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Confirmatory Factor Analysis and further validation of the Comprehensive assessment of Acceptance and Commitment Therapy processes (CompACT)

Katrina Marie Bayliss, BSc, MSc.

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THESIS VOLUME 1

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Statement of Contribution

I declare that this research is the product of my own original work conducted since my commencement of the Trent Doctorate in Clinical Psychology training programme in 2014. Conceptually, the idea for the project was developed by Dr David Dawson and Dr Nima Golijani-Moghaddam, who also provided regular guidance and supervision with all aspects of the research, including feedback on draft versions of my thesis and journal paper, as well as help with data analysis and refining my interpretations and understanding of the implications of the data. As the Principal Investigator for this research, I have taken responsibility for: advertising the research; recruiting participants; collecting data; scoring questionnaires; entering data; undertaking the bulk of the data analysis with some additional support from Dr Nima Golijani-Moghaddam; and writing the thesis.

Portfolio Abstract

The current research provides further testing and validation of the newly developed Acceptance and Commitment Therapy (ACT) measure: Comprehensive assessment of Acceptance and Commitment Therapy (CompACT- Francis et al., 2016). To further evaluate the psychometric robustness of the CompACT the current research: (1) completed an intercorrelated and bifactor confirmatory factor analysis (CFA) of the previously identified three-factor structure; (2) retested the psychometric properties (reliability and validity indicators) in an independent sample (*n=313*); (3) tested the CompACT's stability over a two-week period (test-retest reliability); and (4) tested the ability to distinguish groups based on clinical screening criteria for distress (CompACT clinical cut-offs). Further testing was then carried out to explore and confirm the construct of the CompACT which included: unidimensional analysis and hierarchical analysis.

Both intercorrelated and bifactor analyses in the main study yielded an acceptable model fit confirming the three-factor structure of the CompACT. Test-retest data (*n=112*) confirmed stability over a two-week period (*r = .88*) indicating a large effect. Clinical cut-off data was also analysed, which offered preliminary findings for scores indicative of low psychological flexibility. Regression analysis suggested that scores of 85 and below on the CompACT, within this dataset, were indicative of low psychological flexibility. Further CFA testing suggested that the bifactor model produced the best fitting model overall. However, taking into consideration ACT theoretical conceptualisations and a priori assumptions, it was concluded that the intercorrelated CFA analysis was most representative of the CompACT structure.

This study supports the three-factor model of the CompACT and provides further evidence that it is a useful, reliable, stable and robust tool within the ACT field, for research and clinical practice.

JOURNAL ARTICLE

Confirmatory Factor Analysis and further validation of the Comprehensive assessment of Acceptance and Commitment Therapy processes (CompACT)[1]

Katrina Bayliss[a]*
Email: msxkmj@nottingham.ac.uk

[a]University of Nottingham
Division of Psychiatry and Applied Psychology
School of Medicine
Jubilee Campus
Yang Fujia Building
Wollaton Road
Nottingham, UK
NG1 8BB

Tel: (+44)1158 466646

Dr. David Dawson[b]
Email: Ddawson@lincoln.ac.uk

Dr. Nima Golijani-Moghaddam[b]
Email: NMoghaddam@lincoln.ac.uk

[b]University of Lincoln
College of Social Science,
Sarah Swift Building,
University of Lincoln,
Brayford Wharf East,
Lincoln, UK
LN5 7AY
Tel: (+44)1522 886029
Fax: (+44)1522 837390

*Author note. The study was carried out and funded as part of a doctoral course of study in clinical psychology, undertaken by the first author. Correspondence concerning this paper should be addressed to the first author: Katrina Bayliss, DClinPsy student, University of Nottingham, Division of Psychiatry and Applied Psychology, School of Medicine, Jubilee Campus, Yang Fujia Building, Wollaton Road, Nottingham, UK, NG1 8BB, msxkmj@nottingham.ac.uk, (+44)1158 466646.

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Abstract

The current research provides further testing and validation of the newly developed Acceptance and Commitment Therapy (ACT) measure: Comprehensive Assessment of Acceptance and Commitment Therapy (CompACT- Francis et al., 2016). To further evaluate the psychometric robustness of the CompACT the current research: (1) completed an intercorrelated and bifactor confirmatory factor analysis (CFA) of the previously identified three-factor structure; (2) retested the psychometric properties (reliability and validity indicators) in an independent sample (*n=313*); (3) tested the CompACT's stability over a two-week period (test-retest reliability); and (4) tested the ability to distinguish groups based on clinical screening criteria for distress (CompACT clinical cut-offs).

Both CFA analyses yielded an acceptable model fit confirming the three-factor structure of the CompACT. Test-retest data (*n=112*) confirmed stability over a two-week period (r = .88), indicating a large effect. Clinical cut-off data was also analysed, which offered preliminary findings for scores indicative of low psychological flexibility. Regression analysis suggested that scores below 85 on the CompACT, within this dataset, were indicative of low psychological flexibility.

This study supports the three-factor model of the CompACT and provides promising evidence that it is a useful, reliable, stable and robust tool within the ACT field, for research and clinical practice.

Key words: acceptance and commitment therapy, psychological flexibility, assessment, measures, confirmatory factor analysis

1. Introduction

Psychological health is considered to be of significant importance to human existence. Kashdan and Rottenberg (2010) define a psychologically healthy person as “someone who can manage themselves in the uncertain, unpredictable world around them, where novelty and change are the norm rather than the exception” (p. 876). In recent times poor psychological health has been considered one of the main causes of the overall disease burden worldwide (Whiteford et al., 2013), and costing the UK economy an estimated £105 billion a year and putting a considerable strain on NHS services (Wykes et al., 2015).

An array of theories and interventions have been developed in order to address these issues including: formulaic concepts of health (Frederickson & Losado, 2005); concepts placing emphasis on the commitment to meaningful challenges in accord with self-concept (Vallerand et al., 2003); and psychosocial models (Deci & Ryan, 2000). However, these ‘static’ approaches arguably fail to capture the dynamic and contextually-specific behaviours that people utilise when managing the challenges of daily living (Kashdan & Rottenberg, 2010). It has been suggested that a key component to psychological health which complements traditional perspectives is psychological flexibility (PF).

Research in this area spans the past five decades and represents fragmented research on the area with little attempt at synthesis (Kashdan & Rottenberg, 2010). One of the reasons for this is the various guises in which PF has been discussed and referred to, including: ego-resilience (Block, 1961); response modulation (Patterson & Newman, 1993); executive control (Posner & Rothbart, 1998); and self-regulation (Carver & Scheier, 1998; Muraven & Baumeister, 2000). Kashdan and Rottenberg (2010) synthesised previous research in the area of PF to provide the following definition: the individual (1) is able to adapt to fluctuating situational demand; (2) is able to reconfigure mental resources; (3) is able to shift perspective; and (4) balances competing desires, needs and life

domains (p. 866). This therefore suggests that definitions of PF have to incorporate repeated transactions between individuals and their environment.

The synthesis of the past five decades of existing literature in this area offers insights in the disposition, relationships and consequences of flexibility. Research in these areas has consistently concluded that individuals are evidenced to better tolerate and effectively use emotions, thoughts and behaviour to obtain the best possible outcomes in varying contexts in the presence of PF, and that these 'dynamic abilities' form the essence of health. If so, this suggests that PF could be crucial to the management of psychological health and requires further substantial analysis (see extended paper 1.1 – 1.1.6).

1.1 Acceptance and Commitment Therapy (ACT)

PF has been posited to be a key factor underlying mental health and behavioural effectiveness (Kashdan & Rottenberg, 2010; Kashdan, 2009), and it forms a primary focus within Acceptance and Commitment Therapy (ACT; Hayes, Strosahl & Wilson, 1999) – an emerging, empirically-based model for conceptualising and treating psychological difficulties. PF within ACT terms has been defined as, "contacting the present moment fully as a conscious human being, and based on what the situation affords, changing or persisting in behaviour in the service of chosen values" (Hayes et al., 2006).

Hayes et al. (1999) suggested that PF is underpinned by six interrelated but distinct core processes: (1) *Acceptance*: active and aware embracing of private experiences; (2) *Cognitive Defusion*: changing how thoughts are related to/interacted with; (3) *Self-as-context*: the stories and thoughts that we have about ourselves; (4) *Contact with the Present Moment*: ongoing non-judgmental contact with psychological and environmental events as they occur; (5) *Values*: chosen qualities of purposeful action*;* and (6) *Committed Action*: behaving in line with values (see extended paper 1.3 – 1.3.6). In the ACT model these processes are represented by the ACT 'Hexaflex'- see Figure 1.

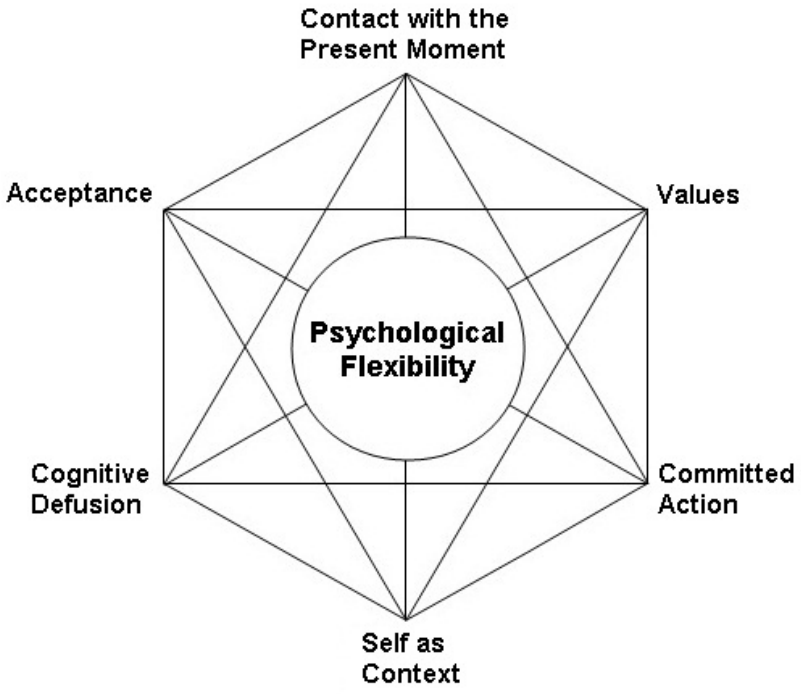


Figure 1. ACT 'Hexaflex' (Hayes, Strosahl & Wilson, 1999)

There are 30 directional relationships among the six core processes of the hexaflex, each representing a theoretical claim of relatedness (Hayes, Strosahl & Wilson, 2012). It is proposed that the six core processes are responsible for fostering PF – the ultimate goal of ACT – and that, in the absence of one or more of them, there is the risk of psychological rigidity.

Initial conceptualisations of the 'hexaflex' indicated that the processes were interlinked with one another (Hayes et al., 1999). However, Hayes et al. (2011) suggest that each core process is deeply interlinked with one process more than the others, as indicated in Figure 2. As with the original 'hexaflex', these three dyads are considered to have significant strength when aligned and functioning together (Robinson & Strosahl, 2008).

Further research by Hayes et al. (2011) identified 'openness', 'awareness' and 'activation' as three basic categories which appear to be present within all behavioural and cognitive third-wave psychotherapies (e.g. Acceptance and Commitment Therapy; Behavioural Activation; Dialectical Behaviour Therapy; Functional Analytic Psychotherapy; Integrative Behavioural Couple Therapy;

Metacognitive Therapy; Motivational Interviewing). This suggests that targeting PF might be a common strategy within other third-wave therapeutic models, and altering it appears related to improved outcomes (see extended paper 4.6).

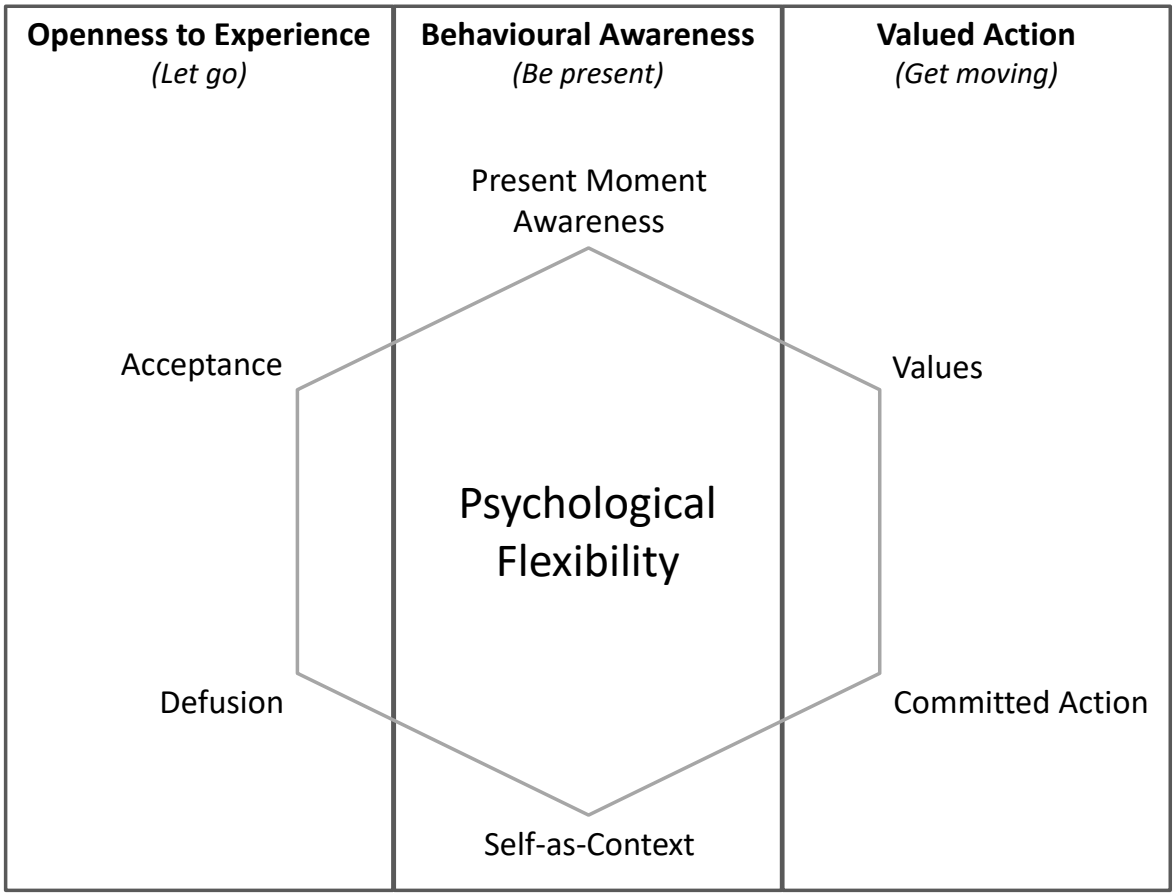


Figure 2. Three Dyadic Processes (Hayes et al., 2011)

1.2 Clinical Utility of Psychological Flexibility

PF is considered to be the key mechanism of change underpinning ACT and has been systematically studied and evidenced within mental health research (McCracken, Gutierrez-Martinez, & Smyth, 2013- see extended paper 1.5). Hayes et al. (2006) examined the relationship between PF and a broad range of psychopathology and quality of life measures, across a number of studies, in order to determine the relationship between the two, if any. These results indicated a moderately sized positive relationship between PF and a range of quality of life indicators. Further research has provided additional evidence of a positive correlation between PF and quality of life outcomes in other settings such as: cancer care (Hulbert-Williams & Storey, 2015) and eating disorders (Hill et al., 2015). Mediation research has also been found to be supportive of

the role of PF and its components as processes of change. For example, acceptance and flexibility partially mediated the difference between treatment conditions on positive action intentions in an intervention for racial prejudice (Lillis & Hayes, 2007).

A meta-analytic review of 16 studies researching ACT interventions for Stigma was completed by Krafft et al. (2017). Findings suggested that the overall effect size was statistically significant with medium to large effect. This indicates that, averaging across samples and types of stigma, PF has a relatively large and stable correlation with stigma. The same authors also completed a systematic review of 15 studies, with findings indicating consistent reductions in stigma following ACT interventions.

The research suggests that PF and its sub-processes function as a mediator of change such that increases in PF mediate or partially mediate changes in psychopathological symptoms such as: depression (Hussey & Barnes-Holmes, 2012; Zettle & Hayes, 1986; Zettle & Rains, 1989); anxiety (Forsyth & Eifert, 2016; Forman et al., 2007); PTSD (Berghoff et al., 2018); pain (Yu & McCracken, 2016; McCracken, Vowles, & Eccleston, 2005); nicotine addiction (Gifford et al., 2004); and psychosis (Bach, Hayes & Gallop, 2012).

Additionally, research has also evidenced PF as being effective not only in moderating mental health, but also in other areas such as: successfully managing physical health difficulties (Gloster et al., 2017); better performance in leadership roles (Moran, 2011; Bond, Hayes, Barnes-Holmes, 2006) and even in promoting better parenting styles (Leeming & Hayes, 2016; Brassel et al., 2016; Williams, Ciarrochi & Heaven, 2012). PF has been demonstrated to correlate with increased quality of life in a range of applied contexts. The research indicates that PF is a key process that underpins psychological health and functional well-being.

1.3 Measuring Psychological Flexibility

Cronbach and Meehl (1955) report that psychological and personality constructs are the inferred characteristics or traits of a person which are not tangible. The only way in which these important concepts can be accessed is to

ensure that theoretical constructs are measured “in a convincing, valid way” (Smith, 2005, p. 396). Abstract constructs can only be accepted and made more distinct if the validity of the methods used to measure them can be ascertained. The testing of hypothetical constructs is necessary to help understand how people behave (McDonald, 2008), which in turn can help to gain a more comprehensive understanding of psychological health.

Despite PF being highlighted as a key mechanism of change in ACT, and perhaps other third-wave therapies, measurement of the concept has been challenging. While some measures have been developed to target one or two of the ACT core processes (e.g. Multidimensional Experiential Avoidance Questionnaire, Gamez et al., 2011; Cognitive Fusion Questionnaire, Gillanders et al., 2014; Mindfulness Scale, Jislin-Goldberg, Tanay & Bernstein, 2012; Valued Living Questionnaire, Wilson et al., 2010; Engaged Living Scale, Trompetter et al., 2013), and others developed for specific populations (e.g. Chronic Pain Acceptance Questionnaire, Vowles, McCracken, & Eccleston, 2008; Avoidance and Inflexibility Scale for smoking behaviours, Gifford et al., 2004; Acceptance and Action Diabetes Questionnaire, Gregg et al., 2007; Acceptance and Action Questionnaire for Weight, Lillis et al., 2009; Acceptance and Action Questionnaire for Prejudice, Lillis & Hayes, 2007), these have been circumspect in focus (see extended paper 1.6). Although research has suggested that these self-report measures might be more sensitive and applicable when focused on a specific and unique problem area (Gifford et al., 2004; Gregg et al., 2007; Luoma et al., 2011), they are unable to capture the broader ACT process of psychological flexibility (Francis et al., 2016).

For this purpose, the Acceptance and Action Questionnaire and the revised Acceptance and Action Questionnaire II (Hayes et al., 2004; Bond et al., 2011), were developed (see extended paper 1.6.1). Both measures are thought to represent a well validated general measure of PF (Ciarrochi, Bilich, & Godsel, 2010).

1.4 Acceptance and Action Questionnaire

Since the conceptualisation of the AAQ-II it has long been seen as the gold standard in ACT research, with evidence suggesting that it diverges and converges in expected ways with related outcomes and processes. The AAQ-II has been found to relate with variables to which it is theoretically tied. For instance, higher levels of psychological flexibility, as measured by the AAQ-II, have been associated with lower levels of depression, anxiety, and overall psychological distress. Longitudinally, higher scores on the AAQ-II have been shown to predict self-reported mental health (Bond et al., 2006).

However, more recently there have been a number of critiques of the measure. For instance, various studies have criticised the AAQ-II for combining ACT processes with distress outcomes (Rochefort, Baldwin & Chmielewski, 2017; Francis et al., 2016; Wolgast, 2014; Gámez et al., 2011). Specifically, authors of these studies have critiqued the wording of items on the AAQ-II as reflecting/overlapping with experiences of distress. Although the measure might be psychometrically robust, it may well be mis-targeted, measuring distress rather than PF. With this being the case, it is expected that the AAQ-II would co-vary with distress, as both are measuring the same thing. Francis et al. (2016) have suggested that the issue is so problematic that the AAQ-II should be considered a distress measure, rather than a measure of general ACT processes.

The problems of the AAQ-II indicate questionable content and construct validity of the measure, which may limit the extent to which current findings about PF can be interpreted.

1.5 Comprehensive Assessment of Acceptance and Commitment Therapy (CompACT)

In order to address the limitations of the AAQ-II and to ensure a broader capture of the processes underpinning ACT, the Comprehensive Assessment of Acceptance and Commitment Therapy (CompACT; Francis et al., 2016) was developed based on the three dyadic ACT processes (Hayes et al., 2011).

Francis et al.'s (2016) development of the CompACT was based on the concept that extant ACT process measures are typically restricted in their focus and have received criticism in relation to discriminant validity and the combining of process and outcome variables. Using the Delphi consensus methodology, a 23-itemed measure was developed and analysed using exploratory factor analysis (see extended paper 1.6.2). A three-factor structure was suggested-based on Hayes' (2011) three dyadic processes, which were labelled 'openness to experience', 'behavioural awareness' and 'valued action'. The CompACT converged and diverged in theory-consistent ways with other measured variables: higher levels of psychological inflexibility were associated with higher levels of distress and lower levels of health and well-being. Unlike the AAQ-II, the CompACT did not conflate with distress, indicating that it is measuring something distinct, compared to the AAQ-II.

However, the findings of Francis et al. (2016) were based on preliminary analysis in a single sample and require confirmatory and additional testing in an independent sample. In particular, based on established test construction principles (e.g. DeVellis, 2016), confirmation of the three-factor structure via an a priori confirmatory factor analysis (CFA) should be completed. The CompACT's suitability for repeated administration via test-retest reliability will also provide additional evaluation of the CompACT's psychometric robustness.

1.6 Aims and Objectives

An exploratory factor analysis of the CompACT has indicated good levels of validity and reliability. To further evaluate the psychometric robustness of the CompACT the current research intends to focus on the following: (1) confirmatory factor analysis of the preliminarily-identified three-factor structure; (2) retesting of psychometric properties (reliability and validity indicators) in an independent sample; (3) testing of the CompACT's stability over time (test-retest reliability); (4) and testing of the ability to distinguish groups based on clinical screening criteria for distress (CompACT clinical cut-offs).

2. Method

Ethical approval for this research was obtained from the appropriate institutional ethics committee (see extended paper Appendix A).

2.1 Research Design

The overarching design for the current study was to confirm the underlying factor structure of the CompACT and complete further empirical testing of the CompACT's psychometric robustness. A cross-sectional online survey design was used to gather the data; a secondary stage of stability testing was also completed.

2.2 Participants

The study recruited a community sample of participants via advertisements on social media platforms (Facebook, Twitter, Instagram and LinkedIn), over a period of six months. Participants were provided with a link on the advertisement which directed them to the Qualtrics platform (see procedure below) where they completed several measures (see extended paper Appendix D for participant information).

Based on empirical power simulations and given a three-factor structure with factor loadings ≈ .65, and 5 or more indicators per factor, it was estimated that two hundred and twenty participants were needed in the current study to have sufficient data to support the CFA (Wolf et al., 2013).

2.3 Measures

Participants were first asked to complete the CompACT. Further to completing the CompACT, participants were also required to complete additional self-report measures (see Table 1) to assess whether the CompACT: (1) converged with measures of theoretically related variables (AAQ-II); (2) diverged from measures of theoretically distinct variables (Short form Marlowe-Crowne Social Desirability scale (MCSD; Ballard, 1992); and (3) correlated in expected directions with established measured outcome variables (Depression Anxiety Stress Scale (DASS-21; Henry & Crawford, 2005) and Short Form Health Survey (SF-12v2; Ware et al., 2002) - see extended paper 2.2 and extended

paper Appendix B. Appropriate copyright licensing was acquired for the use of the SF-12v2 (see extended paper Appendix C).

Participants were also given the opportunity to opt in to complete the test-retest survey two weeks after completing the original measures. The CompACT, DASS-21 and AAQ-II were repeated at this stage.

All data was collated using secure online survey software (Qualtrics) and exported for analysis once the survey closed.

Table 1.

