

# **Research Project Portfolio**

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**Development and validation of a short form of the Comprehensive  
assessment of Acceptance and Commitment Therapy processes  
(CompACT-SF)**

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“If you can fill the unforgiving minute  
With sixty seconds' worth of distance run,  
Yours is the Earth and everything that's in it”

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## Portfolio Abstract

Psychological flexibility is the purported mechanism of change in Acceptance and Commitment Therapy (ACT), theoretically underpinned by the six processes which make up the ACT 'hexaflex' model. However, it has been suggested that the processes can be clustered into three dyadic processes, namely 'Openness to Experience', 'Valued Action', and 'Behavioural Awareness'.

The Comprehensive Assessment of Acceptance and Commitment Therapy Processes (CompACT; Francis et al., 2016) was developed as a new general measure of ACT processes, in response to criticisms relating to the Acceptance and Action Questionnaire (AAQ-II) being a conflated measure of distress. The three-factor structure of the CompACT, and its reliability and validity, were subsequently demonstrated in an independent sample (Bayliss et al., 2018). However, at 23 items in length, the full CompACT measure may present an undue respondent burden for use in idiographic research or as a therapy tracking measure, thus indicating the need for an abbreviated measure.

The present research concerns the development and validation of a short form of the CompACT (the CompACT-SF). To derive the short form, the 23 CompACT items were assessed according to internal, intuitive, and external criteria; this included: 1) internal scale reliability assessed by Cronbach's  $\alpha$ ; 2) inter-item correlation assessed by Pearson's  $r$ ; 3) factor loadings in a Confirmatory Factor Analysis (CFA); 4) judgements regarding content coverage and semantic redundancy; 5) association with measures of psychological flexibility, wellbeing, and distress. The internal reliability, concurrent and convergent validity, and factor structure of the new CompACT-SF were assessed in an independent sample ( $N = 571$ ).

The CompACT-SF demonstrated acceptable levels of internal reliability ( $\alpha > .70$ ) and good convergent validity via significant correlation with the AAQ-II ( $r = -.69$ ;  $p < .01$ ). Concurrent validity with measures of distress and well-being as demonstrated by significant association with the DASS-21 ( $r = -.613$ ;  $p < .01$ ) and SF12v2 Mental Health scale ( $r = .61$ ;  $p < .01$ ), respectively. A CFA supported the three-factor model, with acceptable factor loadings (loadings  $> .50$ ) and good performance on various indices of model fit.

This research provides promising evidence that the CompACT-SF may be a useful, reliable, and valid tool for the brief assessment of psychological flexibility, in both research and clinical practice.

### **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 2015. The idea for the project was developed by Dr David Dawson and Dr Nima Golijani-Moghaddam. They also provided regular guidance and supervision in all aspects of the research, including guidance regarding data analysis, support with interpreting the results and implications of analyses, providing an independently derived version of the CompACT-SF, and feedback on draft versions of both the journal and extended papers. As the Principal Investigator, I took responsibility for: advertising the research; recruiting participants; collecting data; scoring questionnaires; entering data; undertaking the bulk of the data analysis with support; and completing the final write-up.

**JOURNAL ARTICLE**

Development and validation of a short form of the Comprehensive assessment  
of Acceptance and Commitment Therapy processes (CompACT-SF)<sup>1</sup>

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## Abstract

The present research concerns the development and validation of a short form of the Comprehensive Assessment of Acceptance and Commitment Therapy processes (CompACT; Francis et al., 2016). The 23 CompACT items were assessed according to internal, intuitive, and external criteria; this included: 1) internal scale reliability assessed by Cronbach's  $\alpha$ ; 2) inter-item correlation assessed by Pearson's  $r$ ; 3) factor loadings in a Confirmatory Factor Analysis (CFA); 4) judgements regarding content coverage and semantic redundancy; 5) association with measures of psychological flexibility, wellbeing, and distress. The internal reliability, concurrent and convergent validity, and factor structure of the new CompACT-SF were assessed in an independent sample (N = 571).

The CompACT-SF demonstrated acceptable levels of internal reliability ( $\alpha > .70$ ), and good convergent validity was indicated by significant correlation with the AAQ-II ( $r = -.69$ ;  $p < .01$ ). The CompACT-SF also demonstrated concurrent validity with measures of distress and well-being as demonstrated by significant association with the DASS-21 ( $r = -.613$ ;  $p < .01$ ) and SF12v2 Mental Health scale ( $r = .61$ ;  $p < .01$ ), respectively. A CFA supported the three-factor model, with acceptable factor loadings (loadings  $> .50$ ) and good performance on various indices of model fit.

This research provides promising evidence that the CompACT-SF may be a useful, reliable, and valid tool for the brief assessment of psychological flexibility, in both research and clinical practice.

*Keywords:* acceptance and commitment therapy, psychological flexibility, assessment, measures, short-form measures, confirmatory factor analysis



## 1. Introduction

Psychological ill-health is currently considered to be one of the primary contributors to global disease burden, with estimates that mental illness accounts for 32.4% of years lived with disability, and 13% of disability-adjusted life years (Vigo, Thornicroft, & Atun, 2016). Poor psychological health also presents a significant strain on the UK health services and economy. In the period 2016/2017, the National Health Service (NHS) spent £11.6 billion on Mental Health Services, an increase of £375 million on the previous year. When accounting for additional factors such as days of missed employment, or disability benefit payments, the total cost of psychological ill-health to the UK economy and services is significantly larger, with estimates in the region of £105 billion annually (Edwards et al., 2016).

Achieving psychological health has been described as one of the “foremost goals of human existence” (Kashdan & Rottenberg, 2010), however there exists a plethora of models and definitions of what constitutes ‘good psychological health’, with emphasis on a variety of factors. For example, Deci and Ryan (2000) advocate for the importance of the satisfaction of basic psychosocial needs – such as feeling connected to close others or having a sense of mastery over one’s behaviour – as fundamentally important in achieving psychological health; Csikszentmihalyi (1990) proposes that “optimal experience” arises from commitment to meaningful and relevant challenges; others take a more formulaic approach to psychological health, suggesting that a favourable ratio of positive to negative experiences is key (Fredrickson & Losada, 2005). An alternative perspective attributes psychological health to psychological flexibility (PF).

Historically, PF has been neglected as a foundation of good psychological health, due to fragmented research and a lack of consensus on an operational definition of the construct, given that it reflects a number of dynamic processes that unfold over time (Kashdan & Rottenberg, 2010). Broadly, PF refers to an individual’s ability to connect with the present moment fully, as a conscious human being, and to change or persist in behaviour that is in line with identified values (Hayes et al., 1999). This emphasises the importance of PF encompassing repeated transactions between an individual and their environment, rather than focusing on specific intra-psychic content (Kashdan & Rottenberg, 2010).

Kashdan and Rottenberg (2010) synthesised the past five decades of research into PF in its various guises, and found that the existing literature offers rich information regarding the characteristics, correlations, and outcomes of PF, in addition to strong evidence for its value. Indeed, higher levels of PF have been found to correlate with

improved quality of life (Hayes, Levin, Plumb-Villardaga, Villatte, & Pistorello, 2013), suggesting that this ability to tolerate and effectively use emotions, thoughts, and behaviour may form the essence of health and be essential to managing psychological health and ameliorating psychological ill-health. Concomitant with its conceptual and empirically-evidenced importance to psychological health, PF forms a central target of contemporary psychological interventions – most explicitly within Acceptance and Commitment Therapy (ACT) (Hayes, Vilatte, Levin, & Hildebrandt, 2011) (see extended paper 1.1 - 1.1.6).

### **1.1 Acceptance and Commitment Therapy**

ACT is one of a number of third-wave behavioural therapies. These therapies give centrality to the functions and contexts of psychological phenomena (see extended paper 1.2 – 1.2.3); greater focus is placed on an individual's relationship to their thoughts and emotions, rather than the explicit content of them. Thus, where change strategies are indicated, emphasis is placed on contextual and experiential strategies such as mindfulness, acceptance-based procedures, and meta-cognition, rather than direct or didactic approaches which aim to alter the content of thoughts and emotions (Hayes, 2004; Hayes & Hoffmann 2017). ACT itself is a trans-diagnostic approach in which psychological suffering arises as a function of an individual's attempts to avoid aversive or unwelcome private experiences; in doing so, personally meaningful activities and behaviours are sacrificed or reduced. To use ACT terminology – psychological suffering arises when *experiential avoidance* results in *values-inconsistent behaviour*.

By fostering psychological flexibility, ACT aims to reduce unhelpful experiential avoidance, thus increasing values-consistent behaviour and reducing suffering and distress (see extended paper 1.4 for a discussion of the evidence for ACT). While there are various definitions of PF, within ACT terms it is defined as “the ability to contact the present moment more fully as a conscious human being, and to change or persist in behavior when doing so serves valued ends” (Hayes, Luoma, Bond, Masuda, & Lillis, 2006, p.7). It has been proposed that PF, as it is conceptualised in ACT, is underpinned by six ‘core’ processes, which are distinct but connected (see extended paper 1.3 – 1.3.7): (1) *Acceptance*: Willingness to have and accept private experiences as they are; (2) *Defusion*: Thoughts are observed events rather than literal truths that dictate behaviours; (3) *Self-as-context*: Letting go of attachment to the conceptualised self; (4) *Present-moment awareness*: Being fully open to what is happening in the

present moment; (5) *Values*: Directions in life that the individual chooses, which guide their behaviour; (6) *Committed Action*: Chasing the valued direction again and again, even after failure (Hayes et al., 1999; Kashdan & Rottenberg 2010). These processes are represented in the ACT 'hexaflex' (Figure 1).

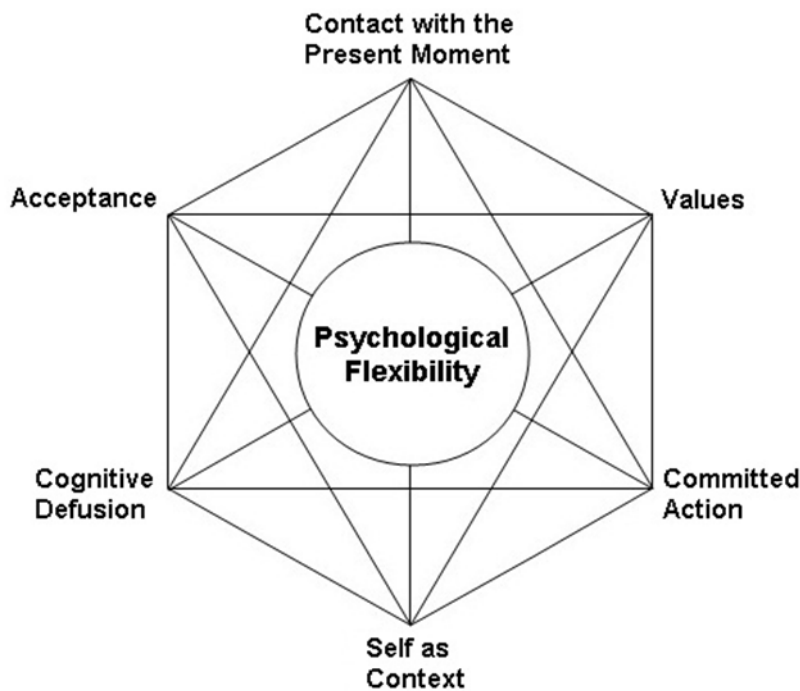


Figure 1. ACT 'Hexaflex' (Hayes, Strosahl & Wilson, 1999).

More recently, attempts have been made to conceptualise the six ACT processes in a more parsimonious manner. While various proposals have been made for two-factor and even single-factor models, Hayes (2011) posits a three-factor model accounting for dyadic relationships between the six core processes. These comprise: (1) "Openness to experience" (acceptance; defusion); (2) "self-awareness and perspective-taking" (present moment awareness; self-as-context); (3) "motivation and activation" (values; committed action). The dyads are more concisely summarised as "Openness to Experience", "Behavioural Awareness", and "Valued Action" (Figure 2). Hayes (2011) also proposes that these factors are common to all third-wave psychotherapies, suggesting that PF and its enhancement is a shared mechanism of change within these models .

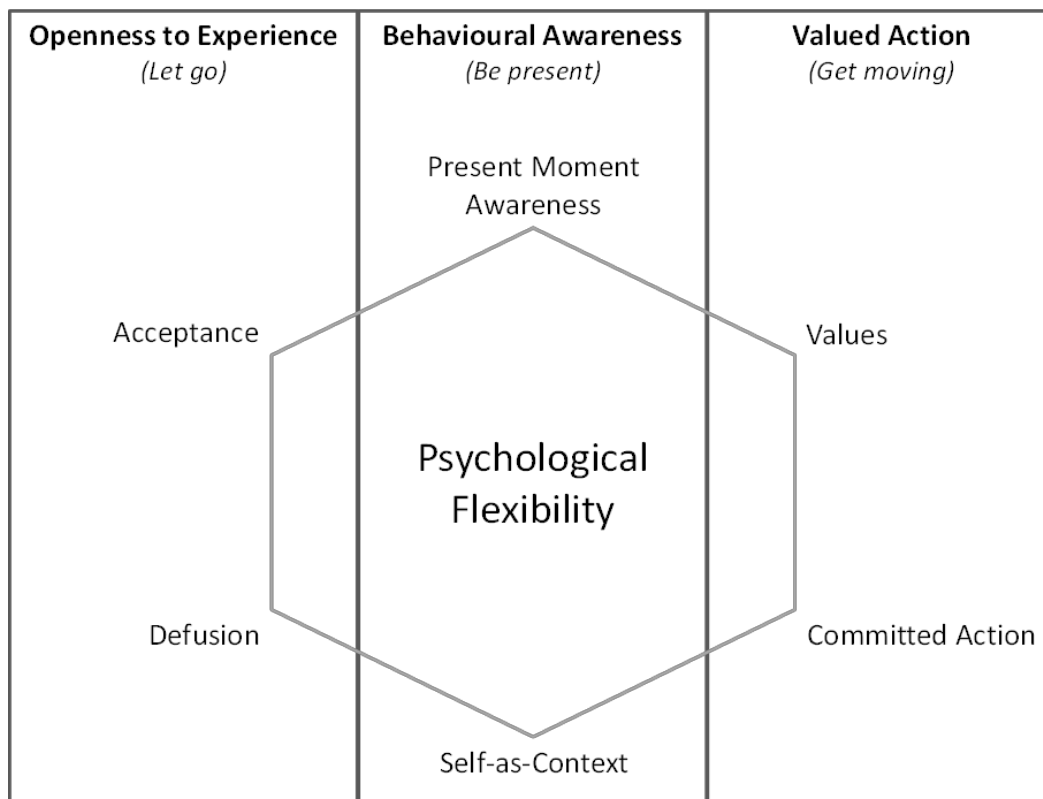


Figure 2. ACT processes as Dyads (Hayes et al., 2011)

## 1.2 Psychological Flexibility

A great deal of research exists to support the fundamental importance of flexibility of behaviour, cognition, and emotion in maintaining psychological wellbeing, and the role that psychological inflexibility plays in the cause and maintenance of psychopathology (Hayes et al., 2013). For example, individuals with a diagnosis or traits of depression demonstrate both increased emotional and adaptive behavioural rigidity (Rottenberg, Gross, & Gotlib, 2005; Hopkinson & Neuringer, 2003), while response to treatment for depression is well-predicted by the level of flexibility of an individual's attributions (Moore & Fresco, 2007). PF has also been implicated as at least a partial mediator in various other forms of psychopathology, including anxiety (Masuda & Tully, 2011), eating disorders (Masuda et al., 2010), post-traumatic stress disorder (Palm & Follette, 2011), and psychosis (White et al., 2013).

In addition to the evidential support for the role of PF in mental health contexts, it has also been identified as an important mediator in broader contexts. For example, higher levels of PF have been associated with reduced caregiver distress (Jansen et al., 2017), improved quality of life in chronic pain patients (McCracken & Morley, 2014),

better job performance and learning (Bond & Flaxman, 2008), and improved responses to interventions for work-related burnout (Lloyd, Bond, & Flaxman, 2013). Collectively, the research indicates that PF plays an integral role in quality of life and functioning, in a wide variety of contexts. However, it is important to determine whether PF is indeed a distinct and unique construct.

A large-sample study using both help-seeking and nonclinical populations has shown that measures of PF correlate with other predictors of wellbeing, and can differentiate patients from healthy controls; furthermore, PF explained unique variance above and beyond established measures for some indices of symptomatology and psychopathology, indicating its clinical validity (Gloster, Klotsche, Chaker, Hummel, & Hoyer, 2011). However, it should be noted that in this study and several of those cited above, PF was measured using the Acceptance and Action Questionnaire (2<sup>nd</sup> version; Bond et al., 2011 [AAQ-II]), which measures PF as a unitary construct with a 1-factor model, which is contradictory to the 3-factor ACT account of PF (see extended paper section 1.5).

### **1.3 Acceptance and Action Questionnaire**

The AAQ-II is the most widely-used general measure of ACT processes (see extended paper section 1.6.1). It is frequently referred to as a measure of psychological flexibility and experiential avoidance, (Larsson, Hooper, Osborne, Bennett & McHugh, 2016) and is considered to be the comparison benchmark for new measures of psychological flexibility (Schmalz & Murell, 2010). Increased PF as measured by the AAQ-II has been shown to be associated with lower levels of anxiety, depression, and overall distress (Bond et al., 2011). However, the AAQ-II has been subject to criticism for several reasons. It has been suggested that it does not have equal, or indeed full, content coverage for all ACT processes, with a greater emphasis placed on items concerning experiential avoidance and fusion / defusion; this is in line with the suggestion that the AAQ-II was originally developed as a measure of experiential avoidance (Gamez et al., 2011), and the findings of Costa et al., (2014), which supports a one-factor model with a latent construct of experiential avoidance.

Other studies have alleged that the AAQ-II (sample item: “emotions cause problems in my life”) conflates ACT processes with experiential avoidance and distress (Tyndall et al., 2018), suggesting that while it may be a psychometrically robust tool, it loses a certain level of discriminant validity and is not assessing the construct or process of interest. These critiques provided a platform for the development of a novel measure of ACT processes, specifically targeting psychological flexibility.

#### **1.4 CompACT Development and Validation**

The Comprehensive assessment of Acceptance and Commitment Therapy (CompACT) in its present form was developed as an alternative to the AAQ-II, in order to address extant criticisms (see extended paper section 1.6.2). Francis et al. (2016) utilised a Delphi consensus methodology, in which ACT experts rated the content and face validity of 106 proposed items, resulting in 37 candidate items. The 37-item measure was then completed by a non-clinical sample alongside other theoretically related and distinct measures, resulting in a 23-item measure which was analysed using exploratory factor analysis. This revealed a three-factor structure which was congruent with Hayes' (2011) three dyadic ACT processes; these were labelled 'valued action', 'openness to experience', and 'behavioural awareness' accordingly. While the CompACT converged and diverged with other measures according to theoretical expectations, further validation and evaluation of its psychometric robustness was required. Additionally, in line with established test construction principles (e.g. DeVellis, 2016), confirmation of the three-factor structure by a confirmatory factor analysis (CFA) was essential.

Using an independent sample, Bayliss et al., (2018) were able to confirm the three-factor structure of the CompACT using CFA. Furthermore, the measure's stability (test-retest reliability) over a two-week period was established, and clinical cut-offs for low psychological flexibility were tentatively hypothesised based on distress screening criteria. Overall, there is evidence to indicate that the CompACT is a theoretically coherent, reliable, and stable ACT measure, which may be used in both research and clinical practice.

#### **1.5 Short-form Assessment Tools**

There has been an increasing trend for creating short forms of various construct measures, largely driven by the need to reduce the burden on respondents (Hagtvet & Sipos, 2016). From a research perspective, this may permit the assessment of a broader range of constructs in a single testing session, allowing for greater latitude in hypothesis testing (Widaman et al., 2011). Furthermore, short-form measures lend themselves to idiographic research designs such as single-case experimental designs (SCEDs), experience sampling, and time-series analyses, where longer measures are impractical and associated with higher attrition rates (Stanton et al., 2002). When considering research into therapeutic processes from a third-wave behavioural therapy perspective, where the therapeutic focus is on the dynamic nature of psychological phenomena and contexts, idiographic research is the most theoretically coherent approach to take (Salvatore & Valsiner, 2010). This further highlights the value of

appropriate short form measures, particularly those which assess changes in an individual's relationship with their external context and internal state. From a more purely clinical perspective, there is an increasing emphasis on the need for provision of data to evidence therapeutic progress and outcomes; given the ever-increasing time pressures on services and clinicians, and that it is pragmatic to reduce response-burden for clients where possible, short-forms of process and outcome measures are desirable (Smith, McCarthy, & Anderson, 2000).

It has previously been suggested that, regardless of how compelling the reason for the development and use of a short form, it is likely that the measure of the construct of interest will have poorer psychometric properties than the original long form, and that the inevitable loss of validity is not justifiable relative to the time saved (Smith et al., 2000; Widaman et al., 2011). However, this critique is presented on the premise that short forms are constructed without rigorous examination of their validity. Smith et al., (2000) propose that if a short form is developed in a methodologically sound way, valuable abbreviated instruments can be produced. Indeed, it has been postulated that if a full scale includes ambiguous, redundant, or outdated items, a short form may in principle represent an improvement (Tambs & Roysamb, 2014). Various methods and steps for the derivation of a short form from an existing measure have been proposed (Widaman et al., 2011; Smith et al., 2000; Stanton, Sinar, Balzer, & Smith, 2002). These include but are not limited to: ensuring the validity of the parent measure; selecting items with the highest factor loadings on the latent constructs of interest; selecting items with the best face validity; and administering the new short-form to an independent sample in order to validate it (Kruven, Emons, & Siitsma, 2013). These recommendations guided the derivation of the CompACT Short Form (CompACT-SF) in the present research (see extended paper sections 1.7 – 1.7.2).

## **1.6 Aims and Objectives**

Previous research into the CompACT has indicated robust psychometric properties (reliability and validity), including test-retest reliability, and a stable three-factor structure. The aims of the current research were to: (1) derive a psychometrically robust short-form of the CompACT using existing data from the previous validation studies (Francis et al., 2016; Bayliss et al., 2018); (2) assess the psychometric properties (reliability and validity indicators) of the new short form in an independent sample; (3) conduct a confirmatory factor analysis of the previously identified three-factor structure, in the new short form.

## 2. Methods

Ethical approval for this research was obtained from the appropriate institutional ethics committee.

### 2.1 Research Design

The design of this research comprised two phases. In the initial phase, existing data used to develop and validate the CompACT (Francis et al., 2016; Bayliss et al., 2018) were used to derive a theoretically and psychometrically coherent short-form of the measure which retained adequate content coverage. In the second phase, the short-form was validated in a general population sample using a cross-sectional online survey design.

### 2.2 Phase 1: Short Form Derivation

In order to address the “sins of short form development” (Smith et al., 2000) outlined above, a multi-stage, iterative approach was taken to the derivation of the CompACT-SF, informed by the recommendations outlined by Stanton and colleagues (Stanton et al., 2002). This included consideration of: (1) *Internal item qualities* – properties of items that are assessed in reference to other items on the scale, or the scale’s summated scores; (2) *External item qualities* – connections between the scale, or individual items, and other theoretically related constructs or indicators; (3) *Judgemental item qualities* – issues which require subjective judgement and / or are difficult to assess in isolation of the context in which the scale is administered (see extended paper sections 2.1 – 2.2.2.5).

Data from the studies used to develop, validate, and re-validate the CompACT and its factor structure were collated, resulting in a dataset of  $N = 616$ . Short form derivation took the following steps:

(1) The internal reliability of CompACT subscales (Valued Action, Openness to Experience, Behavioural Awareness) was assessed using Cronbach’s alpha measure of internal consistency, and the ‘alpha if item removed’ value was noted for each item. Within Phase 1 of the current research, the target was to retain an alpha level of .70 or greater (Henson, 2001). However, given that Cronbach’s alpha is contingent on the number of items with a scale, inter-item correlation was also assessed.

(2) Inter-item correlation using Pearson’s  $r$  was tested for the CompACT as a whole, and for each subscale, to assess for redundancy of items – a high inter-item correlation on the same subscale may be indicative of items testing the same construct.



(3) Face validity of items was assessed to identify those covering semantically similar content.

(4) CFA was completed using SPSS-AMOS (v.23) to identify items with the weakest factor loadings and highest modification indices which could not be corrected by freeing error terms. Please refer to Figure 3 for a diagrammatic summary of the short-form derivation process (see section 2.2.2).

For each of the four stages, the poorest-performing items were identified and removed, resulting in four scales which varied in length and item coverage. These were compared and items which were retained in all four, or three of four scales, were identified as candidate items for the CompACT-SF. Having independently completed the process of identification and removal of weaker items, team members met to discuss results, identify and reconcile any discrepancies, and reach a consensus on a final set of candidate items for the short-form scale.

The internal reliability of the new scale and subscales was re-assessed using Cronbach's alpha, resulting in further amendments. The resulting scale was assessed for concurrent and convergent validity with other measures of psychological flexibility, distress, physical health, and social functioning (See Table 1). Subsequent amendments were made for the sake of parsimony, and to accommodate items which performed well according to these external criteria.

## **2.3 Phase 2: Short Form Validation**

### **2.3.1 Participants.**

In order to establish the psychometric properties of the short-form developed in Phase 1, the study recruited a community sample of participants over a period of two weeks. The study was advertised on social media platforms (Facebook, Twitter, and Reddit), online research recruitment platforms, and University email mailing lists. Participants were provided with an anonymous link which directed them to the Qualtrics platform, where they completed the CompACT-SF and a variety of other measures which were previously used to develop and validate the CompACT.

It has been suggested that a sample size as small as  $N = 30$  may be a “reasonable minimum” recommendation for preliminary scale development (Johnson & Brooks, 2014). However, sample sizes in previous CompACT development and validation studies have been guided by empirical power simulations by Wolf et al., (2013). Assuming the retention of a three-factor structure with factor loadings  $\approx .65$ , with up to three indicator items per factor, a sample size of approximately  $N = 250$  was estimated to be sufficient to support the requisite analyses. Based on previous studies (Francis et al., 2016; Bayliss et al., 2018), it was determined that recruitment should remain open for one month.

### **2.3.2 Measures.**

Participants completed the CompACT-SF first, followed by a variety of self-report measures (see Table 1). These additional measures were used to assess whether the CompACT met the following criteria: (1) convergent validity with measures of theoretically related variables (AAQ-II); (2) divergent validity with theoretically unrelated variables (Marlow-Crowne Social Desirability scale, short form) (MCSD; Ballard, 1992); (3) correlation in expected directions with validated measures of distress, physical health, and social functioning (Depression Anxiety Stress Scale [DASS-21; Henry & Crawford, 2005], and Short Form Health Survey [SF-12v2; Ware et al., 1996]). Appropriate copyright licensing was acquired where relevant.

