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Validity and reliability of the Vigour Assessment Scale and an invigoration task in remitted but avolitional schizophrenia

By

Antonia Gueorguieva Roos (Dlagnekova)

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Supervisor: **Professor Werdie (C. W.) van Staden**

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Statement

I declare that the dissertation submitted by me for the degree of Doctor of Philosophy in Mental Health at the University of Pretoria is my own independent work and has not been submitted by me for a degree at another faculty/university.

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Antonia Gueorguieva Roos (Dlagnekova)

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Summary

In the first empirical study on vigour outside an occupational context, this study examined the validity and the reliability of the Vigour Assessment Scale (VAS) in patients with remitted but avolitional schizophrenia. The validity and the reliability of an imagery-cognitive invigoration task were also examined. The scale and the invigoration task provide means by which to address, scientifically and clinically, the lack of vigour that underpins avolition in schizophrenia, which is a common problem persisting after acute episodes and contributing to marked impairment in socio-occupational functioning. Avolition often responds poorly to treatment and defies other treatment targets that are dependent on vigour.

The vigour of 242 outpatients was assessed on the VAS alongside assessments of workplace vigour, behavioural inhibition and activation, procrastination, fatigue, anxiety, depressive features, and active involvement in growing as a person. Patients furthermore participated in an invigoration task (n=76) that was repeated a month later (n=70) for the examination of its effect in a proof-of-concept quasi-experimental one-group sequentially-repeated pre-test/post-test study design.

Validity of the VAS was observed in its concurrence with existing instruments of similar kind and its discriminant ability to discern vigour from dissimilar constructs. Concurrence was observed in moderate to strong correlations (r=-0.5 to 0.72) between the VAS and measures approximate to vigour. Discriminant validity was supported by statistically highly significant differences (p<0.001 to 0.003) between the VAS and measurements of procrastination, fatigue, depression, behaviour inhibition and activation, personal growth and initiative, and anxiety.

Reliability of the VAS was observed in its internal consistency, split-half reliability, test-retest reliability and standard error of measurement. An exploratory factor analysis yielded six factors, being Task Drive, Indecisiveness, Creative Efforts, Social Disinterest, Active Mobilisation and Torpidity. Internal consistency was excellent with Cronbach alpha coefficients all above 0.8. Split-half reliability testing resulted in a strong correlation between halves (r>0.8). Reliability was further supported by a strong correlation (r=0.8) between initial and repeat VAS measurements. The VAS consistently produced a small standard error of measurement (5.38 or less within a total score range of 77).

Validity of the invigoration task was supported by statistically significant differences in VAS scores before and after the two occasions when the task was performed (p<0.001). The effect

sizes indicated that the task produced changes that were of a medium (d=0.51) to very large extent (d=1.64). The reliability of the task was supported by its having this effect on two occasions a month apart.

The VAS now provides an instrument to assess vigour for diagnostic and therapeutic purposes. Although validated in schizophrenia, it may also prove useful in other clinical or healthy populations, subject to further validation. The proof of concept for the invigoration task warrants a subsequent randomised controlled trial to establish its efficacy by controlling for potential confounding influences. Once established as efficacious in this and other populations, the task holds potential for augmenting standard services and targets in schizophrenia, other clinical populations for whom vigour may be a sensible treatment target, and non-clinical populations affected by burnout or who wish to enhance their vigour as a virtue.