Description of self-report measures

Name of measure and author	**Number of items**	**Aim**	**Item scaling and anchor points**	**Directionality**	**Example item**	**Reliability**
Comprehensive assessment of Acceptance and Commitment Therapy Measure (CompACT); Francis et al. (2016)	23 items	A general measure of psychological flexibility with three factors: 1) Openness to experience; 2) Behavioural awareness; and 3) Valued action	Seven- point scale; 'strongly disagree' (0) to 'strongly agree' (6).	Higher scores indicate higher levels of psychological flexibility	"I make choices based on what is important to me, even if it is stressful"	Internal reliability (.92)
Short form Marlowe-Crowne Social Desirability scale (MCSD); (Ballard, 1992)	13 items	Assesses when a participant's responding is constrained by social desirability	Participants are asked to provide dichotomous 'yes' or 'no' responses to items.	Higher scores indicate more socially desirable responses	"I sometimes feel resentful when I don't get my way"	Internal Reliability: (.62-.76)

Short Form Health Survey (SF-12V2); (Ware et al.,1996; 2002)	12 items	A general measure of health and well-being with two factors: 1) Physical health; and 2) Mental health.	Five-point scale; 'excellent' (1) to 'poor' (5) related to their functioning over the last four weeks across eight domains:1) physical functioning; 2) role limitations due to physical problems; 3) social functioning; 4) bodily pain; 5) mental health; 6) role limitations due to emotional problems; 7) vitality; and 8) general health perceptions.	Higher scores indicate better health and quality of life	"In general, would you say your health is: Excellent; Very Good; Good; Fair; Poor?"	Internal reliability: Physical health scale (.92) Mental health scale (.88) Test-retest reliability: two weeks (.76-.89
Acceptance and Action Questionnaire II; (Bond et al., 2011)	7 items	A general measure of psychological flexibility	Seven-point scale; 'never true' (1) to 'always true' (7)	Higher scores indicate lower levels of	"Emotions cause problems in my life"	Internal reliability: (.78-.88)

				psychological flexibility		Test-retest reliability: 3 months (.81); and 12 months (.79)
Depression Anxiety Stress Scale (DASS-21); (Henry and Crawford, 2005)	21 items	Distress measure assessing three separate constructs: 1) Depression; 2) Anxiety; and 3) Stress.	Three-point scale; 'did not apply to me at all over the last week' (0) to 'applied to me very much or most of the time over the past week' (3)	Higher scores indicate greater levels of distress	Depression item: "I felt downhearted and blue"	Internal reliability: (.82-.97)

Note. Internal reliability scores are calculated using Cronbach's alpha (α); Test-retest reliability scores use Pearson's (r) correlation coefficients.

2.4 Psychometric Data Evaluation

Once all data had been collected it was exported to the Statistical Package for the Social Sciences (SPSS, v.23) for analysis. Incomplete data was deleted, and the presence of multivariate outliers was assessed with the squared Mahalanobis Distance (DM^2) with additional data being removed.

All items requiring reverse scoring were done so at this point and the CompACT's domain totals and overall totals were calculated for each participant. Scoring was then completed for all other measures.

The internal reliability of the CompACT was evaluated using Cronbach's alpha measure of internal consistency as estimated by SPSS (Fornell & Larcker, 1981). Values of alpha greater than 0.7 are indicative of acceptable reliability (Henson, 2001).

The convergent validity of the CompACT was evaluated against the AAQ-II using Pearson's correlation coefficient (*r*). Correlations between theoretically similar measures should be high, but not so high that they are measuring the same construct. Cohen (1992) indicated the following effect sizes: small=.20; medium=.30; and large=.50.

The discriminant validity of the CompACT was evaluated against the MCSD. Correlations between theoretically different measures should be low. Pearson's correlation coefficient was also used in this evaluation and interpreted using Cohen's effect size.

The concurrent validity of the CompACT was evaluated against the DASS-21 and SF12v2. Higher scores on the CompACT should predict lower scores on the DASS-21 and higher scores on the CompACT should predict higher scores on the SF12v2.

Before completing the confirmatory factor analysis, an exploratory factor analysis using parallel analysis was completed to provide confirmation of a three-factor model within this dataset.

Confirmatory factorial analysis (CFA) was conducted to confirm the underlying structure of the CompACT, using SPSS-AMOS (v.23). Intercorrelated confirmatory analysis and bi-factor analysis was performed. The model fit was evaluated using the chi-square statistic (χ^2)/df and other descriptive fit indices based on recommendations by Kline (2010) which included: The Comparative Fit Index (CFI; Bentler, 1990), the Root Mean Square Error of Approximation (RMSEA; Steiger, Shapiro & Browne, 1985), and the Standardized Root Mean Square Residual (SRMR; Hooper, Coughlan & Mullen, 2008- see extended paper 2.2.1 – 2.2.5). Hu and Bentler (1999) suggested the following cut-off criteria, which are thought to be indicative of good model fit: 1) Chi-square/df value <3; 2) CFI value equal to .90 or greater; 3) RMSEA values of .10 or below; 4) SRMR values of <.08. Factor loadings are also reported, with loadings of over .05 suggested as acceptable (Stevens, 1992).

Other analyses are available to examine the underlying structure of a model, including: unidimensional analysis and hierarchical analysis, which have also been considered (see extended paper 3.6 - 3.7).

Test-retest reliability was evaluated using Pearson's coefficient correlations. Higher effect sizes (e.g. *r* >0.70) indicate test-retest reliability.

Finally, clinical cut-offs for the CompACT were assessed using clinical data identified in the current data set by the DASS-21. A regression analysis was used to evaluate and suggest clinical cut-off scores for the CompACT.

3. Results

3.1 Participants

A community sample of 422 adults consented to take part in the study, with 313 completing all measures in full (see Table 2). Of these participants, 128 consented to complete the retest phase, with 112 completing all measures in full.

Table 2.

Participant demographics N=313

Variable	N (%)
Gender	
Male	58 (18.5)
Female	253 (80.8)
Mean Age (Years)	33.3 (*SD*=11.9)
Ethnicity	
White	270 (86.3)
Asian British	16 (5.1)
Mixed Race	15 (4.8)
Black British	6 (1.9)
Other	6 (1.9)

Abbreviations SD= Standard Deviation

3.2 Removing multivariate outliers

In order to ensure the CompACT was not overly influenced by the presence of outliers (i.e. responses which are extreme compared to the mean responses on at least two variables; Field, 2013), the dataset was examined using Mahalanobis distance values. Cases are considered to be multivariate outliers if the probability associated with their Mahalanobis distance value is $p < .001$. 25 cases meeting this criterion were removed and the CompACT's factor structure (and later its validity) was analysed based on the remaining 313 cases (data set one). Participants were then asked to complete specific measures again two weeks later (test-retest); during this stage of analysis seven cases meeting the criterion were removed and the remaining 112 were analysed (data set two).

3.3 Reliability of the CompACT

Internal consistency was evaluated via the Cronbach's alpha measure. The CompACT was found to be highly reliable (23 items; α=.92), indicating that the

items of the CompACT demonstrate excellent levels of correlation with one another.

3.4 Validity of the CompACT

Table 3 below summarises the associations of the CompACT and its three subscales with other measures.

3.4.1 Convergent Validity

The CompACT positively converged with the AAQ-II (*r* = .72). The CompACT's 'openness to experience' subscale had the strongest association with the AAQ-II (*r* = .73), followed by the 'behavioural awareness' subscale (*r* = .49) and the 'valued action' subscale (*r* = .45).

3.4.2 Discriminant Validity

As expected, no significant correlations were found between the CompACT and the MCSD, indicating that the measures are unrelated.

3.4.3 Concurrent Validity

The CompACT was found to have medium-to-large positive correlations (*rs* = .31-.61) with all three subscales representing the DASS-21 and correlated most strongly with the depression subscale (*r* = .61). When the CompACT's three subscales were examined for their associations with the DASS-21 subscales, the ‘openness to experience’ subscale correlated more strongly with all of the DASS-21 subscales (*rs* = .50-57) compared to the CompACT's ‘behavioural awareness’ (*rs* = .39-.49) and ‘valued action’ subscales (*rs* = .27-.43).

The CompACT demonstrated a large significant positive correlation with the SF-12v2's mental health subscale (*r* = .57), and a non-significant negative correlation with its physical health subscale (*r* = -.02). The CompACT's ‘openness to experience’ subscale had the strongest correlation with the SF12v2's mental health subscale (*r* = .56). All three of the CompACT's subscales mirrored the CompACT's stronger associations with the SF-12v2

mental health subscale (*rs* = .38-.58) compared to the physical health subscale (*rs* = -.04-.01).

Table 3.

Correlations between the CompACT, the CompACT's subscales, and other measures (N= 313)

Measure	CompACT Total Score	CompACT Openness Subscale	CompACT Self-awareness Subscale	CompACT Motivation-Activation Subscale	AAQ-II
AAQ-II	.72*	.73*	.49*	.45*	-
DASS- 21					
Depression	.61*	.57*	.47*	.43*	.70*
Anxiety	.50*	.50*	.39*	.27*	.60*
Stress	.55*	.52*	.49*	.31*	.67*
SF-12 V2					
Physical Health Subscale:	*-.02*	-.04	.01	-.01	.08
General Health	.29*	.26*	.17*	.27*	-.30*
Physical Functioning	.05	.04	.07	.01	-.50*
Role Physical	.20*	.18*	.16*	.12*	-.20*
Bodily Pain	.16*	.15*	.15*	.08	-.17*
Mental Health Subscale:	.57*	.56*	.40*	.38*	-.72

Role Emotion	.52*	.51*	.35*	.35*	-.62*
Mental Health	.53*	.54*	.40*	.34*	-.68*
Vitality	.36*	.27*	.34	.29*	-.37*
Social Functioning	.39*	.39*	.30	.19*	-.52*
Short-Form MCSD	0.2	0.2	0.1	0.1	-0.2

Abbreviations: AAQ-II (Acceptance and Action Questionnaire, version 2); DASS-21 (Depression Anxiety and Stress Scales, 21-item version); SF-12v2 (Short-form Health and Survey, 12-item version); MCSD (Marlowe-Crowne Social Desirability Scale, 12-item version).

*Note. *Correlation is significant at p < .01*

3.5 Confirmatory Factor Analysis

Francis et al. (2016) proposed a three-dyadic factor model for the CompACT including: (1) 'openness to experience' (acceptance; defusion); (2) 'behavioural awareness '(present moment awareness; self-as-context); and (3) 'valued action' (values; committed action). An exploratory factor analysis using parallel analysis was conducted which confirmed the three-factor structure within this dataset (see extended paper 3.5).

To evaluate whether this model adequately fit the collected data firstly, an intercorrelated CFA was performed on the 23-item CompACT (*n=313*) using SPSS AMOS (v.23); standardised parameter estimates are presented. A confirmatory factor analysis of the response items yielded a marginal model fit: $\chi 2/df = 3.64$ (df= 227; *p*=.001, CFI = .82, RMSEA = .09 [90% CI= .08, .09], SRMR=.08) with values for the RMSEA falling outside of recommended ranges (as specified above).

Model one identified an inadequate model fit. Modification indices were reviewed as part of the CFA. The presence of covariance between the errors of

two (or more) indicators of the same construct suggests that one indicator is in some way related to the other(s). In general application of CFA, these indicators are reflective and should be independent. A good rationale is needed when freeing the error effects on a CFA (Brown, 2015). The CompACT is a multiple-choice questionnaire, meaning that correlated errors may occur due to similarly worded items, reverse worded items or similarly constructed items. In these circumstances it is acceptable to free the error effects, as long as there are not too many item pairs (Brown, 2015 - see extended paper 3.4 and 4.3).

When the analysis was repeated after freeing correlated errors, the model yielded a better fit $\chi 2/df$ =2.81 (df= 221; *p*= .001); CFI=.88; RMSEA=.07 [90% CI= .06, .08]; and SRMR= .07 (see Figure 3), with all values within adequate ranges – although the model remains suboptimal according to strict cut-off criteria (e.g. CFI values above .90 or even .95 are considered indicative of 'good' model-fit) (Hu & Bentler, 1999). The CompACT's factor loadings were also satisfactory, with all items loading >.05 (Stevens, 1992). Please refer to Table 4 to find a list of the CompACT items and how they relate to the SPSS AMOS output (Figure 3) and the original CompACT ordering (Francis et al., 2016), along with factor loadings for the current study.

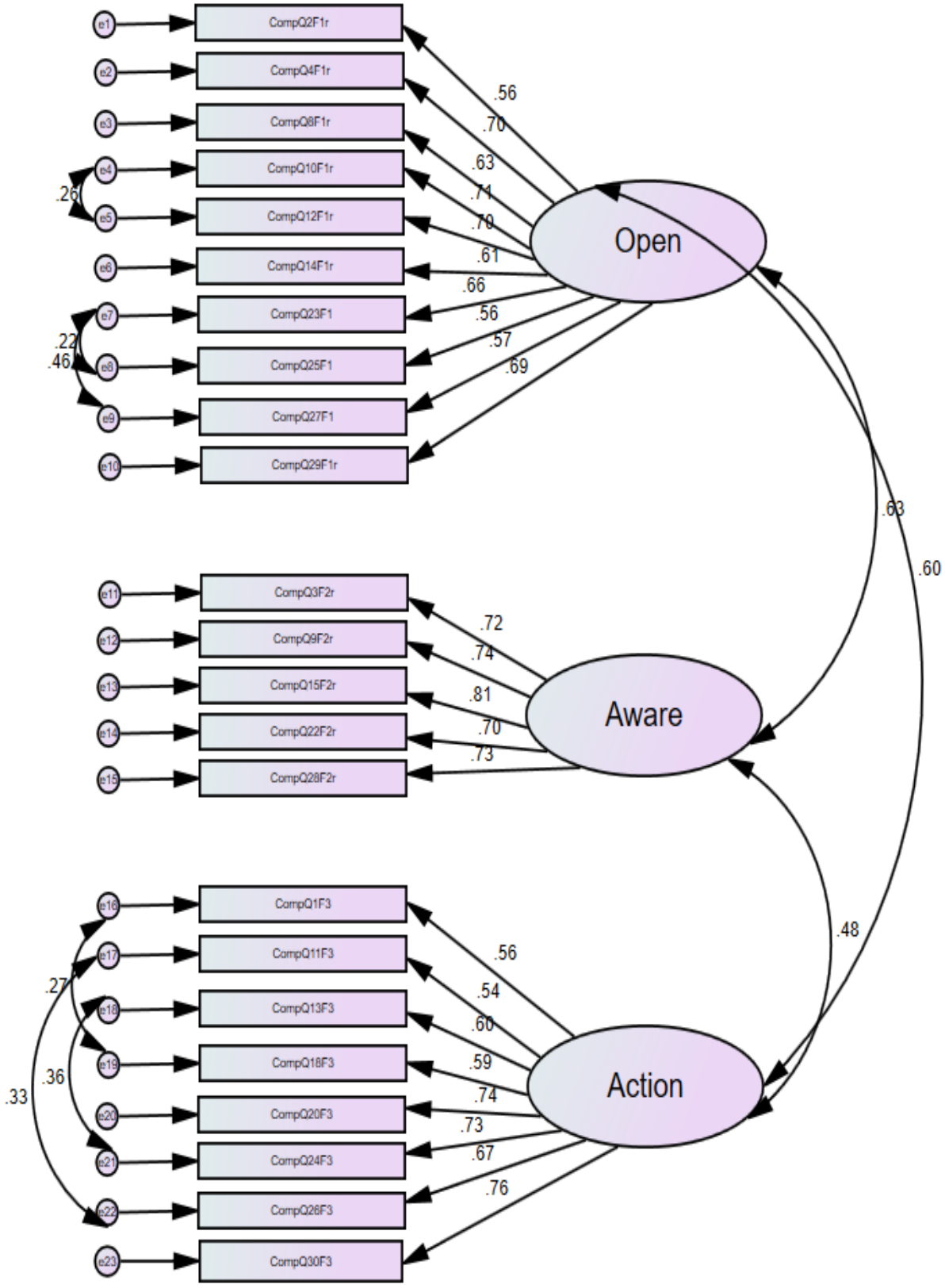


Figure 3. Intercorrelated Analysis Output

Table 4.

Original CompACT item ordering and how it relates to item references in the current study; factor loadings for current study

Item question	Item number in CompACT (Francis et al., 2016)	Item reference in current study	Factor loadings in current study
I can identify the things that really matter to me in life and pursue them	1	CompQ1F3	.56
One of my big goals is to be free from painful emotions	2	CompQ2F1r	.56
I rush through meaningful activities without being really attentive to them	3	CompQ3F2r	.72

I try to stay busy to keep thoughts or feelings from coming	4	CompQ4F1r	.69
I act in ways that are consistent with how I wish to live my life	5	CompQ30F3	.76
I get so caught up in my thoughts that I am unable to do the things that I most want to do	6	CompQ29F1r	.69
I make choices based on what is important to me, even if it is stressful	7	CompQ11F3	.54

I tell myself that I shouldn't have certain thoughts	8	CompQ8F1r	.63
I find it difficult to stay focused on what's happening in the present	9	CompQ28F2r	.73
I behave in line with my personal values	10	CompQ24F3	.73
I go out of my way to avoid situations that might bring difficult thoughts, feelings, or sensations	11	CompQ10F1r	.74

Even when doing the things that matter to me, I find myself doing them without paying attention	12	CompQ9F2r	.74
I am willing to fully experience whatever thoughts, feelings and sensations come up for me, without trying to change or defend against them	13	CompQ27F1	.57
I undertake things that are meaningful to me, even when I find it hard to do so	14	CompQ26F3	.67

I work hard to keep out upsetting feelings	15	CompQ12F1r	.69
I do jobs or tasks automatically, without being aware of what I'm doing	16	CompQ22F2r	.70
I am able to follow my long-term plans, including times when progress is slow	17	CompQ18F3	.59
Even when something is important to me, I'll rarely do it if there is a chance it will upset me	18	CompQ14F1r	.62

It seems I am "running on automatic" without much awareness of what I'm doing	19	CompQ15F2r	.81
Thoughts are just thoughts – they don't control what I do	20	CompQ25F1	.56
My values are really reflected in my behaviour	21	CompQ13F3	.60
I can take thoughts and feelings as they come, without attempting to control or avoid them	22	CompQ23F1	.68

I can keep going with something when it's important to me	23	CompQ20F3	.74

Key: Comp=CompACT; F1= Factor 1 'Openness to experience'; F2= Factor 2 'Behavioural awareness'; F3= Factor 3 'Valued Action'; r= reversed item

Further analysis was completed to evaluate whether the bifactor model adequately fit the collected data, a CFA was performed on the 23-item CompACT (*N=313*) using SPSS AMOS (v.23). A confirmatory factor analysis of the response items yielded an acceptable model fit: χ2/df = 2.30 (df= 201; *p*=.000), CFI = .92, RMSEA = .06 [90% CI= .05, .07], SRMR=.05 (see figure 4). Factor loadings also indicated that the 'Openness to Experience' factor was not distinct from the general PF factor. 'Behavioural Awareness' and 'Valued Action' maintained distinct factors. (see Table 5).

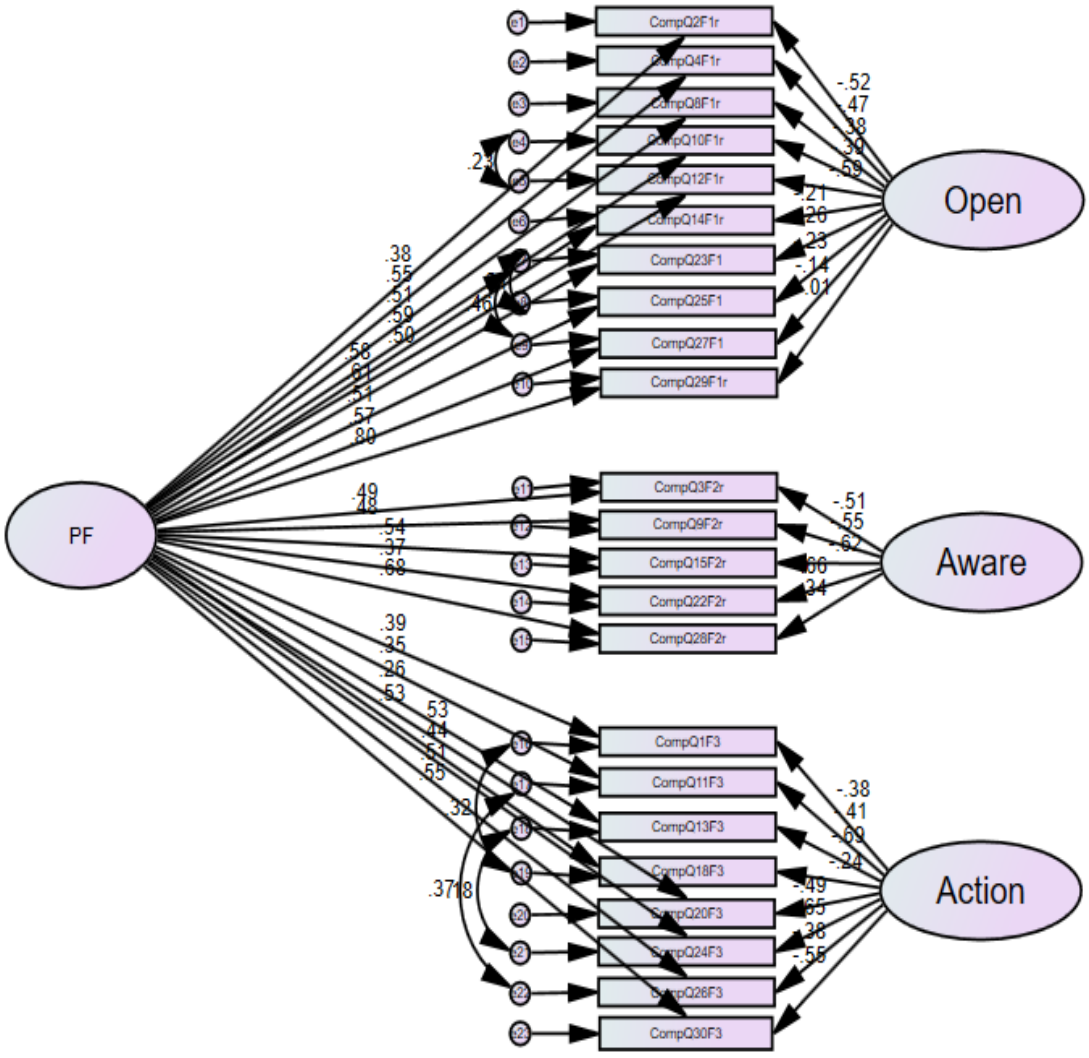


Figure. 4 Bifactor Analysis Output

Table 5.

Factor loadings for the Bifactor model

			Estimate
CompQ2F1r	<---	Open	-.519
CompQ4F1r	<---	Open	-.466
CompQ8F1r	<---	Open	-.380
CompQ10F1r	<---	Open	-.391
CompQ12F1r	<---	Open	-.591
CompQ14F1r	<---	Open	-.205
CompQ23F1	<---	Open	-.257
CompQ25F1	<---	Open	-.233
CompQ27F1	<---	Open	-.142
CompQ29F1r	<---	Open	.010
CompQ3F2r	<---	Aware	-.511
CompQ9F2r	<---	Aware	-.551
CompQ15F2r	<---	Aware	-.619
CompQ22F2r	<---	Aware	-.656
CompQ28F2r	<---	Aware	-.345
CompQ1F3	<---	Action	-.382
CompQ11F3	<---	Action	-.409
CompQ13F3	<---	Action	-.688
CompQ18F3	<---	Action	-.242
CompQ20F3	<---	Action	-.494
CompQ24F3	<---	Action	-.649
CompQ26F3	<---	Action	-.378
CompQ30F3	<---	Action	-.554
CompQ2F1r	<---	PF	.377
CompQ4F1r	<---	PF	.554
CompQ8F1r	<---	PF	.512
CompQ10F1r	<---	PF	.588

			Estimate
CompQ12F1r	<---	PF	.500
CompQ14F1r	<---	PF	.575
CompQ23F1	<---	PF	.612
CompQ25F1	<---	PF	.509
CompQ27F1	<---	PF	.566
CompQ29F1r	<---	PF	.802
CompQ3F2r	<---	PF	.493
CompQ9F2r	<---	PF	.482
CompQ15F2r	<---	PF	.539
CompQ22F2r	<---	PF	.373
CompQ28F2r	<---	PF	.678
CompQ1F3	<---	PF	.388
CompQ11F3	<---	PF	.348
CompQ13F3	<---	PF	.256
CompQ18F3	<---	PF	.529
CompQ20F3	<---	PF	.531
CompQ24F3	<---	PF	.441
CompQ26F3	<---	PF	.515
CompQ30F3	<---	PF	.547

3.6 Test-Retest Reliability

The CompACT total score demonstrated good reliability from time 1 to time 2 (*n=112*) over a two-week period (*r* = .88). The CompACT's scales also demonstrated good reliability over time: 'openness to experience' (*r* = .87); 'behavioural awareness' (*r* = .83); and 'valued action' (*r*= .80).

3.7. CompACT Clinical Cut-offs

Finally, clinical caseness in the current dataset (*n*=313) was analysed. This data indicated a group of participants (*n*=187) who met the clinical cut-offs of the DASS-21 (see Table 5) and participants who did not (non-clinical, *n*=126).

Regression analyses were used to identify CompACT scores associated with established clinical cut-offs for psychological distress. Specifically, following Bond et al. (2011), relevant values were entered into regression equations to identify the CompACT total score (Y) predicted by cut-off values (X) for DASS Depression and Anxiety subscales. The clinical criterion-value for DASS Depression (10) predicted a CompACT score of 85 and the clinical-criterion value for DASS Anxiety (8) predicted a CompACT score of 84. Thus, analyses indicate that CompACT scores of 84-85 and below are associated with clinical levels of psychological distress. These analyses are preliminary, and subject to further testing (e.g. in populations seeking psychological support) but converge on a narrow band of values that may reflect clinically-relevant responses to the CompACT.

Table 6.

Clinical cut-off scores for DASS-21 (Henry & Crawford, 2005)

	Depression	Anxiety
Normal	0-4	0-3
Mild	5-6	4-5
Moderate	7-10	6-7
Severe	11-13	8-9
Extremely Severe	14+	10+

4. Discussion

The overall aim of this research was to undertake additional psychometric analysis of the CompACT in an independent sample. Two confirmatory factor analyses found an acceptable model fit for the original three factors ('openness to experience', 'behavioural awareness', 'valued action') for both an intercorrelated and bifactor CFA. Thus, indicating that the measure performed as expected, and in a manner similar to that described in the original validation study, providing further evidence of the ability to successfully and consistently measure the concept of PF.