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



Table 1

*Measures used in the development and validation of the CompACT-SF*

<b>Name of measure and author</b>	<b>Number of items</b>	<b>Aim</b>	<b>Item scaling and anchor points</b>	<b>Directionality</b>	<b>Example item</b>	<b>Reliability</b>
Comprehensive assessment of Acceptance and Commitment Therapy Measure Short Form (CompACT-SF); (Francis et al., 2016)	8 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 rush through meaningful things without paying attention"	TBC
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	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	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:

		health.	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.			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 psychological flexibility	"Emotions cause problems in my life"	Internal reliability: (.78-.88)  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)



### 2.3.3 Psychometric data evaluation.

Collected data were exported to the Statistical Package for the Social Sciences (SPSS, v.23) for analysis. For the primary analyses, incomplete data were deleted. Multivariate outliers were removed according to the squared Mahalanobis Distance ( $DM^2$ ).

Reverse scoring for relevant items was completed and CompACT-SF subscale and total scores were calculated. All other measures were scored according to the relevant manuals.

Cronbach's alpha measure of internal consistency as estimated by SPSS (Fornell & Larcker, 1981) was used to assess the internal reliability of the CompACT-SF as a whole, and of the separate subscales. Generally a Cronbach's alpha value of 0.7 or above is viewed as an acceptable level of reliability, while a value of 0.8 or above is seen as 'good' (Henson, 2001). Within the short-form derivation phase, the aim was to retain an alpha level of above 0.8 for each sub-scale in order to maximise reliability. A value of 0.7 was viewed to be acceptable within the validation phase. However, it has been suggested that a value of 0.6 may be accepted as a minimum (DeVellis, 2016), and has been used as an acceptable level on other short-form derivation research (Donnellan, Oswald, Baird, & Lucas, 2006). Flexibility with acceptability of alpha levels is particularly important in the context of short-form derivation, given that internal consistency may be lower in smaller scales, and that a Cronbach's alpha value is affected by the number of items within a scale (DeVellis, 2016). Average inter-item correlation using Pearson's  $r$  may be seen as a more appropriate measure of a scale's internal consistency when assessing a short-form (Robinson et al., 1991). Correlation coefficients (Pearson's  $r$ ) between items on the same subscale should theoretically be higher than those on different subscales, however excessively high correlations (greater than  $r = .5$ ) would indicate a level of redundancy of one of the items. It is recommended that the average inter-item correlation for a subscale should lie between  $r = 0.2$  and  $r = 0.4$  in order to achieve the optimal level of homogeneity without redundancy (Briggs & Cheek, 1986; Robinson et al., 1991).

The CompACT-SF's correlation coefficient (Pearson's  $r$ ) with the AAQ-II was used as a measure of convergent validity. Measures which are theoretically similar should ideally correlate sufficiently so as to reflect this similarity, but not so much so that they are potentially measuring the same construct and are therefore redundant. The same assessment was used to determine the CompACT-SF's sensitivity to social desirability,

by evaluating correlations with the MCSD; correlation between these unrelated measures was expected to be low.

Concurrent validity of the CompACT-SF was evaluated against the SF12v2 and DASS-21. Higher scores on the CompACT-SF (indicating higher levels of psychological flexibility) should predict better health outcomes and thus higher scores on the SF12v2. Conversely, higher scores on the CompACT-SF should predict higher levels of distress, and thus higher scores on the DASS-21.

SPSS-AMOS (v.23) was used to conduct a confirmatory factorial analysis (CFA) to confirm the three-factor structure of the CompACT-SF. Intercorrelated confirmatory analysis was performed. The approach to evaluating the data replicated that of Bayliss et al. (2018), which was previously used to confirm the factor structure of the CompACT. Model fit was evaluated using the chi-square statistic ( $\chi^2$ )/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). 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 less than .08. Factor loadings are also reported, with loadings of over .05 suggested as acceptable (Stevens, 1992).

### **3. Results**

#### **3.1 Phase 1: Short-form Derivation**

Secondary data analysis was conducted in multiple stages, resulting in an eight-item version of the CompACT. A summary of the process is presented in Figure 3, and more comprehensive results of each stage are presented below. Item numbers refer to those within the full CompACT measure.



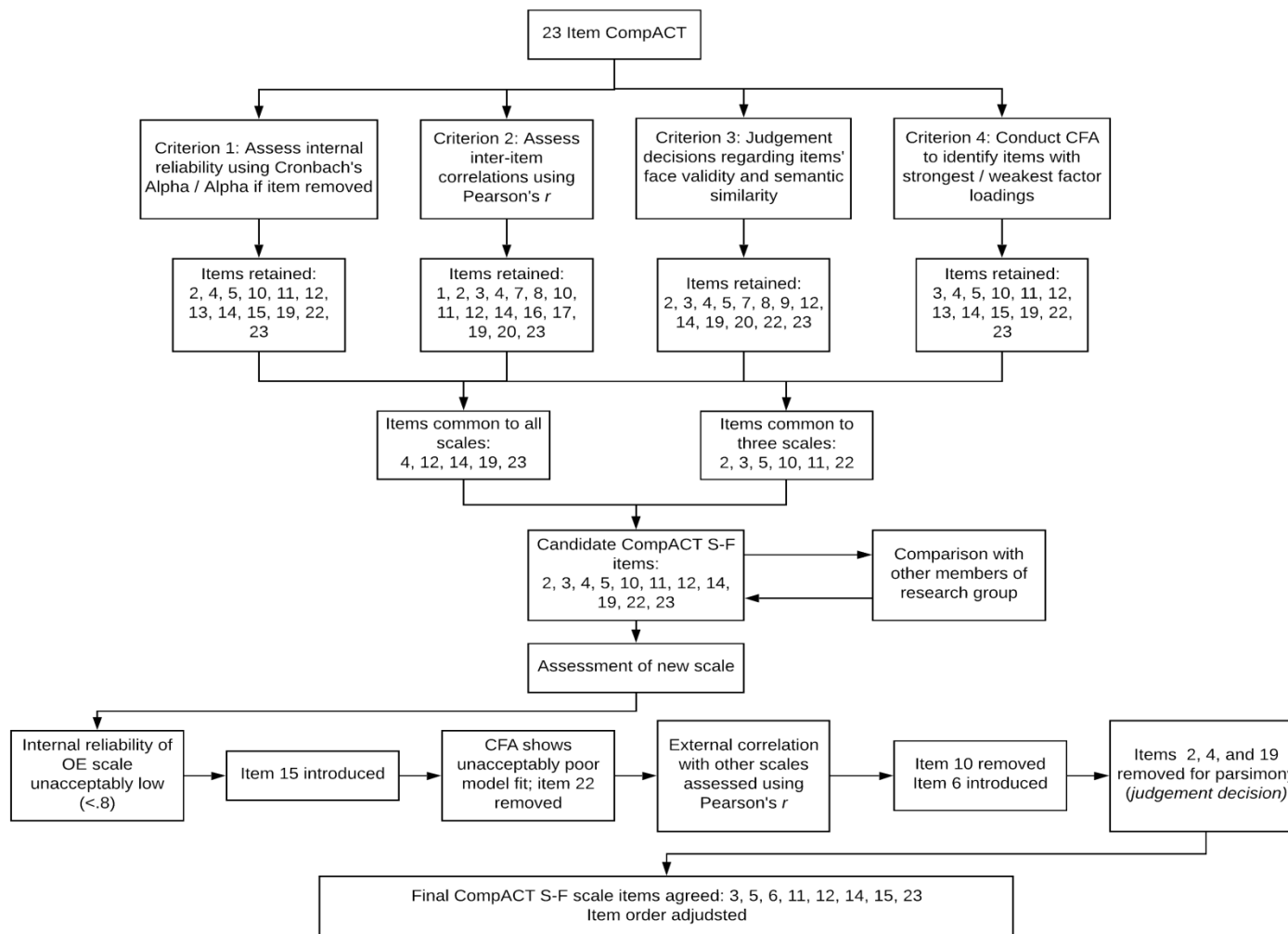


Figure 3. Summary of the short-form derivation process. NB numbers refer to item numbers on the 23-item CompACT full measure

### 3.1.1 Initial item selection.

#### 3.1.1.1 Assessment of internal reliability (Cronbach's alpha).

'Cronbach's alpha if item deleted' statistics were assessed for each item, with a review to reduce each sub-scale by 50%, while retaining an acceptable level of internal reliability. This identified items 1, 7, 17, and 21 as candidates for removal from the VA scale, Items 6, 8, 13, 18, and 20 were candidates for removal from the OE scale, while items 3, 9, and 16 were identified as candidates for removal from the BA scale. The Cronbach's alpha score for the remaining sub-scale if each individual item were deleted is presented in Table 2. According to this criterion, items 2, 4, 5, 10, 11, 12, 13, 14, 15, 19, and 22 were identified as candidates for retention, as their removal would have had the most significant detrimental effects on the reliability of their respective sub-scales.

Table 2.

*Cronbach's Alpha if Item Deleted scores for sub-scales.*

Valued Action Sub-scale		Openness to Experience Sub-scale		Behavioural Awareness Sub-Scale	
CompACT Item number and scale	Cronbach's Alpha if Item Deleted	CompACT Item number and scale	Cronbach's Alpha if Item Deleted	CompACT Item number and scale	Cronbach's Alpha if Item Deleted
C1_VA	0.874	C2r_OE	0.877	C3r_BA	0.827
C5_VA	0.866	C4r_OE	0.876	C9r_BA	0.848
C7_VA	0.873	C6r_OE	0.881	C12r_BA	0.822
C10_VA	0.865	C8r_OE	0.878	C16r_BA	0.843
C14_VA	0.869	C11r_OE	0.875	C19r_BA	0.837
C17_VA	0.874	C13_OE	0.879		
C21_VA	0.871	C15r_OE	0.872		
C23_VA	0.867	C18r_OE	0.882		
		C20_OE	0.882		
		C22_OE	0.875		

*NB: CXX refers to the CompACT item number; r refers to reverse-scored items; VA, OE, and BA refer to the Valued Action, Openness to Experience, and Behavioural Awareness sub-scales, respectively.*

### **3.1.1.2 Assessment of item correlation (Pearson's $r$ ).**

Correlation matrices were created for the full scale, and each sub-scale to identify high association between item scores. A high association was deemed to be a correlation with a Pearson's  $r$  value of greater than .5. Items with high associations with multiple other items were deemed to have a certain level of redundancy and were identified as possible candidates for removal. In the case of pairs of items with high association, the item with greater association with other items (and therefore lower specificity / higher redundancy) was chosen for removal. An example correlation matrix for the OE scale is presented in Table 3, with the highest correlations identified with an asterisk (\*). According to this criterion, items 5, 6, 9, 13, 15, 18, 21, and 22 were excluded (see extended paper sections 3.1.1 – 3.1.1.2).

Table 3.

*Pearson's r statistics correlation matrix for OE sub-scale*

<b>CompACT item number</b>	<b>C2r_OE</b>	<b>C4r_OE</b>	<b>C6r_OE</b>	<b>C8r_OE</b>	<b>C11r_OE</b>	<b>C13_OE</b>	<b>C15r_OE</b>	<b>C18r_OE</b>	<b>C20_OE</b>	<b>C22_OE</b>
<b>C2r_OE</b>		0.5	0.393	0.446	0.499	0.384	0.586*	0.44	0.391	0.444
<b>C4r_OE</b>	0.5		0.424	0.517*	0.468	0.408	0.568*	0.387	0.379	0.464
<b>C6r_OE</b>	0.393	0.424		0.42	0.406	0.37	0.39	0.445	0.453	0.421
<b>C8r_OE</b>	0.446	0.517	0.42		0.44	0.445	0.483	0.307	0.432	0.484
<b>C11r_OE</b>	0.499	0.468	0.406	0.44		0.43	0.607*	0.563*	0.375	0.443
<b>C13_OE</b>	0.384	0.408	0.37	0.445	0.43		0.42	0.321	0.461	0.707*
<b>C15r_OE</b>	0.586	0.568	0.39	0.483	0.607	0.42		0.521*	0.394	0.475
<b>C18r_OE</b>	0.44	0.387	0.445	0.307	0.563	0.321	0.521		0.299	0.323
<b>C20_OE</b>	0.391	0.379	0.453	0.432	0.375	0.461	0.394	0.299		0.498
<b>C22_OE</b>	0.444	0.464	0.421	0.484	0.443	0.707	0.475	0.323	0.498	

*NB: Items marked with an asterisk (\*) represent those with the highest correlations*

*NB: CXX refers to the CompACT item number; r refers to reverse-scored items; VA, OE, and BA refer to the Valued Action, Openness to Experience, and Behavioural Awareness sub-scales, respectively.*

### **3.1.1.3 Judgement decisions.**

Within sub-scales, items covering semantically similar content, thus indicating potential item redundancy, were grouped together. Those judged to have better face validity or readability were retained. For example, within the BA scale, the items “*I do jobs or tasks automatically, without being aware of what I'm doing*” (item 16) and “*It seems I am 'running on automatic' without much awareness of what I'm doing*” (item 19) were deemed to be semantically similar, and item 16 was identified for removal. Similarly, in the VA scale, it was judged that items 5, 10, and 21 - “*I act in ways that are consistent with how I wish to live my life*”, “*I behave in line with my personal values*”, and “*My values are really reflected in my behaviour*”, respectively – were addressing a similar construct. Of these, item 5 was retained.

Using this criterion, it was deemed that items 2, 3, 4, 5, 7, 8, 9, 12, 14, 19, 20, 22, and 23 should be retained (see extended paper section 3.1.2).

### **3.1.1.4 Confirmatory factor analysis.**

A CFA was completed on the secondary data, and items with the lowest factor loadings on the factor of interest were identified for removal. Items 1, 7, 17, and 21 had the poorest loading on the Valued Action factor (0.64, 0.66, 0.67, and 0.71, respectively). Items 2, 6, 8, 18, and 20 represented the lowest loadings on the Openness to Experience factor (0.68, 0.62, 0.66, 0.61, and 0.60, respectively); for the Behavioural Awareness factor, the poorest-performing items were 9 and 16 (0.71 and 0.69, respectively). It should be noted that while these were not necessarily low factor loadings, the scores for these items were lower relative to others within the same sub-scale. Analysis resulted in the retention of items 3, 4, 5, 10, 11, 12, 13, 14, 15, 19, 22, and 23 according to this criterion (see extended paper section 3.1.3).

### **3.1.1.5 Candidate items.**

Items retained according to all four, or three of the four criteria were identified as being both the most statistically robust, and having the best face validity, so were retained as a potential new scale for the CompACT-SF. Members of the research team independently identified the same eleven candidate items. Items 2, 4, 11, and 22

comprised the new OE scale. Items 3, 12, and 19 comprised the new BA scale. Items 5, 10, 14, and 23 comprised the new BA scale.

#### **3.1.1.6 New scale assessment.**

The new scale was further scrutinised with regards to its reliability, model fit, and validity. Cronbach's alpha assessments yielded acceptable levels of internal reliability ( $\alpha > .80$ ) for the VA and BA sub-scales. At this point, it was identified that item 19 could be removed, with minimal impact on the internal reliability of the BA scale; this was later supported within the CFA (see below). However, the OE scale reached an unacceptably low level of reliability ( $\alpha < .80$ ); data from the initial derivation stage were reviewed and item 15 reintroduced, resulting in  $\alpha$  reaching an acceptable level (see external paper sections 3.1.5 – 3.1.7).

A CFA was conducted on the new scale using the existing secondary dataset. An unacceptably poor model fit was identified. Modification indices were reviewed, and item 22 removed from the OE scale, resulting in an acceptable model fit and Cronbach's alpha remaining above .80. The CFA also identified item 19 as having the lowest factor-loading on the BA scale, further supporting its removal.

At this point, external item qualities of the new scale were assessed using Pearson's  $r$  as a measure of concurrent and convergent validity (see extended paper section 3.1.4). Despite having good internal item qualities, item 10 demonstrated poor correlation with other measures of mental health, distress, and psychological flexibility, so was removed. Conversely, despite having relatively poor internal item qualities item 6 demonstrated the strongest associations with all external measures, and so was included. Furthermore, a discussion within the research team identified item 6 as the only candidate item which covered 'defusion', necessitating its inclusion for adequate content coverage.

Finally, the research team discussed the costs and benefits of further shortening the scale to eight items, via the removal of items 2 and 4. The above analyses were repeated for scales with and without the items, and it was decided they would be excluded for the sake of parsimony, as acceptable internal consistency values ( $\alpha > .70$ ) were preserved despite their removal. The final CompACT scale items were agreed, and item order adjusted to ensure that items from the same sub-scale were not adjacent. The CompACT short-form (CompACT-SF) is summarised in Table 4.

Table 4

*CompACT-SF final form*

<b>Item number</b>	<b>Previous item number</b>	<b>Scale</b>	<b>Question</b>
1	5	VA	I act in ways which are consistent with how I wish to live my life
2	6	OE	I get so caught up in my thoughts that I am unable to do the things that I most want to do
3	3	BA	I rush through meaningful activities without being really attentive to them
4	11	OE	I go out of my way to avoid situations that might bring difficult thoughts, feelings, or sensations
5	14	VA	I undertake things that are meaningful to me, even when I find it hard to do so
6	12	BA	Even when doing the things that matter to me, I find myself doing them without paying attention
7	15	OE	I work hard to keep out upsetting feelings
8	23	VA	I can keep going with something when it's important to me

### **3.2 Phase 2: Short form Validation**

#### **3.2.1 Participants.**

A community sample of 689 adults consented to participate in phase two of the study. 579 completed all measures in full (see Table 5); for consistency, only complete datasets were retained for analyses (see extended paper section 3.2.1).

Table 5.

*Participant Demographics N=579*

<b>Variable</b>	<b>N (%)</b>
Gender	
Male	214 (37)
Female	364 (62.9)
Other	1 (0.2)
Mean Age	37.1
(Years)	(SD=11.6)
Ethnicity	
White	545 (94.1)
Asian British	13 (2.2)
Mixed Race	10 (1.7)
Black British	3 (0.5)
Other	8 (1.4)

**3.2.2 Removing multivariate outliers.**

Mahalanobis distance values were calculated in order to ensure that the CompACT-SF was not influenced by the presence of multivariate outliers (i.e. responses which are extreme compared to the mean on two or more variables; Field, 2013). Cases with a probability of  $p < .001$  associated with their Mahalanobis distance value are considered to be multivariate outliers; eight cases meeting this criterion were removed from the dataset. Analyses were based on the remaining 571 cases.

**3.2.3 Reliability of CompACT-SF.**

Cronbach's alpha measure of internal consistency was used to calculate the internal consistency of the short form and subscales. The CompACT-SF was found to have acceptable internal consistency (8 items;  $\alpha = .734$ ). The BA subscale also demonstrated acceptable internal consistency (2 items;  $\alpha = .731$ ); VA and OE subscales revealed lower levels of internal consistency, but achieved an alpha level which may be deemed acceptable as a minimum in short forms (VA 3 items;  $\alpha = .679$ ; OE 3 items;  $\alpha = .608$ ) (see extended paper section 3.2.3 – 3.2.4).



### **3.2.4 Validity of CompACT-SF.**

See Table 6 for a summary of the associations between the CompACT-SF and its component subscales with other measures of psychological flexibility, health, and distress (see extended paper section 3.2.5).

### **3.2.5 Convergent validity of CompACT-SF.**

The CompACT-SF correlated significantly with the AAQ-II ( $r = -.69$ ;  $p < .01$ ), indicating the measure's convergent validity. It should be noted that the direction of the correlation is due to the inverse relationship between the measures – a higher score on the CompACT-SF is indicative of higher levels of psychological flexibility, while a higher score on the AAQ-II is indicative of lower psychological flexibility. Concordant with previous research, the OE subscale had the strongest correlation with the AAQ-II ( $r = -.65$ ;  $p < .01$ ), followed by the BA subscale ( $r = -.43$ ;  $p < .01$ ) and VA subscale ( $r = -.43$ ;  $p < .01$ ).

### **3.2.6 Concurrent validity of CompACT-SF.**

The data relating to the concurrent validity of the CompACT-SF is summarised in Table 6. The CompACT-SF total score correlated positively and significantly with the SF12V2 mental health subscale ( $r = .61$ ;  $p < .01$ ). There was no significant correlation with the physical health subscale ( $r = -.01$ ), however there were small to medium but significant correlations with some individual items ( $r_s = .11$  to  $.32$ ).

The CompACT-SF total score demonstrated a medium-to-large association ( $r_s = -.5$  to  $-.61$ ) with the DASS-21 total score and its three component subscales. In accordance with previous findings, the CompACT-SF subscales significantly correlated with the DASS-21 total score, and each of its sub-scales. The OE subscale demonstrated the strongest association with each DASS-21 subscale ( $r_s = -.46$  to  $-.49$ ), followed by the BA scale ( $r_s = -.35$  to  $-.39$ ); the VA scale demonstrated varying but significant levels of association, correlating most strongly with the depression subscale ( $r_s = -.26$  to  $-.46$ ). None of the CompACT subscales correlated with the SF12V2 physical health subscale ( $r_s = -.03$  to  $-.08$ ); all showed significant medium-to-large correlations with the mental health subscale ( $r_s = .39$  to  $.51$ ), with the OE scale demonstrating the strongest association.

### **3.2.7 Sensitivity to social desirability.**

The CompACT-SF and its subscales demonstrated a small-to medium, but significant correlation with social desirability, as measured by the MCSD. It should be noted that within this sample, responses to the AAQ-II also correlated moderately and significantly with the MCSD ( $r = -.317$ ).

Table 6.

Pearson's *r* Values for correlations between CompACT-SF scales and other measures.

Measure	CompACT-SF			
	CompACT-SF Total Score	Valued Action subscale	Openness to Experience subscale	CompACT-SF Behavioural Awareness subscale
<b>AAQ-II</b>	-.692**	-.429**	-.653**	-.432**
<b>DASS-21</b>	-.613**	-.384**	-.541**	-.429**
<b>Depression</b>	-.601**	-.457**	-.492**	-.394**
<b>Anxiety</b>	-.503**	-.259**	-.484**	-.351**
<b>Stress</b>	-.516**	-.282**	-.460**	-.393**
<b>SF-12 v2</b>				
<b>Physical Health Subscale</b>	-0.079	-0.028	-0.081	-0.06
<b>General Health</b>	.324**	.370**	.217**	.159**
<b>Phys Func</b>	.105*	.175**	0.039	0.041
<b>Role Phys</b>	.213**	.086*	.219**	.152**
<b>Bodily Pain</b>	.117**	0.024	.122**	.103*
<b>Mental Health Subscale</b>	.608**	.457**	.508**	.391**
<b>Role Emotional</b>	.533**	.371**	.475**	.332**
<b>Mental Health</b>	.573**	.454**	.456**	.376**
<b>Vitality</b>	.412**	.349**	.304**	.280**
<b>Social Func</b>	.510**	.372**	.442**	.320**
<b>Short-Form MCS D</b>	.327**	.286**	.209**	.256**

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

Note. \* Correlation is significant at  $p < .05$ ; \*\* Correlation is significant at  $p < .01$

### **3.2.8 Confirmatory Factor Analysis.**

Francis et al. (2016) proposed a three-factor model for the CompACT, encompassing: (1) 'openness to experience'; (2) 'behavioural awareness'; and (3) 'valued action'. This was supported using an exploratory factor analysis and further validated in an independent sample by Bayliss et al. (2018) using a confirmatory factor analysis.

### **3.2.9 Model 1.**

An Intercorrelated CFA was performed on the 8-item CompACT-SF ( $N= 571$ ) using SPSS AMOS v.23; standardised parameter estimates are reported. Responses generated a marginal model fit:  $(X^2)/df = 3.23$  ( $df = 17$ ;  $p > .001$ ); CFI = .96; RMSEA = .06 (90% CI= .04, .08); SRMR = .11, with values for the Chi-squared statistic and SRMR falling outside the recommended ranges specified by Hu and Bentler (1999). Factor loadings were within an acceptable range ( $>.50$ ) with the exception of item 7 (see Table 7; Factor loading = .39). While the fit was marginal, it was deemed to be sub-optimal; Modification Indices were reviewed in order to address this (see extended paper section 3.2.6.1).

### **3.2.10 Model 2.**

To address the sub-optimal model fit of Model 1, Modification Indices were reviewed. Covariance between error terms on indicators of a common construct shows that they are in some way related. While these indicators should generally be independent, allowing the error effects to be freed in a CFA may improve the model fit; however, this requires sufficient justification to do so, and should only be done for a limited number of item pairs (Brown, 2015). In the case of a multiple-choice questionnaire such as the CompACT, similarly constructed or worded items may result in correlated errors; this was seen as sufficient justification to free correlated error terms e4 and e7.

Following adjustments, the CFA yielded an improved model fit  $(X^2)/df = 2.1$  ( $df = 16$ ;  $p > .01$ ); CFI = .98, RMSEA = .05 [90% CI= .03, .07], SRMR = .08. This put all items within an acceptable model fit range, even according to strict cut-off criteria (Hu & Bentler, 1999); for example, a CFI value of .98 where a value greater than .95 indicates a 'good' model fit. Factor loadings remained satisfactory and were largely improved or unchanged by the adjustments to the model. All items loaded  $>.50$  (Stevens, 1992); item 7 remained the exception, with a factor loading of .32 and a decrease following the model adjustment. See Table 7 for a list of CompACT items, corresponding item number in the full CompACT, their corresponding variable in the SPSS AMOS output

(Figure 4), and factor loadings for each of the models in the present study (see extended paper section 3.2.6.2).

Table 7.

