33	0.30	0.53	0.24
6. Likeable	-	-	-	-	-	-	0.52	0.48	0.63
7. Intelligent	-	-	-	-	-	-	-	0.38	0.46
8. Self-esteem	-	-	-	-	-	-	-	-	0.40
9. Empathy	-	-	-	-	-	-	-	-	-

Table 0-1.mean 36 correlation coefficients were computed across 40 videos per each perceiver by averaging each correlation across the 31 perceivers.

To assess the possibility of whether all these 36 correlation values (or one of them) are statistically significantly and greater than the assigned test value of 0 (zero), we performed one sample t-test. This showed that the mean of these 36 correlation values (M=.29, SD=0.34) was greater than the assigned test value of 0 (zero), with $t(35) = -5.07$, $p < .005$.

Furthermore, to find any significant differences between all or any of these 36 correlation values across the two groups (autistic group and non-autistic group), we created a correlation matrix for each group (autistic group and non-autistic group) with each perceiver representing correlations between each of their nine likeability ratings (across the 40 targets). This yielded

36 correlation values per each perceiver for each group. We then calculated the mean correlation coefficient for each correlation by averaging across the 31 perceivers for each group. The total number of correlations was 1,116, i.e. 1,116 R-values and associated p-values from each group (see **Table 0-2**).

Variable	1	2	3	4	5	6	7	8	9
1-Talk to		-0.30	0.49	0.52	0.31	0.67	0.40	0.35	0.56
2-Awkward	-0.46		-0.19	-0.14	-0.29	-0.25	-0.13	-0.34	-0.18
3-Attractive	0.55	-0.34		0.34	0.37	0.45	0.30	0.36	0.40
4-Trustworthy	0.60	-0.30	0.47		0.21	0.60	0.53	0.23	0.59
5-Dominant	0.35	-0.42	0.41	0.27		0.32	0.28	0.54	0.26
6-Likeable	0.71	-0.40	0.54	0.62	0.33		0.48	0.40	0.59
7-Intelligent	0.49	-0.30	0.46	0.51	0.34	0.52		0.31	0.44
8-Self-esteem	0.54	-0.45	0.44	0.37	0.52	0.51	0.43		0.34
9-Empathy	0.63	-0.35	0.48	0.62	0.22	0.66	0.48	0.43	

Table 0-2.The bottom right side shows 36 correlation values for autistic group and the bottom left side shows 36 correlation values for the non-autistic group. Each pair of correlation values were determined by averaging across 31 perceivers .

R-squared values were then calculated as a measure of shared variance between each item pair. The average shared variance across all item combinations was then compared in autistic and non-autistic group using a paired sample t-test between 36 correlation values and groups (36 correlation values for the autistic group and 36 other correlation values for non-autistic group). This revealed a significant difference in these 36 correlation values between autistic group (M=.16, SD=.11) and non-autistic group (M=.22, SD=.11) with t (35) = -9.32, p <.001. This raised the question of whether there are significant differences between each of the correlation values across the groups. We conducted 36 post hoc paired sample t-tests to

compare perceivers' performance across the two target groups for each correlation value independently, which indicated the p value for each correlation between groups. The Bonferroni correction found that the correlation between awkwardness and self-esteem was significant at p =.028, for willing to attract somebody and intelligence, it was p <.001, and for other items there was no significance at all with p >.05 (see **Table 0-3**).

Variable	1	2	3	4	5	6	7	8	9
1-Talk to		0.003	0.094	0.100	0.824	0.516	0.251	0.011	0.046
2-Awkward	0.12		0.024	0.012	0.176	0.008	0.006	0.0007	0.0191
3-Attractive	1	0.87		0.040	0.384	0.033	0.0002	0.006	0.032
4-Trustworthy	1	0.45	1		0.200	0.449	0.416	0.007	0.549
5-Dominant	1	1	1	1		0.756	0.401	0.871	0.924
6-Likeable	1	0.30	1	1	1		0.247	0.133	0.009
7-Intelligent	1	0.22	0.008	1	1	1		0.263	0.347
8-Self-esteem	0.40	0.028	0.22	0.26	1	1	1		0.183
9-Empathy	1	0.69	1	1	1	0.34	1	1	

Table 0-3.The bottom right side shows the p value for each pair of correlation values between autism group and the non-autistic group and the bottom left side shows the Bonferroni correction.

We performed an extra analysis for each perceiver that represents their judged liking of each target using a between groups t-test to determine whether (for each perceiver) their liking ratings are significantly higher when targets are non-autistic than when they have autism. The paired sample t-test found a significance difference between autistic group (M=26.39, SD=4.21) and non-autistic group (M=29.50, SD=4.66) with $t(30) = -8.79$, p <.001 in how each perceiver was likeable in each group (See figure **0.7 below**).