Initial testing of the CompACT's stability over time was completed in the current study with a sample of 112 participants. A large effect was found, which suggests that the CompACT was a reliable measure of ACT core processes over a two-week period. Finally, the current study completed preliminary testing of the CompACT's ability to distinguish groups based on clinical screening criteria for distress. Initial findings suggested that scores of 84-85 and below are indicative of lower levels of PF that were likened to clinical distress scores identified within the DASS-21.

4.1 Strengths and Limitations

The development of the CompACT was, in part, to address the issues raised in other general measures of ACT. The criticism of the AAQ-II's questionable content and construct validity potentially limits the extent to which interpretations of the findings – to date – have been about PF, rather than being about something more specific to the AAQ-II. Therefore, the development of the CompACT serves to provide an additional psychometrically robust measure of PF, to ascertain whether findings are consistent across a range of measurement contexts and are not an artefact of the AAQ-II's item particularities e.g. wording issues. Furthermore, more effective measures of PF will be able to ascertain the contribution of PF to psychological health and well-being, and how to maximise the focus on PF within psychological therapies.

The development of the CompACT included the first exploration and support for Hayes et al.'s (2011) three-dyadic version supporting ACT's clinical model as theoretically and psychometrically viable. CFA analysis in the current study further strengthens the broader argument that ACT's conceptual model may be composed of fewer than six distinct processes. Pragmatically, having fewer processes to target within ACT treatment may have clinical utility such that effective ACT interventions become more succinct.

The confirmed structure of the CompACT, established within this study, provides preliminary evidence of the repeated use of the measure over time for research and clinical purposes. The CompACT has already been identified as suitable for use in process research into ACT's mechanisms of change such as component studies, and/or single case experimental designs (SCEDs) research (Francis et al., 2016), which has a strong tradition of being used to inform and develop psychological theory within a behavioural paradigm (Smith, 2012). Within clinical settings the CompACT has the potential to capture and monitor proposed mediators of change within the ACT model, and thereby support ACT's conceptualisation of psychological distress over and above extant therapies.

The repeated use of the CompACT also has constructive clinical implications, in particular during intervention (e.g. pre-intervention, mid-intervention, post-intervention). Unlike the AAQ-II, the CompACT offers subscale scores for the three-dyadic processes, thus succinctly helping to identify specific processes which the individual may be struggling with and directing clinicians to focus interventions on these areas. Furthermore, clinicians may choose not to use multiple ACT measures to analyse broad and specific PF outcomes. More broadly, the three-dyadic version of the ACT model, along with the CompACT's ability to measure sub-components of PF, potentially offers a more resolute and cost-efficient pathway for ACT intervention. These developments have the potential to work more effectively with the current issues of poor psychological health in a more streamlined and informative way.

A more precise measure is essential for ACT's development and to enable the prediction of behaviour in light of human suffering; however, the use of 'static' measures for 'dynamic' processes of psychopathology has been criticised in the literature (see Wright & Hopwood, 2016). ACT processes are considered to be temporal in nature, changing and responding to different contexts continuously. This suggests that to gain true insight into the application of PF, continuous monitoring and data collection of core processes over long periods of time are necessary. Although there have been developments in dynamic assessments such as ambulatory assessments (Ebner-Priemer, 2018), which utilise technology to collate large volumes of data within individuals' lived-in environments, this method is a long way from being applied to clinical settings and is costly (see extended paper 4.5). Therefore, the development and findings of the CompACT currently provide evidence of a more reliable and valid ACT general measure, compared to the AAQ-II.

However, there remains the need for some caution with the interpretation of these findings. Although the model fit for the CompACT is acceptable, the current indices would not meet stricter cut-offs for evaluating model fit (Brown, 2015; Hu & Bentler, 1999). In this case, further analyses, such as an exploratory factor analysis, can be used to re-examine the model and potentially propose a new factor model (Brown, 2015). However, there is much debate regarding fit indices in CFA (Brown, 2015). Barrett (2007) suggested that fit indices do not add anything to the analysis and only the chi square should be interpreted, with the issue that fit indices allow researchers to claim that a mis-specified model is satisfactory. Other researchers (Hayduk et al., 2007) argue that cut-offs for a fit index can be misleading and subject to misuse. Although most analysts argue the value of fit indices, caution is advised against strict reliance on cut-offs (Kenny, 2011) (please see extended paper section 4.4).

The bifactor model produced a better fitting model for the data. Factor loadings for PF were high on the 'openness to experience' CompACT items (.37-.80) and

relatively low for the specific factor (.14-.59). Thus, bifactor literature indicates that the items are being represented by PF, making the subscale redundant. However, factor loadings on the 'behavioural awareness' and 'valued action' items indicated a relatively equal spread for both PF and specific factors, indicating shared variance and confirming the necessity of three specific factors.

The intercorrelated CFA is an overall indication of an acceptable three-factor model fit, which is in line with the theoretical conceptualisations. Further evidence of this is provided by the item factor loadings, which are all considered to be satisfactory (>.50, Stevens, 1992). A higher factor loading indicates a stronger relationship between an item and an underlying latent variable, and thus provides indirect evidence of an item's construct validity (Comrey & Lee, 2013). Higher factor loadings of the CompACT items, as well as the convergent and discriminant validity, further suggest acceptable construct validation and coherence to the theoretical conceptualisations.

Additionally, recent ACT literature has also suggested that the three factors established within the CompACT ('openness to experience'; 'behavioural awareness', 'valued action') may also be present within most other third-wave psychotherapies (Hayes et al., 2011). More broadly, this provides further evidence that PF is a moderator of mental health and more generally a significant marker of health and well-being. These preliminary findings also suggest that the CompACT may have clinical utility within other third-wave models, providing further evidence of the presence of PF and its sub-processes, with the potential to direct interventions utilising more of ACT's conceptualisations.

This relates to the movement of ACT research working towards the "creation of a psychology more adequate to the challenge of the human condition" (Hayes, Strosahl & Wilson, 2012, p. 375), which attempts to offer some resolution to the issue of poor psychological health and its consequences. It has been named the 'contextual behavioural science' (CBS) approach and identifies several key

steps, one of which is the measurement of theoretical processes and their relationships to pathology and health. Treatment utility, conceptual utility, and coherence are considered to be the key aspects of measurement advances within this concept. This 'comprehensive psychology' aims to provide a trans-theoretical and trans-diagnostic approach with a unified model of intervention. The identification and validation of PF as a moderating factor for quality of life is an essential component, and therefore further development and evaluation of valid and reliable measures is an essential part of the CBS movement.

Further research in this area will be essential in testing this theory and validating this claim; however, the potential outcome of this could have a significant impact in the field of Psychology. The research regarding the CompACT will undoubtedly have important implications in this area and its future developments.

4.2 Future Research

Further research of the CompACT should seek to ensure plausibility and parsimony of the model by testing it within clinical samples and across diverse demographics (e.g. age, race). Further developments of the CompACT might include reducing the number of items to create a short form version which will further improve clinical utility.

5. Conclusion

This study supports the three-factor model of the CompACT and provides promising evidence that it is a useful, reliable, stable and robust tool for research and clinical practice.

Journal word count: 7189

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EXTENDED PAPER

1. Extended Introduction

1.1 Broader Issues

The current research focuses on the validation and further testing of a new measure (CompACT) for ACT. However, it is important to consider the broader issues relating to the need to develop and validate a new ACT measure. The following section will provide an overview of the current state of mental health, as well as discussing some of the current debates regarding psychopathology and psychotherapy. These discussions will inform the understanding of the development of the CompACT and will explore the reasons why PF is a concept that requires further research and measurement.

1.1.1 Mental Illness

Mental illness is said to affect one in four of the population (Mental Health Foundation, 2017), with anxiety and depression being the most prevalent disorders (Fineberg et al., 2013). There is no other health condition which matches mental illness in the combined extent of prevalence, persistence and breadth of impact (Friedli & Parsonage, 2007). Mental illness has been consistently correlated with deprivation, low income, unemployment, poor education, poorer physical health and increased health-risk behaviour (Vigo, Thornicroft & Atun, 2016). According to the Centre for Mental Health (2010), mental illness has not only a human and social cost, but also an economic one, with wider costs in England amounting to £105 billion a year (Mental Health Foundation, 2016).

Statistics such as the ones discussed are widely known, with the UK National Health Service (NHS) attempting to meet the needs of a struggling population. However, despite a 20% increase of referrals per year to community mental health teams in England (Adams et al., 2016), the government has proposed further cuts to the sector (Hoagwood et al., 2018; Stewart et al., 2016; Docherty & Thornicraft, 2015). These issues have direct effects on therapists and psychologists, who are often overwhelmed by such vast numbers of referrals to services. Budget cuts, reduced resources, and increased referrals provide

therapists/psychologists with significant difficulties regarding the way in which psychological care is administered.

Gaining an understanding of such issues can help to guide the development of psychology for the future.

1.1.2 Psychopathology

Traditionally, the literature has focused its research on attempting to understand and measure psychopathology – *the scientific study of mental disorders*. The medical model has been prominently used in the diagnosis and treatment of psychopathology. Diagnostic criteria have developed over time to inform this model (the diagnostic and statistical manual of mental health, 5th ed.; American Psychiatric Association, 2013; international statistical classification of diseases and related health problems - ICD-10; World Health Organisation, 1992), with aims of helping clinicians to quickly identify mental illness via a checklist or criteria of illness and provide treatment accordingly. The medical model drives research and theorising about mental illness on a basis of causation and remediation of symptoms (Anderson, 1995). As the cause of mental illness has often been elusive, the focus has fallen on symptom relief, either in the form of medication or psychotherapy (Lam, Salkovskis & Warwick, 2005).

Historically, there are three main branches of psychotherapy which have aimed to address the psychological needs of the population. These are: Cognitive, Behavioural, and Dynamic psychotherapy. Although each branch has its own theory and ways of working, ultimately the goal of therapy remains the same: to help the client reduce negative symptoms, gain insight into why these symptoms occurred, and work through those issues to reduce the emergence of symptoms in the future (Heffner, 2001). The cognitive branch of psychology considers dysfunctions and difficulties as arising from irrational or faulty thinking (Beck, 1979). The individual's perception of the world from a certain viewpoint (which may or may not be accurate) results in the person acting and feeling a certain way. Behavioural models consider problems as arising from behaviours which have been learned over a number of years via reinforcement (Skinner, 1963). The dynamic model considers issues beginning in early childhood, which

then motivate the individual as an adult at an unconscious level (Freud, 1939). The models have acquired much empirical support, with cognitive behavioural therapy (CBT) gaining the most (Johnson et al., 2016; Dèttore, Pozza & Andersson, 2015; Covin et al., 2008; Spek et al., 2007; Beck & Fernandez, 1998).

Although effective, the current state of crisis within mental health services has raised several issues regarding the use of therapeutic intervention *during* an episode of mental illness such as: therapy duration; cost; and high relapse rates (Eldredge et al., 2016). Research has suggested that preventative therapies and those used within the early onset of mental health issues are needed to help counteract the development of more severe mental health conditions (Wampold & Imel, 2015; Knapp, McDaid & Parsonage, 2011).

In an attempt to address these issues, the Improving Access to Psychological Therapies (IAPT; Layard, 2006) programme was set up to fulfil this need, providing low level psychological support for individuals in the early onset of anxiety and depression. The programme utilised cognitive behavioural therapy (CBT) and trained therapists to exclusively use techniques from this model. Beck (1993) states that the cognitive approach to psychotherapy "is best-viewed as the application of the cognitive model of a particular disorder with the use of a variety of techniques designed to modify and challenge dysfunctional thoughts and faulty information processing characteristic of each disorder" (p. 194). The programme has continually provided evidence suggesting that it has significantly increased access to therapy (NHS Digital, 2018), with most referrals being seen within the six weeks. However, other evidence has indicated that the efficiency of the programme is not as successful as first planned. Recent longitudinal research (Shehzad et al., 2017) studied the efficacy of IAPT by monitoring 439 individuals receiving IAPT services. Their findings suggested that over half of individuals relapsed within one year, with most needing to access further psychological support. This research follows a number of studies that continue to demonstrate a drop in IAPT's recovery rates (Vaillancourt et al., 2015; Chan & Adams, 2014). The reasons for this have

been debated, with one prominent issue regarding the ‘lack of quality’ in the CBT approach (Vaillancourt et al., 2015; Atkinson, 2014).

Despite the abundance of empirical evidence for CBT, there are also some significant criticisms. Research has frequently argued that the model is too mechanistic and fails to address the concerns of the “whole” individual (Gaudiano, 2008). Therefore, this particular approach might not be considered a preventative model. Furthermore, there has been a distinct lack of research to investigate the putative mechanisms of the action of CBT, which, when tested, has often failed to conform to the predictions set forth by the model (Gaudiano, 2006). Burns and Spangler (2001) failed to confirm any of the predicted causal relationships among dysfunctional attitudes and treatment outcomes in a sample of 521 individuals receiving CBT intervention. Research such as this has posed many questions regarding CBT such as: *Do thoughts need to be challenged?* (Longmore & Worrell, 2007).

Traditional therapies have been used to treat individuals with mental health problems. In recent times, there has been a significant increase in the number of individuals requiring mental health treatment, putting a substantial strain on mental health services. Research has suggested that instead of treating individuals when they present at the worse, preventative models should be adopted in an attempt to provide intervention in the early onset of mental health issues. Programmes such as IAPT have significantly increased clinical activity and reduced waiting times. However, recent research has indicated that there are large relapse rates with the ‘quality of therapy’ being cited as one of the main issues. Although suited to some, CBT may not be the correct approach for all individuals accessing mental health services.

1.1.3 Preventative Models

Due to some of the highlighted limitations of CBT and the current state of mental health, the field of psychotherapy has continued to develop, with third-wave cognitive behavioural therapies becoming more widely used. Third-wave therapies are an emerging group of approaches that represent both an

extension of and deviation from traditional CBT approaches (Hayes, 2018; Kahl, Winter & Schweiger, 2012; Öst, 2008). Third-wave therapies prioritise the holistic promotion of health and well-being and are less focused on reducing psychological and emotional symptoms. Many of the strategies and interventions utilised within third-wave cognitive behavioural therapies aim at increasing the effectiveness of traditional cognitive behavioural interventions, such as exposure therapy and behavioural activation, with the ultimate goal of assisting people to live and experience fuller, more satisfying lives (McCracken & Gutiérrez-Martínez, 2011; Hayes et al., 1999).

The main difference of third-wave therapies is that, to some degree, they abandon key assumptions associated with traditional cognitive therapy (Kahl, Winter & Schweiger, 2012). Concepts such as metacognition, acceptance, mindfulness, personal values, and spirituality are frequently incorporated into what might otherwise be considered traditional behavioural interventions. (Mindfulness based Cognitive Therapy - Segal, Teasdale & Williams, 2004; Acceptance and Commitment Therapy - Hayes et al., 1999; Dialectal Behaviour Therapy - Linehan, 1993).

The efficacy of the third-wave movement has seen researchers and clinicians moving away from viewing mental health in terms of the presence or absence of symptoms (Csikszentmihalyi, 2014; Sin & Lyubomirsky, 2009; Fredrickson, 2001; Seligman, 1998). The government paper ‘No health without mental health’ (2011) included in its strategic plans a focus on the promotion of positive mental health and the prevention of mental health problems in adults and children. The document provided evidence that mental health and well-being, and not simply the absence of mental illness, have been shown to result in health, social and economic benefits for individuals, communities and populations (Hayes, 2016; Wells & Fisher, 2015; Prince et al., 2007). The paper also suggested that there is increasingly robust evidence that a range of innovative and preventative approaches can also reduce costs by improving outcomes and increasing quality and productivity. The paper went on to suggest the following areas of potential intervention: (1) early identification and

intervention as soon as mental health problems emerge; (2) the promotion of positive mental health and prevention of mental health problems in childhood and adolescence; (3) the promotion of positive mental health and prevention of mental health problems in adults; (4) addressing the social determinants and consequences of mental health problems; and (5) improving the quality and efficiency of current services.

The publication of this report has generated further interest in research regarding the processes of optimal mental health, and what individuals can do to foster their own mental well-being. Rather than spending time stopping people from being at their worst, these clinicians/researchers have not only developed interventions for distress, but also developed preventative interventions to equip people with skills to be at their best.

To date, there has been little attention given to what constitutes optimal psychological health and how individuals are expected to achieve this (Brassai, Piko & Steger, 2011). The World Health Organization (WHO) provides a definition of optimal mental health as "a state of well-being in which [an] individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community" (WHO, 2004). Historically, psychological health has been essentially defined in terms of the absence of psychopathology (Bergner, 1997).

However, some researchers have focused on what might be considered optimal mental health. The developer of positive psychology, Seligman (1998), provided the following alternative proposal regarding the understanding of mental health:

"Psychology is not just the study of pathology, weakness and damage, it's also the study of strength and virtue. Treatment is not just fixing what is broken; it is nurturing what is best. Psychology is not just a branch of medicine concerned with illness or health; it is much larger."

At the heart of this approach lies the issue of prevention (Csikszentmihalyi, 2014), which has aimed to find ways in which psychologists prevent the problems of mental illness. The approach argues that following fifty years under

the medical model, the pathology approach has not moved psychology closer to the prevention of mental illness. Some of the major steps towards prevention have focused on building competency and not on correcting weaknesses (Seligman & Csikszentmihalyi, 2000).

Huppert (2009) developed a list of ten features of positive well-being (see Table 6). Huppert (2009) reasoned that the attributes of positive mental health would be opposite to those that define poor mental health. The list of features was developed by analysing internationally agreed measures of depression and anxiety and defining the opposite of each symptom.

Table 7.

Features of positive mental health

What defines positive mental health?
• **Positive emotions**: all things considered, how happy do I feel? • **Engagement**: taking an interest in your work and activities • **Relationships**: having people in your life that you care for and who care about you • **Meaning and purpose**: feeling that what you do in life is valuable and worthwhile • **Accomplishment**: feeling that what you do gives you a sense of accomplishment and makes you feel competent • **Emotional stability**: feeling calm and peaceful • **Optimism**: feeling positive about your life and your future • **Resilience**: being able to bounce back in the face of adversity • **Self-esteem**: feeling positive about yourself • **Vitality**: feeling energetic

However, there has been much debate regarding the features of positive mental health. The developers of ACT (Hayes et al., 1999) take an alternative perspective, arguing that the pursuit of happiness can establish an unrealistically high bar for an average person's mood. They suggest that life is

inevitably made up of good and bad experiences, with human suffering being a basic fact of life. According to ACT, suffering is not just about pain, psychological or otherwise. Hayes et al. (1999) postulated that humans do not just have pain; they agonise over painful memories, uncomfortable and distressing emotions and difficult self-evaluations, which consequently result in worry, dread and avoidant behaviours. Reduction of pain and suffering is a valued aim; however, it is not considered to be the ultimate goal. Hayes (2004) suggests that a good life is much more than simply a lack of suffering; people strive to live well and make the best of their time on this earth.

1.1.4 Psychological Flexibility

The ACT community proposes that the means of achieving a fulfilling life is via the concept of PF. PF consists of six core processes: acceptance; defusion; present moment awareness; self-as-context; values and committed action (sections 1.3.1 – 1.3.6). The combination of processes aims to lead individuals into living a more meaningful and fulfilling life, based on their values, and helping individuals to manage the highs and lows of life by developing new relationships with private experiences (Hayes, 1999).

Kashdan and Rottenberg (2010) have written extensively regarding the impact of PF on psychological health. In their review of the PF literature, they suggest that there is significant evidence of the prominence of PF in understanding psychological health. Their meta-analyses synthesised various literature on PF, finding significant evidence of the value of PF. Their research evaluated existing PF work under the umbrellas of emotion regulation, mindfulness and acceptance, neuropsychology, and social, personality, and developmental psychology, providing further insights into the nature, correlates, and consequences of flexibility. The research indicated that individuals are better able to tolerate and effectively use emotions, thoughts, and behaviour to extract the best possible outcomes in varying situations. Furthermore, it suggested that a wide range of dynamic abilities forms the essence of health, concluding that a healthy person is someone who is able to manage themselves in uncertainty and unpredictability, where continuous change is the norm rather than the

exception. In many forms of psychotherapy, these flexibility processes are absent, such as CBT. Finally, the researchers suggest that interventions aimed at increasing flexibility have the potential not only to aid people suffering from pathology, but also to help highly functioning people find greater efficacy and fulfilment in their daily lives. Despite PF making a major contribution to daily well-being and lasting psychological health (Hayes, 2016; Kashdan & Rottenberg, 2010), this construct is only beginning to make an impact within the field of psychology, with some positing it as a new personality trait (e.g. Asgarini et al., 2016; Latzman & Masuda, 2013).

1.1.5 Measurement

Inferences made from the results of psychological measures are used to make important decisions regarding diagnosis and treatment in health care systems on a daily basis. Measurement scores, in particular, are used for research, intervention planning and policy purposes (Devellis, 2016). The inferences made from these measures are highly dependent upon the accuracy and validity of the interpretation of the measurement results. Messick (1975) and Guion (1977) claim that in order to adequately assess the meaningfulness of the inference(s) one makes from measurement scores, there should always be confirmation of what the scores of a measure actually exhibit. Therefore, in order to properly assess the appropriateness, meaningfulness, and usefulness of the inferences made from measurement scores, construct validity needs to be taken into consideration (Lissitz 2009; Cronbach & Meehl, 1955).

1.1.6 Summary of Broader Issues

The mental health crisis has pushed services to their limits regarding care and intervention. Government plans have updated their policies to include preventative psychotherapies which can instil skills in individuals to help them manage and maintain their own mental health and well-being. Such strategies call for psychotherapies that can offer teachable skills to the wider population within diverse contexts, and not only to those who are considered to have a mental illness. Developments in third-wave models have addressed these issues; in particular, ACT has specifically focused on the development of its

processes. These processes, which are used in conjunction with one another, form the model of PF, which is currently assessed via self-report measures. Scores from these measures are used to make important inferences regarding treatment, research and policy making, indicating that good construct validity of these measures is essential.

1.2 Acceptance and Commitment Therapy (ACT) Philosophy & Theory

To understand Acceptance and Commitment Therapy, Hayes et al. (1999) suggest that it is important to first consider the theoretical and philosophical underpinnings on which it is based. Hayes et al. (2012) considered that it was "easier to experience ACT processes first hand when fully invested in its underlying principles" (p. 28).

1.2.1 Functional Contextualism

ACT is grounded in a theory called relational frame theory (RFT; Hayes, Barnes-Holmes & Roche, 2001), a post-Skinnerian account of language and cognition, and the pragmatic philosophy of functional contextualism (Hayes et al., 2006). Functional contextualism seeks to predict and influence events using empirically-based concepts and rules (Hayes et al., 2012; Gifford & Hayes, 1999; Biglan & Hayes, 1996). The core components of functional contextualism include: "(a) focus on the whole event; (b) sensitivity to the role of context in understanding the nature and function of an event; (c) emphasis on a pragmatic truth criterion; and (d) specific scientific goals against which to apply that truth criterion" (Hayes, 2004, p. 646). According to Hayes et al. (2012), the breadth of perspective bestows ACT with the opportunity to function as a unified model of both human suffering and human resilience (see Section 4.6 for a summary of Contextual Behavioural Science – CBS).

One of the main aims of functional contextualism is to look at how things function in specific contexts. It considers that no thought, feeling or memory is inherently problematic, dysfunctional, or pathological; rather, it all depends on the context (Harris, 2009). The thoughts, feelings and memories that are avoided are thought to be toxic and harmful; however, in the context of ACT's

core processes, these same private events function differently and can have less impact and influence.

Functional contextualism proposes a radically different philosophical approach to other models of psychology such as CBT, which utilises a 'mechanistic' approach (Ciarrochi & Bailey, 2008). Mechanistic philosophy identifies thoughts, feelings and memories as 'problematic', 'dysfunctional', and 'maladaptive'. Within these models, the aim is to target these private events by trying to fix or remove them. This philosophy has yielded significant empirical evidence in the literature (Watts et al., 2015; Covin et al., 2008; Reinecke, Ryan & Dubois,1998) and is highlighted in this research to serve as a contrast to that of ACT's functional contextual roots.

There is a longstanding mechanistic tradition in current psychology to focus on the development of models and relationships among individual private experiences such as attitudes, self-efficacy expectations and behaviour with little attention being paid to the contextual influences on behaviour (Biglan & Hayes, 1996; Hayes et al., 2004; Hayes et al., 2012). ACT proposes functional contextualism as an alternate concept for the behavioural sciences. Within this concept, theory and research are evaluated in terms of their prediction and influence of behaviour.

1.2.2 Relational Frame Theory

Relational frame theory (RFT) is a modern behaviour analytic approach to language which aims to better understand the link between human language and behaviour; relational framing is the process that underlies language (Hayes et al., 2001). RFT is considered a complex notion and a detailed explanation of its conceptualisation is far beyond the requirement of the current research; much research in this area has been completed in relation to ACT (see Hughes & Barnes-Holmes, 2016; Hayes, 2016; Hayes, Barnes-Holmes & Roche, 2001).

According to the theory, relational framing can be extremely generative. Any stimulus can be related to any other stimulus in accordance with any relational frame (Blackledge, 2003). Natural language is considered most useful in the description and analysis of our environment. The empirically established process

of relational framing can explain the generativity and flexibility that language facilitates.

According to Hughes and Barnes-Holmes (2016), any objects or events that are relationally framed become verbal – part of the world as known through relational frames. As objects, events, and people are framed through interactions with the socio-verbal community, the network of related stimuli is elaborated, and through transformation of functions, the world increasingly takes on new verbally derived functions. RFT theorists have provided an increasingly large set of data showing that this process is learned and extends to every type of verbal relation: opposition, difference, hierarchy, temporal, deictic, and evaluative and comparative relations among many others (Hayes et al., 2001).