*CompACT-SF items and factor loadings*

<b>Item number</b>	<b>Item reference</b>	<b>Question</b>	<b>Factor Loading Model 1</b>	<b>Factor Loading Model 2</b>
1	C1_VA_prevC5	I act in ways which are consistent with how I wish to live my life	.69	.69
2	C2r_OE_prevC6	I get so caught up in my thoughts that I am unable to do the things that I most want to do	.72	.76
3	C3r_BA_prevC3	I rush through meaningful activities without being really attentive to them	.76	.76
4	C4r_OE_prevC11	I go out of my way to avoid situations that might bring difficult thoughts, feelings, or sensation	.60	.54
5	C5_VA_prevC14	I undertake things that are meaningful to me, even when I find it hard to do so	.60	.60
6	C6_BA_prevC12	Even when doing the things that matter to me, I find myself doing them without paying attention	.75	.76
7	C7r_OE_prev15	I work hard to keep out upsetting feelings	.39	.32
8	C8_VA_prev23	I can keep going with something when it's important to me	.65	.65

*Key: r = 'reverse scored item'; VA=Factor 1, 'Valued Action'; OE=Factor 2, 'Openness to Experience'; BA = Factor 3, 'Behavioural Awareness'; prevCXX = previously CompACT item number X. NB: Factor loadings pertain to item-factor mappings as specified a priori within the CFA; e.g. Item 1 was modelled as a 'valued action' factor, and demonstrated a .69 loading for this factor in both models.*

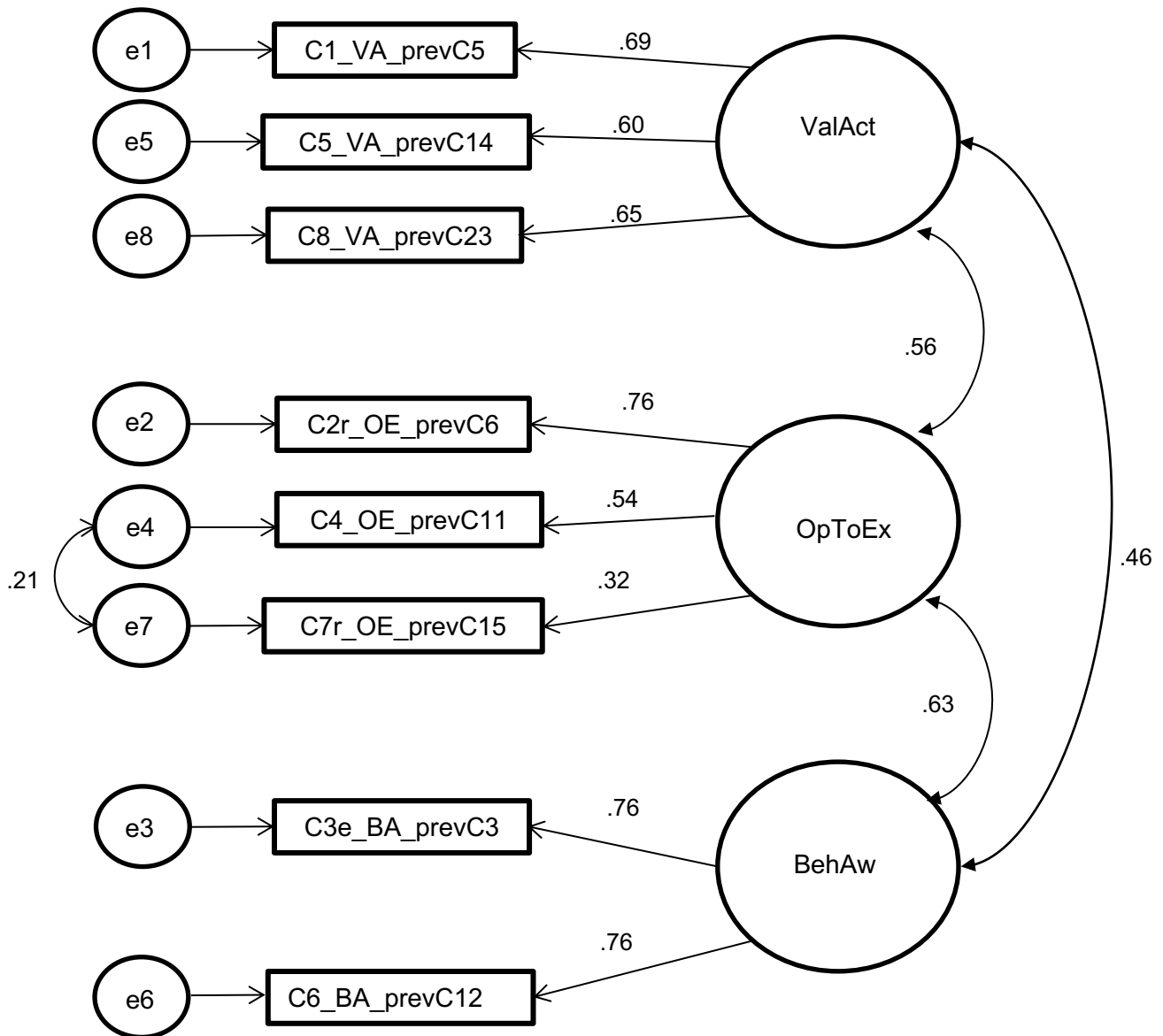


Figure 4. Intercorrelated Analysis Output

#### 4. Discussion

The aims of this research were two-fold: (1) to use existing data to develop a short form of the CompACT which was psychometrically robust and retained adequate content coverage; (2) to validate the short form in an independent sample. Two members of the research team used similar secondary data analysis methods to independently derive short forms of the CompACT and arrived at a common solution. When the new measure was completed by an independent sample, it was found to have acceptable levels of internal consistency (reliability) and demonstrated good convergent and concurrent validity when compared to other measures, with scores that reflected those of the full CompACT. Confirmatory factor analysis found a good model fit for the original three factors identified in the full measure (Francis et al., 2016; Bayliss et al., 2018), indicating that the abbreviated measure retained the same factor structure. This demonstrates that the new measure performed in a similar way to the full CompACT, and that the CompACT-SF may provide a useful, efficient way of measuring PF.

In the development of the CompACT-SF, the authors endeavoured to address the criticisms that have been levelled at the creation and use of short form measures. Smith and colleagues (2000) assert that among the commonest issues with, or 'sins' of short form development, are the derivation of short forms from insufficiently validated full measures, and the assumption that any validation research into the full measure is also applicable to the short form. The reliability, validity, and structure of the CompACT has been verified in independent samples (Francis et al., 2016; Bayliss et al., 2018), thus addressing the former concern. By using this data to derive the short form, but then validating it in a further, large-*N* independent sample, we have endeavoured to address the latter. However, there remains the need for some caution when interpreting the findings.

Firstly, the over-sampling relative to the power calculation should be acknowledged. The apriori power calculation of  $N = 250$  indicated an approximate minimum for the study to achieve sufficient power. However, a larger sample size supports improved statistical power, sampling above the bare minimum allowed this research to address one of the 'sins of short form development' – the suggestion that short forms are insufficiently validated, with a poorer evidence base (Smith, McCarthy, & Anderson, 2000). With this justification in mind, the ethical implications of over-sampling should be recognised; specifically, the issue of survey fatigue. There is evidence to suggest that there is a strong negative relationship between the number of previous survey contacts



and participation in later surveys (Goyder, 1986). By oversampling one risks having a detrimental impact on participants' willingness to engage in future valuable research, despite their participation in the present research not being strictly 'necessary' to achieve sufficient statistical power. In other contexts (for example in animal research), ethical issues of resource consumption and researcher burden may also arise, however these issues do not pertain to the current project.

Secondly, it should be noted that although the CompACT-SF was validated in an independent sample, the demographics of this sample were very narrow, with 94.1% of respondents being white British, and 66.4% having an undergraduate or postgraduate degree. This is evidently an unrepresentative sample, suggesting that, although the preliminary measure appears to be valid in a white, well-educated population, caution should be exercised if the measure is to be used with more diverse groups or individuals. Furthermore, future validation studies should endeavour to recruit a wider demographic in order to address this limitation.

As discussed within the methods and advocated by Stanton and colleagues (2002), some items were retained or rejected on the basis of 'judgement decisions' which a priori prioritised face validity, clarity of expression, semantic redundancy, and optimum length of the final short form. While this research group reached a consensus on these decisions, others may have taken an alternative view which may have resulted in a different version of the CompACT-SF being completed within the second phase of the study.

Smith and colleagues (2000) also suggest that the psychometric properties of short forms are not subjected to such rigorous assessment of their validity as full measures. The internal reliability of the CompACT-SF as a whole was above the level of what is deemed to be acceptable ( $\alpha > .70$ ); there was variation in the performance of the sub-scales – while the 'behavioural awareness' scale achieved an overall acceptable alpha level, the 'valued action' and 'openness to experience' sub-scales achieved the bare minimum that may be deemed acceptable for a short form (DeVellis, 2016). While this could be viewed as problematic, it should be considered that if maximising the internal consistency of a scale or sub-scale is the primary focus of scale reduction, one risks retaining only items which are similarly worded or have content coverage which is so similar it renders them redundant (Stanton et al., 2002). Given that each subscale within the CompACT-SF is thought to be representative of a dyadic relationship between two ACT processes, it was necessary to retain items which were distinct in terms of wording and content; this may explain the lowered alpha levels for these

scales. Furthermore, the average inter-item correlations for the CompACT-SF as a whole, and for the 'valued action' and 'openness to experience' subscales were within the recommended levels (Briggs & Cheek, 1986; Robinson et al., 1991).

The CompACT-SF demonstrated good convergent validity when compared to the AAQ-II. The scale score and each of the sub-scale scores correlated significantly with respondents' AAQ-II scores; the correlations also followed the same pattern as those observed in the research validating the CompACT full scale (Bayliss et al., 2018), with 'openness to experience' correlating most strongly, followed by 'behavioural awareness' and 'valued action'. Although the correlations for the CompACT-SF were overall smaller than those for the full measure, they remained significant to the same degree, indicating that the measures were performing in a similar way.

Assessment of the CompACT-SF concurrent validity, as measured by association with the DASS-21 and SF12v2, also demonstrated a similar performance to that of the full measure. Increased psychological flexibility as measured by the CompACT-SF was associated with lower levels of depression, anxiety, and stress, and better performance on the Mental Health scale of the SF12v2. These correlations were sufficiently large to demonstrate a relationship, but not so high as to imply that the measures assess the same construct. As expected, and in line with previous research, there was no correlation between psychological flexibility and physical health scores.

While tests of the validity of the CompACT-SF mirrored the properties of the CompACT full measure (Bayliss et al., 2018), the results for tests of sensitivity to social desirability differed. In contrast to research into the CompACT full measure, a significant mild-to-moderate correlation was observed between scores on the CompACT-SF and social desirability as measured by the MCSD. This was unexpected, and further examination of the results showed a correlation of similar magnitude between the AAQ-II and the MCSD, despite the AAQ-II having previously been shown to be unrelated to the MCSD (Bond et al., 2011). It should be noted that it is common for social desirability to affect responses on self-report measures (van de Mortel, 2008); it is possible to correct this statistically, however from the present data it is not possible to determine what aspects of the measures, or indeed this particular sample, are promoting more socially desirable responses. Furthermore, it is not possible to determine how socially desirable responding may have influenced CompACT-SF and AAQ-II responding, given that they measure theoretically unrelated constructs and the relationships observed are correlational rather than causal.

Broadly speaking, the CompACT-SF derived within this research has demonstrated that an abbreviated version of the measure can retain psychometric properties that are almost equal to those of the full measure in terms of validity and factor structure, and with an explanation for a reduction in sub-scale reliability (Stanton et al., 2002). Smith et al. (2000) assert that for a short form to be acceptable, developers must demonstrate that it offers meaningful time or resource savings relative to the loss of validity. Given the 65% reduction in measure length (23 items to eight), and the similarity on performance to the full measure, this version of the CompACT-SF is certainly acceptable according to this metric.

It has previously been suggested that the CompACT full measure has clinical utility as a therapy process and outcome measure, to be used pre-, mid-, and post-intervention, and that the subscales may enable clinicians to identify specific processes clients are finding more problematic (Bayliss et al., 2018). This in turn may permit a more pragmatic and individually-tailored intervention. It could be contended that, given the length of the full CompACT measure, it is impractical to administer sufficiently frequently that it may track the dynamic processes underpinning psychological flexibility – it would place an undue burden on both client and therapist resources. At only eight items, the CompACT-SF may be a more fitting candidate for a session-by-session tracking measure for psychological flexibility, or indeed as a research tool in idiographic therapy process research, in the event that its test-retest reliability is validated.

Considering the research more broadly, a tension arose between the need to adequately demonstrate the validity of the short-form and doing so using a measure which was heavily critiqued while proposing the rationale for the research. While this presented a methodological quandary, the position of the AAQ-II as the gold-standard and most comprehensively researched and utilised measure of psychological flexibility (Schmalz & Murell, 2010) positioned it as the most appropriate measure against which to assess the convergent validity of the CompACT-SF. Despite criticisms levelled against it, the AAQ-II does appear to capture key processes of psychological flexibility, notably experiential avoidance / openness to experience (Larsson et al., 2016). Consequently, within the present research full convergence between the AAQ-II and CompACT-SF was not expected or targeted, rather demonstration of an association between the two. The stronger association between the AAQ-II and OE sub-scale relative to other sub-scales supports this argument that the AAQ-II assesses openness / avoidance, but also that it may not adequately account for all ACT sub-processes. This challenge of defining and capturing the process of interest may be seen as applicable to challenges faced by the ACT field in general; ACT targets a construct

which is demonstrably difficult to define and measure (Kashdan & Rottenberg, 2010), making both research and evidence-based practice a challenging endeavour.

Another notable tension identified within this research, which again may be applicable to the wider ACT field, is the use of distress measures to demonstrate the efficacy of a therapy or validity of an outcome measure which does not target the reduction of distress. From a psychometric perspective, increased psychological flexibility as measured by the AAQ-II is associated with lower levels of anxiety, depression, and distress (Bond et al., 2011). Given that increased psychological flexibility is broadly associated with improved outcomes in psychopathology, a relationship between increased psychological flexibility and reduced distress was an important psychometric property for the CompACT-SF to demonstrate. However, this does not account for the challenges faced by proponents of a therapeutic approach which does not ascribe to the traditional reactive, symptom-reduction approaches which are widely used in services (Lam, Salkovskis, & Warwick, 2005). Within a climate where there is significant pressure to demonstrate the efficacy of interventions, the onus is on ACT researchers and clinicians to evidence that their interventions not only increase psychological flexibility, but also to demonstrate outcomes in a way that is useful in the current service context. That is, drawing the link between increased psychological flexibility, improved psychological outcomes, and reduced distress. Incidentally, this provides further support for ongoing research into robust measures of psychological flexibility. While an argument could be made for the need for a shift in the focus of services, towards proactive promotion of wellbeing via preventative models, this is beyond the scope of the present discussion.

The CompACT and CompACT-SF were developed specifically with ACT in mind, as an alternative means of measuring psychological flexibility as it is conceptualised by Hayes' (2011) three-factor model of dyadic processes. However, it has been proposed that a consensus model is emerging amongst contemporary contextual behavioural therapies with regards to the key processes underlying psychopathology and psychotherapeutic change, and that these processes are captured by the 'openness to experience', 'behavioural awareness', and 'valued action' factors (Hayes, 2011). The review of contemporary behavioural therapies including, but not limited to, Metacognitive Therapy, Functional Analytic Psychotherapy, Dialectical Behavioural Therapy, and ACT, examines the components, moderators, and processes of change associated with each (Hayes, 2011). These were grouped into three 'clusters': (1) those addressing issues of acceptance, defusion, and metacognition – broadly, psychological *openness*; (2) those dealing with mindfulness, perspective-taking, theory

of mind, and present-moment *awareness*; (3) those attending to values, motivation to change, and how one is guided by these to take meaningful *action*. This tentatively suggests that, while ACT may be relatively unique in its use of the term 'psychological flexibility' as its target for change processes, this group of therapies may share the common goal of fostering psychological flexibility by enhancing the processes of openness, awareness, and action. Within the contextual behavioural science approach, the measurement of theoretical processes and their relationships with psychopathology and health is seen as key, with particular emphasis placed on measures being theoretically coherent, and having both treatment and conceptual utility. With the common goal of fostering psychological flexibility in mind, the CompACT-SF may serve as a clinically useful and theoretically coherent therapy tracking measure for any of the contextual behavioural therapies, regardless of the specific model employed (see extended paper sections 4.1 – 4.4).

#### **4.1 Future Research**

Further research should seek to investigate alternative combinations of items for the CompACT-SF, in order to address the psychometric weaknesses identified with the short form in its present state; specifically, to determine whether sub-scale reliability for those deemed to be minimally acceptable can be improved without increasing redundancy, and to clarify whether correlation with the MCSD was indeed an artefact of the sample used within the present research. An investigation into the test-retest reliability and sensitivity to change, and how responses to the short form relate to the full measure would be necessary if the short form were to be used as a therapy tracking tool, or as a tool in therapy process research. It was previously asserted that psychological flexibility may be the mechanism of change in therapies other than ACT, albeit under different names; using the CompACT-SF to assess PF in relation to therapeutic gains in other therapeutic models would provide novel evidence in support (or otherwise) of this claim.

### **5. Conclusions**

Using secondary data analysis, this study has developed an initial version of a short form of the CompACT (CompACT-SF) according to best-practice guidelines for short form development. The reliability and validity of the measure has been validated in a large-*N* population sample, and the three-factor structure of the CompACT full measure was confirmed in the CompACT-SF. This provides initial but favourable support for the development of the CompACT-SF to be used as a process measure of psychological flexibility in both research and clinical practice.

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## EXTENDED PAPER

## **1. Extended Introduction**

### **1.1 Broader Issues**

The current research concerns the development and validation of a short form of an existing measure of psychological flexibility, the Comprehensive Assessment of Acceptance and Commitment Therapy Processes (CompACT). It is necessary to consider the broader context of the need for this measure, in order to inform understanding of the need for its development, and why psychological flexibility is a concept worthy of further investigation and measurement. Specifically, current understandings of mental illness, psychopathology, psychological health, and their relationship to psychological flexibility are discussed.

#### **1.1.1 Mental Illness.**

It has been estimated that mental illness affects up to one in four individuals in the population (Mental Health Foundation, 2016). Anxiety, sleep, and mood disorders such as depression have been identified as amongst the most prevalent, with anxiety and mood disorders specifically being identified as some of the most costly (Fineberg et al., 2013).

Links have been demonstrated between mental illness and deprivation, low income, poor education and physical health, and increased risk behaviour (Vigo, Thornicroft, & Atun, 2016). The cost is economic as well as human and social, with estimates that the wider annual costs of mental illness in England amount to approximately £105 billion per year. This supports the suggestion that mental illness is unmatched when it comes to the combined extent of prevalence, persistence, and extent of impact (Friedli & Parsonage, 2007).

Given the significance of the demand mental illness places on the UK National Health Service (NHS), particularly with a 20% increase in referrals to community mental health teams (Adams, Zacharia, Masters, Coffey, & Catalan, 2016), it is unsurprising that the NHS is struggling to meet the needs of this significant proportion of the population. This is likely to be exacerbated by ongoing proposed cuts to mental health sector funding (Hoagwood et al., 2018; Stewart et al., 2016; Docherty & Thornicroft, 2015), which will have a knock-on impact on staff working within these sectors. Budget cuts, time constraints, increased referrals and reduced

resources place significant pressures on therapists and psychologists to evidence the efficacy of their interventions.

### **1.1.2 Psychopathology.**

Literature on psychopathology – *the scientific study of mental disorders* – has historically focused on attempts to understand, measure, quantify, and categorize it. This has largely been informed by the medical model of psychopathology. Over time, this model has been informed by diagnostic criteria; the most contemporary ones being the Diagnostic and Statistical Manual of Mental Health, 5<sup>th</sup> edition (DSM-V; American Psychiatric Association, 2013) and the International Statistical Classification of Diseases and Related Health Problems (ICD-10; World Health Organisation, 1992). The medical model and its focus on diagnosis provides a useful framework to classify patients' difficulties, provide prognoses and inform interventions (Mayes & Horwitz, 2005), and promote shared understanding and effective communication (Paris, 2013). However, diagnostic systems have been criticised for being poorly differentiated due to overlapping criteria (Kendell & Jablensky, 2003) and high levels of co-morbidity (Hyman, 2010). Furthermore, the medical model approaches research and theory about psychopathology from a stance which focuses on cause and remediation of symptoms (Anderson, 1995); however, as the cause of mental illness is often elusive or multifaceted, the focus has been directed more towards symptom relief, either via medication or psychotherapy (Lam, Salkovskis & Warwick, 2005).

The three main branches of psychotherapy comprise: Cognitive approaches, Behavioural approaches, and Dynamic psychotherapy. Despite markedly different theoretical principles, proposed mechanisms of change, and therapist stances, the aim of these approaches remains broadly similar. That is, to identify the origin of symptoms so as to implement interventions to reduce their presence, and minimise the likelihood of recurrence. Cognitive approaches attribute difficulties to 'faulty' thinking patterns (Beck, 1979), in that the individual's perception of the world and the cognitive attributions they give to events (accurate or otherwise) result in them acting or feeling in particular ways. Conversely, behavioural models conceptualise problems as a result of behaviours which have been learned through a lifetime of reinforcement contingencies (Skinner, 1963). The dynamic model places far more emphasis on events in early childhood, with these events later providing unconscious motivations and desires for the individual as an adult (Freud, 1939).

Over the years, each of these approaches have developed a significant evidence base. The most well-researched and evidenced approach is the cognitive behavioural therapy (CBT) model, which amalgamates aspects of both cognitive and behavioural approaches, and is advocated for in National Institute of Health and Care Excellence (NICE) guidelines for many of the most commonly-identified mental health problems (Johnson et al., 2016; Dèttore, Pozza & Andersson, 2015; Covin et al., 2008; Spek et al., 2007; Beck & Fernandez, 1998). However, CBT has been subject to significant criticism. For example, there is a distinct gap in the literature pertaining to the supposed mechanisms of change in CBT; indeed, some investigation has demonstrated that mechanisms of change do not conform to predictions proposed by the model (Gaudiano, 2006). A large-sample ( $N=512$ ) study of individuals receiving CBT interventions failed to confirm any of the theoretical causal relationships between attitudes or beliefs, and treatment outcomes (Burns & Spangler, 2001).

A notable further criticism of CBT, and indeed the other models outlined, is that these models are reactive, in that they provide therapeutic intervention at the point where symptoms are already present and causing difficulties for the individual. There is evidence to suggest that preventative therapeutic models, or early interventions, are key in avoiding the progression of difficulties into more severe and enduring mental health problems (Wampold & Imel, 2015; Knapp, McDaid & Parsonage, 2011). This is further supported by evidence that later intervention results in higher costs related to therapy duration and intensity, use of other services, and relapse rates (Eldredge et al., 2016), which is particularly pertinent given the current significant and increasing demand on mental health services.

### **1.1.3 Psychological health.**

The field of psychotherapy has continued to develop and progress in line with and in response to the current demands on mental health services, and the criticisms levelled at CBT. This is reflected in the increased prevalence of third-wave behavioural therapies – an emergent set of approaches which shift the focus of therapy away from symptom reduction, and instead aim to promote a more holistic approach to health and well-being (Hayes et al., 2011). Despite this shift in focus, many of the therapeutic tools and strategies advocated by third-wave therapies do in fact complement, and indeed enhance, traditional cognitive-behavioural interventions (Harley, 2015). For example, concepts such as mindfulness, identification of personal values, and metacognition, are frequently integrated with



traditional behavioural interventions such as behavioural activation, with a view to enable individuals to live more fulfilling, values-congruent lives (Hayes, Strosahl, & Wilson, 1999).

The emergence of the third-wave therapies has prompted clinicians and researchers alike to reconsider psychological health with a new frame of reference – moving away from the traditional approaches which primarily attend to the presence or absence of symptoms (Hayes & Hofmann, 2017). This is reflected in the ‘No health without mental health’ (2007) paper, which proposes strategies for the prevention of mental health problems, and the promotion of positive psychological health, rather than a treatment model. Notably, the paper demonstrates that good mental health and psychological wellbeing require over and above merely an absence of mental illness, and that an increase in these is associated with improved outcomes for communities and individuals alike, in social, economic, and health domains, as well as psychological (Prince et al., 2007).

The paper advocates for the use of preventative models, with specific areas for intervention including: 1) early identification of mental health problems, and timely intervention; 2) targeting children and young people for the promotion of positive mental health and prevention of mental health problems; 3) promotion of positive mental health and prevention of mental health difficulties in adults; 4) social determinants of mental health problems, and their subsequent consequences; 5) targeting current services to improve quality and efficiency.

One notable consequence of the ‘No health without mental health’ (2007) paper was an increase in research regarding the processes and components of ‘good psychological health’, particularly given that there are few consistent or broadly accepted operational definitions of what constitutes it, and how individuals may go about achieving it (Brassai, Piko, & Steger, 2011). Psychological health has historically been defined in terms of an absence of pathology, rather than a presence of well-being (Bergner, 1997). However, the World Health Organization (WHO) takes a more neutral stance, defining ‘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” – encompassing (although not explicitly) an absence of psychopathology, and the presence of ability to function, contribute, and achieve. Another definition, from the originator of positive psychology (Seligman,

1998), places prevention, and the fostering of positive qualities at the core of good 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.”*

Evidently, this approach encourages a position of prevention and proactivity, rather than one of reactivity. One of the primary components of this is a shift in focus, from correcting weaknesses to fostering and building competency (Seligman & Csikszentmihalyi, 2000). In line with this, Huppert (2009) proposed that the features of good mental health would be the opposite to those characterising poor mental health. This resulted in the development of a list of ten components of well-being (see Table 8), through the analysis of widely-used anxiety and depression measures, and the construction of items which were the opposite of each symptom.

Table 8.

*Huppert’s (2009) features of positive mental health*

<b>Definitions of positive mental health</b>	
<b>Component</b>	<b>Definition</b>
<b>Positive emotions</b>	“All things considered, how happy do I feel?”
<b>Engagement</b>	Taking an interest in your work and activities
<b>Relationships</b>	Having people in your life that you care for and who care about you
<b>Meaning and Purpose</b>	Feeling that what you do in life is valuable and worthwhile
<b>Accomplishment</b>	Feeling that what you do gives you a sense of accomplishment and makes you feel competent
<b>Emotional Stability</b>	Feeling calm and peaceful
<b>Optimism</b>	Feeling positive about your life and your future
<b>Resilience</b>	Being able to bounce back in the face of adversity
<b>Self-Esteem</b>	Feeling positive about yourself
<b>Vitality</b>	Feeling energetic

In contrast to the suggestions that the proactive pursuit of wellbeing or happiness is beneficial and desirable, proponents of ACT argue that the active pursuit of the

'ideal' sets an unrealistic and unachievably high benchmark for the average individual. The ACT approach postulates that suffering and negative experiences are an inevitable component of the human experience, and attempts to avoid such experiences can result in increased distress and lack of pursuit of valued goals and activities. Hayes (2004) proposes that psychological health and wellbeing transcends a lack of suffering, and rather encompasses living well and fully, in line with one's personal values. The ACT approach views the fostering of psychological flexibility as the key to this.

#### **1.1.4 Psychological flexibility.**

Psychological flexibility (PF) is viewed as the lynchpin of good psychological health within the ACT approach; it is placed at the centre of the "Hexaflex" model (Hayes, Strosahl, & Wilson, 1999; see section 1.2), and increasing PF is the fundamental goal of ACT interventions. This is achieved via targeting the six core processes underpinning PF: acceptance, defusion, present-moment-awareness, self-as-context, values, and committed action (see section 1.3); this aims to lead individuals into living a more meaningful, values-based life, and to find new and healthy ways of relating to their private experiences (Hayes, 1999).

An extensive review and synthesis of existing PF literature highlights its position as a 'fundamental aspect of health' (Kashdan & Rottenberg, 2010), in ACT approaches, and under other labels. The review emphasises the challenges of systematically reviewing and synthesising the literature on PF, as it has historically travelled under a multitude of different names, including ego-resilency, response modulation, and executive control (Block, 1961; Patterson & Newman, 1993; Posner & Rothbart, 1998). A further challenge lies in researching a construct that is difficult to operationally define; Kashdan and Rottenberg (2010) claim that PF refers to a number of dynamic processes which unfold over time, and is reflected in how an individual: (1) adapts to fluctuating situational demands; (2) reconfigures mental resources; (3) shifts perspective, and (4) balances competing desires, needs, and life domains. Hayes and colleagues (1999) provide a more parsimonious definition of PF from an ACT perspective, describing it as an individual's ability to connect with the present moment fully, as a conscious human being, and to change or persist in behaviour that is in line with identified values.

Given the breadth of these definitions of PF, it is unsurprising that Kashdan and Rottenberg's (2010) synthesis of PF literature encompassed work in the areas of emotion regulation, neuropsychology, mindfulness and acceptance, personality

psychology, and developmental psychology. Significant evidence was found for the value of PF; it was demonstrated that individuals with greater levels of psychological flexibility were better able to tolerate and effectively use their private experiences to obtain optimal outcomes from situations. The authors propose that the ability to dynamically and flexibly respond to uncertain and unpredictable situations, and to tolerate the negative or difficult private experiences which may be associated with these, is the essence of psychological health.