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Contents

List of tables

List of figures

List of abbreviations

AD ACL: Activation-Deactivation Adjective Checklist

ama-VAS: After one Month Anticipatory Vigour Assessment Scale

am-VAS: After one Month Vigour Assessment Scale

a-VAS: Anticipatory Vigour Assessment Scale

BIS/BAS: Behavioral Inhibition/Behavioral Activation Scales

BNSS: Brief Negative Symptom Scale

CAINS: Clinical Assessment Interview for Negative Symptoms

CBT: Cognitive-Behaviour Therapy

CDSS: Calgary Depression Scale for Schizophrenia

CEO: Chief Executive Officer

DSM-5:   Diagnostic and Statistical Manual of Mental Disorders, 5th edition

EFA: Exploratory Factor Analysis

FAS: Fatigue Assessment Scale

HLOE: Highest Level of Education

IB: Intentional Behavior subscale of the PGIS

i-VAS: Initial Vigour Assessment Scale

KMO: Keiser-Meyer-Olkin measure

MOS: Medical Outcomes Study

OPD: Outpatients' department

PAF: Principal Axis Factoring

PANSS: Positive and Negative Syndrome Scale

PCA: Principal Components Analysis

PEPS: Positive Emotions Program for Schizophrenia

PGIS: Personal Growth and Initiative Scale

Plan: Planfulness subscale of the PGIS

POMS: Profile of Mood States

Proc Scale: Procrastination Scale

RC: Readiness for Change subscale of the PGIS

RCT: Randomised Control Trial

RRA: Retrorubral area

r-VAS: Repeat of Vigour Assessment Scale

SANS: Scale for the Assessment of Negative Symptoms

SB-CBT: Strengths-Based CBT

SDS: Schedule for the Deficit Syndrome

SEM: Standard error of measurement

SF 36:   The Short Form (36) Health Survey

SMVM: Shirom-Melamed Vigor Measure

SN: Substantia nigra

SPSS: Statistical Package for the Social Sciences

S-SARS: Staden Schizophrenia Anxiety Rating Scale

UMACL: UWIST Mood Adjective Checklist

UR: Using Resources subscale of the PGIS

UWES: Utrecht Work Engagement Scale

VAS: Vigour Assessment Scale

VST: Ventral striatum

VTA: Ventral tegmental area

CHAPTER 1

Introduction to the research

For most people, having vigour seems like an appealing prospect, something worthy of instilling and kindling, and it is even taken as a virtuous pursuit. For some people living with schizophrenia, however, vigour is not a mere aspiration; the lack thereof is highly problematic and limiting. Vigour is at issue in the lack of volition (i.e., avolition) that often persists after acute episodes of schizophrenia, contributing to marked impairment in socio-occupational functioning. Moreover, avolition often responds poorly to treatment and defies other treatment targets that are dependent on the patient's vigour (e.g., activities of daily living; exercise; occupational activities; social rehabilitation; treatment adherence, cessation of undermining behaviour and habits; and various activities within psychotherapy). Avolition also places a significant burden on family and caregivers of patients who commonly have little volition to take up and do activities – even basic ones like taking regular showers are a challenge for some.

Vigour per se has not been examined scientifically among these patients, owing in part to the lack of a scale by which to measure vigour. The closest to such are a few items on volition contained in scales used to measure symptoms in schizophrenia. For the general population, little research has been done specifically on vigour, apart from vigour in the workplace (Shirom, 2003).

Similarly, therapeutic tasks that would be specifically invigorating have not been studied. Developing invigorating tasks and a scale to measure vigour are crucial steps for addressing scientifically, and eventually also clinically, the lack of vigour in avolitional schizophrenia patients. Hence, this study developed and examined the validity and the reliability of a scale to assess vigour, as well as the validity and the reliability of an invigoration task, in a sample of patients with remitted but avolitional schizophrenia.

Furthermore, attaining a validated instrument and task offers practical utility in other populations, even when vigour is pursued for improved well-being (positive health) rather than in the treatment of an illness (negative health), subject to subsequent validity and reliability studies. Implementing this study first in a population where vigour is markedly compromised and resistant to interventions, addressed vigour closest to its core, thereby increasing the prospects for establishing validity and reliability of the instrument and the task in other populations.

This introductory chapter provides an overview of the study, with a background of the various aspects it entails, and highlights gaps in the existing literature that prompt the problem statement. The research aim is articulated and subsequently motivated for its significance for both scientific research and clinical practice, and theoretical underpinnings of the invigoration task are introduced.