Derived relations, and the transformation of functions they enable, are learned and under separable contextual control. Contextual features and history standardise how an individual relates to events and another set of contextual features and history regulates the functions of these relations (Fletcher & Hayes, 2005).

The concept of events and objects taking on verbal functions through relational framing can have both positive and negative implications (Torneke, 2010). The human ability to verbally analyse and transform the functions of our environment can allow more effective behaviour, such as in the sciences and technology (Hayes, Gifford, Townsend & Barnes-Holmes, 2002). However, the same capacity can disconnect individuals from important experiences and produce maladaptive responding (Hayes, Strosahl & Wilson, 2011).

According to Hayes et al. (1999), ACT is explicitly contextualistic and is based on a basic experimental analysis of human language and cognition. Hayes notes that the novice ACT therapist must first understand these concepts before utilising ACT interventions. The concepts are included in the current research to provide a richer understanding of the theoretical and philosophical conceptualisations upon which the six core processes of ACT have been developed

1.2.3 Acceptance and Commitment Therapy - Overview

ACT is a third-wave psychotherapy that aims to increase PF. In ACT terms, PF means contacting and fully engaging in the present moment, altering one's behaviour in accordance with chosen values (Hayes et al., 1999). The main conception of the model is that psychological suffering is mostly caused by the interface of language and cognition, and the control of behaviour by experience (Hayes et al., 1999; Hayes, 2004). ACT suggests that psychological inflexibility emerges from experiential avoidance (see Section 1.4), cognitive fusion, attachment of a conceptualised self, loss of contact with the present, and the resulting failure to take needed behavioural steps in accordance with core values (Hayes, Strosahl & Wilson, 1999).

Supported by an associated theory of language and cognition (RFT), ACT proposes that trying to change difficult thoughts and feelings as a means of coping can be counterproductive. The model suggests that alternatives are available in the form of six interrelated core processes: acceptance; contact with the present moment; self-as-context; cognitive defusion; values; and committed action, represented by the 'Hexaflex' (See figure 1).

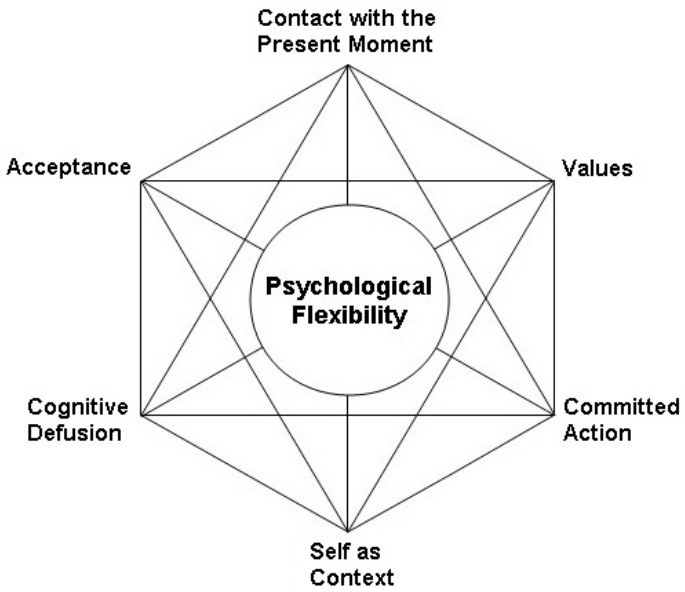


Figure 5. The ACT 'Hexaflex' (Hayes et al., 1999)

1.3 The Six Core Processes

1.3.1 Acceptance

Within ACT terms acceptance is “the voluntary adoption of an intentionally open, receptive, flexible, and non-judgmental posture with respect to moment-to-moment experience” (Hayes, Strosahl & Wilson, 2012). The notion of acceptance in ACT represents the inverse to the idea that symptoms must be controlled or avoided, and that difficult thoughts and feelings need to be absent for meaningful therapeutic change and psychological health to occur. Importantly, however, acceptance is not framed as being an end, but rather it is developed and applied to enable values-consistent change to occur in the individual’s external world (Cullen, 2008). In session, the ACT therapist encourages acceptance using metaphors and mindfulness techniques. The client is encouraged to experience affect states and bodily sensations, such as depression, in the moment, as they occur, rather than trying to control the frequency or intensity of such feelings (Cullen, 2008). It is introduced early on in ACT sessions, and the practice of acceptance and willingness is thought to allow for valued and committed action to occur. Acceptance is a central component of ACT and has been found to mediate outcomes in a number of areas including: anxiety and depression (Forman et al., 2007); chronic pain (Cederberg et al., 2016); work-place stress (Bond & Bunce, 2003); and tinnitus (Hesser, Westin, & Andersson, 2014).

1.3.2 Defusion

The process of becoming more aware of private experiences is called cognitive defusion. Defusion involves viewing thoughts as thoughts rather than considering them as having literal meaning (Masuda et al., 2009). Defusion teaches individuals to alter their relationship to their thoughts, to view them without the need to contest or challenge them to change overt behaviour. The most common exercise used in defusion studies is the “word repetition technique,” first developed by Titchener (1916). This involves repeating a word until its semantic meaning is no longer dominant. When “defused,” the client will start to notice a lower attachment to the literal meaning of an unwanted thought (Masuda et al., 2004). The intended outcomes of this defusion exercise are: 1) a greater attention

to the process of one's thinking, rather than the content; 2) an ability to question the believability of one's negative self-evaluative thinking; and 3) an increase in values-consistent behaviour, that is guided by direct contingencies rather than aversive internal stimuli (i.e. self-critical thoughts).

The efficacy of defusion has been demonstrated in a number of studies with non-clinical populations and has been associated as a mediating factor in long-term outcomes: anxiety disorders (Arch et al., 2012); depression (Zettle, Rains & Hayes, 2011); pain-related disability (Wicksell et al., 2008); substance abuse (Varra et al., 2008); professional burnout (Hayes et al., 2004); and distress in response to hallucinations (Gaudiano, Herbert, & Hayes, 2010). Defusion strategies have also been found to produce a greater reduction in both the discomfort and the believability of negative thoughts compared to distraction and thought suppression tasks (Masuda et al., 2004). An experimental test of a cognitive defusion exercise also illustrated that negative statements created less psychological discomfort, and participants were more willing to believe and engage with their content, when presented in a defused versus non-defused format (Healey et al., 2008).

1.3.3 Present moment awareness

Present moment awareness (mindfulness), involving the practice of being deliberately and purposefully being present in the current moment, is a key process practiced in ACT. Twohig (2012) defines “being present” as “flexible, fluid, and voluntary attention to internal and external events as they are occurring, without attachment to evaluation or judgment” (p. 503). Present moment awareness is thought to encourage the client to live fully and purposefully in the moment, whilst accepting difficult private experiences and decreasing the negative impact of language and cognition (Twohig, 2012). Present moment awareness is not a unique facet of ACT, many other therapeutic modalities incorporate this practice: mindfulness-based stress reduction (MBSR; Kabat-Zinn, 1982); MBCT (Segal et al., 2004); and DBT (Linehan, 1993) and several which were published prior to ACT (e.g. Kabat-Zinn, 1990; Linehan, 1993).

Within the ACT model, present moment awareness is aligned with the notion of self-as-context or the observing self. The combination of these processes aims to assist the client to experience fully being in the present moment, observing the self and the surrounding environment, rather than living within their mind and ruminating over past events or worrying about the future (Arch & Craske, 2008; Cullen, 2008). The client is taught to become more aware of when they are not in the present, and to flexibly shift their attention (Twohig, 2012). Present moment awareness is also thought to counteract experiential avoidance strategies aimed at controlling or reducing discomfort.

However, it is important to note that increased awareness and contact with private experiences, particularly those that are aversive, is not adaptive as such. Evidence suggests that an increase in present moment awareness in the absence of acceptance may exacerbate experiential avoidance (Hayes et al., 2006). Therefore, the ACT therapist must teach awareness in conjunction with acceptance to have a positive rather than aversive therapeutic effect (Cardaciotto et al., 2008). This also provides evidence of the ACT processes being conceptually distinct but also interconnected.

1.3.4 Self-As-Context

Self-as-context is a key focus within ACT which involves the ability to adopt an observing perspective and notice internal experiences, rather than being too involved within internal worlds and self-defined by their content (Hayes et al., 2004). ACT interventions work to develop a sense of self-as-context to assist the individual to disentangle themselves from their painful private experiences and to promote psychological flexibility. With this sense of self, the individual can experience internal and external events and experiences, without being defined by them.

Hayes et al. (1999) suggest that the emergence of the conceptualised self is strongly linked to relational framing. The conceptualised self begins to form from a learning history of being taught to name, categorise, differentiate and evaluate ourselves, based within language. Verbal language can reinforce the ability to relationally frame external and internal experiences of our own self-identity,

generating narratives of self-stories (Hayes, 1995). However, attachment to disparaging narratives and self-stories that include negative causality-based assumptions can lead to distress in a number of ways. Increased avoidance of the contexts which promote negative self-defining stories may occur with potentially a loss of contact with aspects of life that are truly valued.

Research suggests that ACT interventions that incorporate self-as-context exercises may be more effect than those that do not (Williams, 2006). Levin et al.'s (2012) meta-analysis of ACT treatment component studies also found that self-as-context treatments (referred to as 'mindfulness' within the review) had a small but significant effective size on targeted outcomes, when compared to inactive conditions. The findings also suggested that the effects of interventions targeting present moment awareness are significantly enhanced when also targeting values simultaneously, providing further reiteration of ACT processes being indistinguishably linked to each other (Hayes et al., 1999).

1.3.5 Values

Hayes et al. (2012) describe values as "chosen, verbally constructed, consequences of patterns of activity, for which the predominant reinforcer becomes intrinsic to the behavioural pattern itself" (p. 40). The strong and explicit emphasis on values in ACT differentiates it from other therapeutic approaches. Arch and Craske (2008) argue that the ultimate goal of ACT therapy is for the client to live a fulfilled life according to values.

Working towards valued living is distinguishable from the behavioural notion of reinforcing desirable and adaptive behaviours by the nature and location of reinforcers. Values are purported to be behaviours related to the subjective meaning and personal purposes of the individual, whereas behaviours unconnected to values are considered to relate more to predominant cultural rules (Flaxman et al., 2010).

Together with committed action, understanding and clarifying values are ACT's "activation processes", which assist clients to move forward in their chosen life directions (Cullen, 2008). Values are juxtaposed with goals in that they are

pursued in an ongoing lifelong way, whereas goals are obtainable. In ACT, various exercises are used to assist the client to uncover and clarify their values, to help them to regain a sense of life direction that is consistent with these values (Strosahl et al., 2004). The “epitaph exercise” is a frequently used exercise and aims to elicit the client’s values by asking them to imagine what would be written about them on a tombstone regarding the type of person they are.

Evidence suggests that interventions that incorporate work on values have positive therapeutic effects. This has particularly been noted in the area of chronic pain, where post-intervention changes in values-based action have been negatively correlated with changes in pain intensity (r = -0.30), depression (r = -0.41), physical disability (r = -0.39) and psychosocial disability (r = -0.40) (Vowles & McCracken, 2008). Pain tolerance was also observed to be greater in participants receiving an ACT-values protocol than in participants receiving a control-values protocol (Páez Blarrina et al., 2008).

Values interventions used alongside acceptance interventions have been found to enhance pain tolerance compared to acceptance interventions in isolation (Branstetter-Rost, Cushing, & Douleh, 2009). Values exercises have also been found to have positive effects in non-clinical areas, including academic performance (Chase et al., 2013) and intimacy in romantic relationships (Lomore, Spencer & Holmes, 2007).

1.3.6 Committed Action

Hayes et al. (1999) describe committed action as "values-based action designed to create patterns of action that is itself values-based" (p. 95). The therapeutic component of committed action is a key aspect of ACT therapy. Committed action involves the individual choosing to behave in ways that are in line with their personal values; the aim of committed action is to demonstrate to the individual how to gradually build patterns of maintainable, committed, value-driven behaviour (Strosahl et al., 2004). Thus, traditional aspects of behaviour change procedures such as goal-setting are incorporated into therapy, and barriers (in the form of challenging thoughts, emotional reactions, and other difficulties) are prepared for and worked through. Any type of behavioural intervention, which

might include exposure exercises and skills training, is incorporated at this stage, maintaining consistency with ACT processes and principles (Twohig, 2012).

Flaxman et al. (2010) define committed action as involving the following components: 1) the enacting of one's values, as opposed to simply stating that one will behave in a certain way; 2) the moment-by-moment awareness of when behaviour has become values-inconsistent, and the subsequent re-direction of behaviour to re-align with one's values; 3) committing to act in a values-consistent way, even when doing so may result in contact with aversive experiences; 4) adopting an attitude of acceptance and taking the next opportunity to act in a values-consistent way (depending on what the situation affords) where attempts to behave in a values-consistent way fail; 5) publicly declaring one's commitment to one's values, such that help may be enlisted from others in this regard; and 6) planning how one will meet long-term values by setting intermediary goals, and describing how one will achieve them and overcome potential barriers. Committed action is generally thought of as the culmination of ACT, as the client is encouraged to draw upon the various other tools of ACT to assist them; thus, the client practices acceptance, defusion, present moment awareness, and self-as-context to manage the potentially difficult private experiences that may arise as they engage in committed action based on their values.

1.4 Experiential Avoidance

The inverse of acceptance is experiential avoidance, which has been found to involve a narrowing of behaviour, leading to a less values-consistent way of living and psychological distress (Bond et al., 2011). Hayes et al. (1999) indicate that experiential avoidance has evolved from the generalisation of cultural rules that suggest that negative thoughts and emotional states can and should be controlled. For example, common phrases such as, “look on the bright side”, and “get on with it” are seen as maintaining the notion that an individual can achieve control over their internal experiences, which can be the cause of further distress when attempts to do so continuously fail (Hayes et al., 2004). According to ACT, experiential avoidance leads to a long-term increase

in the frequency and intensity of distressing personal experiences, which leads to poorer quality of life (López et al., 2010).

Several studies across different domains of research have demonstrated the negative impact of experiential avoidance. Machell, Goodman and Kashdan (2015) suggested that individuals diagnosed with anxiety reported experiential avoidance on a daily basis. Daily experiential avoidance predicted higher negative affect, lower positive affect, less enjoyment of daily events (exercising, eating food and listening to music) and less meaning in life. In the chronic pain literature, avoidant strategies have been found to negatively impact on disability and quality of life (Costa & Pinto-Gouveia, 2011; Hunfield et al., 2001). Research on thought suppression suggests that attempting to avoid a thought has a paradoxical effect of intensifying it from its original state (Magee, Harden & Teachman, 2012; Wegner et al., 1987). In a review of studies analysing the relationship between psychopathology and experiential avoidance, Ruiz (2010) indicated that the weighted correlations between experiential avoidance and depressive and anxiety symptoms were r=.55, and r=.52 respectively.

1.5 ACT Critique

Although there has been a substantial amount of research and data supporting the ACT model, it has also come under some criticism. Early in ACT's development Herbert (2005) critically analysed the model questioning whether ACT was a 'fad'? He reviewed all of the identified criticisms known about the model to date and analysed whether these were correct or not. He reported, at the time, that the model had been mostly criticised for being 'overly hyped' with claims of its use getting ahead of its data. This particular critique suggested that the ACT developers prematurely disseminating 'self-help' ACT guides to the public before proper confirmation of its proficiency. However, research in the ACT field has rapidly developed and ACT has since provided considerable evidence proving the efficacy of its theory and application (see extended section 1.6). Herbert (2005) also presented the notion that some clinicians were viewing ACT as a cult, rather than a psychotherapeutic model. This critique originated from the concept that ACT clinicians 'needed' to adopt the ACT skills

and techniques as a ‘way of life’ rather than just within the context of therapy. Herbert’s analysis of this was that this was an exaggerated claim. Certainly, clinicians need to be invested enough in the model to be able to convey some of the more animated tasks such as singing out loud your painful thoughts in order to defuse oneself from them. However, Hayes et al. (1999) suggest that the full utilisation of the ACT model is not a requirement but a mere suggestion to facilitate a comprehensive understanding of the model.

Further critique of the model has come from the comparison of ACT to other models, particularly that of CBT. Gaudiano (2011) reported that critics have argued that ACT offers relatively minor variations compared with traditional CBT that may not warrant the widespread clinical and research attention that the treatment has been receiving (Hofmann & Asmundson, 2008; Öst, 2008). Critically the difference between the models has come down to the approach in which they operate. For example, CBT has traditionally been described as having a mechanistic style where dysfunctional thinking is targeted and either fixed or removed. Hayes et al. (1999) argue against the notion of removing thoughts/feelings and propose that ACT helps the individual to form new relationships with them instead. Apart from acceptance and mindfulness concepts, many have argued that ACT offers little more than traditional CBT (Gaudiano, 2011). However, Hayes (2004) accepts this critique and has reported that ACT offers an ‘enriched’ version of CBT drawing upon its strengths and incorporating them into a more process driven model.

1.6 Extended Literature Review

Seven meta-analyses to date (Hayes et al., 2006; Öst, 2008; 2014; Powers et al., 2009; Ruiz, 2012; A-tjak et al., 2015; Hacker, Stone & Macbeth, 2016) have investigated ACT's efficacy across a range of clinical presentations.

In the attempt to clarify its status amongst established therapies, three separate meta-analyses have looked at the efficacy of ACT in relation to a range of conditions (Hayes et al., 2006; Powers et al., 2009; Öst, 2008). In an initial meta-analysis of the efficacy of ACT in 12 randomised controlled trials (RCTs),

Hayes et al. (2006) found a mean controlled effect size of d=0.48 across ACT studies, indicating a moderate effect.

Öst (2008) conducted the first independent review of ACT, in addition to other third-wave behaviour therapies. All therapies were assessed against a sample of comparative CBT studies, using a psychotherapy outcome study methodology rating scale to evaluate whether the therapies constitute empirically-supported treatments (ESTs). A total of 13 ACT randomised control trials (RCTs) looking at a range of psychiatric and non-psychiatric disorders (for example, maths anxiety) were reviewed, with a total of 677 participants across all studies. The mean effect size was d=0.68, suggesting a moderate effect. Two studies found significantly better treatment effects than psychological placebos, and four found ACT to be significantly better than treatment as usual (TAU) but were deemed by the author to have too many methodological issues to be considered "good" research. The two studies considered methodologically sound did not find ACT to be superior to comparison therapies. Based on this review, Öst concluded that none of the third-wave therapies fulfilled criteria for ESTs, and that overall the third-wave therapy RCTs used research methodologies that were significantly less stringent than those used in CBT studies. Gaudino (2009), however, cautions that these conclusions need to be considered in light of the fact that a re-analysis of Öst's data revealed that 38% of the ACT studies included could not be "matched" with a CBT study because the studies looked at different disorders and that, for the most part, the treatment populations included in the ACT studies were more complex and more resistant to treatment than those included in the CBT studies.

Powers et al. (2009) included 18 randomised controlled trials comparing ACT to either control conditions or established treatments (Cognitive Behaviour Therapy - CBT - and Cognitive Therapy - CT) in their ACT meta-analysis. Studies without control conditions were omitted from the meta-analysis. The measure of effect size used in the study was Hedges' g, which can be interpreted equivalently to Cohen's convention of small (0.2), medium (0.5) and large (0.8) effects. The overall results of the meta-analysis suggested that ACT performed significantly better than control conditions (g = 0.42), with the

average participant in an ACT condition improving 66% more than participants in control conditions. However, ACT was not significantly more effective than established treatments overall and was not superior to control conditions for anxiety and depression (effect size = 0.03). Despite this, Powers et al. suggest that the effects of ACT are promising, given that it is not uncommon to fail to find a significant difference between established treatments (for example, comparing CBT with CT and exposure therapy) (Powers, Sigmarsson, & Emmelkamp, 2008). Levin and Hayes (2009) re-analysed the data reported in Powers and colleagues' meta-analysis and concluded that ACT performed better than CBT and CT ($g = 0.27$; $p = .03$).

Ruiz (2012) examined 16 studies which compared ACT and CBT interventions across different outcomes and found that mean effect sizes on primary outcomes significantly favoured ACT over CBT ($g = .40$), except on depression and anxiety outcome measures, where there were no statistically significant differences between therapies ($p = .12$-$.14$). Importantly, Ruiz also found that out of the nine reviewed studies that conducted mediation analyses, six studies supported ACT as working through its purported processes of change (i.e. decrease in experiential avoidance and cognitive fusion processes), whereas four studies failed to find CBT working through its hypothesised processes of change (i.e. change in dysfunctional attitudes and reduction in the frequency of negative automatic thoughts). This finding reiterates CBT literature, which has suggested that the mechanisms of change through which CBT works remain unclear (Longmore and Worrell's, 2007). However, conclusions about evidence supporting ACT's theoretical processes over CBT's in these studies should be considered in light of the limitations of the measures used to examine changes in ACT processes.

In the updated meta-analysis and systematic review Öst (2014) included 60 RCTs on psychiatric disorders, somatic disorders, and stress at work. The findings suggested that the mean effect size across all comparisons was small (0.42). In comparison to the previous meta-analysis (Öst, 2008), it is suggested that there is no significant improvement in methodological quality and deterioration in effect size (from 0.68). Öst's (2014) comparisons of ACT to

various forms of cognitive or behavioural treatments obtained a small and non-significant effect size of 0.16. He concluded that ACT is not established for intervention in any disorder. However, the updated review invited more criticism. Atkins et al. (2017) argued that Öst's research was not reliable or valid in the field of ACT. Atkins et al. (2017) suggested that the review included several 'fundamental errors' including the use of an idiosyncratic and unvalidated rating scheme that appears not to have been reliably applied, along with numerous factual and interpretive errors in the reporting of trials included in the review. They concluded that all areas that were reviewed were dominantly biased against ACT trials.

A-tjak et al. (2015) reviewed 39 randomised control trials (RCT) examining ACT's efficacy in relation to mental health disorders and somatic health problems. Whilst ACT was not considered to be statistically superior to CBT ($p = .14$), it was more effective than waiting list ($g = .82$), treatment as usual ($g = .64$) and placebo controls ($g = .51$) and was as effective as CBT for the treatment of depression, anxiety disorders, addiction and somatic health problems. It is worth considering that the evidence for treatment efficacy within these studies is related to treatment outcomes and does not provide evidence attesting to the processes through which such treatment packages have been effective. Levin and Hayes (2009) argue that in order to understand what treatments are effective and why, empirical research must broaden its standards and method of investigation by including meditational analyses in outcome studies, as well as 'gold standard' RCT criteria.

Further meta-analysis was performed by Hacker, Stone and Macbeth (2016), who evaluated ACT outcomes for anxiety and depression. Sequential meta-analysis (SMA) techniques were used to critically appraise the sufficiency of the existing evidence base. The review included twenty-eight anxiety trials (n=1628) and four hundred and thirty-nine depression trials (n=1987). For both anxiety and depression outcomes the majority of trials compared ACT against a waiting list control (WL; *anxiety trials*=17 and *depression trials*=22). The majority of anxiety treatment trials used CBT as the treatment comparator (seven trials). Similarly, the most frequent control treatment condition in depression treatment

trials was CBT (nine trials). The most frequently used anxiety outcome measure was the Depression Anxiety and Stress Scale (DASS-21). In turn, the most frequently used depression outcome measure was the Beck Depression Inventory (BDI).

The cumulative pooled effect sizes for ACT for anxiety for both pre-post and group comparisons ranged from *d*=.45 to *d*=.95. In turn, the cumulative pooled effect sizes for depression in trials comparing ACT in pre-post and group comparisons ranged from *d*=.54 to *d*=.92. These findings suggest that there is currently cumulative evidence for the efficacy of ACT versus controls in the treatment of anxiety and depression. Findings were concluded as in keeping with the previous literature for the overall cumulative efficacy of ACT (e.g. Hayes et al., 2006; Ost, 2008; Powers et al., 2009; Ruiz, 2010; 2012).

The reviews by Öst (2008) and Powers et al. (2009) cited the methodological weaknesses of many ACT intervention trials that have since been debated within the literature (see Gaudiano, 2009; 2009b). Arguments were made that errors within the matching and coding process within Öst's (2008) meta-analyses resulted in a distorted comparison, and that ACT studies are not weaker when resulting differences in population and funding are excluded.

This debate continues with recent arguments debating the Öst (2014) review. These arguments centre on what Atkins et al. (2017) termed as fundamental errors covering 80% of the studies reviewed; these errors were related to the selection of studies, ratings of methodological quality, meta-analysis, and judgements of quality of evidence. Öst (2017) refuted these criticisms, suggesting that adequate evidence against each of these claims has already been provided.

The APA Division 12 has reviewed the evidence for ACT for chronic pain and given it strong empirical support status. The ACT intervention for depression literature has gathered modest empirical support from APA, suggesting it as a probably efficacious treatment. The research indicates the transdiagnostic nature of ACT is proving to be effective across many areas.

Overall, the findings suggest that ACT is effective in the treatment of common mental health difficulties; however, not more so than traditional treatment approaches (Hacker, Stone & Macbeth, 2016). Within the theoretical literature on ACT there has been discussion of the treatment mechanisms by which ACT leads to changes in clinical presentations (e.g. PF). The current RCT analyses for ACT do not evaluate these questions of process. Therefore, it may be more productive and conclusive for future studies of ACT to emphasise the unique components of the intervention that may generate change in particular presentations (Arch & Craske, 2008). From this perspective, future research can attempt to respond to queries of optimising treatment matching i.e. 'what works for whom' (Roth & Fonagy, 2006).