Within the review, the authors (Kashdan & Rottenberg, 2010) identify areas for valuable future research, such as using PF interventions to increase well-being at personal and even societal levels, and not limiting interventions to those with a “disorder”, to help highly functioning people find greater efficacy and fulfilment in daily life. They also highlight the need for empirically demonstrating temporality, to show that changes in flexibility precede changes in behaviour and functioning (e.g. Dalrymple & Herbert, 2007), but that in order to do this an improvement in methods and approaches to measuring PF is needed.

## **1.2 ACT: Philosophy and Theory**

Proponents of the ACT model argue that one key feature that sets it apart from other therapeutic models is that it is built on a functional contextual program of basic research into language and cognition: Relational Frame Theory (RFT) (Hayes, 2004). Consequently, it has been suggested that in order to fully understand and experience ACT processes, one must consider its theoretical and philosophical underpinnings, and become invested in its underlying principles, respectively (Hayes et al., 1999; Hayes et al., 2012).

### **1.2.1 Contextualism and functional contextualism**

A substantial amount of work was done to clarify the philosophical basis of ACT, which helped to define it as an approach that was distinct from first- and second-wave behavioural therapy (Hayes, 2004). ACT is grounded in functional contextualism, a branch of psychological pragmatism which extends Skinnerian behaviourism (Hayes, Hayes, Reese, & Sarbin, 1993) by adopting a functional approach to truth and meaning linked to the prediction and influence of whole organisms, interacting in and with a context, and doing so with precision, scope, and depth (Hayes, Levin, Plumb-Villardgarda, Villatte, & Pistorello, 2013).

Prior to describing functional contextualism specifically, it is helpful to consider the principles of contextualism more broadly. Functional contextualism emerged from a form of contextualism described by Parker and Pepper (1942), who note that philosophical systems tend to cluster around a few distinct 'world views'; each of these is characterised by a distinct underlying 'root metaphor' and 'truth criterion'. Root metaphors are based on seemingly well-understood, common-sense ideas, and serve as the basic analogy by which an individual attempts to understand the world; the root metaphor corresponds to the world view's ontological assumptions, or views about the nature of existence (for example, whether the universe is deterministic). The truth criterion associated with a world view is intricately related to the root metaphor – it provides the basis for evaluating whether an analysis of a situation or event is valid. The truth criterion corresponds to the world view's epistemological assumptions – that is, its views about the nature of knowledge and truth (Parker & Pepper, 1942). The root metaphor, or unit of analysis, adopted is the 'act in context' – all actions are considered to be whole events, having meaning only with reference to their context (Hayes et al., 2013). The truth criterion of contextualism is referred to as 'successful working' towards one's analytic goals, whereby the 'truth' of an idea lies in its function or utility, rather than how well it might mirror 'reality'. Simply, what is considered "true" is what works (Hayes, 2004). An analysis is said to be true or valid in that it leads to effective action, or the achievement of a goal; functional contextualists are less interested in ontological claims of an objective Truth, because that claim would also always be an 'act in context' (Hayes et al., 2013).

Having considered contextualism, the core components of functional contextualism specifically are as follows: "(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). Functional contextualism is a realistic philosophy which rejects ontology on epistemological grounds; within ACT the analyst or client does not seek to identify what is objectively 'true' or 'real', because the world is only experienced through interactions with it, and these interactions are always limited by context (Hayes, 2004). Instead, ACT interventions are designed to make a particular difference, and they are 'true' only to the extent that they do so – they seek to predict and influence events using empirically based rules, and rules or theories which do not contribute to the achievement of one's practical goals are rejected as inconsequential (Fox, 2006). Similarly, ACT clients are encouraged to

abandon the idea of a literal truth in their own thoughts and evaluations, and are instead encouraged to embrace an interest in how to live according to their values (Hayes, 2004). Given that functional contextualism is holistic and context-focused, ACT encourages a conscious posture of openness and acceptance to all psychological events; it views no private events (thoughts, feelings, etc.) as inherently dysfunctional or pathological, rather the issue is in their contextually established function and meaning (Harris, 2009; Hayes, 2004). The foundational nature of goals in contextualism is reflected in the emphasis ACT places on chosen values as a necessary component of a meaningful life, and on a therapeutic level, a meaningful course of treatment (Hayes, 2004).

### **1.2.2 Relational Frame Theory.**

Relational Frame Theory (RFT) is based on functional contextualism, and focuses on how humans learn language and communication through interactions with their environment (Hayes & Brownstein, 1986). It is a psychological theory of human language (Steele & Hayes, 1991), which is credited as being both inspired by, and inspiration for, ACT (Hayes, 2004). RFT asserts that the building block of human language and higher cognition is the ability to create bi-directional links between things and concepts ('relating'). RFT argues that in addition to specifying the strength of a link between stimuli, human language specifies the type of relation (e.g. 'bigger than' or 'further away than' and the dimension along which that relationship exists (e.g. 'size' or 'distance') (Steele & Hayes, 1991). RFT claims that although there may be an arbitrary number of types of relations and dimensions, the core unit of 'relating' is a key part of human language and higher cognition (Hayes, 2004).

A great deal of research has investigated the testable aspects and implications of RFT (O'Connor, Farrell, Munnely, & McHugh, 2017), however an in-depth discussion of this, and a full account of RFT is beyond the scope of this research. Notably, however, it has been demonstrated that increased rigidity of automaticity of relating within certain domains has implications in psychopathology (Nicholson & Barnes-Holmes, 2012).

### **1.2.3 ACT Overview.**

ACT is a third-wave psychotherapy and a branch of clinical behaviour analysis (Plumb, Stewart, Dahl, & Lundgren, 2009); it is an empirically-based psychological intervention that uses acceptance and mindfulness strategies combined with

commitment and behaviour-change strategies to increase PF (Hayes, 2011). In ACT terms, PF means contacting and fully engaging in the present moment, and altering one's behaviour in line with chosen values (Hayes et al., 1999). Psychological Inflexibility is seen as arising from experiential avoidance, cognitive fusion, attachment to a conceptualised self, lack of contact with the present moment, and an associated failure to behave in accordance with core values (Hayes, Strosahl, & Wilson, 1999).

ACT rejects the 'assumption of healthy normality' – the culturally shaped perspective that happiness and feeling 'good' are hallmarks of psychological health; instead, the approach suggests that individuals experience a variety of ever-changing internal experiences, and that regardless of whether they are painful or pleasant, no thought, feeling, memory, or physical sensation is more "right" than another (Boone, Mundy, Morrissey Stahl, & Genrich, 2015). ACT is supported by relational frame theory (RFT) in its proposition that trying to alter the content of difficult thoughts and feelings is a counterproductive coping method. The model instead advocates for individuals to notice, and accept private events, including previously unwanted ones, by fostering six interrelated core processes: acceptance; contact with the present moment; self-as-context; cognitive defusion; values; and committed action (Hayes et al., 1999). These processes are seen as underpinning psychological flexibility, and are depicted within the ACT "hexaflex" (see Figure 5).

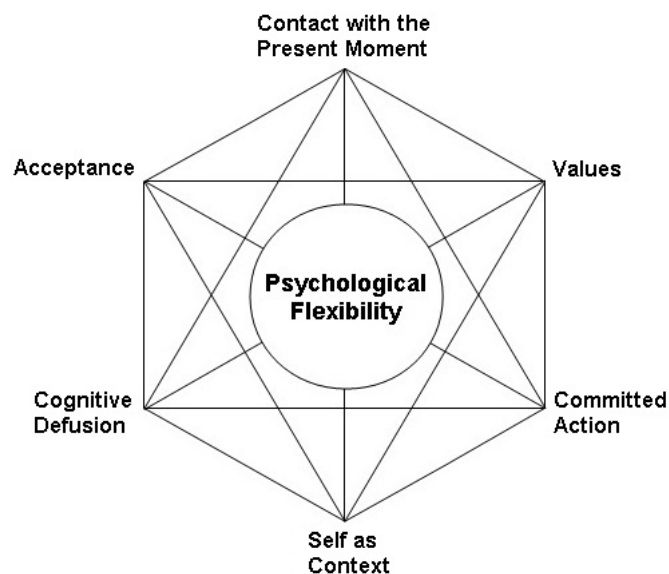


Figure 5. The ACT "Hexaflex" (Hayes et al., 1999)

### **1.3 ACT Six Core Processes**

#### **1.3.1 Acceptance.**

At its fundamental level, 'acceptance' connotes the active intake of an event or situation, while at a higher level it encompasses the abandonment of dysfunctional change agendas, alongside an active process of feeling feelings as feelings, thinking thoughts as thoughts, and remembering memories as memories (Hayes, Strosahl, & Wilson, 1999). In ACT, acceptance is not merely tolerance – it is the active and non-judgemental embracing of experiences and events in the moment and as they are (Hayes, 2004). Specifically, it is “the voluntary adoption of an intentionally open, receptive, flexible, and non-judgemental posture with respect to moment-to-moment experience” (Hayes, Strosahl, & Wilson, 2012), thus rejecting the notion that an absence of symptoms, or aversive thoughts and experiences, is required for good psychological health. Therapeutically, the notion of acceptance is introduced early on in the process, and is developed (rather than achieved) through the use of metaphors and mindfulness, with the aim of promoting valued and committed action (Hayes, 2004). Acceptance is one of the central tenets of ACT and there is evidence that it is a mediator for treatment outcomes in chronic pain (Cederberg et al., 2016), work-place stress (Bond & Bunce, 2003), and anxiety and depression (Forman et al., 2007), to name but a few.

Within ACT terms, the opposite of acceptance is experiential avoidance; this can be broadly defined as attempts to avoid thoughts, feelings, memories, and other internal experiences, even when doing so creates harm in the long run (Hayes et al., 1999). It is thought that experiential avoidance is maintained through negative reinforcement, in that the avoidance achieves short-term relief from discomfort, thereby increasing the likelihood that the behaviour will recur. Within the ACT literature, an important distinction is made in that negative thoughts, emotions, and sensations are not inherently problematic; responses to them, a habitual and persistence unwillingness to experience uncomfortable thoughts and feelings, and the associated avoidance and inhibition, are viewed as the problem (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). Hayes et al. (1999) suggest that experiential avoidance has emerged from the generalisation of cultural rules that advocate the suppression and control of negative thoughts and emotions; when attempts to do so continually fail, further distress arises as a consequence (Hayes et al., 2004). From a behavioural perspective, the avoidance of experiences leads to the narrowing of an individual's behavioural repertoire, and a reduction in values-



consistent action and ways of living, further exacerbating psychological distress (Bond et al., 2011).

In support of this, there is evidence to show that avoidance of thoughts is paradoxical, in that concerted efforts to suppress particular thoughts often lead to an increase in intensity or frequency of that thought (Wegner et al., 1987). Similarly, studies examining emotional suppression and pain suppression indicate that avoidance is ineffective in the long term (Gross & Levenson, 1997; Cioffi & Holloway, 1993), while expression of difficult emotion results in a short-term increase, but longer-term decreases in arousal (Hughes, Uhlmann, & Pennebaker, 1994). Furthermore, various self-report studies have linked experiential avoidance and related constructs such as avoidance coping and thought suppression to psychopathology including obsessive-compulsive symptoms, substance abuse, and emotional dysregulation (Abramowitz, Lackey, & Wheaton, 2009; Forsyth, Parker, & Finlay, 2003; Gratz, Rosenthal, Tull, Lejuez, & Gunderson, 2006).

Experiential avoidance may be conceptualised as a product or function of psychological inflexibility. Consequently, ACT interventions which promote acceptance and enhance psychological flexibility may also be seen as targeting a reduction in experiential avoidance.

### **1.3.2 Defusion.**

Cognitive defusion techniques attempt to alter the undesirable functions of thoughts and other private events, rather than trying to alter their form, frequency, or situational sensitivity (Hayes et al., 2006). Cognitive defusion is thought to facilitate acceptance through reducing the behaviour-regulatory function of private events (Masuda et al., 2009); that is, reducing the direct impact private psychological events (thoughts and emotions) have on one's behaviours. ACT views cognitive defusion as particularly relevant in contexts where unsuccessful attempts to control private events, such as thought suppression, distraction, rumination, and avoidance, are maintained by one's thinking (Masuda et al., 2009). Defusion exercises are intended to foster an individual's attention to the process rather than the content of thoughts, to encourage active questioning of the believability of thoughts, and to increase values-consistent behaviour. Exercises include the "word repetition technique" (Titchener, 1916), which involves repeating a word until it loses its semantic meaning – this may often be done with a single word variant of a

troublesome thought a client experiences (e.g. 'stupid' or 'weak'); this serves to make the point that "thoughts do not mean what they say they mean" (Hayes et al., 2006). Other techniques include treating thoughts as an externally observed event, by giving it a shape, size, or form to reduce their literal quality.

It is important to distinguish defusion from mere distraction from thoughts – it has been demonstrated that defusion strategies are more effective than thought suppression or distraction tasks when it comes to reducing the believability of negative thoughts (Masuda et al., 2004). Defusion and defusion techniques have been identified as a potentially mediating factor in the long-term outcomes for individuals with depression (Zettle, Rains, & Hayes, 2011), substance abuse (Varra et al., 2008), anxiety disorders (Arch et al., 2012), and pain-related disability (Wicksell et al., 2008).

### **1.3.3 Present-moment awareness.**

ACT promotes non-judgemental contact with both private and external events as they occur, with the goal of having clients experience the world more directly, so as to facilitate more flexible behaviour and values-consistent actions (Hayes et al., 2006). Present-moment awareness is intrinsically linked with mindfulness, and in ACT terms is defined as "flexible, fluid, and voluntary attention to internal and external events as they are occurring, without attachment to evaluation or judgement" (Twohig, 2012, p. 503). Present-moment awareness is by no means exclusive to ACT. Indeed, various therapeutic modalities which pre-date ACT also heavily advocate for a mindfulness-based approach; these include Dialectical Behavioural Therapy (DBT; Linehan, 1993), and mindfulness-based stress reduction (MBSR; Kabat-Zinn, 1982).

Present moment awareness is thought to counteract experiential avoidance by encouraging an individual to experience the world as it is occurring rather than engaging in strategies aimed at controlling or reducing discomfort, and by decreasing the impact of the cognitively constructed world (Twohig, 2012). "Being present" in ACT terms is linked with the notion of the "observing self", or "self as context", and requires the ability to regulate attention to the here and now, to openly and fully experience what is occurring, and to describe these in a non-judgemental manner; these are skills which would be encouraged and enhanced throughout therapy. Rather than constantly being present, one is encouraged to notice when they are not present, and flexibly shifting attention to the present if it is in their best interests (Twohig, 2012). It is crucial to emphasise the importance of

awareness in conjunction with acceptance; if awareness is increased in isolation, experiential avoidance may be exacerbated rather than prevented (Hayes et al., 2006).

#### **1.3.4 Self-as-context.**

Self-as-context is intrinsically linked to present-moment awareness in that it also involves the ability to notice and observe internal experiences and events, supporting the notion that although ACT processes are conceptually distinct, they are fundamentally related. Adopting a self-as-context stance allows for awareness of one's own flow of experiences, as opposed to a self-as-content, or "conceptualised self" position, which fosters attachment to or investment in the content of one's experiences (Hayes et al., 2006).

It has been suggested that the conceptualised self arises as a result of a learning history of naming, categorising, and evaluating oneself using verbal language (Hayes et al., 1999); a predominantly verbal society reinforces our tendency and ability to relationally frame our experiences, both internal and external, with how we define 'who we are' (Hayes, 1995). Stringent efforts are made to protect a consistent sense of the conceptualised self, as alternatives feel threatening; however, maintenance of this consistency may come in the form of distortion or reinterpretation of events or experiences that feel inconsistent with the conceptualised self (Hayes et al., 1999). For example, if a person believes themselves to be kind, they leave themselves with less "space" to deal with instances of their own behaviour or thoughts which could be construed as cruel; thus, a conceptualised self becomes resistant to change or flexibility, and fosters self-deception. ACT aims to develop a sense of self-as-context, where the self is the place of perspective, rather than the content of experiences, allowing internal and external events to be experienced in the "here and now", without them being self-defining. This promotes a sense of flexibility, in which one can choose to follow and adhere to the sense of "who we are" in some situations, but not in others (Twohig, 2012). Self-as-context is thought to be facilitated by applying cognitive defusion techniques to conceptualization of the self, and by mindfulness exercises, again demonstrating the interplay between the ACT processes.

When compared to other ACT processes, there are relatively few studies which seek to demonstrate the role or effectiveness of self-as-context as a mediator of change; this may be in part due to there being only one specific measure of self-as-context (Gird & Zettle, 2013), and, being relatively recent, this has not yet had a

thorough investigation of its psychometric properties. However, there is some evidence to suggest that ACT interventions that do not include self-as-context exercises are less effective than those which do include it (Williams, Duggan, Crane, & Fennell 2006). Furthermore, a meta-analysis of ACT treatment component studies identified that self-as-context interventions (albeit referred to as 'mindfulness' within the review), had a significant effect size on targeted outcomes relative to inactive conditions (Levin et al., 2012).

### **1.3.5 Values.**

The emphasis on values is one of the features of ACT which distinguishes it from many alternative treatments, and it has been suggested that it is only within the context of values that the other processes of action, acceptance, and defusion come together into a sensible whole (Hayes, 2004). In ACT terms, values are elements of life that are important to the individual and motivate them to engage in certain activities (Twohig, 2012); they have been described as “verbally construed global desired life consequences (Hayes et al., 1999 p. 206). Unlike goals, which are obtainable, values can only be instantiated as an aspect of ongoing action – they can be pursued, but not possessed, and can provide guidance, meaning and purpose to an individual’s actions (Twohig, 2012). Thus, one of the early therapy tasks within ACT is often to do values clarification work; evocative exercises such as the “epitaph exercise”, in which a client is asked what they would like to see on their tombstone or hear at their eulogy, are used to develop clarity about fundamental values (Hayes, 2004). Tasks such as these serve to focus verbal processes towards psychological meaning and motivation. Once values have been clarified, achievable goals which serve to embody those values and associated goal-based actions can be identified, along with any specific barriers to performing these. Within ACT, the development of acceptance, defusion, present-moment-awareness, and self-as-context are not ends in themselves, but rather processes which allow the individual to pursue a more values-consistent life (Hayes et al., 2006).

There is evidence to indicate that ACT interventions which integrate values work have positive therapeutic effects. For example, pain tolerance is improved following ACT-values protocols compared to a control-values protocol (Páez Blarrina, Luciano, Gutiérrez Martínez, Valdivia, Ortega, & Rodríguez Valverde, 2008); in chronic pain populations, post-intervention increases in values-based action are associated with improved pain intensity, depression, and physical and psychosocial

disability (Vowles & McCracken, 2008). Positive effects have also been found for values exercises in non-clinical areas; for example, undergraduates who received values-based goal-setting training showed significantly improved academic grades (Chase et al., 2013).

### **1.3.6 Committed action.**

ACT encourages the development of increasing patterns of flexible and effective responding, both by removing the repertoire-narrowing effects of cognitive fusion and experiential avoidance, and promoting deliberate patterns of action that are concordant with an individual's chosen values; it is in the latter area that traditional behavioural change procedures are incorporated into therapy (Hayes, 2004; Twohig, 2012). While other ACT processes serve to either alter the context of inner experience, or alter the reinforcing or punishing effects of stimuli, committed action is more skills-based; it involves enacting one's values while practicing acceptance, defusion, being present, and treating oneself as the context for inner experiences, rather than the content (Twohig, 2012). Indeed, almost any behaviourally coherent behaviour change method – exposure, skills acquisition, goal-setting, and shaping methods, to name but a few - can be fitted into an ACT protocol in the pursuit of behaviour-change goals. Behaviour change efforts lead to contact with the psychological barriers which may be addressed through the other ACT processes, such as acceptance and defusion (Hayes et al., 2006), again serving to highlight the overlap between the various ACT processes.

Twohig (2012) describes committed action as involving “defining personal goals along a path and acting on those goals, while practicing the other ACT strategies, thus building larger patterns of values-oriented action”. It has been suggested that an individual can verbally state a value and their desire to act in ways which are consistent with this value, without ever translating this desire into tangible actions, and that a key task of an ACT therapist's values-based interventions is to facilitate this translation. Flaxman et al. (2010) provided an operationalised definition of committed action, comprising the following six components: (1) the enacting of one's values, as opposed to merely stating that one intends to behave in a particular way; (2) the moment-by-moment awareness of points at which behaviour has become inconsistent with one's values, and the subsequent re-direction of behaviour to re-align it with values; (3) committing to act in a values-consistent manner, even when doing so may result in contact with aversive experiences; (4) adopting an attitude of acceptance and taking each opportunity to act in a values-

consistent way (when the situation affords) including when attempts to behave in a values-consistent way are unsuccessful; (5) publically declaring one's values and commitment to them, such that one may enlist the help of others in pursuing values-based behaviour; (6) planning how one will pursue long-term values by setting concrete intermediary goals, describing how one will achieve them, and identifying potential barriers and ways in which to overcome these.

In the absence of committed action, two broad categories of consequences may arise: narrowing of behavioural repertoires via inaction and passivity; or excessive unhelpful behaviours such as drinking, taking drugs, or self-harming. Within the hexaflex model, people engaged in these types of behaviours are described as lacking the psychological flexibility to act sensitively to direct reinforcement contingencies, and are instead guided by private stimuli such as thoughts, feelings, and memories. This lack of flexibility restricts one's ability to adapt behaviour to the present circumstances, resulting in a less values-consistent way of living.

### **1.3.7 Three dyadic processes.**

In the initial conception of the ACT model, it was suggested that six interrelated processes underpinned psychological flexibility (Hayes et al., 1999). However, it was proposed that each process has a theoretically stronger link with one other process, forming three pairs that could be described as 'response styles': (1) the acceptance and defusion pair forms "open" responses; (2) present-moment awareness and self-as-context pair forms "centred" responses; (3) values and committed action link to form "engaged" responses. The suggestion that the six processes may be described more parsimoniously was reiterated by Hayes et al. (2004), by dividing the ACT model into two superordinate components: *mindfulness and acceptance processes*, comprising present-moment awareness, self-as-context, acceptance, and defusion; and *commitment and behaviour change processes*, comprising values and committed action.

Hayes and colleagues (2011) reviewed the empirical and theoretical literature on the contextual and behavioural therapies, and identify the emergence of an "empirical, if not intellectual consensus" regarding the key processes involved in psychopathology and psychotherapeutic change. This proposes that components, moderators, and processes of change across the contextual CBT approaches can be organized into three categories or "clusters". The first cluster comprises

techniques or processes designed to foster greater psychological openness, through techniques designed to reduce the automatic behavioural regulatory power of private events such as thoughts, feelings, and memories. The second cluster addresses flexible attention, ability to be present and attend to the here and now, perspective-taking, and theory of mind. The processes within this category deal with an individual's conscious awareness of the present moment, both internally and externally. Finally, the third cluster addresses meaningful action, specifically towards values; this encompasses motivation to change, commitment, and behavioural activation.

The identification of these three categories within the broader contextual CBT therapies resulted in a proposed reconfiguration of the ACT model. Within this reconfiguration, the six ACT processes are organised into three dyadic processes which reflect the three clusters identified by Hayes and colleagues (2011). The acceptance and defusion processes are combined to form an "openness to experience and detachment from literalness" dyad, corresponding to the first cluster described above. Present-moment awareness and self-as-context are combined to form a "self-awareness and perspective taking" dyad, corresponding to the second cluster. Values and committed action combine to form a "motivation and activation" dyad.

#### **1.4 Evidence for ACT**

There has been a great deal of research assessing the efficacy of ACT, comparing it to a range of therapies and across a broad spectrum of presentations. A full review of the literature is beyond the scope of this project; instead, the results of meta-analyses synthesising data from large numbers of ACT studies are addressed. An early meta-analysis of ACT interventions across 12 randomized control trials (RCTs; Hayes et al., 2006) found a moderate therapeutic effect for ACT, with a mean controlled effect size of Cohen's  $d = .48$ . To a certain extent, this was supported by an independent review of ACT and other third wave behavioural therapies - Öst (2008) also found a moderate effect size for ACT interventions ( $d = .68$ ) across 13 RCTs. Despite this effect size Öst concluded that, due to methodological issues, neither ACT nor the other third wave therapies assessed could be deemed empirically supported therapies; this latter point was later contested, in part due to the complexity of the ACT treatment groups relative to others (Gaudiano, 2009).

Other meta-analyses have reviewed both RCTs comparing ACT to control groups or established treatments (Powers, 2009; Levin & Hayes, 2009), and studies comparing ACT to CBT (Ruiz, 2012). ACT was broadly found to be equivalent to or superior to the alternatives. This was supported by a later review, which found that ACT was more effective than waiting list, treatment as usual, and placebo controls, and as effective as CBT in the treatment of addiction, anxiety disorders, depression, and somatic disorders (A-tjak et al., 2015). Further extensive meta-analysis of 28 trials concerning anxiety disorders, and 439 depression trials (Hacker, Stone, & Macbeth, 2016) revealed cumulative evidence for the efficacy of ACT relative to controls in the treatment of these disorders. A meta-analysis into the effectiveness of ACT for chronic pain patients (Veehof et al., 2011) also found that while not superior to CBT in reducing pain ( $d = .37$ ) or depression ( $d = .32$ ) in this patient group, it could be viewed as a useful alternative.

Conversely, a large-scale meta-analysis and systematic literature review found ACT to be ineffective and not established for intervention in somatic and psychiatric disorders, and in workplace stress (Öst, 2014). Again, Öst's findings were contested, this time by Atkins and colleagues (2017), arguing that "fundamental errors" such as the use of an idiosyncratic and un-validated rating scale (amongst other factors), rendered the review biased and invalid.

Overall, the current state of the evidence indicates that compared to placebo and waiting-list controls, ACT is an effective therapeutic approach for common mental and physical health difficulties; however it has not been demonstrated to be more effective than other approaches such as CBT (Hacker, Stone, & Macbeth, 2016). It is important to note that the claims regarding the effectiveness of ACT are based on treatment outcomes, and the majority of the cited research base does not scrutinise the processes by which the treatments have been effective. It has been argued that to develop a greater understanding of the mechanisms of change, empirical research must expand to include mediational analyses in studies of therapeutic effectiveness (Levin & Hayes, 2009). In the case of ACT, this would involve measurement and tracking of levels of psychological flexibility prior to, throughout, and even beyond the intervention period.

### **1.5 Psychological Flexibility – a Target for Therapy**

ACT is the only therapeutic approach which explicitly identifies psychological flexibility as the focus for intervention. However, it is not necessarily the only intervention which targets it. Kashdan and Rottenberg (2010) defined psychological



flexibility as a number of dynamic processes which unfold over time, and is reflected in how an individual: (1) adapts to fluctuating situational demands; (2) reconfigures mental resources; (3) shifts perspective, and (4) balances competing desires, needs, and life domains. Similarly, Hayes and colleagues (1999) defined it as an individual's ability to connect with the present moment fully, as a conscious human being, and to change or persist in behaviour, so as to bring it in line with identified values. With these definitions in mind, it has been suggested that contextual cognitive behavioural therapies (also known as third wave CBT) all converge on psychological flexibility as a mechanism of change (Hayes, Villatte, Levin, & Hildebrandt, 2011).