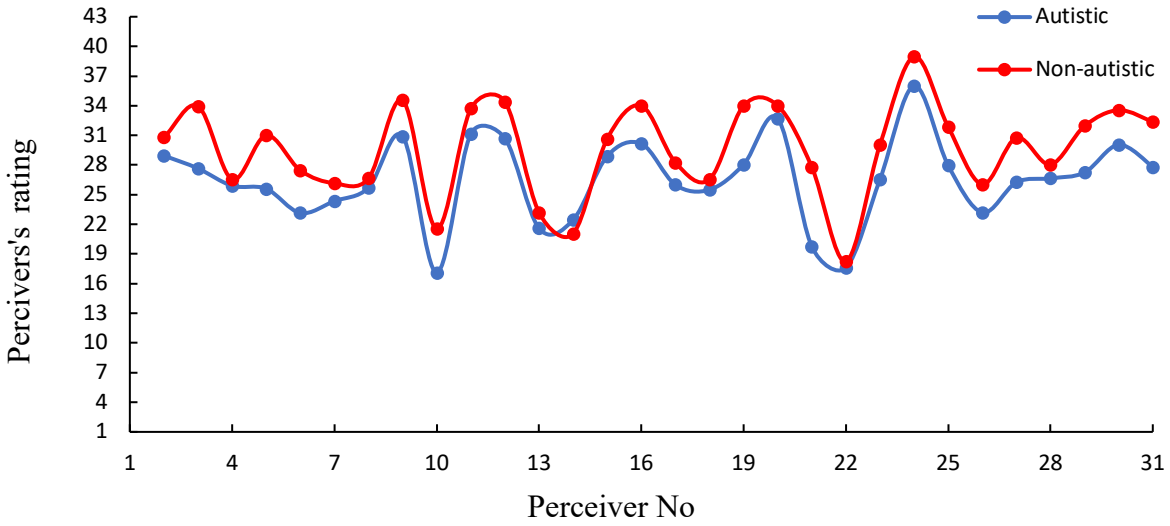


Figure 0.7. Social favourability rating was given by each perceiver for each group. The error bars represent one standard error of the mean.

A correlation analysis was performed between social favourability and readability values (values associated with each target based on previous data coding for targets in each scenario independently). Each correlation was based on ten targets (five non-autistic and five autistic). The results yielded four correlation values. The data revealed a positive relationship between social favourability and readability in the compliment scenario ($r = 0.82$, p=.004) and the story scenario ($r = 0.62$, p=.05), while there was a strong negative correlation between social favourability and readability in the waiting scenario ($r = -0.72$, p=.021). However, there was no correlation between social favourability and readability in the joke scenario (r = -0.24, p=.512).

An extra analysis was added to determine whether there is a link between readability/or social favourability and expressiveness of targets. The findings highlighted a positive correlation between readability (the waiting scenario was excluded) and the expressiveness

rating (r=48,p=007), and this correlation still appeared when diagnostic status was controlled (r=45 , p=02).

There was a strong positive correlation between the social favourability rating (scenarios were undisclosed) and the expressiveness of targets (r=755 p<001), and this connection was apparent even when controlled for diagnostic status (r=761 p<001). There was also a strong correlation when scenarios were disclosed for perceivers (r=77, p<=001) and the correlation was still maintained, even when controlled for diagnostic status (r= 81, p<001). The results suggest that the correlation value is completely unaffected by the diagnostic status of the target.

Appendix 4 Mean and standard deviation of each scale for autistic and non-autistic targets for social favourability/likeability for each chapter).

1) Chapter 2

Group	Talk to	Awkward	Attractive	Trustworthy	Dominant	Likeable	Intelligent	Self-esteem	Empathy
Autistic Mean (SD)	3.05 (0.63)	2.80(0.53)	2.30(0.38)	3.03(0.45)	2.54(0.56)	3.21(0.65)	3.15(0.42)	3.02(0.53)	3.06 (0.51)
Non-autistic Mean (SD)	3.53 (0.63)	3.08(0.53)	2.76(0.38)	3.36(0.45)	2.70(0.56)	3.66(0.65)	3.56(0.42)	3.47(0.53)	3.39(0.51)

Table 0-1. Mean and standard deviation of autistic and non-autistic targets ratings for each item (Chapter 2-study 1).

Scenario	Autistic Mean (SD)	Non-autistic Mean (SD)
Compliment	2.96(0.56)	3.66(0.55)
Joke	3.19(0.56)	3.42(0.57)
Story	3.11(0.47)	3.66(0.59)
Wait	2.37(0.59)	2.35(0.71)

Table 0-2. For each target group, the mean and standard deviation for Social Favourability (Chapter 2-study 1).