1.7 Current ACT measures

There are many ACT measures in use, most of which focus on one or two of the core processes. Batink, Jansen and Peeters (2015) reviewed all the available ACT measures; at the time of publication they found that there were 58 measures available in the public domain (see Table 7). Table 8 provides a breakdown of these measures into specific ACT processes and problem areas. Since this publication, the development of ACT measures continues to grow with the recently developed Multidimensional Psychological Flexibility Inventory (MPFI) (Rolffs, Rogge & Wilson, 2016). It was also found to be missing other measures such as the Acceptance and Action Questionnaire for Depression (Cooper, 2008).

Table 8.

Overview of available ACT measures with references

Questionnaire	*Abbreviation*	*Reference*
Acceptance and Action Diabetes Questionnaire	AADQ	Gregg e.a. 2007
Acceptance and Action Questionnaire - Acquired Brain Injury	AAQ-ABI	Sylvester 2011
Acceptance and Action Epilepsy Questionnaire	AAQEpQ	Lundgren e.a. 2007
Acceptance and Action Questionnaire	AAQ-II	Bond e.a. 2011
Acceptance and Action Questionnaire - Pain	AAQ-II-P	Reneman e.a. 2014
Acceptance and Action Questionnaire - Stigma	AAQ-S	Levin e.a. 2014
Acceptance and Action Questionnaire - Substance Abuse	AAQ-SA	Luoma e.a. 2011
Acceptance and Action Questionnaire - Trichotillomania	AAQ-TTM	Houghton e.a. 2014
Acceptance and Action Questionnaire - Weight	AAQ-W	Lillis and Hayes 2008
Avoidance and Fusion Questionnaire for Youth	AFQ-Y	Greco e.a. 2008
Avoidance and Inflexibility Scale	AIS	Gifford e.a. 2004
Automatic Thoughts Questionnaire (Frequency / Belief)	ATQ-F&B	Zettle e.a. 1986
Believability of Anxious Feelings and Thoughts Questionnaire	BAFT	Herzberg e.a. 2012
Brief Experiential Avoidance Questionnaire	BEAQ	Gámez e.a. 2014
Bull's Eye Values Survey	BEVS	Lundgren e.a. 2012
Body Image – Acceptance and Action Questionnaire	BI-AAQ	Sandoz e.a. 2013
Body Image Psychological Inflexibility Scale	BIPIS	Callaghan e.a in press
Brief Pain Response Inventory	BPRI	McCracken e.a. 2010
Child and Adolescent Mindfulness Measure	CAMM	Greco e.a. 2011
Cognitive and Affective Mindfulness Scale - Revised	CAMS-R	Feldman e.a. 2007
Committed Action Questionnaire	CAQ	McCracken 2013
Cardiovascular Disease Acceptance and Action Questionnaire	CDV-AAQ	Spatola e.a. in press
Cognitive Fusion Questionnaire	CFQ	Gillanders e.a. 2014

Chronic Pain Acceptance Questionnaire	CPAQ	McCracken e.a. 2004
Chronic Pain Values Inventory	CPVI	McCracken and Yang 2006
Drexel Defusion Scale	DDS	Foreman e.a. 2012
Experiential Avoidance in Caregiving Questionnaire	EACQ	Losada e.a. 2014
Engaged Living Scale	ELS	Trompetter e.a. 2013
Experiences Questionnaire	EQ	Fresco e.a. 2007
Food Acceptance and Action Questionnaire	FAAQ	Juarascio e.a. 2011
Five Facet Mindfulness Scale	FFMQ	Bohlmeijer e.a. 2011
Five Facet Mindfulness Scale – Short Form	FFMQ-SF	Bohlmeijer e.a. 2011
Freiburg Mindfulness Inventory	FMI	Wallach e.a. 2006
Irritable Bowel Syndrome Acceptance and Action Questionnaire	IBSAAQ	Ferreira e.a. 2013
Kentucky Inventory of Mindfulness Skills	KIMS	Baer e.a. 2004
Mindful Attention Awareness Scale	MAAS	Brown e.a. 2003
MS Acceptance Questionnaire	MSAQ	Pakenham and Fleming 2011
Multidimensional Experiential Avoidance Questionnaire	MEAQ	Gámez e.a. 2011
Parental Acceptance and Action Questionnaire	PAAQ	Cheron e.a. 2009
Physical Activity Acceptance Questionnaire	PAAQ	Butryn e.a. in press
Parental Psychological Flexibility Questionnaire	PPF	Burke and Moore in press
Parent Psychological Flexibility Questionnaire	PPFQ	Wallace e.a. in press
Philadelphia Mindfulness Scale	PHLMS	Cardaciotto e.a. 2008
Psychological Inflexibility in Pain Scale	PIPS	Wicksel e.a. 2008
Parent Pain Acceptance Questionnaire	PPAQ	Smith e.a. in press
Personal Values Questionnaire II	PVQ-2	Blackledge e.a. 2010
Stigmatizing Attitudes Believability	SAB	Hayes e.a. 2004
Self as Context Scale	SACS	Gird e.a. 2012
Self-Compassion Scale	SCS	Neff 2003
State Mindfulness Scale	SMS	Tanay and Bernstein 2013
Southampton Mindfulness Questionnaire	SMQ	Chadwick e.a. 2008
Tinnitus Acceptance Questionnaire	TAQ	Weise e.a 2013
Toronto Mindfulness Scale	TMS	Lau e.a. 2006

Voices Acceptance and Action Scale	VAAS	Shawyer e.a. 2007
Valued Living Questionnaire	VLQ	Wilson e.a. 2004
Valuing Questionnaire	VQ	Smout e.a. 2014
Work-related Acceptance and Action Questionnaire	WAAQ	Bond e.a. 2013

Table 9.

Overview of available ACT measures by act processes and specific problem areas/disorders

Acceptance	AAQ-II, MEAQ, BEAQ.
Defusion	CFQ, ATQ-F&B, BAFT, DDS.
Self as Context	SACS, EQ, SCS.
Here and Now	FFMQ-SF, FFMQ, MAAS, KIMS, FMI, TMS, CAMS-R, PHLMS, SMQ, SMS.
Values	VLQ, PVQ-2, BEVS, VQ, ELS.
Committed Action	ELS.
Psychological Flexibility	AAQ-II.
Specific problem areas / disorders	
AAQ variations	FAAQ (Food), AAQ-W (Weight), CVD-AAQ (Cardiovascular Disease), BI-AAQ (Body Image), AADQ (Diabetes), IBSAAQ (Irritable Bowel Syndrome), MSAQ (MS), TAQ (Tinnitus), AAQ-ABI (Acquired Brain Injury), AAQEpQ (Epilepsy), AAQ-SA (Substance Abuse), AIS (Smoking), SA-AAQ (Social Anxiety), SAB & AAQ-S (Stigma), VAAS (Hearing Voices), WAAQ (Work), AAQ-TTM (Trichotillomania).
Chronic Pain	CPAQ, CPVI, PIPS, BPRI, CAQ, AAQ-II-P, PAAQ.
Children, Adolescents & Parents	AFQ-Y, PAAQ, CAMM, PPF, EACQ, PPAQ, PPFQ.
Other	BIPIS (Body Image).

The continuing development of ACT measures suggests that there are components of ACT which are not being captured in those that are already available. Cooper (2009) developed a specific ACT measure for depression

(AAQ-D), citing that the need for the measure was due to the “marginal reliability” of the AAQ. Cooper (2009) also argued that the AAQ has been found to be less sensitive to clinical change than revised population-specific versions (Cooper, 2009; Lillis & Hayes, 2008; Hayes et al., 2004). Similar reasons have also been reported in the development of other ACT-specific measures (e.g. Food Craving Acceptance and Action Questionnaire - Juariscio et al., 2011; Parental Psychological Flexibility Questionnaire - Burke & Moore, 2014; Chronic Pain Acceptance Questionnaire - McCracken, Vowles & Eccleston, 2005), with each study highlighting the same concerns of general measures of psychological flexibility/inflexibility being less useful than measures targeted to specific developmental, social or individual situations.

Multiple measures that access the same process have also been developed. According to the literature, the Cognitive Fusion Questionnaire (Gillanders et al., 2014) was the fourth measure developed for assessing defusion within the ACT model. Gillanders et al. (2014) suggested that the need for a new defusion measure was because other measures of defusion were “content specific, operationalized in a narrow way, and confounded measurement with understanding, as well as containing priming effects” (p. 86). To date, there is no general measure of PF that offers a breakdown of individual ACT processes; therefore, it is clear why individual process measures have been developed. However, these measures are also coming under scrutiny and attempts to create effective measures that accurately analyse specific processes appear to be ongoing.

The review of existing measures highlights a gap in the literature for a reliable and clinically sensitive measure of PF. The issues and criticisms of the AAQ are the most commonly cited reason for the development of ACT-specific measures.

1.7.1 AAQ-II

The items on the AAQ-II are rated on a 7-point Likert scale from 1 (never true) to 7 (always true). High scores on the AAQ-II are reflective of greater experiential avoidance and immobility (Psychological Rigidity), while low scores reflect greater acceptance and action (Psychological Flexibility).

Bond et al.'s (2011) evaluation of the AAQ-II indicated a 'satisfactory structure, reliability and validity' of the measure. The mean alpha coefficient was reported as .84, indicating a large effect size. Test-retest data was collected at 3 and 12 months and was reported as .81 and .79, respectively, also indicating large effect sizes.

Fledderus et al. (2012) completed a further empirical evaluation of the AAQ-II using Confirmatory Factor Analysis (CFA). The one-factor model for the AAQ-II showed poor overall fit (CFI =0.74, TLI = 0.67, RMSEA = 0.12, SRMR = 0.06), although all factor loadings were = 0.5 or above. The second model that allowed the error terms between items 2 and 5 to correlate showed a marked improvement in overall fit (CFI = 0.95, TLI = 0.93, RMSEA = 0.05, SRMR = 0.04). Given the high observed factor loadings, the overlapping content in items 2 and 5 appears to be the source of misspecification in the first model. All the fit indices for the second model were in acceptable ranges according to recommended criteria (Hu & Bentler, 1999). The overall conclusion of the CFA was that the one-factor model fitted the data very well after accounting for the previously found method effect produced by the overlapping content in items 2 and 5; therefore, the analysis supported the notion that the AAQ-II data were essentially unidimensional.

The unidimensionality of the AAQ-II measures the continuum of PF, with scores interpreting whether individuals have low or high levels. This type of scale is preferred when devising a measure; summed scores on the individual indicators provide a clear indication of individual differences on the latent variable of interest. However, unidimensional solutions are rarely identified (Hyland, 2014; Brown, 2015). The unidimensional nature of the AAQ-II queries whether the measure remains true to the theoretical conceptualisation of ACT's six distinct, yet interrelated, processes which form PF. The AAQ-II is unable to distinguish between individuals who might present with high levels of committed action and values yet low levels of acceptance and defusion, for example.

Francis et al. (2016) provided further critique of the AAQ-II, which included not measuring each of the ACT processes in equal measure; for example, there is a

focus on acceptance and defusion; and using negatively valenced items only, indicating that the measure is one of psychological inflexibility rather than psychological flexibility, as it is reported to be. The problems of the AAQ-II indicate there may be a lack of consistent standard for measuring PF, making it difficult to correlate the outcomes of different studies of PF (Kashdan & Rottenberg, 2010). It also raises difficulties with integrating the various theoretical and empirical studies of PF.

1.7.2 CompACT

Exploratory Factor Analysis (EFA) was used to analyse the psychometric validity of the CompACT. 352 participants were recruited via online social media campaigns which targeted the general public. The CompACT showed good internal consistency, with the average item-total correlation (.31) falling within the recommended ranges for adequate internal consistency (Briggs & Cheek, 1986).

However, the development of the CompACT did encounter some issues. Self as context is not represented in the CompACT due to lack of psychometrically validated available measures. Although attempts were made by Francis et al. (2016) to include items pertaining to this process, they reported that none of these items were rated high enough during the delphi process to be included. This was due to the raters finding the wording of these items to be 'too abstract' and 'incomprehensible.' Comprehensible items were prioritized by the authors to ensure that the CompACT could be used in settings for individuals who had not undergone ACT interventions.

Furthermore, the CompACT possesses an uneven distribution of items representing different ACT processes, with defusion/fusion having the lowest number of items. A potential issue with this is that the breadth and scope of a particular ACT process may not be adequately represented. Francis et al. (2016) accounted for this uneven distribution via a number of factors, including: 1) an initial uneven distribution of items representing different ACT processes within the preliminary 106 item pool during the delphi process, due to a higher prevalence of measures of certain ACT processes over and above others

processes within the extant literature; 2) how ACT experts rated the face and content validity of items, resulting in them being either retained/excluded; and 3) the removal of certain items which comprised the resolution of the CompACT's factor structure. Francis et al. (2016) reported that additional defusion items could have been added for further rating in subsequent rounds, however consensus had already been achieved for the existing items, and further rating could have led to burden and therefore attrition of ACT experts from the panel.

Despite these issues, the CompACT converged with measures of theoretically related constructs, demonstrating large significant correlations with the AAQ-II (r=.78) and indicating good convergent validity with established measures of ACT processes. The CompACT's 'openness' subscale had the strongest association with the AAQ-II (r = .77), followed by the 'awareness' subscale (r = .54) and the 'action' subscale (r = .38).

The CompACT was able to be discriminated from measures of theoretically divergent constructs (short form Marlowe-Crowne Social Desirability scale [MCSD; Ballard, 1992]), finding no significant correlations.

Concurrent validity analysis was assessed to determine whether the CompACT correlated with measures of outcome variables in expected ways (Depression Anxiety Stress Scale [DASS-21; Henry & Crawford, 2005]; Short Form Health Survey [SF-12v2; Ware, Kosinski & Keller, 1996; Ware et al., 2002]). The CompACT was found to have large positive correlations (rs = .56-.64) with all three subscales representing the DASS-21 and correlated most strongly with the depression subscale (r = .64). The CompACT demonstrated a large significant negative correlation with the SF-12v2's mental health subscale (r = -.65), and a small but significant negative correlation with its physical health subscale (r = -.23).

Overall, the CompACT was found to be a psychometrically robust measure of Hayes et al.'s (2011) three dyadic processes.

2. Extended Method

2.1 Measures

The Depression Anxiety Stress Scale (DASS-21; Henry & Crawford, 2005; Lovibond & Lovibond, 1995) is a self-report questionnaire which consists of three subscales designed to measure the severity of a range of symptoms common in depression, anxiety and stress (seven items per symptom). The DASS-21 asks participants to consider their experiences over the preceding week and then indicate the extent to which each statement applies to them on a four-point Likert scale ranging from ‘did not apply to me at all over the last week' to 'applied to me very much or most of the time over the past week'. The measure has demonstrated good internal reliability (.82-.97) in clinical and nonclinical samples (Henry & Crawford, 2005; Lovibond & Lovibond, 1995). It was predicted that higher scores on the CompACT should correlate with lower scores on the DASS-21.

The Short Form Health Survey (SF-36; Ware and Sherbourne, 1992) is a 36-item measure of health status that broadly assesses areas of physical health, sense of well-being, quality of life and ability to function. The SF-36 requires participants to indicate on a five-point Likert scale (from 'poor' to 'excellent') their view of their health across eight domains: physical functioning; role limitations due to physical problems; social functioning; bodily pain; mental health; role limitations due to emotional problems; vitality; and general health perceptions. There are two summary component scores which are derived from the SF-36: The Physical Component Summary Score (PCS); and the Mental Health Component Summary Score (MCS). Higher scores on the SF-36 suggest better health and quality of life.

A shortened version of the SF-36 has been developed (SF-12v2; see Ware, Kosinski & Keller, 1996; Ware et al., 2002) using regression methods. Ware et al. (1996) found high correlations between the SF12v2 and SF-36 and good test-retest reliability scores at two weeks for the SF12v2 (.76-.89). The measures were also found to have good internal consistency for the physical health subscale (.92) and mental health subscale (.88). The SF12v2 has been

found to be as responsive to longitudinal changes in health status as the SF-36 (Jenkinson et al., 1997; Maruish, 2012). Higher scores on the CompACT should correlate with higher scores on the SF-12v2, indicating a better quality of health and life functioning.

2.2 Confirmatory Factor Analysis (CFA)

Furr (2011) suggests that the first three steps of the CFA need to be established before the analysis can be completed. These include: (1) the number of latent factors has been specified; (2) items are specified to load onto particular factors; and (3) associations between factors have been identified. Preliminary research by Francis et al. (2016) demonstrated the completion of these initial steps.

Before the CFA analysis can proceed, the latent factors need to be given a scale (a mean and variance). This is due to the factor being unobservable and 'non-existent' (Brown, 2015). The current project chose to use a marker item where one loading is fixed to 1; the factor is scaled as a reliable part of that marker item.

According to Furr (2011), there are several phases in a CFA (see Figure 5). In the first phase, AMOS uses the collected data to compute the items' actual variances and the actual covariances among the items. This information is used to estimate item parameters and to estimate the model's accuracy.

In the second phase, AMOS uses the items' actual variances and covariances to estimate parameters as specified by the researcher; for example, the actual association between two items to estimate the factor loadings that they might have on a common factor. Additionally, AMOS computes inferential statistics for each parameter. For the typical inferential test of a parameter, the null hypothesis is that the parameter is zero in the population. For example, AMOS tests all hypothesised factor loadings, evaluating whether each item loads significantly on its factor.

In the third phase, AMOS uses the estimated parameters to create "implied" item variances and covariances. Based upon statistical rules linking parameters

to item variances and covariances, it produces item variances and covariances as implied by the specified model and its estimated parameters. If the model is a good approximation of the true factor model underlying the scale's items, then the implied variances and covariances will match closely the actual variances and covariances computed in the first phase of analysis. If the model is poor, then the implied values will differ greatly from the actual values.

In the fourth phase, AMOS generates information reflecting the overall adequacy of the hypothesised model. It compares the implied variances and covariances to the actual variances and covariances, computing indices of "model fit" and modification. Small discrepancies between implied and actual values produce indices reflecting good fit, suggesting that the hypothesised measurement model adequately accounts for the associations among the scale's items. In comparison, large discrepancies produce indices suggesting that the hypothesised measurement model does not adequately account for the scale's data.

Furthermore, "modification indices" reveal specific ways in which the hypothesised measurement model might be modified. More specifically, they indicate potential modifications that would make the hypothesised factor structure more consistent with the factor structure that truly may be underlying the scale's items.

2.2.1 Evaluating Model Fit

Several statistics can be used to evaluate model fit; researchers are discouraged from choosing the statistics which demonstrate the best fit. Although there is an array of options to choose from, Kline (2014) recommends reporting the chi-squared test, the root mean square error of approximation (RMSEA), the comparative fit index (CFI), and the standardised root mean square residual (SRMR). Each of these will now be considered.

2.2.2 Chi-Squared Test

The chi-squared test is an indication of the differences between the observed and expected covariance matrices. Values closer to zero suggest a better fit,

with a smaller difference between expected and observed covariance matrices (Gatignon, 2010). Chi-squared statistics can also be used to directly compare the fit of nested models to the data. One criticism of the chi-squared test of model fit, however, is that researchers may fail to reject an inappropriate model in small sample sizes and may reject an appropriate model in large sample sizes (Brown, 2015). Therefore, the chi-squared test is often reported when it has been divided by degrees of freedom, with values < 3 considered acceptable.

2.2.3 Root Mean Square Error of Approximation (RMSEA)

The root mean square error of approximation (RMSEA) avoids issues of sample size by analysing the discrepancy between the hypothesised model, with optimally chosen parameter estimates, and the population covariance matrix (Hooper, Coughlan & Mullen, 2008). The RMSEA ranges from 0 to 1, with smaller values indicating better model fit. A value of .06 or less is indicative of acceptable model fit (Brown, 2015).

2.2.4 The Comparative Fit Index

The comparative fit index (CFI) analyses the model fit by examining the discrepancy between the data and the hypothesised model, while adjusting for the issues of sample size inherent in the chi-squared test of model fit (Gatignon, 2010). CFI values range from 0 to 1, with larger values indicating better fit. Previously, a CFI value of .90 or larger was considered to indicate acceptable model fit (Hu & Bentler, 1999).

2.2.5 The Standardized Root Mean Square Residual (SRMR)

The standardised root mean square residual (SRMR) is the square root of the discrepancy between the sample covariance matrix and the model covariance matrix (Hooper, Coughlan & Mullen, 2008). The standardised root mean square residual ranges from 0 to 1, with a value of .08 or less being indicative of an acceptable model (Hu & Bentler, 1999).

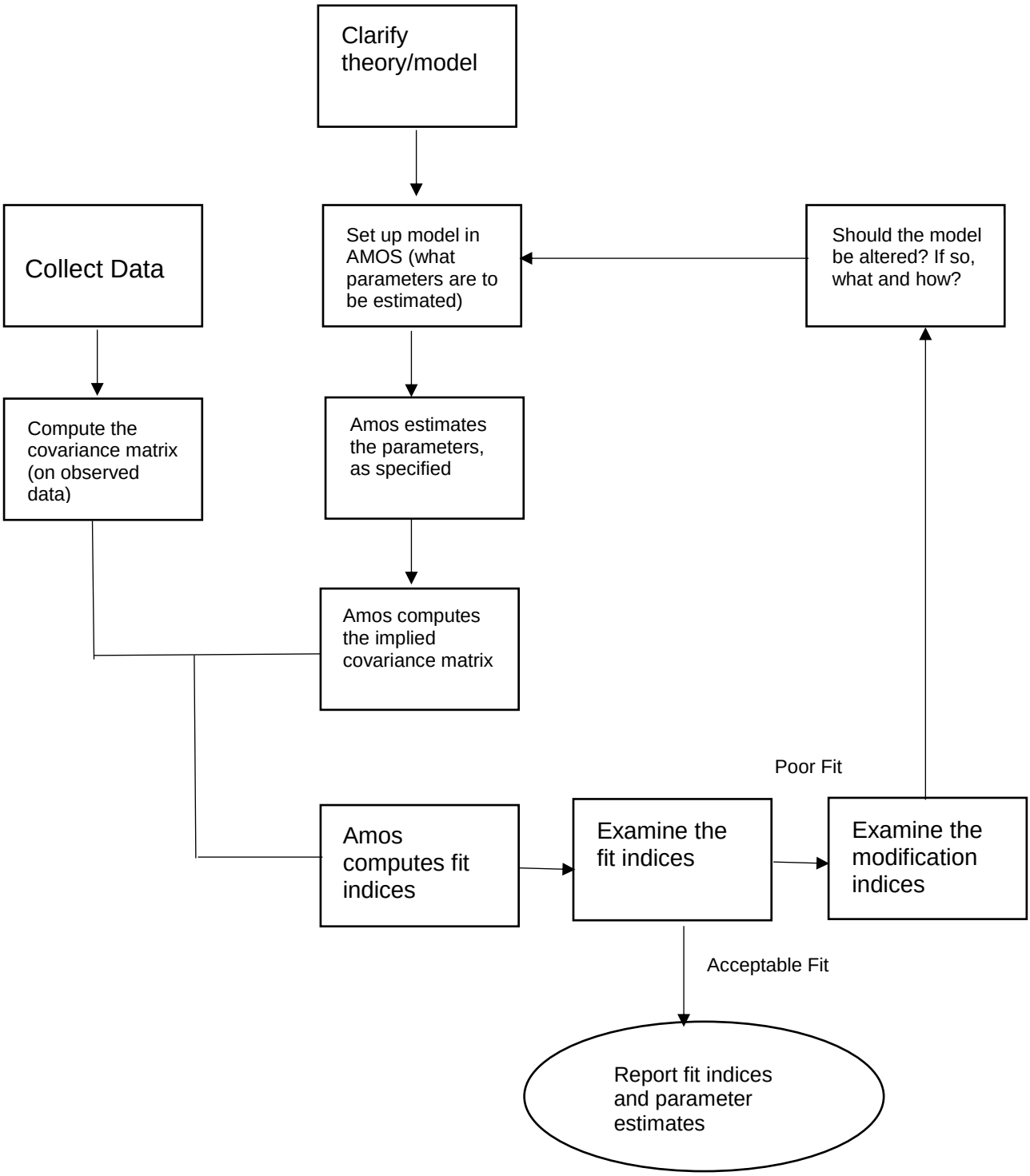


Figure 6. Flowchart of Confirmatory Factor Analysis

2.2.6 Analysis Markers

The current research has utilised several markers of analysis. Firstly, internal reliability, convergent validity (AAQ-II), discriminant validity (MCSD) and concurrent validity (DASS 21 & SF12v2) were used for consistency and comparability with the original project (Francis et al., 2016). Additionally, retest analysis and clinical cut-off analysis were also completed.

Secondly, CFA (intercorrelated analysis) was used to test and confirm the construct of the CompACT based on a priori assumptions along with bifactor analysis. Further CFA testing has also been completed in the interest of exploring and evaluating the construct of the model; these include: unidimensional analysis and hierarchical analysis.

It is considered of significant importance that convergent validity, discriminant validity and reliability are established within a CFA. This has already been considered via the above analysis comparing the CompACT with other measures.