Hayes and colleagues (2011) clarify that while not all contextual CBT approaches target all processes of psychological flexibility, they are broadly designed to foster and improve it by promoting an open, aware, and active approach to living. This is based upon the premise that a life rich in these three components gives more space for an individual to experiment, grow, and be moved by experiences (Hayes et al., 2011). More historically, it was proposed that there were five key features of contextual CBT approaches (Hayes et al., 2004). These included: 1) Contextual methods and principles; 2) Broad and flexible repertoires versus an eliminative approach to syndromes; 3) Applied to the clinician, not just the client; 4) Builds on other strands of behavioural and cognitive therapy; 5) Deals with more complex issues characteristic of other traditions. The former two features in particular lend themselves to the promotion of psychological flexibility. Specifically, contextual methods and principles target the context and function of psychological events, rather than their content or intensity; the contextual targets include awareness, acceptance, cognitive flexibility, and defusion (amongst others) (Hayes et al., 2011). The focus on broad and flexible repertoires of responding to situations corresponds directly to the "adapts to fluctuating situational demands" aspect of Kashdan and Rottenberg's (2010) definition of psychological flexibility.

In their 2011 review, Hayes and colleagues provide specific examples and evidence for how different contextual CBT therapeutic approaches target different specific elements of psychological flexibility, to illustrate how the various approaches converge on this one transdiagnostic concept. For example, mindfulness-based therapies, based on Buddhist practices, which attempt to increase a focused, purposeful awareness of the present moment and relating to one's experiences in an open, non-judgemental, and accepting manner (Baer et al., 2006; Kabat-Zinn, 1994). This is thought to increase one's sensitivity to the

environment and own reactions, thus enhancing successful coping; present-moment awareness is also thought to serve as an alternative behaviour to rumination, and can help reduce engagement with maladaptive processes. In terms of the definitions of psychological flexibility identified above, this clearly corresponds to aspects of Hayes' (1999) definition – the individual's ability to connect the present moment fully. Another more integrative approach, Dialectical Behavioural Therapy (DBT; Linehan 1993), is broadly used as an approach for emotion dysregulation disorders and difficulties. As an integrative approach, DBT draws on various components of other treatments; notably within this context, DBT aims to strengthen the effective use of skills in mindfulness, distress tolerance, emotion regulation, and interpersonal effectiveness – again skills which map onto the definitions of psychological flexibility (Hayes et al., 2011; Kashdan & Rottenberg, 2010; Hayes et al., 1999).

Table 9 (adapted from Hayes et al., 2011) further serves to illustrate how particular techniques within the various contextual CBT approaches target openness, awareness, or action, and whether there is component or process evidence for each of these.

Given the theoretical and empirical evidence to indicate the centrality of psychological flexibility in these emerging, increasingly popular therapies, this suggests that it is a construct with broader relevance for understanding and influencing health. This supports the need for a measure which can assess, and indeed track, levels of psychological flexibility across time and interventions, to provide evidence for treatment efficacy and contribute to the ever-increasing body of therapy-process evidence. Furthermore, as not all approaches target all components of psychological flexibility, a measure which can also assess change in these individual processes (openness, awareness, action) would have great clinical and research utility.



Table 9.

Putative Process examples and component and process evidence for contextual forms of CBT (Adapted from Hayes et al., 2011)

Methods	Processes								
	Putative process example	Open		Putative process example	Aware		Putative process example	Active	
		Components	Processes		Components	Processes		Components	Processes
<b>Mindfulness based</b>	Open, accepting, focus	-	✓	Attentional training – following the breath	-	✓		-	-
<b>MCT</b>	Detached mindfulness	-	-	Attentional training technique	✓	-	Exposure	✓	-
<b>MI</b>	Open questions	-	-	-	-	-	Exploration of motives	-	✓
<b>BA</b>	Undermining avoidance	-	-	-	-	-	Scheduling events	-	✓
<b>IBCT</b>	Acceptance methods	-	✓	-	-	-	Behavioural homework	-	✓
<b>FAP</b>	Acceptance modelled in the relationship	-	✓	Focus on present-moment awareness	-	✓	Behavioural homework	-	-
<b>DBT</b>	Radical acceptance	-	✓	Attentional flexibility and control	-	-	Skills training	✓	✓
<b>ACT</b>	Acceptance and defusion exercises	✓	✓	Observer self and taking perspective	✓	✓	Values work	✓	-

Key: ACT, Acceptance and Commitment Therapy; BA, Behavioural Activation; DBT, Dialectical Behavioural Therapy; FAP, Functional Analytic Psychotherapy; IBCT, Integrative Behavioural Couple Therapy; MCT, Metacognitive Therapy; MI, Motivational Interviewing

## **1.6 Current Measures of Psychological Flexibility**

At present, there are a number of measures of psychological flexibility and its component processes. A systematic review of publically available measures of psychological flexibility and its processes (Batink, Jansen & Peeters, 2015) identified 58 different measures, encompassing disorder-specific, disease-specific, and process-specific assessments. This review was not exhaustive, omitting measures such as the Acceptance and Action Questionnaire for Depression (Cooper, 2009); the list of available psychological flexibility measures has also since been added to – for example the Multidimensional Psychological Flexibility Inventory (MPFI; Rolffs, Rogge & Wilson, 2016).

The ongoing development of PF measures suggests a deficiency in those currently available. In particular, concerns have been highlighted regarding the sensitivity and utility of general measures (Cooper, 2009; Lillis & Hayes, 2008; Hayes et al., 2004), precipitating the development of a variety of population-specific and condition-specific measures such as the Acceptance and Action Questionnaire for Weight (AAQ-W; Lillis & Hayes, 2008), the Chronic Pain Values Inventory (CPVI; McCracken & Yang, 2006), the Parental Acceptance and Action Questionnaire (PAAQ; Cheron et al., 2009), and the Avoidance and Fusion Questionnaire for Youth (AFQ-Y; Greco et al., 2008).

An additional critique of extant measures is that those which purport to be general measures of psychological flexibility do not provide a breakdown of the individual ACT processes. This has resulted in the development of process-specific measures such as the Cognitive Fusion Questionnaire (Gillanders et al., 2014). As with population- and condition-specific measures, endeavours to create sensitive and useful process-specific measures are ongoing.

### **1.6.1 AAQ-II.**

The AAQ-II is a 7-item questionnaire in which items are rated on a 7-point Likert scale from 1 (never true) to 7 (always true); low scores on the measure are thought to be indicative of higher levels of psychological flexibility, while high scores reflect psychological rigidity, avoidance, and immobility.

The AAQ-II is viewed as the 'gold standard' measure for psychological flexibility; Bond et al. (2011) identified it as having good factor structure, reliability, and

validity. Furthermore, the measure has been found to have good test-retest reliability, with both 3- and 12-month follow up data demonstrating large effect sizes (.81 and .79, respectively).

The factor structure of the AAQ-II was further evaluated using Confirmatory Factor Analysis (CFA), using a single-factor model (Fledderus et al., 2012). While the initial model showed satisfactory factor loadings of 0.5 or above, the model demonstrated a poor overall fit (CFI = .74; TLI = .67; RMSEA = .12; SRMR = .06). Freeing error terms on two specific items (allowing them to correlate) showed a pronounced improvement in overall model fit (CFI = .95; TLI = .93; RMSEA = .05; SRMR = .04), placing all fit indices within the recommended acceptable ranges (Hu & Bentler, 1999). This accounted for overlapping content in the two items, and permitted the researchers to conclude that a one-factor model provided a good fit for the data, and supporting the notion that the AAQ-II is unidimensional in its structure.

The single factor in the AAQ-II purportedly measures the construct of psychological flexibility along a continuum, indicating whether an individual has low or high levels. While this simplistic quality is desirable in a measure, in that summed scores allow for identification of individual differences on the latent construct of interest, a true unidimensional solution is uncommon (Hyland, 2014; Brown, 2015). In particular, the demonstrable single-factor structure of the AAQ-II calls into question whether the measure has remained faithful to the theoretical ACT model of six distinct processes, underpinning a latent construct of psychological flexibility. From a clinical perspective, the AAQ-II fails to discriminate between individuals with for example, high levels of self-as-context and defusion, but low levels of acceptance and committed action.

It should also be considered that the AAQ-II was originally developed as a measure of experiential avoidance rather than psychological flexibility. Indeed, even if the measure is accepted as a measure of psychological flexibility, the presence of only negatively valenced items identifies it as a measure of psychological inflexibility, rather than one of flexibility, particularly if one assigns to the views that the direct opposite of psychological flexibility is not psychological inflexibility. The issues identified with this “gold standard” measure of psychological flexibility supports the claims made by Kashdan and Rottenberg (2010) that there is a lack of consistent and operationalised definition and measure of psychological flexibility, making it a challenging area for both theoretical and empirical research.

### 1.6.2 CompACT.

In the initial development of the CompACT, 352 participants were recruited using online social media channels, targeting a general population. Exploratory Factor Analysis (EFA) was used to analyse the psychometric validity of the CompACT, which suggested a three-factor structure; the measure was found to have adequate internal consistency according to recommended ranges (Briggs & Cheek, 1986), with an item total correlation of .31. It was found to have a large significant correlation with the AAQ-II ( $r = .78$ ), indicating convergent validity with an established measure of ACT processes. Regarding the sub-scales, the CompACT 'openness' subscale demonstrated the strongest correlation with the AAQ-II ( $r = .77$ ), followed by the 'awareness' ( $r = .54$ ) and 'action' ( $r = .38$ ) subscales.

In order to assess the concurrent validity of the CompACT, correlations with outcome measures were evaluated. The CompACT demonstrated a large positive correlation with all three subscales of the Depression Anxiety Stress Scale (DASS-21; Henry & Crawford, 2005); the strongest association was with the depression subscale ( $r = .64$ ), with other scales ranging from  $r = .56$  to  $r = .64$ . The CompACT demonstrated a small but significant negative correlation ( $r = -.23$ ) with the Short Form Health Survey (SF-12v2; Ware, Kosinski & Keller, 1996; Ware et al., 2002) physical health subscale, and a large significant negative correlation ( $r = -.65$ ) with the mental health subscale. Collectively, these findings indicated that high scores on the CompACT, indicating higher levels of psychological flexibility, are associated with greater psychological wellbeing.

The factor structure, psychometric properties, and test-retest reliability of the CompACT were later evaluated in an independent sample ( $N = 313$ ) (Bayliss et al., 2018) and provided further support for CompACT being a reliable and valid measure of psychological flexibility, with a three-factor structure. An intercorrelated confirmatory factor analysis (CFA) yielded an acceptable model fit confirming the three-factor structure of the CompACT. Results of convergent, concurrent, and discriminant validity assessments reflected those of Francis et al., (2016). Test-retest data ( $N = 112$ ) confirmed stability over a two-week period with a large effect size ( $r = .88$ ).

Despite the evidence for the CompACT being a well-developed, psychometrically robust measure of psychological flexibility, as described by Hayes' et al.'s (2011) three dyadic processes, it would be remiss to not acknowledge some of the issues encountered and identified in the development process. During the Delphi process

used to identify candidate items for the CompACT (Francis et al., 2016), no items pertaining to the “self-as-context” processes were rated highly enough for inclusion, due to these items being ‘incomprehensible’ or overly abstract. In order to avoid biasing the measure towards individuals who had undergone ACT interventions, or were familiar with the terminology, items with good readability were given precedence.

A further consequence of utilising a Delphi methodology is the uneven distribution of items representing the different ACT processes, meaning that the breadth and scope of this process may not be adequately represented. Francis et al. (2016) provide a variety of plausible accounts for this inequality, including: 1) the prevalence of items measuring particular ACT processes in the measures used to populate the preliminary item pool; 2) items being retained or excluded based on the judgement decisions made by ACT experts regarding the face and content validity of items, rather than decisions being made to ensure coverage of all processes; 3) certain items were removed because they compromised the resolution of the CompACT factor structure. It was suggested that additional items pertaining to defusion processes could have been included in subsequent rating rounds; however, given that consensus was achieved for existing items and further rating would have risked attrition of the panel experts, this was deemed to be an unnecessary step.

## **1.7 Short Form Development**

### **1.7.1 Pros and cons of short form development.**

The argument for short-form use in both research and clinical practice is a somewhat intuitive one. Since the early 20<sup>th</sup> century (Doll, 1917), researchers have been developing short forms in a wide variety of topics, including personality assessments (e.g. the Minnesota Multiphasic Personality Inventory [MMPI]; Butcher & Hostelter, 1990), intelligence testing (e.g. the Wechsler scales; Wechsler, 1967; Silverstein, 1990), and health and wellbeing surveys (e.g. the Short Form Health Survey [SF12v2]; Ware & Sherbourne, 1992), to name but a few. Using an abbreviated measure reduces the burden on both the participant and the individual administering or scoring the measure. Given the proliferation of online, self-report research, and moves towards delivering online therapy (thus necessitating online outcome measure collection), participant and client retention is crucial; it has been demonstrated that, unsurprisingly, participant dropout increases as a function of measure length (Hoerger, 2010), highlighting the benefit of concise, abbreviated



measures. Furthermore, shorter measures permit researchers to investigate or assess a greater breadth of concepts and constructs, or to use multiple assessments of the same construct (thus improving validity), in a single testing session, without over-burdening participants (Widaman et al., 2011).

The functional contextualist underpinnings of ACT emphasise the importance of an individual's context, and their responding within that context; they also assert that something is 'true' insofar as it is 'useful' (Hayes, 2004). With this in mind, in order to assess the utility or 'truth' of ACT and other contextually-oriented therapies, idiographic research is needed to assess clients or participants across time and contexts, necessitating concise process and outcome measures.

Despite the apparently convincing arguments for the development of short forms, and their utility, they have been referred to as a 'necessary evil' by some (Tellegen & Briggs, 1967), while Weschler took an even harder line, claiming that the reduction of measures "as a time-saving device is unjustifiable and not to be encouraged" (p.37), asserting that those who felt there was not sufficient time for a full assessment should "find the time" (p. 37) (Wechsler, 1967). These criticisms are largely based on the argument that the use of short forms is rarely justified, and that actual practice for deriving short forms falls short of acceptable standards (Marsh et al., 2005; Smith et al., 2000). Levy (1968) identified a host of issues with short forms of intelligence tests, such as the use of small and unrepresentative samples, over-estimation of the psychometric properties, and failure to justify the trade-off between time saved and psychometric robustness lost. Indeed, it has been argued that the most likely outcome of using a short form is that the clinician or researcher will have a measure of the construct of interest that has poorer psychometric properties than if a full measure had been used (Widaman et al., 2011). Smith and colleagues (2000), in their review of practices in short form development, conceptualised these issues as the 'two general sins of short form development' - investigators making the assumption that the reliability and validity evidence for the full-length form directly applies to the abbreviated version, or that shorter forms require less validation evidence. The authors went on to identify 'Nine specific sins of short form development (Smith et al., 2000), including failure to show that content coverage of factors is preserved, failure to replicate factor structures, and failure to demonstrate that the short form measures each factor scale reliably, to name but a few.

Heavy criticisms of abbreviated measures notwithstanding, Smith et al. (2000) appeared to acknowledge the need for short forms in applied research and other areas and developed a set of guidelines for developing and judging short forms. These have since been discussed, added to, and applied by, a number of researchers (e.g. Marsh et al., 2005; Widaman et al., 2011 Hagtvet & Sipos, 2016) (see section 1.8.2). These were integral in informing the methodology used to derive and validate the CompACT-SF (see section 2.1).

### **1.7.2 Guidelines for short form development**

Various authors have outlined methodologically robust processes for developing and subsequently validating a short-form psychometric. One of the overarching messages in the literature is that the short form must be developed from a sufficiently validated full-length measure (Smith et al., 2000; Marsh et al., 2005; Widaman et al., 2011). As previously discussed, the full-length CompACT was developed in a methodologically robust fashion, validated, and then subsequently validated in an independent sample (Francis et al., 2016; Bayliss et al., 2018).

Beyond this initial key point, the recommendations from various authors are relatively concordant with one another. Widaman and colleagues (2011) assert that the validity of a form takes precedence over its reliability, while also acknowledging that reliability is to a certain extent a pre-requisite for validity. Smith and colleagues (2000) also indicate that an a priori calculation of a short form's scale reliability is a necessary step, however they are not directive with regards to how to demonstrate this. A common method for establishing the reliability of a scale is calculating the Cronbach's alpha statistic. This is a function of the items within a scale the average covariance between item pairs, and the variance of the total score (see section 2.1.1 for a further discussion of Cronbach's alpha). It should be noted that one issue of selecting items based on high reliability alone, is the risk of selecting items which have a high overlap with one another, and therefore one produces a scale including items with a high level of redundancy (Widaman et al., 2011). Another common method for assessing reliability is the Mean Interitem Correlation (MIC) (Widaman et al., 2011), however the issues with this are similar to those which arise if the Cronbach's alpha statistic is used. Indeed, Loewinger (1954) described the attenuation paradox in which increasing reliability leads to increasing validity up to a point, after which further increases in homogeneity and reliability decreases validity.

Another suggested method for selecting items is to do so based on those with the highest factor loadings on the common factor underlying the items, as demonstrated by a CFA (Widaman et al., 2011); selection of items with minimal cross-loadings on other factors, so as to minimise redundancy, is also advocated (Marsh et al., 2005). It has been proposed that the item selection should be influenced by apriori estimates of validity correlations with key criteria (Smith et al., 2000). That is, the selected items should be those which have strong associations with other measures of the same construct of interest; in the case of this research, this may be exemplified by the association of items with the AAQ-II. Arguments are made that subjective 'judgement decisions' (Smith et al., 2000) regarding the content coverage and face validity of items should be a key stage or feature in item selection (Marsh et al., 2005; Widaman et al., 2011), despite the risk of the bias of particular researchers affecting item selection. Widaman and colleagues (2011) briefly suggest random selection of items, however it is readily acknowledged that while this method is the most unbiased, it will likely not result in the most psychometrically robust short form. It should be noted that many of the item selection methodologies outlined here are empirical methods which may select based on patterns arising in a particular dataset (Widaman et al., 2011), resulting in a short form measure reflecting specific patterns of responding within this population.

In addition to outlining the steps for rigorously developing a short form through appropriate item selection, Smith and colleagues (2000) provide guidelines for the validation of short form measures. This includes demonstrating time or resource savings and their relation to loss of validity, given that this is arguably the primary justification for short form use. The authors advocate that the short form is administered to an independent sample, in order to assess whether the scales for each factor meet reasonable reliability standards, and demonstrate that the factor structure of the short form either reflects the full-length version, or to make readers aware of any differences. Finally, it is recommended that short form developers validate the short form in the form that it will be used, rather than doing so based on extraction of data from the full-length measure.

## 2. Extended Methods

### 2.1 Short Form Derivation

The methods used to derive the CompACT-SF were based on the recommendations of various authors (Smith et al., 2000; Stanton et al., 2002; Widaman et al., 2011). There were three broad domains on which items were assessed for retention or rejection, comprising: (1) *Internal item qualities* – properties of items that are assessed in reference to other items on the scale, or the scale’s summated scores; (2) *External item qualities* – connections between the scale, or individual items, and other theoretically related constructs or indicators; (3) *Judgemental item qualities* – issues which require subjective judgement and / or are difficult to assess in isolation of the context in which the scale is administered. The three domains, and the relevant processes within each, are discussed in more depth below.

Throughout the subsequent sections, each CompACT and CompACT-SF item were assigned a code which referred to its item number, its corresponding subscale, and whether it is a reverse-scored item. For example, C2r\_OE refers to CompACT item 2 (C2), which is reverse scored (*r*), and is part of the Openness to Experience subscale (*OE*). The Valued Action and Behavioural Awareness scales are demarcated by “VA” and “BA”, respectively.

#### 2.1.1 Internal item qualities.

##### 2.1.1.1 Internal consistency.

Internal consistency of a scale is typically based on the correlations between different items on the same measure or subscale. Internal consistency of a scale is most commonly measured with Cronbach’s alpha (Cronbach, 1951), which is calculated from the pairwise correlations between items; it is a function of the number of items in a test, the average covariance between item-pairs, and the variance of the total score. Because intercorrelations among scale or test items are maximal when all items measure the same construct, Cronbach’s alpha is widely accepted as an indirect indicator of the degree to which a set of items measure a single unidimensional latent construct. Commonly accepted values for alpha are outlined in Table 10.

Table 10.

*Summary of Cronbach's alpha statistic classifications.*

<b>Cronbach's alpha statistic</b>	<b>Internal consistency of scale</b>
$0.9 \leq \alpha$	Excellent
$0.8 \leq \alpha < 0.9$	Good
$0.7 \leq \alpha < 0.8$	Acceptable
$0.6 \leq \alpha < 0.7$	Questionable
$0.5 \leq \alpha < 0.6$	Poor
$\alpha < 0.5$	Unacceptable

### **2.1.1.2 Inter-item correlations**

Inter-item correlations examine the extent to which scores on one item are related to scores on other items within a scale or sub-scale (Piedmont, 2014). It provides an assessment of redundancy: the extent to which items on a scale are assessing the same content (Cohen & Swerdlik, 2005). This statistic may be used alongside, or instead of Cronbach's alpha, as the average inter-item correlation is less affected by the number of items on a scale – an important factor when seeking to reduce the number of items on a scale. Recommendations vary, however the general consensus is that average inter-item correlation should ideally lie between 0.2 and 0.4 (as measured by Pearson's  $r$ ), as this suggests that while the items are reasonably homogenous, they contain sufficiently unique variance so as to not be isomorphic (Briggs & Cheek, 1986; Robinson et al., 1991). Clark and Watson (1995) further advocate that individual inter-item correlations should fall between 0.15 and 0.5.

### **2.1.1.3 Factor loadings**

Factor analysis, when used for scale reduction, can lead to increased internal consistency of a scale (Clark & Watson, 1995). By extracting the factors underlying a particular set of items, one can discard items that fail to load strongly on the factor of interest (Stanton et al., 2002). This requires a Confirmatory Factor Analysis (CFA) to be completed on data collected using the full-length measure; the process for completing a CFA is outlined in section 2.3. The factor loading refers to the regression coefficient of a variable for the linear model that describes a latent

variable in a factor analysis (Field, 2013). Within this context, a higher factor loading indicates a more robust relationship between an item and the underlying latent variable (the sub-scale on which it loads); a higher factor loading is indicative of an item's construct validity (Comrey & Lee, 2013). A factor loading of  $>.50$  is deemed to be satisfactory, however loadings of  $>.70$  are desirable (Stevens, 1992; Field, 2013).

### **2.1.2 External item qualities.**

External item qualities capture the relationship between an item and measures of other theoretically similar constructs or meaningful criteria (Stanton et al., 2002). Hinkin (1995) recommended that externally based evaluations of construct validity should be integral in item selection, using concurrent or predictive validity correlations. Within this research, the Pearson's  $r$  correlations between CompACT items and the AAQ-II were used as an assessment of concurrent validity, as this is currently viewed as the gold standard measure of psychological flexibility. Correlation of items with clinically meaningful outcomes such as depression, anxiety, stress, and overall mental health, as measured by the Depression Anxiety Stress Scale (DASS-21; Henry & Crawford) and Short Form Health Survey (SF12v2; Ware, Kosinski, & Keller, 1996) respectively, were additional external qualities used in item selection.

### **2.1.3 Judgement decisions.**

Judgement decisions refer to criteria beyond statistical relations used to determine item selection; examples of such qualities include clarity of expression, semantic redundancy relative to other items, and an item's 'face' validity (Stanton et al., 2002). While these qualities may be seen as intrinsically less important than the internal and external qualities, Stanton and colleagues (2002) argue that this is not the case. For example, perceived invasiveness of items may affect respondent motivation, and therefore response rates (Baehr, Jones, Baydoun, & Behrens, 1994); similarly, wording of items, such as inclusion of negation and absolutes can influence the quality of items (Holden & Fekken, 1990) – neither of these qualities can be captured by statistical methods alone.

Within this research, judgement decisions were made specifically regarding the semantic redundancy or similarity of items, their face validity, and content coverage. Furthermore, given that items were assessed for both internal and

external item qualities, and performed differently across different criteria, judgement decisions were ultimately used to dictate which criteria were given precedence.

## **2.2 Short Form Development and Validation**

### **2.2.1 Measures.**

Various measures were used in the development and validation of the CompACT full measure, and in the derivation and validation of the CompACT-SF. The measures were used to assess convergent and concurrent validity, and sensitivity to social desirability, and are discussed in greater detail below.

#### ***2.2.1.1 Depression Anxiety Stress Scale (DASS-21).***

The 21-item Depression Anxiety Stress Scale (DASS-21) is a short form version of the 42-item measure of depression, anxiety, and stress (DASS) developed by Lovibond and Lovibond (1995). It is a self-report questionnaire assessing the severity of various symptoms associated with depression, anxiety, and stress; it has also been suggested that the DASS-21 taps a more general dimension of psychological distress or 'negative affect'. The measure requires participants to consider their experiences over the last week and indicate on a four-point Likert scale the degree to which statement applies to them; the scale ranges from 'did not apply to me at all (NEVER)' to 'applied to me very much, or most of the time (ALMOST ALWAYS)'. Research into the measure has identified a consistent factor structure, good internal reliability (Cronbach's alpha .82-.97) and concurrent validity, in both clinical and nonclinical samples (Antony, Bieling, Cox, Enns, & Swinson, 1998; Henry & Crawford, 2005; Lovibond & Lovibond, 1995). It has previously been demonstrated that higher scores on the CompACT correlate with lower scores on the DASS-21 (Francis et al., 2016; Bayliss et al., 2018); it was predicted that this pattern would be replicated in the CompACT-SF.

#### ***2.2.1.2 Short Form Health Survey.***

The Short Form Health Survey (SF-36; Ware & Sherbourne, 1992) is a 36-item self-report measure which assesses participants' physical health, sense of well-being, quality of life, and ability to function. Participants rate their view of their health on a five-point Likert scale ranging from 'poor' to 'excellent', across eight domains. These domains are: physical functioning, role limitations due to physical problems, social functioning, bodily pain, mental health, role limitations due to emotional

problems, vitality, and perceptions of general health. These eight domains are distilled into two summary component scores: The Physical Component Summary (PCS) and Mental Health Component Summary (MCS), with higher scores reflecting better quality of life and physical and emotional health.

Ware, Kosinski, and Keller (1996) used regression methods to select 12 items from the SF-36 to produce a short-form of the measure which reproduces the PCS and the MCS available from the longer measure, while reducing respondent burden. The SF12v2 was found to correlate highly with the SF-36, and to have good test-retest reliability, excellent internal consistency for both the physical and mental health subscales (Cronbach's alpha = .92 and .88, respectively), and to be equal to the SF-36 in responsiveness to longitudinal changes in health (Jenkinson et al., 1997; Maruish, 2012; Ware et al., 2002). Higher scores on the SF12v2 reflect better health and quality of life; the CompACT full measure and subscales have been found to have large significant correlations with the SF12v2 mental health subscale, but no significant association with the physical health subscale (Francis et al., 2016; Bayliss et al., 2018). Similar relationships were predicted for the CompACT-SF.