Group	Talk to	Awkward	Attractive	Trustworthy	Dominant	Likeable	Intelligent	Self-esteem	Empathy
Autistic Mean (SD)	3.0(0.74)	2.78 (0.71)	2.21 (0.40)	3.04(0.35)	2.73 (0.61)	3.29(0.57)	3.18(0.40)	3.10(0.55)	3.12(0.52)
Non-autistic Mean (SD)	3.64(0.73)	3.10(0.55)	2.99(0.58)	3.43(0.37)	2.94(0.37)	3.83(0.57)	3.64(0.43)	3.49(0.45)	3.55(0.51)

Table 0-3. Mean and standard deviation of autistic and non-autistic targets ratings for each item Chapter 2-study 2) .

Scenario	Autistic Mean (SD)	Non-autistic Mean (SD)
Compliment	2.79(0.36)	3.73(0.44)
Joke	3.25(0.42)	3.52(0.43)
Story	3.15(0.44)	3.61(0.49)
Wait	2.56(0.47)	2.74(0.45)

Table 0-4. For each target group, the mean and standard deviation for Social Favourability (Chapter 2-study 2).

2) Chapter 3

Group	Talk to	Awkward	Attractive	Trustworthy	Dominant	Likeable	Intelligent	Self-esteem	Empathy
Autistic Mean (SD)	3.16(0.66)	2.66 (0.46)	2.365(0.54)	3.10(0.47)	2.86(0.60)	3.42(0.60)	3.29(0.53)	3.20(0.54)	3.21(0.53)
Non-autistic Mean (SD)	3.76(0.83)	2.97(0.54)	2.95(0.65)	3.58(0.65)	2.95(0.38)	3.90(0.76)	3.97(0.55)	3.63(0.61)	3.71(0.70)

Table 0-5. Mean and standard deviation of autistic and non-autistic targets ratings for each item (Chapter 3-study 1) .

Scenario	Autistic Mean (SD)	Non-autistic Mean (SD)
Compliment	2.89(0.44)	3.93(0.54)
Joke	3.26(0.43)	3.77(0.46)
Story	3.29(0.43)	3.60(0.43)
Wait	2.69(0.48)	2.73(0.36)

Table 0-6. For each target group, the mean and standard deviation for social favourability (Chapter 3-study 1).

Group	Talk to	Awkward	Attractive	Trustworthy	Dominant	Likeable	Intelligent	Self-esteem	Empathy
Autistic Mean (SD)	3.01(0.44	2.745(0.48	2.46(0.41	3.023(0.44	2.67(0.57	3.29(0.46	3.36(0.42	3.09(0.56	3.15(0.40)
Non-autistic Mean (SD)	3.42(0.48)	3.0(0.49)	2.98(0.55)	3.35(0.42)	2.81(0.50)	3.69(0.50)	3.81(0.40)	3.61(0.55)	3.49(0.49)

Table 0-7. Mean and standard deviation of autistic and non-autistic targets ratings for each item (Chapter 3-study 2).

Scenario	Autistic Mean (SD)	Non-autistic Mean (SD)
Compliment	2.96(0.55)	3.60(0.47)
Joke	3.02(0.45)	3.52(0.65)
Story	3.27(0.53)	3.54(0.55)
Wait	2.64(0.51)	2.76(0.54)

Table 0-8. For each target group, the mean and standard deviation of social favourability (Chapter 3-study 2).

3) Chapter 4

Scenario	Autistic Mean (SD)	Non-autistic Mean (SD)
Compliment	16.8 (8.43)	26.2(2.77)
Joke	18.6 (7.98)	25.4 (3.57)
Story	16.8 (7.56)	26(2.54)
Wait	8.2(1.92)	4.8(3.11)

Table 0-9. For each target group, the mean and standard deviation of 'Likeability' for each scenario(Chapter 4-study 1).

scenario	Autistic Mean (SD)	Non-autistic Mean (SD)
Compliment	2.74(0.43)	3.40(0.50)
Joke	2.71(0.50)	3.18(0.58)
Story	2.66(0.48)	3.23(0.66)
Wait	2.03(0.43)	2.05(0.51)

Table 0-10. For each target group, the mean and standard deviation for social favourability (Chapter 4-study 1).

Scenario	Autistic Mean (SD)	Non-autistic Mean (SD)
Compliment	15.4 (10.64)	26.6(2.79)
Joke	21.6 (8.84)	23 (6.36)
Story	18.8 (9.12)	25.4(2.50)
Wait	12.8(4.54)	10.8(4.08)

Table 0-11 .Mean and standard deviation of "likeability" for each of the scenarios for each target group (Chapter 4-study 2).

Scenario	Autistic Mean (SD)	Non-autistic Mean (SD)
Compliment	2.57(0.40)	3.39(0.45)
Joke	2.97(0.37)	3.18(0.41)
Story	2.85(0.43)	3.36(0.40)
Wait	2.44(0.36)	2.48(0.40)

Table 0-12.Mean and standard deviation of social favourability for each of the scenarios for each target group (Chapter 4-study 2).