However, CFA research strongly suggests that analysis to provide further evaluation of the internal structure of the model is considered (Brown, 2015; Furr, 2011). If there are convergent validity issues within this analysis, it will suggest that the items do not correlate well with each other within their parent factor; i.e. the latent factor is not well explained by its observed variables. If there are discriminant validity issues, this will suggest that items correlate more highly with items outside their parent factor than with the variables within their parent factor; i.e. the latent factor is better explained by some other variables (from a different factor) than by its own observed variables. Measures used for establishing validity and reliability are: Composite Reliability (CR) > 0.7, Average Variance Extracted (AVE), Maximum Shared Variance (MSV), and Average Shared Variance (ASV). Acceptable thresholds are considered as: (reliability) CR >0.7; (convergent validity) AVE > 0.5; (discriminant validity) MSV<AVE (Hair et al., 2010). Therefore, additional analysis was completed to evaluate the reliability, as well as the convergent and discriminant validity, of the CompACT (see Section 3.3).

2.3 Further CFA Analyses

The current research utilises traditional methods to analyse PF firstly via an intercorrelated CFA model, which also satisfied a priori assumptions. The intercorrelated model produced an acceptable model fit and provided conceptual consistency with ACT theory. The bifactor model also confirmed the need for multidimensionality. With the intercorrelated and bifactor model providing statistically passable findings, other competing CFA models were also considered to further examine model fit; these included: unidimensional modelling and hierarchical modelling. Bifactor modelling will also be considered in more detail.

2.3.1 Unidimensional Models

In a unidimensional model the summed score provides an unambiguous interpretation of individual differences on the target construct. It is assumed that any observation is the sum of two values; a true score plus error; the error is uncorrelated with all other variables, and the expected value for error is zero (Embretson & Reise, 2013). The AAQ- II is representative of a unidimensional model where all items of the measure load onto PF alone.

Psycho-educational and health measures often utilise composite scale scores in order to make inferences. Slocum-Gori et al. (2009) suggested that these scales represent two different types of unidimensionality: strict and essential. Although some psycho-educational and health measures meet strict unidimensionality, most measures meet the criteria for essential unidimensionality (Slocum-Gori et al., 2009). According to Hattie (1985), in order to measure any psychological latent variable of interest, the inclusion of numerous minor latent variables is not merely desirable but unavoidable. The inclusion of these secondary minor latent variables is referred to as ‘essential unidimensionality’. Strict unidimensionality, however, is defined as one dominant latent variable with no secondary minor dimensions. McDonald (1981) reported that cases of finding perfectly unidimensional data will not occur in the application of theory.

In the current research, a satisfactory intercorrelated model has already been identified; therefore, the chances of a unidimensional CompACT model may be unlikely.

2.3.2 Hierarchical Models

Thompson (2004) provided the following metaphor to facilitate and differentiate between first-order and second-order analysis. First-order analysis is a close-up view that focuses on the details of the valleys and the peaks in mountains. Second-order analysis is like looking at the mountains from a greater distance and yields a potentially different perspective of the mountains as constituents of a range. Both perspectives may be useful in facilitating understanding of data.

Hierarchical factor analysis (also known as higher-order or second order analysis) is often used for theory testing (Brown, 2015). This model presumes a second-order factor that has direct causal paths to multiple first-order factors, which in turn have direct causal paths to observed variables (Kline, 2010). Hierarchical models account for the correlations among the dimensions in an intercorrelated model (e.g. first-order factors) by putting a measurement structure on the correlations (second-order factor). It is also important to note that the relationship between the items and the second-order factor is indirect because the items only load onto the first-order factors. First-order factors provide a high degree of accuracy, but a low degree of generalisation. Second-order factors offer a lower degree of accuracy, but a higher degree of generalisation.

Hierarchical factor analyses progress in the following way: (1) the first-order factors must be rotated obliquely, yielding correlated factors in the form of a factor pattern coefficient matrix. The resulting correlated factors make up a factor correlation matrix that itself is then used as the matrix of associations, or input, for the second-order factor analysis. (2) From the factor correlation matrix of associations, second-order factors are extracted, and a retention rule is applied to determine the number of factors.

One common mistake in factor analysis is to base interpretations of higher-order factors on first-order factors (Thompson, 2004). This practice is deemed as essentially "basing interpretations upon interpretations" (Gorsuch, 1983, p. 245). The extraction of first-order factors aims to remove the variance that is not important or useful in explaining the latent construct. Variance that is not useful in explaining first-order factors may be useful in explaining second-order factors. The latent construct changes from one step to the other; limiting the amount of variance under consideration to that which was useful in describing the first-order factors would be meaningless. Thompson (2004) suggests that a better approach to the interpretation of second-order factors is to use information given by the variables themselves.

Hierarchical models are potentially applicable when (a) the lower-order factors are substantially correlated with each other, and (b) there is a higher-order factor that is hypothesised to account for the relationship among the lower-order factors. The focus of the hierarchical factor analysis is on the interrelations of the lower and higher-order factors. Brown (2015, p.290) reported the sequence for CFA-based hierarchical factor-analysis as the following: (1) Develop a conceptually valid, well-fitting first-order CFA solution; (2) examine the magnitude and pattern of correlations among factors in the first-order solution; and (3) fit the second-order factor model, as justified on conceptual and empirical grounds.

In the current hierarchical analysis, PF is the general factor that accounts for the commonality among lower-order factors representing each of the three factors: openness to experience, behavioural awareness and valued action. Multiple items on the CompACT, in turn, represent each of the lower-order factors. Although this is helpful in establishing the higher-order factor and testing theoretical assumptions, this type of modelling can only evaluate the CompACT items indirectly. Conceptually, this poses an issue in analysing and determining the utility of the items within the CompACT.

2.3.3 Bi-Factor Models

The bifactor model (Harman, 1976; Holzinger & Swineford, 1937) specifies a general factor that accounts for all significant covariance in all observed measures, as well as specific factor domains accounting for the unique variance in the indicators of a specific domain over and beyond the general factor.

A bifactor model is considered to be a helpful tool for measuring the dimensionality of scales (Murray & Johnson, 2013). As the general and specific factors are orthogonal (uncorrelated), the size of the loadings on both general and specific factors needs to be scrutinised. These loadings reflect the degree to which items are largely unidimensional, and good indicators of the general factor, or are influenced more by the secondary factors. Therefore, bifactor modelling can be used to get a broad sense of the extent to which items are multidimensional. The general rule of thumb is that larger loadings on items from the general factor, and smaller loadings on items from the specific factor, are indicative of a unidimensional model. However, bifactor modelling is considered to have highly restrictive assumptions which need to be satisfied in order that group factors will be identified. Data in the model must be multidimensional and the multidimensionality be well-structured; for example, each item measures a general factor and only one group factor. Due to these limitations, bifactor modelling is not often used as an analysis (Hyland et al., 2014).

Within the current construct the bifactor model suggests that there is a single PF factor that underlies each of the items in the CompACT. Separately, there are domain specific factors (‘Openness to Experience’, ‘Behavioural Awareness’ and ‘Valued Action’), each of which accounts for unique variance in its own separate set of domain-related items. The difference between bifactor modelling and the intercorrelated model is that the factors are no longer orthogonal within the latter model, as well as the general factor loadings being constrained at zero (and thus, are missing).

There is evidence of mounting research for the use of bifactor modelling within education and psychology (Armon & Shirom, 2011; Bear et al., 2011; Betts,

Pickart, & Heistad, 2011; Brown, Finney, & France, 2010; Cai, Yang, & Hansen, 2011). However, this model is still considered to be a less commonly used approach to that of hierarchical/ intercorrelated models (Brown, 2015). One of the main reasons for this is the proposal of the existence of a group factor that partially reflects PF, but which also has a specific component that is independent of PF. This particular issue of bifactor modelling has gained much criticism, with some researchers claiming that the model itself is illogical (Bonifay, Lane & Reise, 2017; Reise, 2012).

2.4 Alternate Methods of Analysis

Following a priori assumptions and based on previous factor analysis, CFA was chosen as the method of analysis for the current research. However, alternative methods of research are available; two of the most popular alternatives – *Network Analysis* and *Item Response Theory* – are considered.

2.4.1 Network Analysis

In network analysis, a network is an abstract model that contains nodes and edges. The nodes are representative of the objects or variables of the research, whilst the edges represent the connections between the nodes (the “link” that connects them). Nodes can be an array of variables such as, for example, psychopathological symptoms, personality traits, or environmental triggers e.g. traumatic experiences or alcohol use (Isvoranu et al., 2017; Klippel et al., 2017). They can also be other types of variables from levels of analysis that are not considered to be observable e.g. genetics, psychophysiological or neurocognitive (Santos Jr et al., 2017). The existing graphical representation between nodes and edges is known as a graph. Such representations can be executed with specific packages such as Qgraph (Epskamp et al., 2012).

In network analysis, personality is likened to an ecosystem in which some characteristics and behaviours stimulate each other, while others have inhibitory relations. It is proposed that the proper way to analyse personality data is not via the a priori imposition of a latent variable structure, but via the construction of a network representing the most important dynamic relations between

variables. This method suggests that analysing networks in this way can lead to the understanding of the structure of the bionetwork of personality.

Network analysis literature has suggested that the traditional CFA method, which is reliant on latent variable models in personality, is static and not representative of the dynamic interrelations of personality (Fonseca-Pedrero, 2018). It has been argued that the majority of the structural covariation in personality measures results from direct interactions between the variables measured through personality items. For example, it might be supposed that people who like attending parties gain more friends because they meet more people, and people who have more friends get invited to good parties more often (Constantini & Perugini, 2017). Therefore, an explanation of the relevant pattern of covariation is provided without the need to postulate the latent variables.

Whilst factor analysis focuses on the components shared among the observable indicators, network analysis emphasises the direct relationship among the observable indicators (Brandes, 2005). It appears that the difference between factor analysis and network analysis is the way in which the researcher's attention is directed towards different aspects of personality (Borgatti et al., 2009).

Comparatively, CFA focuses exclusively on the components shared among indicators, whether or not interpreted causally, whilst network analysis shifts the focus towards the direct relationships among the observable variables. Network analysis researchers do not challenge the use of CFA but suggest that both procedures can be combined (Borsboom & Cramer, 2013).

2.4.2 Item Response Theory

Item Response Theory (IRT) is based upon the concept of classical test theory. Classical test theory is a traditional quantitative approach to testing the reliability and validity of a scale based on its items (Cappelleri, Lundy & Hays, 2014). Classical test theory assumes that each observed score is a combination of an underlying true score (*T*) on the concept of interest and unsystematic (i.e.

random) error (*E*). Classical test theory, also known as true score theory, assumes that each person has a *true score*, *T*, that would be obtained if there were no errors in measurement. A person's true score is defined as the expected score over an infinite number of independent administrations of the scale. Scale users never observe a person's true score, only an *observed score*, *X*. It is assumed that *observed score* (*X*) = *true score* (*T*) plus some *error* (*E*).

Item response theory attempts to explain the response of a person to an item (Hambleton, Swaminathan, & Rogers, 1991). IRT posits that if a person has a high ability in a particular field, he or she will probably get an easy item correct. Conversely, if a person has a low ability and the item is difficult, he or she will probably get the item wrong. The main question of IRT is, "What is the probability of a person with a given ability responding correctly to an item with a given difficulty?" The purpose of IRT is therefore to provide a framework for evaluating how well assessments work, and how well individual items on assessments work. This can be expressed mathematically through a number of different formulae; one of the most common models used within IRT is the one-parameter logistic model, also known as the Rasch Model (see Bond & Fox, 2013; Fischer & Molenaar, 2012).

IRT is based on the assumption that test responses reflect an underlying trait and that the relation between response and trait can be described for each test item by a monotonically increasing function called an item characteristic curve (ICC). Individuals with higher levels of the trait have higher expected probabilities for answering an item correctly in the keyed direction, with the ICC providing the precise value of these probabilities for each level of the trait.

IRT is most often used in education to assess exams. It is able to analyse both unidimensional and multidimensional models; however, due to the increased complexity of multidimensionality, IRT has mostly focused its attention on unidimensional models (Embreston & Reise, 2013; Strout, 1990). The main focus of this analysis is directly related to the items themselves; confirmation of

latent factors is not the purpose of this analysis. Therefore, the use of IRT and Rasch modelling would not meet the requirements of the current project.

2.4.3 Summary of Alternative Methods

Conforming to scale measurement development guidance (DeVellis, 2016), the current research followed traditional procedures along with a priori assumptions, and therefore confirmatory factor analysis was completed. Alternative methods of analysis have been briefly explored in relation to the current research project, namely network analysis and IRT/Rasch analysis.

Network analysis highlighted important issues regarding the assessment and representation of dynamic processes, with latent factor construction (CFA) being regarded as static (see Section 4.5). Both network analysis and IRT have more of a focus on the observable items with less attention on the latent factors that might be influencing them. Although both methods provide an interesting alternative method of analysis, neither fulfils the aims and objectives for the current research project. CFA offers the researcher an opportunity to assess factor structures, in addition to evaluating construct validity and reliability, as well as considering the correlation to theoretical conceptualisations. It is also the next distinct step following exploratory factor analysis, and when validating a new measure.

2.5 Test-Retest Reliability

Bujang and Baharum (2016) suggested that sample size estimation is an important step when researchers are validating a measure. The internal validity of the CompACT was analysed over a two-week period using test-retest reliability. Test-retest reliability is assessed over a relatively brief period of time, in order to mitigate against conclusions being due to age-related changes in performance, as opposed to poor test stability.

The sample size was in the ‘excellent’ range for the rating of test-retest reliability designs in the COSMIN checklist (standards for assessing psychometric evaluation studies) – i.e. more than 100 participants.

2.6 Construct Validity

Construct validity pursues agreement between a theoretical concept and a specific measurement (i.e. CompACT). Messick (1988) claims that one of the major concerns of the validity of inferences is the unanticipated or negative consequences of test score interpretation, which can often be related to construct under-representation or construct-irrelevant variance. If a measurement instrument excludes the essential facets of a construct, or if the instrument includes facets that may be irrelevant, the inferences made from the test scores could involve an array of inappropriate consequences. For example, if an instrument intended to measure only depression actually included secondary facets of anxiety, the inferences made from the test scores could potentially lead to inappropriate diagnosis and treatment. One way to prevent inappropriate consequences from test score interpretation is to focus on the theoretical dimensions of the construct a test is intended to measure.

Investigating the dimensionality of tests is an essential component of construct validity. When the items of a test are summed to one total score, there is an implied assumption that the test is measuring one dimension and that this dimension is measured on a continuum. If, for example, a measure is actually multidimensional yet is being treated as strictly unidimensional, the interpretation of the test scores can be invalid and can entail unwanted consequences.

3. Extended Results

3.1 Participants

Survey one: Four hundred and twenty-two participants consented to take part in the initial phase of the survey. After removing incomplete data and multivariate outliers, three hundred and thirteen participants were included, giving a response rate of 74%.

Survey two: One hundred and twenty-eight participants consented to complete the test-retest phase of the study. After removing incomplete data and multivariate outliers, one hundred and twelve participants were included in the test-retest phase, giving a response rate of 88%. Please see Table 9 for survey response rates.

Table 10.

Survey Response Rates

Item	n=422
Eligible population (A)	422
Consent forms completed (B)	422
Survey 1 completions (C)	313
Survey 2 completions (D)	112
Opt-in rate (A/B)	100%
Survey 1 response rate (A/C)	74%
Survey 2 response rate (A/D)	26%

3.2 Descriptive Statistics

Table 11.

Descriptive statistics for the CompACT (*n=313)*

	N	Minimum	Maximum	Mean	Std. Deviation
OE	313	2	60	31.85	11.797
BA	313	0	30	16.05	6.730
VA	313	7	48	37.17	6.592
CompACT Total	313	16	136	85.07	20.623
Valid N (listwise)	313				

Abbreviations: OE=Openness to Experience; BA= Behavioural Awareness; VA= Valued Action

3.3 CompACT: Further Convergent and Discriminant Validity and Reliability Testing

Using the output from the correlations and standardised regression weights, convergent and discriminant validity as well as reliability for the current model were analysed (see Table 11).

Table 12.

Validity, reliability and factor correlation matrix with square root of AVE on the diagonal.

	CR	**AVE**	**MSV**	**Open**	**Aware**	**Action**
Open	0.875	0.413	0.397	**0.643**		
Aware	0.858	0.549	0.397	0.630	**0.741**	
Action	0.855	0.429	0.373	0.611	0.476	**0.655**

Key: (CR) Composite Reliability; (AVE) Average Variance Extracted; (MSV) Maximum Shared Variance; and Average Shared Variance (ASV). Red= Issues with the model

Reliability

CR values are >.70 for all factors, indicating acceptable model reliability.

Convergent Validity

AVE results for the factor ‘Behavioural Awareness’ are >.50, indicating convergent validity. AVE results for the ‘Openness to Experience’ and ‘Valued Action’ factors were <.50, suggesting inadequate levels of convergent validity for these factors.

Discriminant Validity

MSV values < AVE indicate discriminant validity; all values for each factor were indicative of acceptable discriminant validity. Discriminant validity for all constructs is achieved when a diagonal value (in bold) is higher than the values in its row and column. Referring to Table 11, it can be concluded that discriminant validity for all three constructs is achieved (see Section 4.2).

3.4 Correlated Errors

Modification indices were reviewed as part of the CFA and error effects freed for the six item pairs that were affected (see Table 12). The presence of covariance between the errors of two (or more) indicators of the same construct suggests that one indicator is in some way related to the other(s). In general application of CFA, these indicators are reflective and should be independent. According to the literature, MI levels > 20 and par change > 0.10 indicate that certain items are redundant of each other in the measurement model (Brown, 2015).

Table 13.

Freed error covariances, the items they respond to and MI/Par Change indicators

Identified Correlated Errors	Corresponding CompACT items	Factor	M.I before correlated errors were freed	Par Change
e4-e5	'I go out of my way to avoid situations that might bring difficult thoughts, feelings, or sensations' – 'I work hard to keep out upsetting feelings'	Openness to Experience	21.9	.44
e7-e8	'Even when something is important to me, I'll rarely do it if there is a chance it will upset me'- 'Thoughts are just thoughts – they don't control what I do'	Openness to Experience	26.4	.46
e7-e9	'Even when something is important to me, I'll rarely do it if there is a chance it will upset me' – 'I am willing to fully	Openness to Experience	73.0	.68

	experience whatever thoughts, feelings and sensations come up for me, without trying to change or defend against them'			
e16-e19	'I can identify the things that really matter to me in life and pursue them' – 'I am able to follow my long-term plans, including times when progress is slow'	Valued Action	23.2	.30
e17-e22	'I make choices based on what is important to me, even if it is stressful' – 'I behave in line with my personal values'	Valued Action	30.1	.22
e18-e21	My values are really reflected in my behaviour' – 'I behave in line with my personal values'	Valued Action	36.7	.24

3.5 Exploratory Factor Analysis

Parallel analysis was completed to provide further evidence of the CompACT's three-factor structure. Eigenvalues from a principal component analysis (PCA) conducted in SPSS (v.23) were compared to eigenvalues calculated from randomly generated correlation matrices (https://analytics.gonzaga.edu/parallelengine/).

Table 14 shows a comparison of the eigenvalues and the originally suggested number of factors.

Table 14.

Parallel Analysis of the Eigenvalues

Parallel	PCA
1.526866	8.086
1.439767	2.500
1.371675	2.044
1.312027	1.129
1.263695	1.014
1.217847	0.845
1.173973	0.707
1.129264	0.665
1.088553	0.648
1.051899	0.613
1.012521	0.550
11 factors	5 factors

The PCA analysis suggested that there were five underlying factors in the dataset, the parallel analysis suggested that there were 11 underlying factors in the dataset. The number of factors to retain is the number of eigenvalues (generated from the PCA) that are larger than the corresponding random eigenvalues (Horn 1965). This analysis suggests that there are three factors which need to be retained.

3.6 Original Model Fit

The original analyses produced a marginal model fit: χ2/df = 3.64 (df= 227; *p*=.000), CFI = .82, RMSEA = .09 [90% CI= .08, .09], SRMR=.08 with values for RMSEA falling outside of recommended ranges (see Figure 7). The original model prompted the researchers to examine the modification indices, as suggested in the phases of CFA (Furr, 2011). Factor loadings are presented in Table 15.

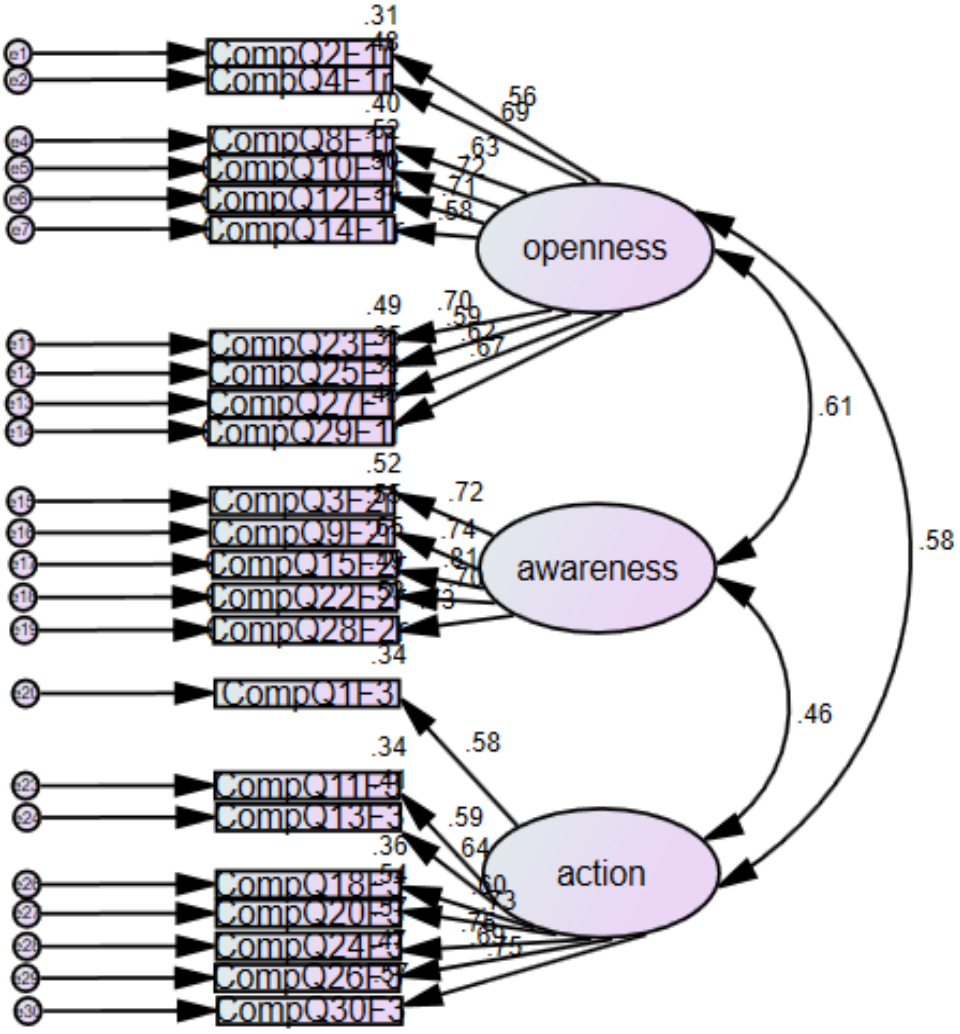


Figure. 7 Original CFA Analysis: AMOS Output

Table 15.

Standardised Regression Weights of Original Model

			Estimate
CompQ2F1r	<---	Open	.555
CompQ4F1r	<---	Open	.692
CompQ8F1r	<---	Open	.631
CompQ10F1r	<---	Open	.721
CompQ12F1r	<---	Open	.708
CompQ14F1r	<---	Open	.580
CompQ23F1	<---	Open	.702
CompQ25F1	<---	Open	.594
CompQ27F1	<---	Open	.623
CompQ29F1r	<---	Open	.669
CompQ3F2r	<---	Aware	.724
CompQ9F2r	<---	Aware	.738
CompQ15F2r	<---	Aware	.808
CompQ22F2r	<---	Aware	.702
CompQ28F2r	<---	Aware	.726
CompQ1F3	<---	Action	.582
CompQ11F3	<---	Action	.586
CompQ13F3	<---	Action	.640
CompQ18F3	<---	Action	.597
CompQ20F3	<---	Action	.732
CompQ24F3	<---	Action	.752
CompQ26F3	<---	Action	.686
CompQ30F3	<---	Action	.754

3.7 Unidimensional Analysis

To evaluate whether the model was unidimensional, a CFA was performed on the 23-item CompACT (N=313) using SPSS AMOS (v.23). A confirmatory factor analysis of the response items yielded a poor model fit: $\chi 2/df = 6.69$ (df= 230; *p*=.000), CFI = .60, RMSEA = .13 [90% CI= .13, .14], SRMR=.11 with all values falling outside of recommended ranges. Factor loadings ranged from .40-.71 (see Table 16) with many falling below the .50 recommended range (Stevens, 1992). Therefore, this suggests that a unidimensional model is not acceptable and can be rejected (see Figure 8).