### ***2.2.1.3 Marlowe-Crowne Social Desirability Scale.***

The Marlowe-Crowne Social Desirability scale (MCSD; Crowne & Marlowe, 1960) is a 33-item self-report measure designed to identify whether a participant's responding is constrained by social desirability. Respondents are required to provide a 'yes' or 'no' response to items such as "I have never intensely disliked anyone", and "I sometimes feel resentful when I don't get my way"; responses are coded and a higher score is indicative of more socially desirable responses. Various short forms of the MCSD have been developed; a study using confirmatory factor analysis to evaluate different abbreviated versions and compare them to the structure of the full MCSD (Loo & Loewen, 2004) identified Ballard's (1992) 13-item version as being optimal of those available, based on RMSEA and AGFI indices. Various validation studies have demonstrated that this version has good internal consistency (.62 to .76) (Ballard, 1992; Loo & Thorpe, 2000), and strong correlation with the full MCSD (.91 to .97) (Fischer & Fick, 1993; Loo & Thorpe, 2000), making this version a good candidate for this study. It was predicted that there would be little to no association between scores on the CompACT-SF and the MCSD.



## 2.2.2 Confirmatory Factor Analysis.

Prior to conducting a CFA, three steps must be established, comprising: (1) specification of the number of latent factors; (2) specification of items to load onto particular factors; (3) identification of association between factors (Furr, 2011). Preliminary and subsequent research into the CompACT (Francis et al., 2016; Bayliss et al., 2018) completed these steps. Following this, latent factors must be assigned a scale (mean and variance), due to them being unobservable (Brown, 2015). Within this research, one item was identified as a 'marker item' with the loading is fixed to 1; the factor is then scaled as a reliable part of that marker item.

Furr (2011) describes several phases in a CFA, which are summarised in Figure 6. First, AMOS (the software) calculates the actual item variances and the covariances between the items from the collected data; this is used to estimate item parameters and assess model accuracy. Secondly, AMOS uses these actual variances and covariances to estimate parameters as specified by the researcher. For example, it uses the actual association between two items to estimate the factor loadings that they may have on a common factor. The information is used to estimate all factor loadings, inter-factor correlations, error variances, etc. The software also computes inferential statistics for each parameter; for a typical inferential test of a parameter, the null hypothesis is that the parameter is zero in the population. For example, the software tests all hypothesized 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 on statistical rules linking parameters to item variances and covariances, AMOS produces item variances and covariances as implied by the specified model and its estimated parameters. If the model is a good fit - in that it is a good approximation of the true factor model underlying the scale's items - the implied variances and covariances will closely match those computed in the first phase of analysis. If the model is poor, the implied and actual values will differ greatly.

In the fourth phase, AMOS generates information which reflects the overall adequacy of the hypothesized model. Specifically, it compares the implied and actual variances / covariances, computing 'model fit' indices, and 'modification indices'. A small discrepancy between implied and actual values results in indices of 'good fit', implying that the hypothesized measurement model adequately accounts for the associations among the scale's items. Conversely, large

discrepancies between implied and actual values result in 'poor fit' indices, which suggest that the hypothesized measurement model provides an inadequate account of the scale's data. 'Modification indices' indicate ways in which the hypothesized measurement model may be modified to make the hypothesized factor structure more consistent with the factor structure that may truly underlie the scale's items.

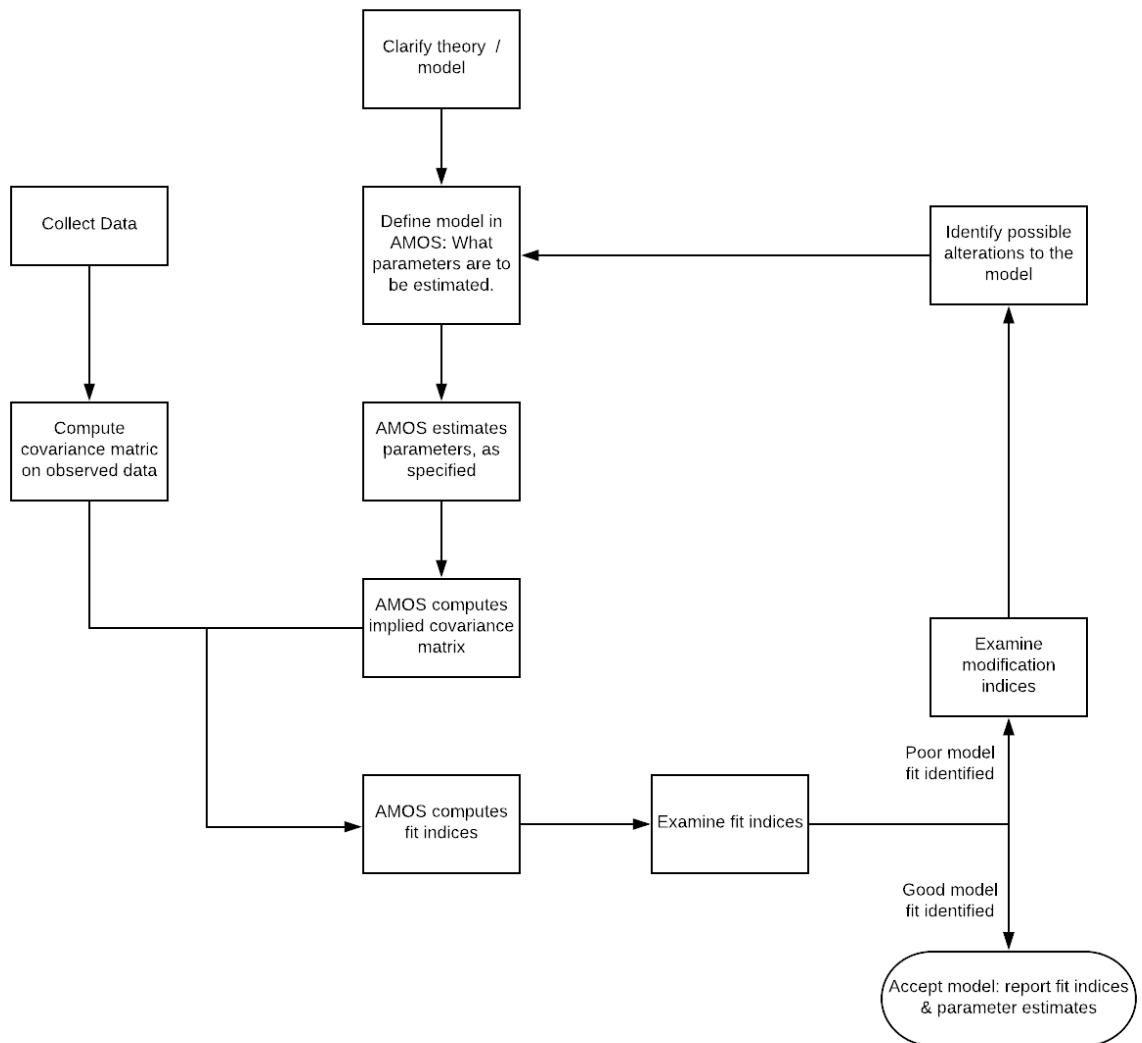


Figure 6. Flowchart of Confirmatory Factor Analysis (Furr 2011).

### 2.2.2.1 Evaluating model fit

Model fit can be evaluated using various statistics, and researchers are encouraged to use a variety of measures, rather than only selecting those which demonstrate the best fit, as different fit indexes work better with different sample

sizes and types of data (Schreiber et al., 2006). Although there is no universally agreed upon number of fit indices to report, it is suggested that the minimum should include: (1) the chi-squared value and the associated degrees of freedom and  $p$ -value; (2) an index to describe incremental fit, such as the Tucker-Lewis Index (TLI) or Comparative Fit Index (CFI); and (3) a residuals based measure (Jackson, Gillaspay & Purc-Stephenson, 2009). In line with this, Kline (2014) specifically recommends reporting the chi-squared test, the comparative fit index (CFI), the root mean square error of approximation (RMSEA), and the standardised root mean square residual (SRMR).

#### **2.2.2.2 Chi-squared**

The chi-squared statistic indicates the difference between the observed and expected covariance matrices. A value of zero would indicate no difference, and a perfect model fit, while values closer to zero indicate a smaller difference between observed and expected covariance matrices (i.e. a better fit); the greater the chi-squared value, the greater the discrepancy between the observed and expected matrices (Gatignon, 2010). The use of the chi-squared test as a measure of model fit has been criticised on the basis that it may result in failure to reject an inappropriate model in small sample sizes (Type I error), and reject an appropriate model in large sample sizes (Type II error) (Brown, 2015). In order to address this, the chi-squared statistic is often divided by the degrees of freedom ( $X^2/df$ ); for this statistic, values of  $< 3$  are deemed acceptable.

#### **2.2.2.3 Root mean square error of approximation (RMSEA).**

The root mean square error of approximation (RMSEA) (Steiger & Lind, 1980) analyses the discrepancy between the hypothesised model with optimally selected parameter estimates and the population covariance matrix, thus avoiding issues of sample size (Hooper, Coughlan, & Mullen, 2008). RMSEA values range from 0 to 1; values above .1 are considered to be indicators of a poor fit (Hu & Bentler, 1999). MacCallum, Browne, and Sugawara (1996) suggest that values of .01, .05, and .08 indicate excellent, good, and mediocre fit, respectively. It should be noted that the use of RMSEA has attracted criticism as models with a small  $df$  and low  $N$  may have an artificially large RMSEA value and thus be rejected, leading to the argument that RMSEA should not be used as a fit index for such models (Kenny, Kaniskan, & McCoach, 2014), however this criticism does not pertain to the current research.

#### **2.2.2.4 Comparative fit index**

The comparative fit index (one of a number of 'relative fit indices' (Bentler, 1990) compares the chi-squared statistic for the hypothesised model to that observed in the data, and examines the discrepancy. The inherent issues of sample size in the chi-squared test of model fit are also adjusted for in the CFI (Gatignou, 2010). Values range from 0 to 1, with larger values indicating greater similarity between the hypothesised and observed model, and therefore a better model fit. CFI values of .90 or larger have been considered to indicate acceptable model fit (Hu & Bentler, 1999), however other researchers advocate a stricter cut-off of .95 or above (Schreiber et al., 2006).

#### **2.2.2.5 Standardized root mean square residual (SRMR).**

The standardized root mean square residual is an absolute measure of fit and is defined as the standardised difference between the observed correlation and the predicted correlation. The value is the square root of the discrepancy between the observed and predicted covariance matrices (Hooper, Coughlan, & Mullen, 2008). Because it is an absolute measure of fit, a value of zero indicates perfect fit, with values of .08 or less being seen as acceptable (Hu & Bentler, 1999; Schreiber et al., 2006). As a measure, it is positively biased, however that is greater for small  $N$  and low  $df$  studies.

### **3. Extended Results**

#### **3.1 CompACT-SF Derivation**

The results of each stage of the derivation process are outlined below.

##### **3.1.1 Inter-item correlations.**

Inter-item correlations for all items on the full CompACT are shown in Table 11. Inter-item correlations for the VA, OE, and BA scales are shown in Tables 12, 13, and 14 (respectively) below

### **3.1.1.1 Full-scale inter-item correlation matrix.**

Table 11.

*Inter-item correlations for CompACT full measure*

Item	C1				C5		C7																
Num	_V	C2r	C3r	C4r	_V	C6r	_V	C8r	C9r	C10	C11r	C12r	C13	C14	C15r	C16r	C17	C18r	C19r	C20	C21	C22	C23
ber	A	_OE	_BA	_OE	A	_OE	A	_OE	_BA	_VA	_OE	_BA	_OE	_VA	_OE	_BA	_VA	_OE	_BA	_OE	_VA	_OE	_VA
<b>C1_</b>					0.5																		
<b>VA</b>		0.13	0.24	0.14	6	0.30	2	0.17	0.26	0.44	0.17	0.17	0.26	0.43	0.14	0.14	0.55	0.26	0.19	0.25	0.37	0.25	0.45
<b>C2r_</b>	0.1				0.1																		
<b>OE</b>	3		0.27	0.50	8	0.39	9	0.45	0.32	0.12	0.50	0.22	0.38	0.16	0.59	0.18	0.22	0.44	0.21	0.39	0.10	0.44	0.14
<b>C3r_</b>	0.2				0.2																		
<b>BA</b>	4	0.27		0.33	8	0.37	1	0.23	0.55	0.28	0.28	0.69	0.26	0.31	0.29	0.55	0.25	0.34	0.54	0.20	0.23	0.28	0.27
<b>C4r_</b>	0.1				0.2																		
<b>OE</b>	4	0.50	0.33		0	0.42	6	0.52	0.42	0.11	0.47	0.28	0.41	0.16	0.57	0.26	0.18	0.39	0.34	0.38	0.08	0.46	0.17
<b>C5_</b>	0.5																						
<b>VA</b>	6	0.18	0.28	0.20		0.41	4	0.25	0.31	0.58	0.30	0.23	0.32	0.52	0.21	0.16	0.47	0.30	0.26	0.35	0.54	0.35	0.54
<b>C6r_</b>	0.3				0.4																		
<b>OE</b>	0	0.39	0.37	0.42	1		3	0.42	0.56	0.24	0.41	0.36	0.37	0.28	0.39	0.26	0.34	0.45	0.36	0.45	0.19	0.42	0.33
<b>C7_</b>	0.4				0.4																		
<b>VA</b>	2	0.09	0.21	0.06	4	0.23		0.04	0.20	0.47	0.20	0.16	0.23	0.58	0.08	0.13	0.47	0.34	0.18	0.17	0.49	0.17	0.48
<b>C8r_</b>	0.1				0.2																		
<b>OE</b>	7	0.45	0.23	0.52	5	0.42	4		0.35	0.15	0.44	0.25	0.45	0.14	0.48	0.19	0.24	0.31	0.26	0.43	0.11	0.48	0.16
<b>C9r_</b>	0.2				0.3																		
<b>BA</b>	6	0.32	0.55	0.42	1	0.56	0	0.35		0.26	0.33	0.55	0.37	0.26	0.34	0.48	0.27	0.37	0.53	0.33	0.19	0.38	0.30
<b>C10</b>	0.4				0.5																		
<b>_VA</b>	4	0.12	0.28	0.11	8	0.24	7	0.15	0.26		0.19	0.23	0.22	0.51	0.13	0.17	0.45	0.25	0.24	0.22	0.71	0.24	0.55
<b>C11r</b>	0.1	0.50	0.28	0.47	0.3	0.41	0.2	0.44	0.33	0.19		0.28	0.43	0.23	0.61	0.27	0.24	0.56	0.28	0.38	0.13	0.44	0.21

<b>_OE</b>	7				0		0																
<b>C12r</b>	0.1				0.2		0.1																
<b>_BA</b>	7	0.22	0.69	0.28	3	0.36	6	0.25	0.55	0.23	0.28		0.19	0.26	0.28	0.56	0.23	0.29	0.59	0.19	0.17	0.21	0.22
<b>C13</b>	0.2				0.3		0.2																
<b>_OE</b>	6	0.38	0.26	0.41	2	0.37	3	0.45	0.37	0.22	0.43	0.19		0.27	0.42	0.17	0.28	0.32	0.26	0.46	0.16	0.71	0.27
<b>C14</b>	0.4				0.5		0.5																
<b>_VA</b>	3	0.16	0.31	0.16	2	0.28	8	0.14	0.26	0.51	0.23	0.26	0.27		0.18	0.18	0.50	0.35	0.23	0.26	0.46	0.24	0.55
<b>C15r</b>	0.1				0.2		0.0																
<b>_OE</b>	4	0.59	0.29	0.57	1	0.39	8	0.48	0.34	0.13	0.61	0.28	0.42	0.18		0.26	0.18	0.52	0.31	0.39	0.11	0.48	0.17
<b>C16r</b>	0.1				0.1		0.1																
<b>_BA</b>	4	0.18	0.55	0.26	6	0.26	3	0.19	0.48	0.17	0.27	0.56	0.17	0.18	0.26		0.19	0.23	0.57	0.07	0.15	0.15	0.13
<b>C17</b>	0.5				0.4		0.4																
<b>_VA</b>	5	0.22	0.25	0.18	7	0.34	7	0.24	0.27	0.45	0.24	0.23	0.28	0.50	0.18	0.19		0.28	0.25	0.30	0.39	0.26	0.54
<b>C18r</b>	0.2				0.3		0.3																
<b>_OE</b>	6	0.44	0.34	0.39	0	0.45	4	0.31	0.37	0.25	0.56	0.29	0.32	0.35	0.52	0.23	0.28		0.32	0.30	0.21	0.32	0.33
<b>C19r</b>	0.1				0.2		0.1																
<b>_BA</b>	9	0.21	0.54	0.34	6	0.36	8	0.26	0.53	0.24	0.28	0.59	0.26	0.23	0.31	0.57	0.25	0.32		0.18	0.20	0.25	0.21
<b>C20</b>	0.2				0.3		0.1																
<b>_OE</b>	5	0.39	0.20	0.38	5	0.45	7	0.43	0.33	0.22	0.38	0.19	0.46	0.26	0.39	0.07	0.30	0.30	0.18		0.17	0.50	0.25
<b>C21</b>	0.3				0.5		0.4																
<b>_VA</b>	7	0.10	0.23	0.08	4	0.19	9	0.11	0.19	0.71	0.13	0.17	0.16	0.46	0.11	0.15	0.39	0.21	0.20	0.17		0.16	0.49
<b>C22</b>	0.2				0.3		0.1																
<b>_OE</b>	5	0.44	0.28	0.46	5	0.42	7	0.48	0.38	0.24	0.44	0.21	0.71	0.24	0.48	0.15	0.26	0.32	0.25	0.50	0.16		0.26
<b>C23</b>	0.4				0.5		0.4																
<b>_VA</b>	5	0.14	0.27	0.17	4	0.33	8	0.16	0.30	0.55	0.21	0.22	0.27	0.55	0.17	0.13	0.54	0.33	0.21	0.25	0.49	0.26	

NB: CXX refers to the CompACT item number; r refers to reverse-scored items; VA, OE, and BA refer to the Valued Action, Openness to Experience, and Behavioural Awareness sub-scales, respectively.





### 3.1.1.2 Sub-scale inter-item correlation matrix

Table 12.

*Inter-item correlations for the Valued Action sub-scale*

<b>Item Number</b>	<b>C1_VA</b>	<b>C5_VA</b>	<b>C7_VA</b>	<b>C10_VA</b>	<b>C14_VA</b>	<b>C17_VA</b>	<b>C21_VA</b>	<b>C23_VA</b>
<b>C1_VA</b>		0.562	0.415	0.439	0.427	0.549	0.372	0.454
<b>C5_VA</b>	0.562		0.438	0.576	0.519	0.465	0.542	0.536
<b>C7_VA</b>	0.415	0.438		0.466	0.583	0.465	0.485	0.484
<b>C10_VA</b>	0.439	0.576	0.466		0.509	0.451	0.714	0.546
<b>C14_VA</b>	0.427	0.519	0.583	0.509		0.5	0.455	0.552
<b>C17_VA</b>	0.549	0.465	0.465	0.451	0.5		0.389	0.539
<b>C21_VA</b>	0.372	0.542	0.485	0.714	0.455	0.389		0.488
<b>C23_VA</b>	0.454	0.536	0.484	0.546	0.552	0.539	0.488	

NB: CXX refers to the CompACT item number; r refers to reverse-scored items;

Table 13.

*Inter-item correlations for the Openness to Experience sub-scale*

<b>Item Number</b>	<b>C2r_OE</b>	<b>C4r_OE</b>	<b>C6r_OE</b>	<b>C8r_OE</b>	<b>C11r_OE</b>	<b>C13_OE</b>	<b>C15r_OE</b>	<b>C18r_OE</b>	<b>C20_OE</b>	<b>C22_OE</b>
<b>C2r_OE</b>		0.5	0.393	0.446	0.499	0.384	0.586	0.44	0.391	0.444
<b>C4r_OE</b>	0.5		0.424	0.517	0.468	0.408	0.568	0.387	0.379	0.464
<b>C6r_OE</b>	0.393	0.424		0.42	0.406	0.37	0.39	0.445	0.453	0.421
<b>C8r_OE</b>	0.446	0.517	0.42		0.44	0.445	0.483	0.307	0.432	0.484
<b>C11r_OE</b>	0.499	0.468	0.406	0.44		0.43	0.607	0.563	0.375	0.443
<b>C13_OE</b>	0.384	0.408	0.37	0.445	0.43		0.42	0.321	0.461	0.707
<b>C15r_OE</b>	0.586	0.568	0.39	0.483	0.607	0.42		0.521	0.394	0.475
<b>C18r_OE</b>	0.44	0.387	0.445	0.307	0.563	0.321	0.521		0.299	0.323
<b>C20_OE</b>	0.391	0.379	0.453	0.432	0.375	0.461	0.394	0.299		0.498
<b>C22_OE</b>	0.444	0.464	0.421	0.484	0.443	0.707	0.475	0.323	0.498	

NB: CXX refers to the CompACT item number; r refers to reverse-scored items;

Table 14.

*Inter-item correlations for the Behavioural Awareness sub-scale*

<b>Item number</b>	<b>C3r_BA</b>	<b>C9r_BA</b>	<b>C12r_BA</b>	<b>C16r_BA</b>	<b>C19r_BA</b>
<b>C3r_BA</b>		0.548	0.692	0.55	0.542
<b>C9r_BA</b>	0.548		0.55	0.482	0.531
<b>C12r_BA</b>	0.692	0.55		0.557	0.59
<b>C16r_BA</b>	0.55	0.482	0.557		0.57
<b>C19r_BA</b>	0.542	0.531	0.59	0.57	

NB: CXX refers to the CompACT item number; r refers to reverse-scored items;

### 3.1.2 Judgement decisions.

Items were assessed for face validity, content coverage, and semantic similarity. Items identified as having similar wording or content coverage were paired or grouped together with the 'best' candidates selected for retention. Table 15 illustrates the grouping of items within each sub-scale.

Table 15.

*Item pairings according to judgement decisions on item quality.*

Scale and Item Reference	Item Pairs
<b>Valued Action</b>	
C1_VA	I can identify the things that really matter to me in life and pursue them
C23_VA	I can keep going with something when it's important to me
C5_VA	I act in ways that are consistent with how I wish to live my life
C10_VA	I behave in line with my personal values
C21_VA	My values are really reflected in my behaviour
C7_VA	I make choices based on what is important to me, even if it is stressful
C14_VA	I undertake things that are meaningful to me, even when I find it hard to do so
C17_VA	I am able to follow my long terms plans including times when progress is slow
<b>Openness to Experience</b>	
C2r_OE	One of my big goals is to be free from painful emotions
C11r_OE	I go out of my way to avoid situations that might bring difficult thoughts, feelings, or sensations
C15r_OE	I work hard to keep out upsetting feelings
C8r_OE	I tell myself that I shouldn't have certain thoughts

<b>C13_OE</b>	I am willing to fully experience whatever thoughts, feelings and sensations come up for me, without trying to change or defend against them
<b>C20_OE</b>	Thoughts are just thoughts – they don't control what I do
<b>C22_OE</b>	I can take thoughts and feelings as they come, without attempting to control or avoid them
<b>*C4r_OE</b>	I try to stay busy to keep thoughts or feelings from coming
<b>*C6r_OE</b>	I get so caught up in my thoughts that I am unable to do the things that I most want to do
<b>*C18r_OE</b>	Even when something is important to me, I'll rarely do it if there is a chance it will upset me
<b>Behavioural Awareness</b>	
<b>C3r_BA</b>	I rush through meaningful activities without being really attentive to them
<b>C12r_BA</b>	Even when doing the things that matter to me, I find myself doing them without paying attention
<b>C16r_BA</b>	I do jobs or tasks automatically, without being aware of what I'm doing
<b>C19r_BA</b>	It seems I am "running on automatic" without much awareness of what I'm doing
<b>*C9r_BA</b>	I find it difficult to stay focused on what's happening in the present

Key: \* refers to items which were not paired with any others

NB: CXX refers to the CompACT item number; r refers to reverse-scored items.

### 3.1.3 CFA.

A confirmatory factor analysis was completed using the secondary data, with an a priori defined three-factor structure (Francis et al., 2016; Bayliss et al., 2018). Table 16 shows factor loadings for items on each subscale; each subscale was represented by a factor. Items with the highest factor loadings were identified as candidate items for the final short-form.

Table 16.

*Factor loading of items onto factors corresponding to subscales.*

<b>Openness to Experience</b>		<b>Valued Action</b>		<b>Behavioural Awareness</b>	
<b>Item</b>	<b>Factor Loading</b>	<b>Item</b>	<b>Factor Loading</b>	<b>Item</b>	<b>Factor Loading</b>
<b>C2r_OE</b>	.68	<b>C1_VA</b>	.64	<b>C3r_BA</b>	.80
<b>C4r_OE</b>	.69	<b>C5_VA</b>	.75	<b>C9r_BA</b>	.71
<b>C6r_OE</b>	.62	<b>C7_VA</b>	.66	<b>C12r_BA</b>	.81
<b>C8r_OE</b>	.66	<b>C10_VA</b>	.76	<b>C16r_BA</b>	.69
<b>C11r_OE</b>	.71	<b>C14_VA</b>	.72	<b>C19r_BA</b>	.73
<b>C13_OE</b>	.66	<b>C17_VA</b>	.67		
<b>C15r_OE</b>	.75	<b>C21_VA</b>	.71		
<b>C18r_OE</b>	.61	<b>C23_VA</b>	.73		
<b>C20_OE</b>	.60				
<b>C22_OE</b>	.70				

NB: CXX refers to the CompACT item number; r refers to reverse-scored items.

### 3.1.4 External correlations.

Correlations between candidate CompACT-SF items and external criteria are shown in Tables 17 and 18.

Table 17.

*Correlations between candidate CompACT-SF items and scores on the DASS-21 (and subscales) and AAQ-II*

<b>Measure</b>	<b>DASS-21 Depression</b>	<b>DASS-21 Anxiety</b>	<b>DASS-21 Stress</b>	<b>DASS-21 Total</b>	<b>AAQ-II Total</b>
<b>Candidate</b>					
<b>Item</b>					
<b>C1_VA</b>	-0.389	-0.213	-0.213	-0.314	-0.343
<b>C2r_OE</b>	-0.406	-0.367	-0.354	-0.429	-0.513
<b>C3r_BA</b>	-0.383	-0.3	-0.342	-0.392	-0.394
<b>C4r_OE</b>	-0.381	-0.404	-0.458	-0.472	-0.55
<b>C5_VA</b>	-0.433	-0.29	-0.3	-0.392	-0.45
<b>C6r_OE</b>	-0.534	-0.467	-0.495	-0.57	-0.647
<b>C7_VA</b>	-0.249	-0.141	-0.11	-0.193	-0.239
<b>C8r_OE</b>	-0.396	-0.359	-0.407	-0.442	-0.505
<b>C9r_BA</b>	-0.476	-0.4	-0.477	-0.516	-0.552
<b>C10_VA</b>	-0.268	-0.203	-0.223	-0.265	-0.309
<b>C11r_OE</b>	-0.384	-0.367	-0.344	-0.416	-0.539
<b>C12r_BA</b>	-0.39	-0.342	-0.351	-0.412	-0.391
<b>C13_OE</b>	-0.327	-0.314	-0.341	-0.374	-0.524
<b>C14_VA</b>	-0.261	-0.154	-0.141	-0.214	-0.284
<b>C15r_OE</b>	-0.364	-0.372	-0.364	-0.417	-0.515
<b>C16r_BA</b>	-0.28	-0.259	-0.315	-0.325	-0.268
<b>C17_VA</b>	-0.384	-0.264	-0.253	-0.345	-0.374
<b>C18r_OE</b>	-0.439	-0.368	-0.308	-0.425	-0.493
<b>C19r_BA</b>	-0.393	-0.333	-0.378	-0.421	-0.383
<b>C20_OE</b>	-0.365	-0.314	-0.348	-0.392	-0.509
<b>C21_VA</b>	-0.208	-0.13	-0.117	-0.175	-0.213
<b>C22_OE</b>	-0.355	-0.323	-0.395	-0.409	-0.565
<b>C23_VA</b>	-0.332	-0.192	-0.179	-0.271	-0.33





Table 18.