1.1 Background to the study

The study developed a scale to assess vigour as well as an invigoration task, and examined the validity and the reliability of both the new scale and the task in a sample of 242 patients with remitted but avolitional schizophrenia. A literature review was carried out regarding vigour and the pathology of avolition in schizophrenia, as well as their measurement and inclusion in existing treatment strategies. Searches on vigour pertaining to schizophrenia were initially conducted using the keywords ('vigour' OR 'vigor') AND ('schizophrenia') in the titles of academic publications. The search involved Pubmed, ScienceDirect, Science Open, EBSCO, Elsevier, SpringerLink, WorldCat, SAGE, CiteSeerX, Google Scholar, JSTOR, PsychINFO and Questia. Suitable papers on vigour and schizophrenia were not found. Results proximal to vigour in schizophrenia referred to avolition instead, considered in section 1.1.3. Similarly, no literature was found for either assessment of vigour in this population or for vigour as a treatment target. The literature review subsequently explored peripheral studies that included the keywords in no particular combinations, with consideration of existing conceptualisations, available psychometric measures and existing treatment targets.

1.1.1 The concept of vigour

The concept of vigour may be traced back to the Taoist culture of ancient China (Shraga & Shirom, 2009). It referred to one's feelings of energy and power in the form of Chi and Jing, which could be accessed and developed through a particular lifestyle (Shraga & Shirom, 2009). In more recent times, vigour is mostly referenced in occupational or work-related contexts. On a broader level, although not explicitly articulated as such in literature, the concept of vigour is well suited to the approach in positive psychology that concerns the study of health, well-being, resilience and human strength (Seligman & Csikszentmihalyi, 2014).

Shirom (2011) defined vigour as a tri-faceted state. The construct validity for this conceptualisation has been demonstrated (Shraga & Shirom, 2009). This includes mobility, emotional energy or the capacity for empathy, as well as cognitive liveliness (thought flow and mental agility). Accordingly, vigour entails a balance between energy and intensity. For instance, it encompasses both calm energy affects, such as contentment and pleasure, as well as high-intensity affects, including joy and enthusiasm. Vigour may be considered as an affect in that it can be fleeting and varied throughout the day (Sonnentag & Niessen, 2008); a

mood state, where it may be enduring, lasting between days and weeks; and a trait, with a between-individual variation.

Several constructs have been linked to vigour. Resilience, or one's ability to persist and experience positive affect despite challenges, is one of these, and Clinton, Conway and Sturges (2017) include resilience as part of their conceptualisation of vigour. Another related concept is vitality, which refers to one's subjective experience of aliveness, and is seen as more of a character strength than a positive affect (Ryan & Frederick, 1997; Shirom, 2011). Further concepts are thriving, which includes a learning component in addition to vitality (Spreitzer, Sutcliffe, Dutton, Sonenshein, & Grant, 2005) and engagement, which is a tri-dimensional construct with vigour being one of the dimensions (Shirom, 2011). Elation has been related to vigour, but is higher in intensity (Shirom, 2011). In contrasting terms, vigour has been referred to as the antithesis to burnout and exhaustion (Shirom, 2007), which relate to the affective component of the withdrawal-oriented behavioural inhibition system (Shirom, 2011).

1.1.2 Understanding the mechanisms of vigour

Vigour has been linked to creativity, particularly in the context of generating new ideas for solving problems (Shirom, 2011). Having more vigour makes it more likely that one may engage in a creative process of generating ideas and solutions. A new study by Groenewoudt, Rooks and Van Gool (2019) among a group of employees found that vigour is linked to increased social interaction beyond one's regular network system. More interaction seems to increase the chances of creativity, owing to a person being exposed to new sources of information (Groenewoudt et al., 2019).