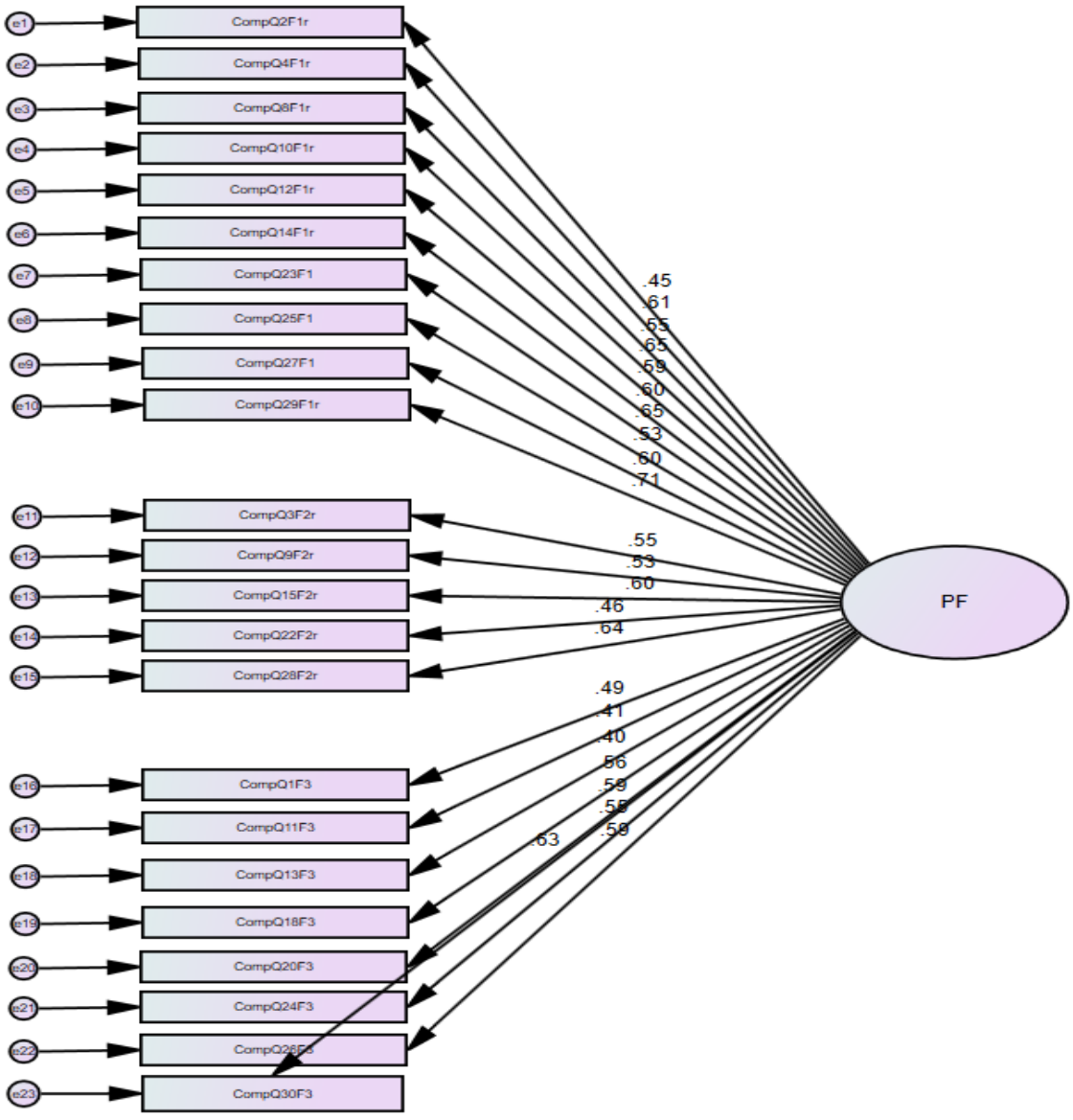


Figure 8. Unidimensional Analysis

Table 16.

Standardised Regression Weights of the Unidimensional Analysis

			Estimate
CompQ2F1r	<---	PF	.448
CompQ4F1r	<---	PF	.606
CompQ8F1r	<---	PF	.549
CompQ10F1r	<---	PF	.649
CompQ12F1r	<---	PF	.590
CompQ14F1r	<---	PF	.599
CompQ23F1	<---	PF	.653
CompQ25F1	<---	PF	.531
CompQ27F1	<---	PF	.604
CompQ29F1r	<---	PF	.713
CompQ3F2r	<---	PF	.550
CompQ9F2r	<---	PF	.531
CompQ15F2r	<---	PF	.596
CompQ22F2r	<---	PF	.457
CompQ28F2r	<---	PF	.645
CompQ1F3	<---	PF	.489
CompQ11F3	<---	PF	.410
CompQ13F3	<---	PF	.401
CompQ18F3	<---	PF	.563
CompQ20F3	<---	PF	.591
CompQ24F3	<---	PF	.553
CompQ26F3	<---	PF	.587
CompQ30F3	<---	PF	.631

3.8 Hierarchical Model

To evaluate whether the hierarchical model adequately fit the collected data, a CFA was performed on the 23-item CompACT (N=313) using SPSS AMOS (v.23). A confirmatory factor analysis of the response items yielded a marginal model fit: χ2/df = 2.81 (df= 221; *p*=.000), CFI = .88, RMSEA = .07 [90% CI= .06, .08], SRMR=.07 (see Figure 9). Factor loadings from PF to the first-order factors were as follows: 'Openness to Experience', .90; 'Behavioural Awareness', .71; and 'Valued Action', .67 (see Table 17).

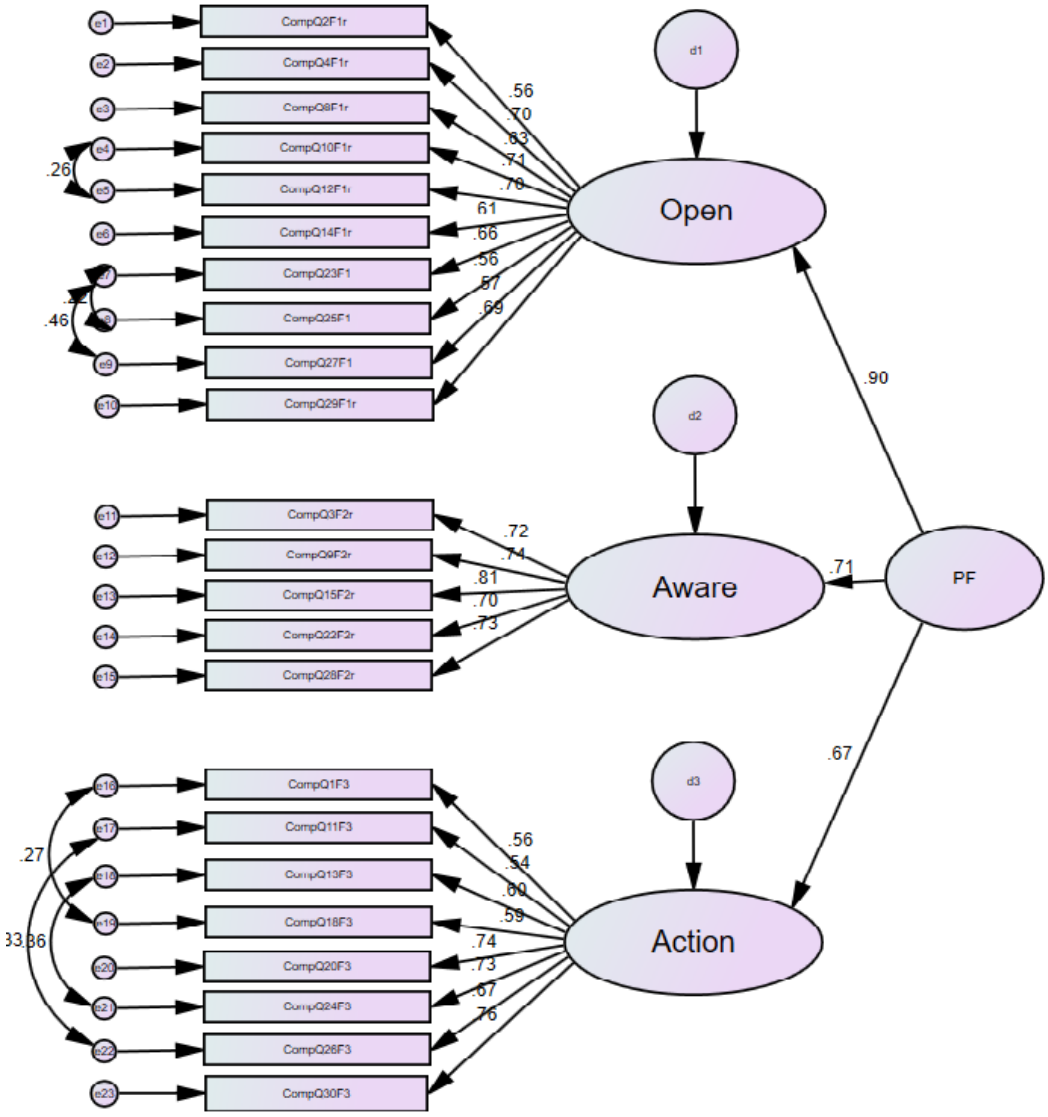


Figure 9. Hierarchical Factor Analysis

Table 17.

Standardised Regression Weights of the Hierarchical Model Analysis

			Estimate
Open	<---	PF	.896
Aware	<---	PF	.706
Action	<---	PF	.674
CompQ2F1r	<---	Open	.557
CompQ4F1r	<---	Open	.698
CompQ8F1r	<---	Open	.631
CompQ10F1r	<---	Open	.711
CompQ12F1r	<---	Open	.695
CompQ14F1r	<---	Open	.610
CompQ23F1	<---	Open	.659
CompQ25F1	<---	Open	.560
CompQ27F1	<---	Open	.573
CompQ29F1r	<---	Open	.686
CompQ3F2r	<---	Aware	.724
CompQ9F2r	<---	Aware	.739
CompQ15F2r	<---	Aware	.808
CompQ22F2r	<---	Aware	.701
CompQ28F2r	<---	Aware	.727
CompQ1F3	<---	Action	.563
CompQ11F3	<---	Action	.545
CompQ13F3	<---	Action	.597
CompQ18F3	<---	Action	.590
CompQ20F3	<---	Action	.742
CompQ24F3	<---	Action	.732
CompQ26F3	<---	Action	.673
CompQ30F3	<---	Action	.759

3.8 Model Analyses Comparison

The following CFAs were used to analyse model fit: correlated factors; unidimensional; hierarchical and bifactor; the unidimensional model was rejected as an unacceptable model fit. The bifactor model provided the best model fit, followed by the correlated factor model and the hierarchical model (see Table 18).

Table 18.

Comparisons of all CFA findings

Model	df	χ2	CFI	RMSEA	SRMR
Correlated Factors	221	2.81	.88	.07	.07
Unidimensional	230	6.69	.60	.13	.11
Hierarchical	221	2.81	.88	.07	.07
Bifactor	201	2.30	.92	.06	.05

Green= Acceptable Model Fit; Red=Rejected Model

4. Extended Discussion

4.1 Further Analyses

The purpose of the extended analyses was to consider two alternative competing models to further investigate the structure of the CompACT. Unidimensional modelling and hierarchical modelling were used to analyse the data in addition to the intercorrelated model analysis and bifactor analysis, as can be seen in Table 17. The bifactor model produced the best model fit followed by intercorrelated factor analysis and hierarchical analysis, with both producing similar outputs. A unidimensional model was analysed to see if the items in the CompACT are accounted for by PF alone; the results produced an unacceptable model fit and subsequently the unidimensional model was rejected.

The hierarchical model (higher-order model) produced an acceptable model fit, mirroring the findings from the intercorrelated analysis. PF strongly loaded onto all factors of the CompACT e.g. >.70, with 'openness to experience' loading at .90; 'behavioural awareness' loading at .71, and 'valued action' loading at .67. The results are consistent with the theoretical conceptualisation of ACT, indicating that PF is the overall construct made up of its constituent parts (three dyadic processes) which are being measured by the observable items (CompACT). Items of the CompACT within this model reflect both the latent construct (PF) and one of three factor groups.

The high loadings on the 'openness to experience' factor, both in the hierarchical and bifactor models, indicate that this factor is representing a moderate portion of the PF construct. The ACT processes represented within this factor are acceptance and defusion, both of which have been demonstrated in the literature to mediate outcomes in a number of different areas (Cederberg et al., 2016; Arch et al., 2012; Zettle, Rains & Hayes, 2011; Forman et al., 2007). This finding is therefore not unexpected. However, pursuing acceptance and defusion alone, or in conjunction, deviates from the theoretical underpinnings of the psychological flexibility model and is conceptually

inconsistent. Literature researching the remaining processes is also relevant and indicative of moderating change; therefore, it is of value to consider PF with all its constituent parts.

Traditionally, intercorrelated factor models and higher-order models are more frequently used due to the way in which dimensionality is conceptualised (Brown, 2015). The assumption in the intercorrelated factors model is that the observed item covariation is the result of two or more correlated primary factors. In the higher-order model, the latent construct is of interest and is determined by what the primary latent variables have in common, rather than what observable indicators have in common. In bifactor models, the latent construct explains some proportion of covariation among observable indicators, with other group factors explaining additional covariation among observable indicators (Hyland et al., 2014). The latent construct and group factors are therefore on equal conceptual footing and compete in explaining item covariance—neither factor being “higher” or “lower” than the other. In contrast to the higher-order model, in a bifactor model conceptualisation the latent construct of interest is measured by what is common among the observable indicators (Reise et al., 2016). This means that variations in the intensity of the specific latent construct will influence levels of the observable indicators directly rather than indirectly, as is the case with the higher-order model.

Although hierarchical and bifactor models provide acceptable alternative model fit findings for the current data, there are a number of limiting factors. The hierarchical model provides a statistically acceptable model fit and is also consistent with the theoretical conceptualisations of ACT. However, higher-order factors are not defined by the observed measures (Brown, 2015), raising conceptual issues in the current research. Item analysis is an important part of a measure’s development and validation (DeVellis, 2016); the hierarchical model does not give any information regarding the evaluation of observable items.

The bifactor model provided a statistically better fitting model. However, the absence of correlations between factors is contradictory to ACT's theoretical conceptualisations. Furthermore, the concept of there not being a 'higher-order factor' is also inconsistent with the PF model. Individually, the hierarchical and bifactor models are not considered to be the most appropriate fit for the current measure and its theoretical foundations. However, further analysis of these models does provide additional information to the validation of the CompACT. For example, although it is theorised that PF is the general factor, this cannot be determined in the intercorrelated analysis. Hierarchical modelling is able to do this and provides strong evidence for PF as the overarching factor. Bifactor modelling suggested that the openness to experience domain could be representative of PF alone; however, this is inconsistent with ACT theory, which stipulates that PF can only be achieved in the presence of the six core processes. In conclusion, the intercorrelated model provides the best representation of the data, fulfilling a priori assumptions as well as being theoretically and conceptually consistent with the ACT model.

4.2 Convergent Validity

Convergent validity results within the model indicated that there were issues with two of the factors, 'Openness to Experience' and 'Valued Action', falling slightly below the acceptable value (<.50; section 3.3). It is suggested that when poor convergent data is found, factor loadings should be assessed and items with low factors deleted from the model (Brown, 2015). However, Malhotra and Dash (2011) suggest that AVE is a strict measure of convergent validity. They note that "AVE is a more conservative measure than CR. On the basis of CR alone, the researcher may conclude that the convergent validity of the construct is adequate, even though more than 50% of the variance is due to error" (Malhotra & Dash, 2011, p.702). As CR for each of the CompACT factors was more than adequate (>.70) and both factors fell slightly short of the acceptable value, it can be concluded that convergent validity on this occasion is acceptable.

4.3 Correlated Errors: CFA

The intercorrelated analysis produced an acceptable model fit following model modification. Correlated errors were identified for six pairs of CompACT items (see Section 3.4). The underlying assumption of this specification is that the observed relationship between any two indicators loading onto the same factor is due entirely to the shared influence of the latent factor (Brown, 2015). Therefore, if the factor is partialled out, the intercorrelations between the indicators will be zero. However, some of the shared variance can be due to other sources apart from the common factor (method effect).

A good rationale is needed when freeing the error effects on a CFA (Brown, 2015). Such post hoc model fitting has been severely criticised in the literature (MacCallum, 1986; Danneels, 2016). However, it has also been argued (e.g. Tanaka & Huba, 1984; Brown, 2015) that as long as full awareness of the exploratory nature of the analysis is considered, the process can be substantively meaningful. Post hoc processes are a key part of the CFA, whereby practical as well as statistical significances are taken into account.

The CompACT is a multiple-choice questionnaire, meaning that method effects may occur due to similarly worded items, reverse worded items, and similarly constructed items. In these circumstances it is considered to be acceptable to free the error effects, as long as there are not too many item pairs (Brown, 2015). Correlated errors within items of the CompACT reflected similarly worded and similarly constructed items, which accounted for method effect within the CFA.

4.4 Guideline Variability

One of the most indistinct areas of the research was working with the guidelines in relation to CFA cut-off criteria. According to the widely used cut-off criteria developed by Hu and Bentler (1999), the original CompACT CFA produced an unacceptable model fit, despite high factor loadings and excellent internal reliability. Modification indices were investigated, and the model was amended, freeing correlated errors for certain items. As discussed, the modification of a

model is vigorously discouraged within CFA (Brown, 2015) and can only be carried out with sound reasoning.

The use of CFA techniques for examining factorial validity and identifying acceptable levels of fit has been documented as challenging (Perry et al., 2015). Hopwood and Donnellan (2010) demonstrated this difficulty by examining eight commonly used personality measurements, applying more relaxed cut-off criteria than Hu and Bentler (1999; e.g. CFI and TLI > .90, RMSEA < .10) and allowing cross-loadings in some of the measures. Their findings suggested that none of the measures used came close to the recommended cut-off values. The authors concluded that claims that a measure is invalid because of a weak CFA fit are exaggerated and ignore other types of validity such as content and criterion-related validity. The personality assessments utilised within their research could have perhaps performed better in a CFA by reducing their size and/or complexity. However, the authors argue that if this is at the cost of predictive or other forms of validity, it is not a virtuous academic pursuit. Perry et al. (2015) further add that while referencing Hu and Bentler's (1999) suggested cut-offs is not necessarily an issue itself, the extent to which many researchers view these recommendations as golden rules potentially creates a substantial amount of type II errors. Research by Hopwood and Donnellan (2010) and Perry et al. (2015) urges caution for researchers when employing CFA, suggesting that if a scale fails to achieve a 'good' fit, it should not be automatically discredited.

Taking this into consideration, the original model fit fell slightly below optimum criteria, and perhaps could have been accepted without model adjustment. When making the decision about whether to accept model fit following model adjustment, statistical outcomes were not solely relied upon. As previously discussed, the model has a strong theoretical basis and in the context of how the CompACT performed within this study it was concluded that the intercorrelated model provided a suitable model fit.

4.5 Self-report Measures

The CompACT is a self-report measure that is intended to capture the dynamic processes of PF. Although self-report methods are one of the most popular ways of capturing information from individuals regarding certain aspects of personality/internal worlds, they are considered to be 'static' in nature, raising criticism regarding their ability to capture 'dynamic' processes.

The self-report measure has an expectation that the individual answers the questions honestly. However, individuals may not choose to answer honestly for a number of reasons, such as embarrassment and social desirability, which may lead to exaggeration or understating responses (Peterson & Mitchell, 2005). Temperament and mood may also influence how some individuals respond from one occasion to the next, providing more positive or negative answers and limiting the information collated by the measure. These issues are starting to be researched and advances in the development of dynamic assessments are beginning to emerge (Wright & Hopwood, 2016).

Dynamic psychological processes such as those cited in ACT are considered to be a sequence of thoughts, feelings and behaviour (private events) that play out over time. Dynamics may occur within or across contexts, and within or across individuals. The definition of most forms of psychopathology is thought to be, at least in part, dynamic (Wright & Hopwood, 2016).

Recent research has suggested that common clinical self-report measures are limited in their correspondence to clinical theory in this context (Wright & Hopwood, 2016), capturing an incomplete picture of the inherently dynamic clinical formulations and intervention plans which form the focus of clinical working.

One of the main issues discussed in the literature is the limitation that current theories are not sufficient in defining the time scaling of processes that provide direct implications for clinical assessment. For example, do the ACT processes play out over hours, days, weeks, months or longer? And is this within certain contexts or across all contexts? Carpenter, Wycoff and Trull (2016) suggest that

processes play out over different temporal levels. To this end, various temporal measures have been developed for use in capturing this information. Clinical settings utilise observational methods (Girard & Cohn, 2016); however, this is something that the ACT therapist is already active in doing. The fluid nature of ACT (Hayes, 2012) means that observation of the processes emerging in therapy is essential in providing the correct interventions.

However, capturing ACT processes in other environments and contexts is often attempted by the individual self-reporting (e.g. diaries, thought-capturing tasks). Ambulatory assessment (AA) has gained some evidence for its use in assessing individuals within their lived environments using self-report, observational, and biological/physiological/behavioural methods (see Ebner-Priemer, 2018; Trull & Ebner-Priemer, 2014). The benefits of such methods are thought to be increased ecological validity and minimised retrospective biases (Carpenter, Wycoff & Trull, 2016). What is unique about this method is the use of technology to capture information regarding psychopathology. Electronic devices such as smartphones and mobile physiological devices mean that individuals can log data at all times, creating a more accurate picture of their psychological presentation.

This method comes with its limitations; the development of user-friendly software and data collection is still in its infancy and further work is needed before such technology can be used within applied settings (Wright & Hopwood, 2016). Currently there are very few dynamic assessment systems that could be easily transported to clinical practice; despite the current advances, dynamic data still appears to be relatively expensive and time-consuming to collect (Carpenter, Wycoff & Trull, 2016; Trull & Ebner-Priemer, 2014).

Despite their limitations, self-report measures within ACT provide the best means of capturing information at the current time. The CompACT indicated excellent stability over time, suggesting that it is capturing appropriate information regarding the ACT processes. However, advances within AA appear promising and perhaps in the future could play a bigger part in the assessment and measurement of ACT's processes.

4.6 Contextual Behavioural Science

As the evidence base expands within the ACT field, via research confirming its efficacy and developments in new measures, the developers have proposed the concept of a unified model of human resilience (CBS). Hayes et al. (2012) define CBS as, “a naturalistic, inductive approach to system building in the behavioural sciences that emphasizes the evolution of historically and situationally embedded action, extending that unit across levels of analysis and into knowledge and development itself” (p. 356).

Consistent with a functional contextual approach to science, environmental variables are considered central to any analysis of behaviour. CBS prioritises theory within its research, rather than the efficacy testing of intervention packages. It considers a scientific analysis correct only if it helps to meet scientific goals and focuses on variables that can be manipulated (Hayes, Barnes-Holmes & Wilson, 2012). In these ways, CBS offers a potential answer for how to develop a progressive ‘unified approach’ to behavioural science that might better meet the psychological health challenges faced by society and provides opportunities for further growth.

According to Hayes et al. (2013), CBS is a principle-focused, inductive strategy of psychological system building that emphasises developing interventions based on theoretical models tightly linked to basic principles that are continually developed and evaluated. The strategy has been abstracted and extended from traditional behaviour analysis. CBS involves the dynamic integration and simultaneous development of multiple levels of a research programme, including philosophical assumptions, basic science, basic and applied theory, intervention development, treatment testing, and dissemination (Hayes et al., 2013). Nine key features of the CBS approach have been developed from behaviour analysis and include: (1) explicating philosophical assumptions; (2) developing a basic account of complex human behaviour, with contextual principles organised into theories; (3) developing a model of pathology, intervention, and health tied to basic behavioural principles and theories; (4) building and testing techniques and components linked to these processes and

principles; (5) measuring theoretical processes and their relationships to pathology and health; (6) emphasising mediation and moderation in the analysis of applied impact; (7) early and continuous testing of effectiveness, dissemination, and training strategies; (8) testing the research programme across a broad range of areas and levels of analysis; and (9) creating an open, diverse and non-hierarchical development community.

Principle 5 focuses on the development of measuring theoretical processes. Hayes et al. (2012) suggest that the popularity of ACT is based on "how well the concepts are applied and measured" (p. 366). Hayes et al. (2012) indicate that the literature regarding PF has so far provided significant evidence in explaining psychopathology and human adaptability. Undoubtedly, the measurement of ACT's processes is an important part of the CBS approach, with the CompACT playing an important role. As research continues to develop towards the concept of CBS's unified model, the role for the CompACT becomes more evident.

Research by Hayes et al. (2011) investigated third-wave models for the presence of shared processes and components. These third-wave models of therapy were grouped together according to their emphasis on the context and function of psychological events rather than their validity, frequency or form, with Hayes et al. (2011) coining the collective models as "contextual cognitive behavioural therapies." These models included: Mindfulness-Based Stress Reduction (MBSR; Kabat- Zinn, 1990); Mindfulness-Based Cognitive Therapy (MBCT; Segal et al., 2002); Mindfulness-Based Relapse Prevention (MBRP; Witkiewitz et al., 2005); Metacognitive Therapy (MCT; Wells 1999); Motivational interviewing (MI; Miller, 1983); Behavioural activation (BA; Ferster, 1973); Integrative Behavioural Couple Therapy (IBCT; Jacobson & Margolin, 1979); Dialectical Behaviour Therapy (DBT; Linehan 1993); Functional analytic psychotherapy (FAP; Kohlenberg & Tsai 1993); and ACT (Hayes et al., 1999).

Hayes et al. (2011) purport that contextual cognitive behavioural models are comprised of five distinctive features. Each third-wave model was reviewed and assessed according to the following five attributes: (1) the model targets the

context and function of psychological events such as thoughts, sensations, or emotions; (2) the model is broad and fits with a transdiagnostic approach to mental health; (3) the model requires or encourages therapists to explore these same processes such as by having their own mindfulness practice or by working on acceptance of their own emotions; (4) the model has emerged without an interest in disputing traditional CBT approaches so much as carrying them forward; and (5) the model deals with more complex issues characteristic of other traditions.

The research suggested that the components, moderators and processes of change within these 'contextual cognitive behavioural models' can be organised into three basic categories: open, aware and action. Table 19 shows the three categories and the aims of their use within the models.