*Correlations between candidate CompACT-SF items and scores on the sf-12v2*

<b>Measure</b>	<b>Physical Function</b>	<b>Role Physical</b>	<b>Bodily Pain</b>	<b>General Health</b>	<b>Vitality</b>	<b>Social Function</b>	<b>Role Emotional</b>	<b>Mental Health</b>	<b>Physical Health (comp)</b>	<b>Mental Health (comp)</b>
<b>Candidate Item</b>										
<b>C1_VA</b>	0.076	0.118	0.136	0.214	0.217	0.254	0.273	0.278	0.039	0.299
<b>C2r_OE</b>	0.048	0.151	0.153	0.178	0.192	0.322	0.377	0.355	-0.012	0.388
<b>C3r_BA</b>	0.087	0.152	0.112	0.184	0.267	0.266	0.286	0.321	0.024	0.333
<b>C4r_OE</b>	-0.007	0.103	0.109	0.151	0.195	0.329	0.348	0.404	-0.074	0.415
<b>C5_VA</b>	0.044	0.141	0.114	0.264	0.259	0.328	0.391	0.375	-0.01	0.419
<b>C6r_OE</b>	0.085	0.211	0.186	0.252	0.323	0.468	0.529	0.513	-0.021	0.564
<b>C7_VA</b>	0.05	0.087	0.07	0.19	0.189	0.091	0.194	0.17	0.038	0.187
<b>C8r_OE</b>	0.017	0.131	0.138	0.143	0.23	0.329	0.372	0.384	-0.049	0.415
<b>C9r_BA</b>	0.101	0.219	0.161	0.26	0.375	0.404	0.45	0.452	0.018	0.498
<b>C10_VA</b>	0.036	0.126	0.11	0.157	0.201	0.214	0.256	0.221	0.021	0.263
<b>C11r_OE</b>	0.084	0.173	0.155	0.213	0.264	0.297	0.401	0.359	0.015	0.398
<b>C12r_BA</b>	0.16	0.18	0.136	0.198	0.288	0.294	0.317	0.325	0.063	0.343
<b>C13_OE</b>	0.03	0.139	0.115	0.172	0.267	0.267	0.342	0.414	-0.04	0.405
<b>C14_VA</b>	0.026	0.093	0.045	0.183	0.208	0.143	0.211	0.195	0.012	0.226
<b>C15r_OE</b>	0.026	0.126	0.131	0.185	0.151	0.279	0.316	0.348	-0.016	0.348
<b>C16r_BA</b>	0.098	0.16	0.152	0.209	0.271	0.188	0.184	0.244	0.096	0.234

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<b>C17_VA</b>	0.112	0.173	0.173	0.288	0.25	0.214	0.329	0.31	0.082	0.318
<b>C18r_OE</b>	0.027	0.166	0.172	0.162	0.209	0.276	0.303	0.287	0.023	0.321
<b>C19r_BA</b>	0.077	0.124	0.154	0.207	0.299	0.291	0.29	0.358	0.022	0.363
<b>C20_OE</b>	-0.005	0.088	0.143	0.145	0.189	0.301	0.385	0.389	-0.073	0.414
<b>C21_VA</b>	-0.028	0.063	0.042	0.104	0.118	0.123	0.197	0.129	-0.023	0.182
<b>C22_OE</b>	0.088	0.174	0.117	0.217	0.259	0.32	0.379	0.443	-0.012	0.433
<b>C23_VA</b>	0.065	0.133	0.084	0.225	0.248	0.199	0.292	0.254	0.029	0.293

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### 3.1.5 Review, external criteria, and judgement decisions

As per recommendations for short form development (Smith et al., 2000; Stanton et al., 2005; Widaman et al., 2011), following the assessment of internal item qualities, members of the research team met to discuss candidate items for retention and removal, and to resolve disagreements or discrepancies. A consensus was reached for the following items to be retained as candidates for the CompACT-SF: C2r\_OE, C3r\_BA, C4r\_OE, C5\_VA, C10\_VA, C11r\_OE, C12r\_BA, C14\_VA, C19r\_BA, C22\_BA, C23\_VA.

The new scale and component subscales were assessed for internal reliability using Cronbach's alpha. The internal reliability of the openness to experience scale was found to be unacceptably low ( $\alpha < .80$ ); item C15r\_OE was identified as having a low "alpha if item removed" statistic, so was reintroduced as a candidate item to preserve scale reliability. This resulted in acceptable  $\alpha$  levels for the new scale and sub-scales. A CFA was run on the secondary data for the new candidate scale, yielding an unacceptable model fit. Review of the modification indices resulted in the removal of item C22\_BA.

At this point, relationships between CompACT items and external criteria were assessed using Pearson's  $r$ ; these are illustrated in Table 17 and Table 18. All CompACT items were assessed with a view to ensure that items which performed poorly according to internal criteria, but well on external criteria, were not erroneously removed (and vice versa). Item C10\_VA was identified as having weak relationships with all external criteria, so was removed. Item C6r\_OE was identified as having the strongest relationships with external criteria relative to all other items, so was re-introduced as a candidate item; discussions also identified item C6r\_OE as being the only item for retention which covered the "Cognitive Fusion / Defusion" aspect of the ACT Hexaflex.

At this point, the candidate CompACT-SF was ten items in length and is summarised in Table 19. Further discussions with the research team balanced the need for parsimony versus content coverage and statistical robustness. The relative weighting of scales and item wordings were reviewed; it was identified that the Openness to Experience sub-scale was over-represented and, in the view of the research team, there was some redundancy evident. Items 2, 4, 11, and 15 were identified as tapping into similar constructs; given that item 15 had been re-

introduced to maintain an acceptable level of internal consistency, this was retained by default. It was decided that semantically, items 2 and 4 were the weakest; they also achieved the lowest factor loadings in the CFA of the four items in question (0.68 and 0.69, respectively). Items were then assessed to determine which would have the smallest impact on the internal consistency of the scale (measured by Cronbach's  $\alpha$ ) if it were removed, however there was no discernible difference. The research team collectively decided that the parsimony and balance afforded by removing both items, outweighed the cost to the consistency and coverage of the scale.

It was identified that a Behavioural Awareness sub-scale with three items (C3r\_BA, C12r\_BA, and C19r\_BA) achieved an internal consistency of  $\alpha = .823$ , with little impact if item 19 were to be removed ( $\alpha = .818$ ). Furthermore, item 19 demonstrated the weakest factor-loading of candidate BA items. The research team reached the consensus that item 19 could also be removed without great cost to the scale.

Table 19.

*Candidate CompACT-SF scale*

<b>CompACT Item Number</b>	<b>Scale</b>	<b>Question</b>
2	OE	One of my big goals is to be free from painful emotions
3	BA	I rush through meaningful activities without being really attentive to them
4	OE	I try to stay busy to keep thoughts or feelings from coming
5	VA	I act in ways which are consistent with how I wish to live my life
6	OE	I get so caught up in my thoughts that I am unable to do the things that I most want to do
11	OE	I go out of my way to avoid situations that might bring difficult thoughts, feelings, or sensations
12	BA	Even when doing the things that matter to me, I find myself doing them without paying attention
14	VA	I undertake things that are meaningful to me, even when I find it hard to do so
15	OE	I work hard to keep out upsetting feelings
19	BA	It seems I am “running on automatic” without much awareness of what I’m doing
23	VA	I can keep going with something when it’s important to me

**3.1.6 Item removals and reasons.**

A summary of items removed from the CompACT full measure, and reasons for their removal, is provided in Table 20.

Table 20.

*CompACT Items not retained for the CompACT-SF, and reasons.*

<b>Item Number</b>	<b>Reason for Item removal</b>
<b>C1_VA</b>	Not retained on criteria 1, 3, and 4
<b>C2r_OE</b>	Judgement decision: Item removed for parsimony
<b>C4r_OE</b>	Judgement decision: Item removed for parsimony
<b>C7_VA</b>	Not retained on criteria 1 and 4
<b>C8r_OE</b>	Not retained on criteria 1 and 4
<b>C9r_BA</b>	Not retained on criteria 1, 2, and 4
<b>C10_VA</b>	Low correlations with external measures
<b>C13_OE</b>	Not retained on criteria 2 and 3
<b>C16r_BA</b>	Not retained on criteria 2, 3, and 4
<b>C17_VA</b>	Not retained on criteria 1, 3, and 4
<b>C18r_OE</b>	Not retained on criteria 1, 2, 3, and 4
<b>C19r_BA</b>	Judgement decision: Item removed for parsimony
<b>C20_OE</b>	Not retained on criteria 1 and 4
<b>C21_VA</b>	Not retained on criteria 1, 2, 3, and 4
<b>C22_OE</b>	Removal resulted in better model fit

NB: Criterion 1 refers to Cronbach's alpha measure of internal consistency; criterion 2 refers to inter-item correlations; criterion 3 refers to judgement decisions on semantic qualities of items; criterion 4 refers to factor loadings in the CFA

### 3.1.7 Final CompACT-SF.

The final form of the CompACT-SF which was used in phase 2 of the study is summarised in Table 21.

Table 21.

*Final version of the CompACT-SF*

Item number	Previous item number	Scale	Question
1	5	VA	I act in ways which are consistent with how I wish to live my life
2	6	OE	I get so caught up in my thoughts that I am unable to do the things that I most want to do
3	3	BA	I rush through meaningful activities without being really attentive to them
4	11	OE	I go out of my way to avoid situations that might bring difficult thoughts, feelings, or sensations
5	14	VA	I undertake things that are meaningful to me, even when I find it hard to do so
6	12	BA	Even when doing the things that matter to me, I find myself doing them without paying attention
7	15	OE	I work hard to keep out upsetting feelings
8	23	VA	I can keep going with something when it's important to me

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

## 3.2 Short-form Validation

### 3.2.1 Participants.

A total of 689 participants consented to participate in the second phase of the study. Of these, a total of 579 participants completed the measures in full, indicating an 84% completion rate. A further eight datasets were removed as multivariate outliers, comprising approximately 0.1% of the completed datasets. A summary of participants' employment and educational statuses are provided in Table 22 and Table 23, respectively. The majority of participants identified themselves as being in paid employment, with those in full-time education making

up the next largest proportion. Of those who selected 'other', none provided further details. Of the participants who selected 'Other' as their highest qualification, many identified professional and postgraduate and qualifications.

Table 22.

*Frequency statistics for participant employment status.*

<b>Please choose one of the options below which best describes your current situation: -</b>					
<b>Selected Choice</b>					
		<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Valid	In paid employment (employee or self-employed)	501	87.7	87.7	87.7
	In unpaid employment (e.g voluntary, working in family business)	2	.4	.4	88.1
	Looking after family or home	8	1.4	1.4	89.5
	Retired	10	1.8	1.8	91.2
	In full-time education	25	4.4	4.4	95.6
	Registered unemployed	10	1.8	1.8	97.4
	Other	15	2.6	2.6	100.0
	<b>Total</b>	<b>571</b>	<b>100.0</b>	<b>100.0</b>	

Table 23.

*Frequency statistics for participant education status.*

<b>What is your highest level of education? – Selected Choice</b>					
		<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Valid	Secondary School	50	8.8	8.8	8.8
	6 <sup>th</sup> form / College	109	19.1	19.1	27.9
	Undergraduate degree	168	29.4	29.5	57.4
	Postgraduate degree	210	36.8	36.8	94.2
	Other (please specify)	33	5.8	5.8	100.0
	<b>Total</b>	<b>570</b>	<b>99.8</b>	<b>100.0</b>	
Missing	System	1	.2		
	<b>Total</b>	<b>571</b>	<b>100.0</b>		



### 3.2.2 Descriptive statistics

Table 24.

*Descriptive statistics for the CompACT-SF (N = 571)*

	N	Minimum	Maximum	Mean	Std. Deviation
Openness to Experience	571	0	18	9	3.96
Valued Action	571	1	18	14.52	2.85
Behavioural Awareness	571	0	12	6.87	3.03
CompACT Total	571	9	48	30.39	7.41
Valid N (listwise)	571				

### 3.2.3 Scale reliability

The internal reliability of the CompACT-SF and sub-scales were assessed using Cronbach's alpha, and are summarised in Table 25. Item-total statistics, including item-total correlations, and Cronbach's alpha if item deleted, for the CompACT-SF are shown in Table 26. Table 27 shows the same statistics for each sub-scale.

Table 25.

*Internal reliability statistics for the CompACT-SF*

Scale	Cronbach's alpha	N of items
Openness to Experience	.608	3
Valued Action	.679	3
Behavioural Awareness	.731	2
CompACT-SF	.734	8

Table 26.

*Item-total statistics for the CompACT-SF*

Item number	Previous item number	Scale	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1	5	VA	.427	.708
2	6	OE	.550	.679
3	3	BA	.507	.689
4	11	OE	.466	.699
5	14	VA	.346	.721
6	12	BA	.510	.689
7	15	OE	.257	.743
8	23	VA	.383	.717

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

Table 27.

*Internal reliability statistics for CompACT-SF sub-scales*

CompACT-SF Item Number	Previous Item Number	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
<b>Valued Action Sub-scale</b>			
1	5	.498	.583
5	14	.483	.597
8	23	.505	.576
<b>Openness to Experience Sub-scale</b>			
2	6	.414	.511
4	11	.469	.429
7	15	.368	.576
<b>Behavioural Awareness Sub-Scale</b>			
3	3	.576	-
6	12	.576	-

### 3.2.4 Inter-Item Correlations

Inter-item correlations were assessed using Pearson's  $r$  statistic. Inter-item correlations for the CompACT-SF are shown in Table 28. Inter-item correlations for VA, OE, and BA sub-scales are shown in Tables 29, 30, and 31, respectively. Average inter-item correlations for the full scale, VA, and OE sub-scales were  $r = 0.3$ ,  $r = 0.4$ , and  $r = 0.4$ , respectively. The inter-item correlation for the BA scale was  $r = 0.6$ .

Table 28.

*Inter-Item correlations of CompACT-SF items*

Item number	C1_VA_pre vC5	C2r_OE_pre vC6	C3r_BA_pre vC3	C4r_OE_prev C11	C5_VA_prev C14	C6_BA_prev C12	C7r_OE_pre v15	C8_VA_pre v23
<b>C1_VA_prev</b>								
<b>C5</b>		0.355	0.229	0.213	0.406	0.255	0.035	0.433
<b>C2r_OE_prev</b>								
<b>C6</b>	0.355		0.364	0.404	0.214	0.346	0.274	0.282
<b>C3r_BA_prev</b>								
<b>C3</b>	0.229	0.364		0.3	0.188	0.576	0.179	0.206
<b>C4r_OE_prev</b>								
<b>C11</b>	0.213	0.404	0.3		0.189	0.262	0.344	0.174
<b>C5_VA_prev</b>								
<b>C14</b>	0.406	0.214	0.188	0.189		0.233	-0.027	0.414
<b>C6_BA_prev</b>								
<b>C12</b>	0.255	0.346	0.576	0.262	0.233		0.182	0.229
<b>C7r_OE_prev</b>								
<b>15</b>	0.035	0.274	0.179	0.344	-0.027	0.182		0.006
<b>C8_VA_prev2</b>								
<b>3</b>	0.433	0.282	0.206	0.174	0.414	0.229	0.006	
<b>C1_VA_prev</b>								
<b>C5</b>		0.355	0.229	0.213	0.406	0.255	0.035	0.433

NB: CXX refers to the CompACT item number; r refers to reverse-scored items.: prevCXX = previously CompACT item number X.VA, OE, and BA refer to Valued Action, Openness to Experience, and Behavioural Awareness sub-scales, respectively.

Table 29.

*Inter-Item correlations of CompACT-SF VA sub-scale*

Item Number	C1_VA_prevC5	C5_VA_prevC14	C8_VA_prev23
C1_VA_prevC5		0.406	0.433
C5_VA_prevC14	0.406		0.414
C8_VA_prev23	0.433	0.414	

*NB: CXX refers to the CompACT item number; r refers to reverse-scored items.:  
prevCXX = previously CompACT item number X.*

Table 30.

*Inter-Item correlations of CompACT-SF OE sub-scale*

Item Number	C2r_OE_prevC6	C4r_OE_prevC11	C7r_OE_prev15
C2r_OE_prevC6		0.404	0.433
C4r_OE_prevC11	0.404		0.414
C7r_OE_prev15	0.274	0.344	

*NB: CXX refers to the CompACT item number; r refers to reverse-scored items.:  
prevCXX = previously CompACT item number X.*

Table 31.

*Inter-Item correlations of CompACT-SF BA sub-scale*

Item Number	C3r_BA_prevC3	C6_BA_prevC12
C3r_BA_prevC3		0.576
C6_BA_prevC12	0.576	

*NB: CXX refers to the CompACT item number; r refers to reverse-scored items.: prevCXX = previously CompACT item number X.*

### 3.2.5 External correlations.

Pearson's *r* for correlations between CompACT-SF total and sub-scale scores, and scores on other measures of psychological flexibility, health, and wellbeing, are shown in Table 32.

Table 32.

*Correlations between CompACT-SF total and sub-scale scores, and external criteria.*

	<b>CompACT Total</b>	<b>Valued Action</b>	<b>Openness to Experience</b>	<b>Behavioural Awareness</b>
<b>AAQ Total</b>	-0.688	-0.416	-0.654	-0.432
<b>DASS Scales</b>				
<b>DASS Total</b>	-0.604	-0.368	-0.54	-0.421
<b>Stress</b>	-0.512	-0.271	-0.464	-0.389
<b>Depression</b>	-0.596	-0.444	-0.495	-0.39
<b>Anxiety</b>	-0.497	-0.248	-0.485	-0.345
<b>Sf12v2 Scales</b>				
<b>Physical Functioning</b>	0.103	0.163	0.047	0.038
<b>Role: Physical</b>	0.199	0.08	0.209	0.138
<b>Bodily Pain</b>	0.121	0.014	0.133	0.108
<b>General Health</b>	0.32	0.361	0.219	0.156
<b>Vitality</b>	0.397	0.349	0.289	0.264
<b>Social Functioning</b>	0.505	0.366	0.436	0.319
<b>Role Emotional</b>	0.522	0.368	0.465	0.321
<b>Mental Health</b>	0.565	0.45	0.45	0.37
<b>Physical Health (composite)</b>	-0.07	-0.034	-0.065	-0.055
<b>Mental (composite)</b>	0.6	0.457	0.498	0.384

### 3.2.6 CFA.

#### 3.2.6.1 Model 1.

Due to the sub-optimal fit of Model 1, Modification indices were reviewed. Covariance between errors of two or more indicators on the same construct shows that they are related in some way. It has been suggested that MI levels >20 and par change >.10 demonstrates that items may be redundant (Brown, 2015). Within a CFA, allowing the errors to covary ('freeing the errors') can improve model fit. While there is caution against this, within a multiple-choice questionnaire such as the CompACT, similarly worded or constructed items – for example, items tapping into the same aspect of psychological flexibility – may result in correlated errors. Table 33 shows the modification indices for Model 1.

From this, it was identified that although the MI was less than the level of 20 suggested by Brown (2015), the MI and par change level for the correlation between error terms e7 and e4 would justify freeing these error terms, allowing them to covary. This adjustment resulted in Model 2.

Table 33.

*Modification indices for Model 1*

<b>Error Term</b>		<b>Correlated Item</b>	<b>Modification Index</b>	<b>Par Change</b>
e2	<-->	ValAct	6.988	.131
e7	<-->	OpToEx	5.328	.113
e7	<-->	ValAct	23.876	-.261
e7	<-->	e4	15.431	.412
e1	<-->	e2	9.529	.221
e5	<-->	e7	6.489	-.184

**3.2.6.2 Model 2.**

The final model for the CompACT-SF is shown in Figure 7.

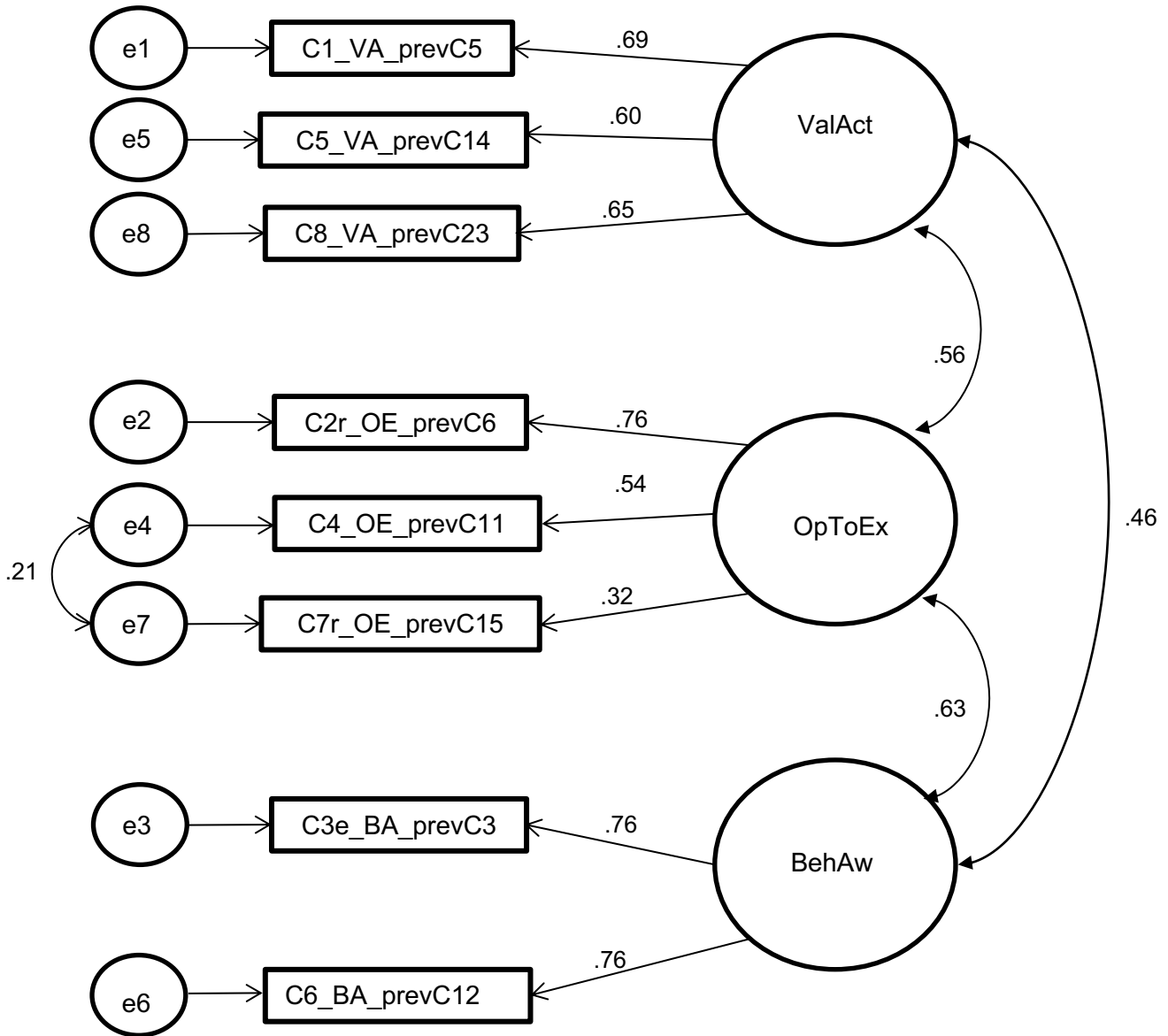


Figure 7. Intercorrelated Analysis Output



## 4. Extended Discussion

### 4.1 Correlated Errors: CFA and Method Errors

The intercorrelated CFA initially yielded a marginal model fit, however following modification the fit was found to be acceptable. Correlated errors were identified for one pair of items – items 4 and 7, which both loaded onto the Openness to Experience factor. The underlying assumption is that any relationship between two indicators loading onto a common factor is due to the shared influence of that latent factor (Brown, 2015). This means that were the factor to be partialled out, the intercorrelation between those indicators would be equal to zero. However, some shared variance may also be attributed to other sources, for example common method variance (CMV), or “method effects”. Method effects are generally understood as occurring when any characteristic of a measurement process or instrument contributes variance to scores beyond what is attributable to the construct of interest (Maul, 2013). It should be noted that this definition of CMV has been critiqued for its lack of rigour, and indeed CMV itself has been “viewed as everything from a hobgoblin to a ghost” (Richardson, Simmering, & Sturman, 2009, p. 762), however it provides a sufficient account of the form and function of method effects for the purposes of this discussion.

Freeing the error effects within a CFA requires robust justification (Brown, 2015), particularly as post-hoc model modification has been widely criticized (Hayduk, 1990; Landis, Edwards, & Cortina, 2009). However, it has been argued that post-hoc processes are a key aspect of a CFA, and that if model modification is undertaken with full transparency and acknowledgement, and that only substantively meaningful parameters are added to the model (Brown, 2015; Byrne, 2005).

The CompACT-SF is a multiple-choice questionnaire, meaning that similarly worded or constructed items, or indeed reverse-scored items, may cause method effects. In this instance, the wordings of the correlated items were as follows: 4) I go out of my way to avoid situations that might bring difficult thoughts, feelings, or sensations; 7) I work hard to keep out upsetting feelings. Although item 7 is more parsimonious, both items are constructed similarly, and both apply to the process of experiential avoidance; it could be argued that they are sufficiently similar to cause method effects and intercorrelation. Brown (2015) indicates that under these circumstances, freeing error effects is justified, particularly given that there is only one error pair.

#### **4.1.1 Item 7.**

A further consideration of CMV may be given to item 7 in isolation, as this was the only item which did not reach an acceptable factor loading ( $<.50$ ), and which also demonstrated a large intercorrelation with the Valued Action factor. Post-hoc discussions with other members of the research team identified that “I work hard to keep out upsetting feelings” may be interpreted in a number of ways, for example: “I put a lot of mental effort into keeping out upsetting feelings”, or “I put a lot of effort in at my place of employment to keep out upsetting feelings”. This ambiguity, and the potential semantic emphasis on “work” as a form of valued action, may have resulted in CMV and as such may be worthy of further investigation.