Although Groenewoudt et al. did not find that the extent of vigour was significant to the creative process, vigour was conceptualised as energy without the component of intrinsic motivation. Given that vigour is correlated with increased social interaction, and that intrinsic motivation is required in order to be able to interact with others, the results of their study may be interpreted to indicate that vigour does hold significance on creativity. The concept of vigour may then be broadened by considering vigour to be inclusive of intrinsic motivation, as is the case in the present study. The generation of new ideas is in line with a positive psychology theory by Frederickson, namely the Broaden and Build Theory of Positive Emotions (Fredrickson & Joiner, 2002, 2018; Fredrickson, Kring, Johnson, Meyer, & Penn 2010). This theory states that positive emotions temporarily broaden or expand one's attention and thoughts, making a broader range of possibilities and ideas available ('broaden hypothesis'). This broadened outlook, in turn, fosters the creation or building of valuable personal resources ('build hypothesis').

The Broaden and Build Theory has been verified scientifically and has been shown to create an 'upward positive spiral' (Schmitz, Rosa, & Anderson, 2009). A significant element of this is the lasting positive impact demonstrated by research, with neurological studies showing lasting changes in the brain (Garland & Howard, 2009). This means that igniting positive emotions makes it more likely for these to occur in future, which over time increases the probability of attaining personal resources necessary for achieving and maintaining overall well-being (Fredrickson, Cohn, Coffey, Pek, & Finkel, 2008).

A review of this theory prompted the consideration that the stimulation of positive emotion is an investment in mental health, in that the gains are lasting, enduring and build on each other. Therefore, we anticipated that through a task, once ignited, an invigorated state may create a similar upward spiral for the patients with avolitional schizophrenia.

1.1.3 Schizophrenia and avolition

Schizophrenia is a complex and chronic mental disorder characterised by disturbances in thought, perception and behaviour (also referred to as 'positive symptoms'), as well as by a significant a lack of volition, emotional responsiveness and social interest ('negative symptoms'). Individuals who have schizophrenia also display marked impairment in their daily functioning.

Individuals with avolitional schizophrenia experience a reduction in their motivation to initiate or persist in goal-directed behaviour (Barch & Dowd, 2010). Avolition has been considered as the core feature of schizophrenia, and among the most disabling deficits in schizophrenia, consistently predicting poor psychosocial outcomes (Foussias, Mann, Zakzanis, Van Reekum, & Remington, 2009; Marder & Galderisi, 2017), although this view has been disputed (Galderisi, Mucci, Buchanan, & Arango, 2018).

In understanding avolition as a symptom in schizophrenia, it is noteworthy that a clear demarcation of the concept of avolition is not possible owing to it being a high-order concept (similar to the concept of time). There is thus an inevitable overlap with related concepts. A recent review of literature on the study of motivation in schizophrenia (Najas-Garcia, Carmona, & Gómez-Benito, 2018) reported that avolition has been the least used concept in the study of motivation in schizophrenia, among related terms of intrinsic motivation, self-efficacy and defeatist beliefs, apathy, rewards or reinforcements and other motivation terms. The authors of this review further reported that apathy has been a preferred term in the literature to avolition, although the two terms have been used synonymously. Hence, avolition has been related with partially overlapping terms and is often practically entangled with other related features.

Factor analyses on several scales measuring negative symptoms of schizophrenia found two stable structures: reduced expression and avolition (Marder & Galderisi, 2017). Foussias and Remington (2010) suggest that while negative symptoms are varied and broad, they may all be considered as part of the concept of avolition.

Some definitions of avolition focus on outward behaviour, while others include one's subjective experience of motivation. Messinger, Trémeau, Antonius, Mendelsohn, Prudent, Stanford, and Malaspina (2011) describe avolition as the subjective reduction in personal interests, desires or goals. Avolition has been conceptualised behaviourally as a reduction in self-initiated and purposeful acts (such as spontaneous motor activity, hygiene), fewer activities in work, recreation or leisure, as well as diminished social engagement. Avolition is also at times described as being secondary to conditions such as depression, paranoid beliefs or lack of opportunities.

1.1.4 Neurobiological mechanisms of avolition

Several studies have examined avolition on a neurological level, implicating avolition in specific neural circuits involved in reward impulses. Reward impulses may broadly be described as referring to "liking" and "wanting". "Liking" refers to the hedonic aspects of experiencing pleasure at the moment (hence the lack thereof referring to anhedonia), whereas "wanting" refers to the desire for such an experience. "Liking" has been implicated in opioids, whereas "wanting" has been implicated in both opioids and dopamine (Berridge, 2007; Gruber, 2019).