Table 19.

Open, Aware & Action: a summary of their aims within *'Contextual Cognitive Behavioural Models'*

Category	Aim within models
Open	To reduce the automatic behavioural regulatory power of thoughts, feelings, memories and bodily sensations, but without necessarily first changing the form or frequency of these experiences.
Aware	To address awareness and mindfulness, from a conscious person and towards the present moment both externally and internally.
Action	To increase behavioural action: motivation to change, values and commitment.

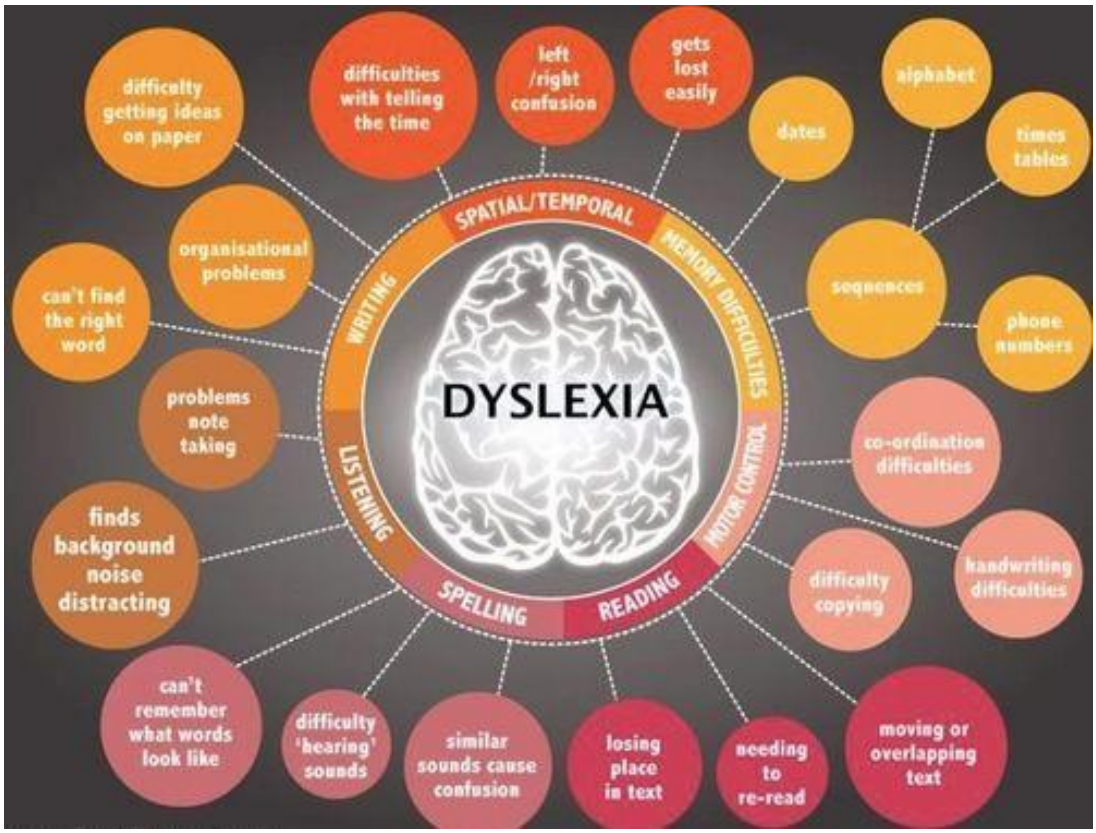
These three categories are reported to be present within the suggested third wave models as well as related to other psychological concepts such as openness to experience. Openness to experience- a well-established domain used to describe personality in the five-factor model (Goldberg, 1993) – is said

to consist of the following six facets: active imagination (fantasy); aesthetic sensitivity; attentiveness to inner feelings; preference for variety; and intellectual curiosity (Costa & McCrae, 1992). This particular construct along with its subcomponents map onto similar concepts within PF. People scoring low on the openness to experience domain within the five-factor model are considered to be 'closed to experience', PF (and the CompACT) may therefore provide linkage to 'openness to experience' and other constructs within the five-factor model providing further insights into the broader issue of general individual differences.

The findings of this research provide further evidence towards the CBS approach and a unified model of working. The three categories highlighted within Hayes et al.'s (2011) research are the same factors which have been confirmed and validated within the current study, providing additional evidence of the importance of PF along with the CompACT's potential utility within the 'contextual cognitive behavioural models'.

5. Reflections

5.1 Personal Reflections



5.1.2 Thesis Issues

5.1.3 Learning Points

5.2 Ontological/Epistemological Reflections

The purpose of the researcher declaring his/her epistemological stance (the theory of knowledge, especially with regard to its methods, validity and scope, and the distinction between justified belief and opinion) informs the reader of how knowledge is thought to be obtained. Personally, I have always considered this a complex area requiring much reading to understand the philosophical concepts. I have therefore remained 'on the fence' as it were with my view, previously stating that I align myself with the epistemological view of being a critical realist. Critical realism is the theory that some sense-data (for example, of primary qualities) can and do accurately represent external objects, properties and events, while other sense-data (for example, secondary qualities and perceptual illusions) do not accurately represent any external objects, properties or events. In short, critical realism refers to any position that maintains that there exists an objectively knowable, mind-independent reality, while acknowledging the roles of perception and cognition. More simply, there are things that can be observably measured and things that cannot be observably measured.

However, ACT's philosophy argues for a pragmatic contextualist epistemology and declares a departure from traditional ontological assumptions (Hayes, 2012). In order to understand what seemed like an important concept underlying ACT, I will briefly outline and compare ACT's position on ontology compared to elemental realism (a common assumption on which natural science has been built).

Ontology is considered to be a set of concepts and categories in a subject area or domain that shows their properties and the relations between them, or simply, what kinds of things exist. The discussion of such philosophical conceptualisations is raised due to the interesting position in which ACT (Hayes et al., 2012) declares itself. Hayes et al. (2012) write, "if there is a single shift in perspective that supports learning and applying ACT, it is this: letting go of ontological assumptions ingrained in the common-sense conception of language and cognition" (p. 35). My understanding of this is that functional contextualism is pragmatic and holistic in nature; the *whole* event is primary and is understood in reference to context rather than being made up of different parts.

All psychological theories that postulate causal linkages between hypothetical mental constructs, illustrated using 'box and arrow' diagrams, are considered to be from an elemental realist position (Atkins, 2012), in the sense that they emphasise causal relations between hypothesised parts and are directed towards obtaining greater correspondence with what is 'real'.

By contrast, the contextualist position posits the action of the whole organism in context (Pepper, 1942). In order to understand the act, the context, including historical and current systemic influences upon the organism, must also be understood. Hayes and Wilson (1995) stipulate that from a contextualist standpoint, the world is understood to be an undifferentiated process, and the divisions and dichotomies that are imposed upon the flow of experience are functional; the world is divided up in ways that help individuals to achieve their ends. The truth criterion for contextualists is not correspondence between model predictions and actual outcomes, but effective action – does this

particular way of viewing the world help us to achieve our ends? (Gifford & Hayes, 1999).

Considering the ontological and epistemological positions leads to some of my own reflections relating to this. As discussed, I have previously considered my epistemological position to be one of critical realism; ontologically, I had not taken a stance. Whilst completing this research project, I have noted the amount of critical thinking and development which has taken place prior to ACT being published. Its philosophical assumptions are the foundations of the ACT model and provide a different position for researchers and clinicians to consider. Research has already started to criticise the traditional assumptions in favour of the functional contextual approach. By doing so, Hayes et al. (2012) suggest that the premise of ontology must be let go. I find this an interesting concept which moves away from the compartmentalisation of information that has a sense of safety and containment attached to it. Seeing events as one whole process without differentiation further challenges the traditional assumptions in which psychology has become accustomed.

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APPENDICES

Appendix A

Ethical Approval for the extension of Francis et al.'s (2016) original CompACT project received from SOPREC to research supervisor Dr Nima Moghaddam

From: Soprec
Sent: 04 May 2016 09:14
To: Nima Moghaddam
Subject: RE: Routine extension to study request

Dear Nima
Thank you for your email and apologies for the delay, I am not sure why this did not come through. I can confirm that the extension has been approved.
Regards
SOPREC

Appendix B

A list of all measures used to assess the different aspects of the CompACT's validity including the CompACT measure

Comprehensive Assessment of Acceptance and Commitment Therapy (CompACT)- Francis et al. (2016)

CompACT

Name:	Date:

Please rate the following 23 statements using the scale below:

0	1	2	3	4	5	6
Strongly disagree	Moderately disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Moderately agree	Strongly agree

1. I can identify the things that really matter to me in life and pursue them	0	1	2	3	4	5	6
2. One of my big goals is to be free from painful emotions	0	1	2	3	4	5	6
3. I rush through meaningful activities without being really attentive to them	0	1	2	3	4	5	6
4. I try to stay busy to keep thoughts or feelings from coming	0	1	2	3	4	5	6
5. I act in ways that are consistent with how I wish to live my life	0	1	2	3	4	5	6
6. I get so caught up in my thoughts that I am unable to do the things that I most want to do	0	1	2	3	4	5	6
7. I make choices based on what is important to me, even if it is stressful	0	1	2	3	4	5	6
8. I tell myself that I shouldn't have certain thoughts	0	1	2	3	4	5	6
9. I find it difficult to stay focused on what's happening in the present	0	1	2	3	4	5	6
10. I behave in line with my personal values	0	1	2	3	4	5	6
11. I go out of my way to avoid situations that might bring difficult thoughts, feelings, or sensations	0	1	2	3	4	5	6
12. Even when doing the things that matter to me, I find myself doing them without paying attention	0	1	2	3	4	5	6
13. I am willing to fully experience whatever thoughts, feelings and sensations come up for me, without trying to change or defend against them	0	1	2	3	4	5	6
14. I undertake things that are meaningful to me, even when I find it hard to do so	0	1	2	3	4	5	6
15. I work hard to keep out upsetting feelings	0	1	2	3	4	5	6
16. I do jobs or tasks automatically, without being aware of what I'm doing	0	1	2	3	4	5	6
17. I am able to follow my long terms plans including times when progress is slow	0	1	2	3	4	5	6
18. Even when something is important to me, I'll rarely do it if there is a chance it will upset me	0	1	2	3	4	5	6
19. It seems I am "running on automatic" without much awareness of what I'm doing	0	1	2	3	4	5	6
20. Thoughts are just thoughts – they don't control what I do	0	1	2	3	4	5	6
21. My values are really reflected in my behaviour	0	1	2	3	4	5	6
22. I can take thoughts and feelings as they come, without attempting to control or avoid them	0	1	2	3	4	5	6
23. I can keep going with something when it's important to me	0	1	2	3	4	5	6

Acceptance and Action Questionnaire (AAQ-II)- Bond et al. (2011)

AAQ-II

Below you will find a list of statements. Please rate how true each statement is for you by using the scale below to fill in your choice.

1	2	3	4	5	6	7
never true	very seldom true	seldom true	sometimes true	frequently true	almost always true	always true

1. My painful experiences and memories make it difficult for me to live a life that I would value.	
2. I'm afraid of my feelings.	
3. I worry about not being able to control my worries and feelings.	
4. My painful memories prevent me from having a fulfilling life.	
5. Emotions cause problems in my life.	
6. It seems like most people are handling their lives better than I am.	
7. Worries get in the way of my success.	
TOTAL	

This is a one-factor measure of psychological inflexibility, or experiential avoidance. Score the scale by summing the seven items. Higher scores equal greater levels of psychological inflexibility.

Depression, Anxiety and Stress Scale (DASS21)- Henry & Crawford (2005)

Depression, Anxiety and Stress Scale (DASS21)

For each statement below, please circle the number in the column that best represents how you have been feeling in the last week.

Statement	Did not apply to me at all	Applied to me to some degree or some of the time	Applied to me a considerable degree or a good part of the time	Applied to me very much or most of the time
1. I found it hard to wind down	0	1	2	3
2. I was aware of dryness of my mouth	0	1	2	3
3. I couldn't seem to experience any positive feeling at all	0	1	2	3
4. I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5. I found it difficult to work up the initiative to do things	0	1	2	3
6. I tended to over-react to situations	0	1	2	3
7. I experienced trembling (eg, in the hands)	0	1	2	3
8. I felt that I was using a lot of nervous energy	0	1	2	3
9. I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
10. I felt that I had nothing to look forward to	0	1	2	3
11. I found myself getting agitated	0	1	2	3
12. I found it difficult to relax	0	1	2	3
13. I felt down-hearted and blue	0	1	2	3
14. I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15. I felt I was close to panic	0	1	2	3
16. I was unable to become enthusiastic about anything.	0	1	2	3
17. I felt I wasn't worth much as a person	0	1	2	3
18. I felt that I was rather touchy	0	1	2	3
19. I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)	0	1	2	3
20. I felt scared without any good reason.	0	1	2	3
21. I felt that life was meaningless	0	1	2	3

Marlowe-Crowne Social Desirability Scale Short Form (Ballard, 1992)

Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide if the statement is True or False for you.

	True	False
1. It is sometimes hard for me to go on with my work if I am not encouraged.	○	○
2. I sometimes feel resentful when I don't get my way.	○	○
3. On a few occasions, I have given up doing something because I thought too little of my ability.	○	○
4. There have been times when I felt like rebelling against people in authority even though I knew they were right.	○	○
5. No matter who I'm talking to, I'm always a good listener.	○	○
	True	False
6. There have been occasions when I took advantage of someone.	○	○
7. I'm always willing to admit it when I make a mistake.	○	○
8. I sometimes try to get even rather than forgive and forget.	○	○
9. I am always courteous, even to people who are disagreeable.	○	○
10. I have never been irked when people expressed ideas very different from my own.	○	○
	True	False
11. There have been times when I was quite jealous of the good fortune of others.	○	○
12. I am sometimes irritated by people who ask favors of me.	○	○
13. I have never deliberately said something that hurt someone's feelings.	○	○

Short Form Health Survey (SF-12-v2)- Ware, Kosinski, Turner-Bowker, & Gandek (2002) Copyrights license acquired for permitted use of the measure.

ADMINISTRATIVE INFORMATION

0a. Completion Date: ☐☐/☐☐/☐☐☐☐ (Month / Day / Year) 0b. Staff ID: ☐☐☐

Instructions: Enter the answer given by the participant for each response.

This survey asks for your views about your health. This information will help you keep track of how you feel and how well you are able to do your usual activities. Answer every question by selecting the answer as indicated. If you are unsure about how to answer a question, please give the best answer you can.

1. In general, would you say your health is:
   Excellent 1☐ Very good 2☐ Good 3☐ Fair 4☐ Poor 5☐

2. The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

	Yes, limited a lot	Yes, limited a little	No, not limited at all
a. **Moderate activities,** such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	1☐	2☐	3☐
b. Climbing **several** flights of stairs	1☐	2☐	3☐

3. During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. Accomplished less than you would like	1☐	2☐	3☐	4☐	5☐
b. Were limited in the kind of work or other activities	1☐	2☐	3☐	4☐	5☐

4. During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. Accomplished less than you would like	1☐	2☐	3☐	4☐	5☐
b. Did work or other activities less carefully than usual	1☐	2☐	3☐	4☐	5☐

5. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

Not at all	1 ☐
A little bit	2 ☐
Moderately	3 ☐
Quite a bit	4 ☐
Extremely	5 ☐

6. These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks...

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. Have you felt calm and peaceful?	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
b. Did you have a lot of energy?	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
c. Have you felt downhearted and depressed?	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

7. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.)?

All of the time	1 ☐
Most of the time	2 ☐
Some of the time	3 ☐
A little of the time	4 ☐
None of the time	5 ☐

Appendix C

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OPTUM

NON-COMMERCIAL LICENSE AGREEMENT
Office of Grants and Scholarly Research (OGSR)

License Number: QM044178

Licensee Name: Katrina Bayliss c/o Nottingham University

Licensee Address: Lincolnshire NG31 8JL GB

Approved Purpose: Confirmatory Factor Analysis of the Comprehensive assessment of Acceptance and Commitment Therapy processes (CompACT)

Study Name: Thesis/Dissertation
Study Type: Non-commercial academic research and/or thesis – Unfunded Student
Data Collection Method: Paper

Therapeutic Area: Wellness & Lifestyle

Royalty Fee: None, because this License is granted in support of the non-commercial Approved Purpose

A. Effective Date: This Non-Commercial License Agreement (the "Agreement") from the Office of Grants and Scholarly Research (OGSR) is made by and between OptumInsight Life Sciences, Inc. (f/k/a QualityMetric Incorporated) ("Optum"), 1301 Atwood Ave, Suite 311N, Johnston, RI 02919 and Licensee. This Agreement is entered into as of the date of last signature below and is effective for the Study Term set forth on Appendix B.

B. Appendices: Capitalized terms used in this Agreement shall have the meanings assigned to them in Appendix A and Appendix B. The appendices attached hereto are incorporated into and made a part of this Agreement for all purposes.

C. Grant of License: Subject to the terms of this Agreement, Optum grants to Licensee a non-exclusive, non-transferable, non-sublicensable worldwide license to use, solely for the Approved Purpose and during the Study Term, the Licensed Surveys, Software, SMS Scoring Solution, and all intellectual property rights related thereto ("Survey Materials"), in the authorized Data Collection Method, Modes of Administration, and Approved Languages indicated on Appendix B; and to administer the Licensed Surveys only up to the total number of Administrations (and to make up to such number of exact reproductions of the Licensed Surveys necessary to support such Administrations) in any combination of the specific Licensed Surveys and Approved Languages, Data Collection Method, and Modes of Administration.

EXECUTED by the duly authorized representatives as set forth below.

OptumInsight Life Sciences, Inc.	**Katrina Bayliss** (Licensee)
Signature: DocuSigned by: Michelle White	Signature: [signature]
Name: Michelle White	Name: Katrina Bayliss
Title: Vice President and Senior Scientist	Title:
Date: 17-January 2018	Date: 14/01/2018

Appendix D

Participant Information Sheet

Participant Information Sheet

Title of Study: Investigating the validity and reliability of the Comprehensive assessment of Acceptance and Commitment Therapy processes (CompACT)

Name of Researcher: Katrina Bayliss

Dear participant,

This research is being organised by the Trent Doctorate course in Clinical Psychology, hosted by the Universities of Lincoln and Nottingham.

Before you decide to take part in our research I would like you to understand why the research is being done and what it would involve for you. Please see information below.

What is the purpose of the study?

Acceptance has been found to be a key factor in determining the impact of life events on our psychological well-being. Specific therapies have developed to increase acceptance (e.g. Acceptance and Commitment Therapy [ACT]). A precise measure of acceptance is needed to see if ACT therapy has been effective. Currently, there are several scales which can measure a person's acceptance, but they all have limitations. We have developed the CompACT measure to address these limitations.

In order for the CompACT to be used, evidence is needed to show that the measure measures what it is intended to (i.e. acceptance) and not something else (e.g. depression), and that it can measure this consistently and accurately across different people at different times.

What will happen if I decide to take part?

Follow the web-link address provided. This will direct you to a survey which hosts the CompACT measure and other measures which you will be asked to complete. These other measures assess depression and quality of life. This should take 15-20 minutes.

Do I have to take part?

Your involvement in the study is voluntary and your data will be anonymised so that we will not know who you are. You can withdraw at any time.

Will my taking part in the study be kept confidential?

The privacy of each participant will be maintained in accordance with the 'data protection principles' as per the Data Protection Act (1998). Each participant will

be assigned a randomly generated number using software packages and this will serve as a reference from which participants will be referred to in any dissemination of the findings, in order to maintain anonymity.

All data will be analysed on a password protected laptop. All written documents pertaining to the analysis and write-up of the study will also be electronically password-protected and only accessible by me and my supervisors.

Expenses and payments

In order to incentivise participants to take part in the study, Amazon vouchers to the value of £50 (1st prize) and £25 (2nd prize; two available) will be offered. A winner will be selected at random and contacted once the recruitment phase is completed and participant data has been obtained.

What are the possible disadvantages and risks of taking part?

It is not foreseen that any risks or disadvantages should come about as a result of taking part in the study. Please contact your General Practitioner (GP) if after completing the measures you feel low in mood, anxious or any other symptoms which are inconsistent with how you have been feeling recently. Contact details for support organisations will also be provided at the end of the survey.

What are the possible benefits of taking part?

I cannot promise the study will be of help to you, but your participation will help us to develop a more accurate measure of therapy. This will be of benefit to people receiving psychological treatment.

What happens when the research study stops?

After completing the questionnaire, I will examine the results of all completed questionnaires and will write up the findings as a partial fulfilment of the requirements of the Doctorate in Clinical Psychology (DClinPsy) at the Universities of Lincoln and Nottingham. It is also intended that the results will be written up for publication in a scientific journal.

What if there is a problem?

If you have a concern about any aspect of this study, you should contact me via the details given at the end of this information sheet. If you remain unhappy, you may wish to contact my supervisors, whose details are also given at the end of this information sheet.

Who has reviewed the study?

The research is looked at by an independent group of people, called a Research Ethics Committee, who belong to the University of Lincoln. The Ethics Committee is involved to ensure that your interests are protected. This study has been reviewed and given favourable opinion by the University of Lincoln Research Ethics Committee.

Further information and contact details

Principal Investigator

Katrina Bayliss,
Division of Psychiatry and Applied Psychology,
School of Medicine,
YANG Fujia Building,
The University of Nottingham, Jubilee Campus, Wollaton Road, Nottingham, NG8 1BB
Email:msxkmj@nottingham.ac.uk

Supervisors

Dr David Dawson
Dr Nima Golijani-Moghaddam
University of Lincoln,
College of Social Sciences,
Brayford Pool,
Lincoln, LN6 7TS
Email: ddawson@lincoln.ac.uk, nmoghaddam@lincoln.ac.uk
Tel: 01522 886029

Poster

Confirmatory Factor Analysis of the CompACT

Katrina Bayliss, Nima Moghaddam, David Dawson
Trent Doctorate in Clinical Psychology, University of Nottingham
Contact: msxkmj@nottingham.ac.uk

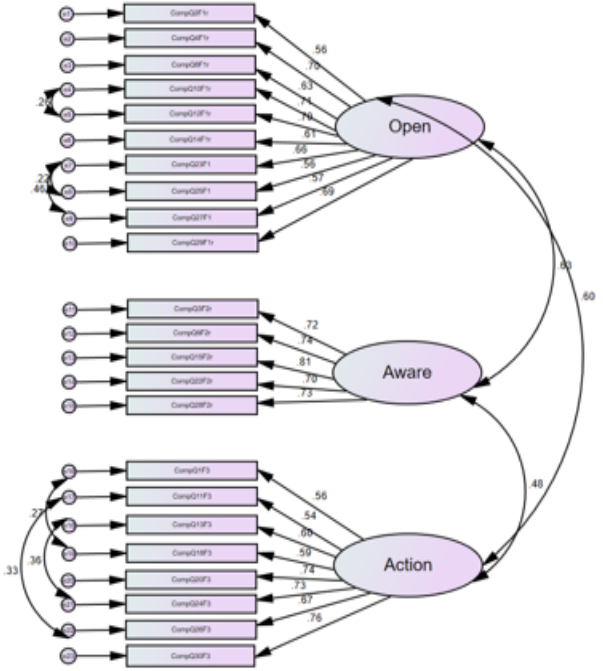
Conclusions: The overall aim of this research was to undertake additional psychometric analysis of the CompACT in an independent sample. A confirmatory factor analysis found an acceptable model fit for the original three factors indicating that the measure performed as expected, and in a similar manner that described in the original validation study. Thus, providing further evidence of the CompACT's ability to successfully and consistently measure the concept of psychological flexibility.

Background:
Research has suggested that individuals are evidenced to better tolerate and effectively use emotions, thoughts and behaviour to obtain the best possible outcomes in varying contexts in the presence of psychological flexibility (PF), and that these 'dynamic abilities' form the essence of health.

Current measures of PF (AAQ-II) have come under criticism due to questionable content and construct validity of the measure. The CompACT was developed to address these issues and required further testing to establish validity and reliability.

Aims: (1) confirmatory factor analysis; (2) retesting of psychometric properties in an independent sample; (3) testing of the CompACT's stability over time and; (4) identification of the CompACT's clinical cut-offs

Results: Confirmatory Factor Analysis was completed accepting correlated factors, the model yielded an acceptable fit $\chi 2/df$ =2.81 (df= 221; *p*= .001); TLI= .86; CFI=.88; RMSEA=.07 [90% CI= .06, .08]; and SRMR= .07



Discussion:. CFA provided further evidence of the CompACT's factor structure. Validity and reliability testing also reconfirmed psychometric properties.

Initial testing of the CompACT's stability over time found a large effect suggesting that the CompACT was a reliable measure of ACT core processes over a two-week period.

Preliminary testing of the CompACT's ability to distinguish groups based on clinical screening criteria for distress (DASS21) was tested. Findings suggested that scores of 120 and higher are an indication of higher PF, whilst scores of 100 and lower suggested lower levels of PF.

References:

Bond, F. W., Hayes, S. C., Baer, R. A., Carpenter, K. M., Guenole, N., Orcutt, H. K., ... & Zettle, R. D. (2011). Preliminary psychometric properties of the Acceptance and Action Questionnaire–II: A revised measure of psychological inflexibility and experiential avoidance. *Behavior Therapy*, 42(4), 676-688.

Francis, A. W., Dawson, D. L., & Golijani-Moghaddam, N. (2016). The development and validation of the Comprehensive assessment of Acceptance and Commitment Therapy processes (CompACT). *Journal of Contextual Behavioral Science*, *5*(3), 134-145.