#### **4.2 Guideline Variability**

Goodness-of-fit indices provide ‘rules of thumb’ – recommended values for assessing fit in structural equation modelling (Marsh et al., 2004). Using simulation research, Hu and Bentler (1999) proposed a more rigorous approach to evaluating decision rules based on goodness-of-fit, resulting in the proposal of more stringent cut-off values for various indices – the values which were used in the present research. However, identifying acceptable levels of fit for a CFA has been described as a challenging exercise (Prudon, 2015), particularly given that an attempted replication of Hu and Bentler’s simulation study failed to confirm their advised cut-off values (Marsh et al., 2004). Further difficulty was demonstrated by Hopwood and Donellan (2010), who found that eight commonly-used personality measures failed to reach even more relaxed criteria than those proposed by Hu and Bentler (1999), despite allowing for model modifications. The researchers concluded with the argument that a weak model fit does not necessarily render a measure invalid, as other forms of validity, such as criterion- or content-related validity are neglected within a CFA (Hopwood & Donellan, 2010).

Perry and colleagues (2015) contributed to the discussion, advocating that it is not necessarily the cut-offs themselves which pose the issue, but rather the rigidity with which they are adhered to. By treating the recommendations as a ‘golden rule’ rather than guidelines, researchers run an inflated risk of committing a Type II error.

Considering this lack of clarity regarding optimum model-fit cut-offs, and the criticisms levelled at post-hoc model modifications (see section 4.1), it could be

argued that Model 1 could have been accepted without modification, particularly given the fact it met two of the four model fit criteria used. Conversely, one of the arguments against rejecting models if they do not reach model-fit cut-offs, is that these cut-offs do not account for the content and criterion validity of the scale. As content and criterion validity were assessed as part of the derivation of the CompACT-SF in advance of the CFA, this argument may be seen as less valid. Furthermore, the theoretical justification for a single pair of error terms in order to achieve an optimal model fit across all criteria, suggests that the intercorrelated model should be accepted.

### **4.3 Self-report and Static Measures of Dynamic Processes**

The CompACT and CompACT-SF are static, self-report measures of inherently dynamic processes – factors which must be considered in the interpretation of the results.

While self-report measures are commonly used, it is imperative that researchers are mindful of their potential pitfalls. Firstly, self-report measures assume that respondents are able to understand the question posed to them, interpret it in the way the researcher intended, and then answer it; these assumptions may not always be correct. For example, people often have limited or imperfect access to their own internal mental processes; when asked about these, respondents may construct a logical response based on their theories about their own mental processes rather than on objective knowledge, thus creating an inaccurate reflection (Lavrakas, 2008). Furthermore, responses may be reflective of context and temperament at the time of responding; although it should be emphasised that the full CompACT has been shown to have good stability over time (Bayliss et al., 2018), suggesting that the CompACT-SF may be less susceptible to this. A further challenge inherent to self-report measures is the issue of respondents deliberately misrepresenting themselves; for example, exaggeration or understatement due to embarrassment, shame, or perceived social demands and rules about self-presentation (Peterson & Mitchell, 2005).

Despite self-report measures being commonly used to capture information regarding internal processes and events, they are ostensibly static tools designed to capture disposition (e.g. 'how do you feel most of the time'), or behaviours aggregated over time (e.g. 'in the past two weeks have you drunk more than five units of alcohol in a day') (Wright & Hopwood, 2016). Consequently, they risk glossing over clinically important functional details regarding how behaviours

manifest across time and context. This is particularly pertinent given that theories of psychopathology concern dynamic processes – sequences of thoughts, feelings, and behaviours which play out over time, within and across contexts and individuals (Wright & Hopwood, 2016). It has been suggested that common clinical self-report measures, in their static nature, have limited correspondence to inherently dynamic formulations and treatment plans which occur in clinical practice (Wright & Hopwood, 2016).

One of the primary issues with attempts to measure dynamic processes is that the time scales of processes are not explicitly accounted for or defined by underpinning theories, despite the fact that this has direct implications for clinical assessment and intervention. For example, the ACT theoretical literature does not indicate whether processes unfold over a matter of hours, days, weeks, or otherwise; nor is it clear whether these time scales are consistent or vary across contexts. Some researchers have suggested that processes play out at different temporal levels (Carpenter, Wycoff, & Trull, 2016); this necessitates the use of temporal measures which are able to capture information which demonstrates this. Within ACT, due to its fluid nature, the therapist plays an active role in observing key processes emerging in therapy, which is key to providing appropriate and timely interventions (Hayes, 2012).

There have been some developments in the field of Ambulatory Assessment, which permits the assessment of individuals in their day-to-day environments and contexts through self-report, physiological, and observational methods (see Ebner-Priemer, 2018). For example, the use of smart-phone technology allows for regular, in-the-moment data collection, thus potentially providing a more ecologically valid method for capturing dynamic processes. However, such technology remains in its infancy, meaning that as of yet there are few, if any dynamic assessments which could be effectively, and indeed cost-effectively employed in clinical practice (Carpenter, Wycoff, & Trull, 2016; Trull & Ebner-Priemer, 2018). With this in mind, despite the limitations discussed above, self-report measures remain the better option of those available for the collection of ACT process data.

The CompACT-SF offers a measure which addresses some of the aforementioned issues. Because of its brevity and reduced response burden relative to other self-report measures, it is possible to administer it more frequently. This would allow for the collection of more in-depth data regarding the temporal nature of ACT processes and changes over time. However, it should be noted that the stability of

the CompACT-SF over time would first need to be validated in a similar way to the CompACT full measure (Bayliss et al., 2018) prior to its application in any such clinical or research context.

#### **4.4 Contextual Behavioural Science**

Hayes and colleagues (2012) define contextual behavioural science (CBS) as “a naturalistic, inductive approach to system building in the behavioural sciences that emphasises the evolution of historically and situationally embedded action, extending that unit across levels of analysis and into knowledge and development itself” (p. 356). CBS has been proposed as a unified model of human resilience, which is supported by the expanding evidence base in the ACT and third-wave behavioural fields.

CBS theoretical underpinnings are consistent with a functional contextualist approach to science, in that environmental variables are considered central to analysis, and an analysis is only considered ‘correct’ if it helps to achieve scientific goals, while focusing on variables which can be manipulated. CBS is a principle-focused, inductive approach to psychological system-building (Hayes, 2013); emphasis is placed on developing interventions which are based on theoretical models tightly linked to basic principles, which are themselves constantly subject to evaluation and upgrades. In this sense, emphasis is placed on theoretical coherence of research and interventions, above efficacy testing of intervention packages.

CBS as an approach involves the integration and simultaneous development of multiple levels of a research program. These levels include philosophical assumptions, basic science, basic and applied theory, intervention development, treatment testing, and dissemination; all of which are done dynamically and “horizontally” (Hayes et al., 2013). Although the approach itself represents an abstraction of and development from traditional behavioural analysis, the nine key principles of CBS have been derived from behavioural analysis. These are: 1) Explicate philosophical assumptions; 2) Develop a basic account of human behaviour with contextual principles organised into theories; 3) Develop a model of pathology, intervention, and health tied to basic behavioural principles and theories; 4) Build and test techniques and components linked to these processes and principles; 5) Measure theoretical processes and their relationships to pathology and health; 6) Emphasise mediation and moderation in the analysis of applied impact; 7) Early and continuous tests of effectiveness, dissemination, and training

strategies; 8) Test the research program across a broad range of areas and levels of analysis; 9) Create an open, diverse, and non-hierarchical development community.

Of the above, points four and five are particularly pertinent to the present research. They highlight the importance of testing and measuring techniques and processes; considering that within the functional contextualist stance, the truth of a concept is defined by its utility, evidence of this utility in a theoretically coherent fashion is critical. As research processes towards the prospect of a CBS unified model of resilience, underpinned by openness, awareness, and action, the role for a brief but theoretically and psychometrically robust measure of these processes is clear.

## 5. Reflections

### 5.1 Development as a Researcher

I feel that the process of completing this project has enabled me to develop as a researcher, a clinician, and a student, in more ways than I had anticipated. It has taken me out of my comfort zone in a number of ways, while enabling me to pursue existing research and clinical interests.

Throughout my undergraduate and master's degrees, I made a habit of taking on or becoming involved in ambitious projects with steep learning curves. I enjoyed learning from knowledgeable and experienced researchers and seeing how studies may translate into practice; it also provided me with the excuse to do as little statistics as possible. Despite my interest in research, I hated "stats" – I found it anxiety-provoking, confusing, and frustrating, so I avoided it at all costs. That fairly entrenched view made committing to this project a challenge in itself.

In a seemingly contradictory fashion, I have a long-standing interest in neuropsychological assessment, psychometrics, and measures. Consequently, despite being an anxiety-provoking prospect, this project afforded me the opportunity to learn more about the mechanics of psychometrics – to gain insight into the development and construction, rather than simply administration and scoring. The effect of approaching the project with this mindset was two-fold; it transformed the project from a seemingly impossible feat, to a valuable learning opportunity worth pursuing (over and above the need for a doctoral thesis). This led to me being increasingly motivated to overcome the statistics-related anxiety – to open SPSS, to watch the tutorials, and to actually learn rather than doing the bare minimum. I feel that this has been one of my biggest developments as a student and a researcher; I now feel more confident in my abilities to not only learn about, but teach myself about, and apply statistical methods. This has been helped in no small part by the patience and constant positive reinforcement demonstrated by my research supervisors.

An additional, broader impact of undertaking this project is the impact it has had on my clinical practice and approach to psychometric assessment. I find myself challenging the use of short forms when full measures are available, and questioning the use, validation, and application of measures, with some knowledge of the literature to support this. As someone who would like to pursue a career in

neuropsychology, in which psychometrics are fundamental, I hope this development is something I will carry into my post-qualification career.

As may be evident throughout these and subsequent reflections, I have chosen to adopt ACT concepts and terminology to frame and communicate my ideas. This is representative of how I have found an increasingly interesting and helpful model to learn about and apply. In addition to addressing the statistics-related anxiety, this project has given me the opportunity to explore the ACT and psychological flexibility to a greater degree than I was able to during the main components of clinical training. At times this has been challenging – for example, I have found it difficult to reconcile the seemingly opposing positions of functional contextualism (see section 5.2) and psychometrics, in that ACT’s pragmatic truth criterion is at odds with the classic test theory assumption that an individual’s test score directly corresponds to the theoretical construct of interest (Borsboom, 2008). However, these theoretical challenges, along with the practical challenges of familiarising myself with therapeutic theories and concepts in sufficient depth to produce a doctoral thesis, have contributed to the learning process.

It is suggested that DClinPsy trainees graduate with in-depth experience in CBT and one other therapeutic model. The reading and time invested into completing this research has made me feel as though I am finishing training with an additional model in this repertoire. This is reflected in my confidence in using ACT approaches in clinical practice, and in applying it to my own difficulties. For example, over the course of the research process I have become more aware of when I am becoming cognitively fused with thoughts about previous projects (“that failed therefore I am a failure”); I am mindful of the need to take perspective and pursue valued activities even when they seem futile (I have done a great deal of literally running away from my thesis), and I have certainly endeavoured to be more open to challenges rather than persisting in being experientially avoidant – in particular, avoidance of criticism, risk of looking and feeling incompetent, and perceived threat of failure.

## **5.2 Ontological and Epistemological Reflections**

Although this research has endeavoured to address psychological flexibility, and to some extent the CompACT-SF as trans-diagnostic and trans-theoretical constructs, the measure and literature it has been informed by stem predominantly from the ACT school of thought. Consequently, this has been the focus of my reflections on the underpinning philosophical approaches of this work.



Clarifying, stating, and adhering to the ontological and epistemological position of research is crucial for maintaining its theoretical coherence. Ontology concerns itself with the nature of being and ways of constructing reality, while epistemology is concerned with what constitutes valid knowledge of that reality, and how it may be obtained (Denzin & Lincoln, 1998). The position taken with regards to these, informs the methodology chosen to acquire said knowledge, the claims made by the findings produced by the research, and the role of the researcher themselves. Briefly, positivists assert that there exists one true, measurable reality, while constructivists advocate the existence of multiple constructed realities; post-positivists maintain the stance of there being a single true reality, but that the claims made regarding our knowledge of that reality must be tentative at best, as it cannot be perfectly perceived or measured (Ponterotto, 2005).

My approach was previously that of a critical realist; within critical realist ontology, reality is stratified into three levels: the empirical, the actual, and the real (Bhaskar, 2008). At the “empirical” level, events are as we experience them, and are observable and measurable; at the “actual” level, there is no filter of human experience, and events occur whether they are observed or not; at the “real” level, there are seen to be causal mechanisms inherent to objects or structures, which may act to produce events which are observable at the empirical level. Simply put – there exists an objectively knowable reality, however the roles of perception and cognition play a role in the observation and measurement of this reality.

The ACT position is considerably different to the above; it is embedded within a functional contextualist philosophy (Biglan & Hayes, 1996; Hayes et al., 1999). Functional contextualism as an ontological philosophy is underpinned by a ‘pragmatic truth criterion’ (Hayes & Brownstein, 1986). Simply put – an analysis is only true insofar as it is useful for the function of predicting and directing behaviour – that which is useful, is true. This is a departure from the traditional ontological definition of ‘truth’. Objective reality is seen as unknowable from a functional contextualist standpoint, on the ground that human perception itself is inherently biased. Furthermore, proponents of the functional contextualist standpoint argue that, just as the subject matter one observes may be influenced by the contexts imposed on it for the purposes of observation, the observer is also influenced by those contexts, and indeed by their own position as an observer. As such, it is deemed impossible for ontological truth to be claimed, as that which is under investigation is shaped by context, which in turn influences the phenomena under investigation. Within the context of this research – by questioning respondents

about their psychological flexibility (however implicitly we may have done so), we are asking them to reflect on it, thus changing the context in which that latent construct exists.

In light of this, it stands to reason that psychological research informed by functional contextualist philosophy would aim for an understanding of reality and / or behaviour that has practical and clinical applications as a best-case scenario. However, in keeping with the functional contextualist philosophy, any understanding claimed regarding behaviour must always be in relation to both its context, and its intended function within that context. One of the inherent risks in this approach is abandoning the concept of 'truth' or 'reality' entirely, and accepting any questionable analysis that may be seen as 'pragmatically useful'. To protect against this risk, although it may not be wholly theoretically coherent, it is critical that traditional scientific practices of independent replication and validation are applied to those proposals and analyses underpinned by functional contextualist philosophy.

### **5.3 Additional Reflections: Prior Research**

The development and validation of the CompACT-SF was not my first-choice DClinPsy research project; nor indeed was it my second. I came to this project through a convoluted combination of decisions, challenges, failures, and risks taken; I was encouraged to reflect on this by a previous supervisor, in order to demonstrate the other skills and learning acquired through this lengthy process, and as a form of personal catharsis. This section comprises an overview of the previous research projects and the difficulties encountered, followed by my personal reflections on what I learned from the process.

My original project was identified the moment I found out I had a place on clinical training. It was to be a pilot RCT, in collaboration with another trainee, under a supervisor with whom I had an existing working relationship. Several months into training, following my failure to answer some ostensibly simple questions regarding the epistemological position of the project, I was advised by a research tutor that I wasn't a "research monkey" (Dawson, 2016), and that if I were to pursue an 'off the shelf' research project, I needed to demonstrate more ownership. After some reflection on these comments with my personal tutor, I concluded that clinical training was the ideal time to pursue research that had personal interest for me, and to expand my personal research repertoire in a supportive environment with experienced supervisors.

The second, and what I believed would be my final research project, took the form of a qualitative investigation into how young people and their caregivers manage the wait for first treatment in Child and Adolescent Mental Health Services (CAMHS). This research was based on the premise that the 2014 CAMHS review (House of Commons Health Committee [HCHC], 2014) identified concerns regarding service accessibility, young people and carers experiencing “battles” to be seen, and professionals and families alike recounting a “large and significant gap in mental health provision for distressed [...] children” (HCHC, 2014 p. 32). An abundance of evidence suggested that experiences when accessing a service have a significant impact on later interactions with that service, for example, families who wait longer between referral and initial appointment are more likely to not attend (Stern & Brown, 1994), and longer perceived waiting times predict lower scores of relationships with health personnel in CAMHS (Holmboe, Iversen, & Hanssen-Bauer, 2011). This was supported by theoretical models of tension and suspense (Lehne & Koelsch, 2015), and wait experiences (Taylor, 1994). Despite this evidence, there existed a notable gap in the qualitative literature regarding both pre-treatment experiences, and children and young people’s experiences.

With the support of two new supervisors, a new protocol was written, contact was made with local CAMHS services for recruitment purposes, and the protracted process of obtaining both University and NHS ethical approval was undertaken. My supervisors and the clinicians at the recruiting service were enthusiastic and saw value in the research; having already rejected one project I became highly invested in this new one, quite possibly to my eventual detriment. Following some challenges and delays with the ethical approval process, recruitment for the study was opened. Recruitment was dependent on CAMHS clinicians who were completing initial assessments – they were required to hand information sheets to service users and / or parents who potentially met the inclusion criteria. The onus was then on the families to make contact if they wished to participate.

Recruitment remained open for three and a half months, without a single response from potential participants. Attempts were made to set up an additional recruitment site in Lincolnshire, however due to a lack of response from the Clinical Psychologist within that service, this was abandoned. Multiple emails to recruiting clinicians requesting updates also elicited minimal responses. In late May 2018, I met with my supervisor to discuss possible ways forward. It was made clear to me that all data for whatever research project I pursued, needed to be collected by the end of my September 2018 – the end of my ‘official’ three years on the DClinPsy. I

was presented with the options of: (1) pursuing the CAMHS project in a different format, by attempting to collect data online; (2) abandoning it entirely for either a yet-to-be-defined investigation into group formulation; (3) abandoning it entirely for a continuation of previous trainees' work investigating a short-form psychometric. Evidently, I opted for the latter. This left me with three months in which to learn the process by which one may derive a psychometrically robust short-form psychometric, do so, then collect sufficient data with which to validate it.

Having put some time and distance between myself and these previous projects, I have had a chance to reflect on what I learned from the process. I have two main reflections from the experience – one regarding what I learned, and one regarding what kept me “stuck” on project 2 for as long as I was. There were undoubtedly many more learning points and reflections, however a complete consideration of these is far beyond the scope of this section.

One of the biggest oversights, and consequently my biggest learning point, was the importance of linking my literature reviews to the practicalities of the project and the nature of the participant group I was trying to recruit in project 2. Within my systematic literature review, my ethics applications, and my introduction sections, I wrote extensively about young people and families having difficult and draining experiences of accessing services. I wrote about frustration, disillusionment, and disengagement; I wrote about over-stretched services, and staff overwhelmed with huge caseloads. And yet I was confused and frustrated when few information sheets were given out in assessment clinics; I did not understand why not one person had taken “the opportunity” to opt-in and speak to a stranger about their difficulties and frustrations. In short, I could not understand why my research was “failing”. With the benefit of hindsight and reflection, I can see that I had not applied what I learned in the process of literature searching, to the research design itself. I had not made the connection between the numbers and quotations, and the real people I was trying to recruit – I was trying to recruit participants, but failing to see them as people, and I was asking clinicians to be recruiters when their priorities were elsewhere. On reflection, the recruitment strategy was poorly thought-out, and I attribute this largely to my failure to make that fundamental link between research and practice.

I have also reflected on what led to me pursuing an evidently (in hindsight) unworkable project for as long as I did. To use the terminology I have learned through the process of writing this thesis, I would attribute my “stuckness” to a lack

of psychological flexibility in this context. In keeping with the rest of the project I have returned to Kashdan and Rottenberg's (2010) definition of psychological flexibility to structure my thoughts and reflections. Psychological flexibility is reflected in how an individual:

- 1) *Adapts to situational demands*: It is somewhat self-evident that I was not adapting to the changing demands of the situation as the project progressed. As time went on and the deadline for data collection approached, I became, if anything, more stuck. To a certain extent I even convinced myself that I was adapting to demands, by adding recruitment sites and widening inclusion criteria; on reflection, by investing effort into maintaining the project, I was limiting my opportunities to consider bigger changes.
- 2) *Reconfigures mental resources*: At the time, I felt unable (or unwilling?) to redirect my mental resources away from everything else I was doing (placement, job applications, significant personal life changes) and devote time to a new project. I felt I already knew from experience how much time and mental effort went into starting a new project from scratch, and I lacked the flexibility of thought to consider that this was a different context to before. I distinctly remember saying to myself, and to anyone else who would listen, "I don't have it in me to start again".
- 3) *Shifts perspective*: For me, the most difficult shift in perspective was from "failure" to "opportunity", when considering abandoning project 2 and pursuing something new, because to me that shift also meant going from "almost there" to "back to square one". I also found it incredibly hard to take a broader perspective on the research project – at some point, it needed to shift from being something personally meaningful and (hopefully) ground-breaking, to a means to an end. On reflection, the context of my training cohort contributed to this – others spoke about their projects as if it was their life's work and greatest accomplishment, and I wanted to feel the same way about mine, which I didn't think could happen if I switched at such a late point.
- 4) *Balancing competing desires, needs, and life domains*: As with point 3), I feel that I remained stuck and pursuing the failing project because I struggled to balance and resolve my *need* to have a thesis project, with my *desire* to pursue the project I felt I had put so much into. I also resented the idea of having to tip the balance of my time back towards the need to work, and away from other valued life domains (read: I did not want to spend my summer salvaging a thesis).

With the above in mind, I have one final reflection utilising ACT and psychological flexibility terminology to explain the mechanism which kept me “stuck”. I was being experientially avoidant of the experience of admitting defeat, of what I saw as a failure, and of a new challenge. I see this as a function of the meaning I had attached to project 2 – because that project was “mine”, my design, and I had taken the risk to pursue it over project 1, if it failed, it meant that I was also failure. Despite my inflexibility in this context, my avoidance, and my anxiety, I was encouraged to acknowledge that project 2 was no longer feasible, and that the present research was a viable and valuable possibility. For their role in this, I will be forever grateful to the research tutors who supported this.

Being able to re-examine this process through an ACT framework has afforded me a better understanding of why I took quite so long to change the trajectory of my research project. It has helped to assuage the relentless self-criticism which took the form of “Why couldn’t I just move on sooner?”, because I can now answer that question for myself, and I can look back on the process for what it was – a valuable, challenging learning experience.

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## **APPENDICES**


## Appendix A

Email correspondence granting ethical approval for the extension of Francis et al.'s (2016) original CompACT project received from SOPREC representative to Jessica Morris; personally identifiable details removed.

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 Jessica Morris (16591160) <16591160@students.lincoln.ac.uk>    | 

Fri 20/07/2018, 14:03


 School of Psychology Et...  
51 KB

Download Save to OneDrive - The University of Nottingham

To whom it may concern,

Further to my previous email regarding the attached ethics application, would it be possible to have confirmation that it has been received and is under review?

Kind regards,

Jessica Morris  


---

**From:** Jessica Morris (16591160)  
**Sent:** 16 July 2018 16:28:55  
**To:** Soprec  
**Cc:** msxjlm@nottingham.ac.uk  
**Subject:** Ethics approval form: Extension

To whom it may concern,

Please find attached the ethical approval form and checklist for a routine extension to an existing study, as part of a DClinPsy research project.

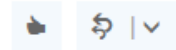
I hope to hear back from you with your approval at your earliest convenience.

Kind regards,  
Jessica Morris



[Redacted]

Thu 26/07/2018, 14:57



Hi Jessica  
This is to confirm that the changes have now been approved.  
Thanks  
Zoë



[Redacted] Senior Administrator/PA to [Redacted]

(Head of School for Psychology)  
College of Social Science  
University of Lincoln. Brayford Pool, Lincoln, Lincolnshire. LN6 7TS  
tel: +44 (0)1522 835510  
[staff profile](#) | [facebook.com](#) | [twitter.com](#) | [lincoln.ac.uk](#)



[Redacted]

Tue 24/07/2018, 07:41



Hi Jessica  
I have sent this to the chair for their comment on this and will get back to you asap  
Thanks  
Zoë



[Redacted] Senior Administrator/PA to [Redacted]

(Head of School for Psychology)  
College of Social Science  
University of Lincoln. Brayford Pool, Lincoln, Lincolnshire. LN6 7TS  
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## **Appendix B**

Measures used to assess the validity of the CompACT-SF

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



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.	<input type="checkbox"/>
2. I'm afraid of my feelings.	<input type="checkbox"/>
3. I worry about not being able to control my worries and feelings.	<input type="checkbox"/>
4. My painful memories prevent me from having a fulfilling life.	<input type="checkbox"/>
5. Emotions cause problems in my life.	<input type="checkbox"/>
6. It seems like most people are handling their lives better than I am.	<input type="checkbox"/>
7. Worries get in the way of my success.	<input type="checkbox"/>
TOTAL	<input type="checkbox"/>

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)

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



Short Form Health Survey (SF-12-v2)- Ware, Kosinski, Turner-Bowker, & Gandek (2002)

**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. <b>Moderate activities</b> , such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
b. Climbing <b>several</b> flights of stairs	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>

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 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
b. Were limited in the kind of work or other activities	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>

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 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
b. Did work or other activities less carefully than usual	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>

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 <input type="checkbox"/> | 2 <input type="checkbox"/> | 3 <input type="checkbox"/> | 4 <input type="checkbox"/> | 5 <input type="checkbox"/> |
| b. Did you have a lot of energy?            | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> | 3 <input type="checkbox"/> | 4 <input type="checkbox"/> | 5 <input type="checkbox"/> |
| c. Have you felt downhearted and depressed? | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> | 3 <input type="checkbox"/> | 4 <input type="checkbox"/> | 5 <input type="checkbox"/> |

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

### Participant Information Sheet



Trent Doctorate  
in  
Clinical Psychology



The University of  
Nottingham

### Participant Information Sheet

**Title of Study:** Development and validation of a short form of the Comprehensive assessment of Acceptance and Commitment Therapy processes (CompACT-SF)

**Name of Researcher:** Jessica (Lucy) Morris

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?**

Thank you for your interest in this survey. Our research is aiming to test whether a new psychotherapy process measure we have developed can accurately and consistently measure what it has been designed to. This research will be submitted in partial fulfilment for the Doctorate in Clinical Psychology at the Universities of Lincoln and Nottingham.

#### **What does the study involve?**

You will be asked to complete our measure, as well as some other measures of distress and quality of life. It should take approximately 20 minutes to complete all measures. Your responses will be anonymous and so we won't know who you are.

#### **Why should you take part in the study?**

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 which will be of benefit to people receiving psychological treatment.

By completing this survey you will also have a chance to win a £50 (1st prize, 1 available) or £25 (2nd prize, 2 available) Amazon Voucher in a prize draw. A web link is provided at the end of this survey which will take you to a separate website where you will be asked for a contact email address - this ensures your survey responses and your personal email address are separate and thus maintains your anonymity.

## **Right to withdraw**

You can withdraw your participation at any time in the study by contacting the Principal Investigator Jessica Lucy Morris ([msxjlm@nottingham.ac.uk](mailto:msxjlm@nottingham.ac.uk)).

## **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.

This research study has received ethical approval from the University of Lincoln's School of Psychology Research Ethics Committee (SOPREC). If you have ethical questions regarding this survey, please contact the committee ([soprec@lincoln.ac.uk](mailto:soprec@lincoln.ac.uk))

## **Further information and contact details**

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