The difference in neural circuits is further reflected in studies demonstrating that "liking" is relatively unaffected in patients with avolitional schizophrenia, whereas "wanting" is impaired (Cohen & Meesters, 2019; Da Silva et al., 2017). This means that patients with avolitional schizophrenia may *experience* pleasure in the same manner as healthy individuals, but they are less likely to engage in behaviours that are aimed at *obtaining* rewards and pleasurable outcomes (Marder & Galderisi, 2017).

Cognitively, patients with prominent avolition struggle with rapid learning of reward cues and with changes in outcomes and feedback (Strauss, Waltz, & Gold, 2014). They also have difficulty when presented with tasks requiring incrementally increasing effort, such that they are more likely to give up exerting themselves to obtain a reward than patients without avolition or with mild avolition. New research considers cognition and reward abnormalities to be interrelated rather than separate in schizophrenia, where avolition is purported to arise from abnormal cognitive-reward interactions (Robison, Thakkar, & Diwadkar, 2019). Accordingly, while hedonic responses are intact, there is impairment in reinforcement learning, reward anticipation, representing values, exploratory behaviour and effort allocation.

1.1.5 Brain imaging studies relevant to avolition

While mechanisms in the brain relevant to avolition are complex, with details beyond the scope of this study, they are broadly based on the mesolimbic dopaminergic system. Dopamine neurons in the substantia nigra (SN), ventral tegmental area (VTA) and retrorubral area (RRA) project to the striatum (caudate and putamen) and certain regions of the frontal cortex. The ventromedial orbital cortex targeting the ventromedial striatum is significant to the process, as it encodes the subjective value of a reward (Smith, Clithero, Boltuck, & Huettel, 2014). These areas work together to assimilate information regarding stimulus salience, reward value and reward probability (Olivetti, Balsam, Simpson, & Kellendonk, 2019). It has been found that the severity of negative symptoms correlates negatively with dopamine in the ventral area of the striatum (VST) (Deserno, Schlagenhauf, & Heinz, 2016).

Brain imaging studies have illustrated differences between responses from reward-related cues and responses related to the effortful behaviour to acquire rewards (Olivetti et al., 2019). Compared to a situation where one passively views reward cues with no opportunity for attainment, greater activation is seen in situations where the cue is coupled with an opportunity for attainment. This is even more evident when the reward requires increased effort. Greater activation of the VST was observed with more considerable instrumental effort and thus greater activation of prefrontal, premotor and motor cortex via VST efferents to the frontal regions.

1.1.6 The role of social motivation in addressing avolition

In addition to the cognitive-reward interactions described above, social motivation in schizophrenia has also been investigated in research. While many studies have investigated motivation in the context of non-social rewards, such as receiving tokens, Fulford, Campellone, and Gard (2018) found that social rewards are significant incentives as well. Their study indicated that participants were motivated more by encouragement from the practitioner during sessions than encouragement that was non-social, such as incentives or motivation displayed on a computer screen.

1.1.7 Conceptualisation of vigour and avolition in this study

Although both vigour and avolition are high-order concepts, and for this reason it is not possible to provide a fully demarcated definition of either, for the sake of clarity, the components inclusive to the conceptualisation of vigour in this study are described below:

The study conceptualised vigour as a stimulated and positive state of a person, encompassing emotional, physical, cognitive, behavioural and social domains. The concept vigour is considered to be congruent with the positive psychology terms of motivation, engagement,

vitality and curiosity. Vigour may be considered to be in an inverse conceptual relation to avolition, burnout and inactivity.

The concept 'avolition' is operationalised in the next chapter as part of the inclusion and exclusion criteria for the recruiting of eligible participants.

1.1.8 Psychiatric interventions for avolitional schizophrenia

At present, there are no published interventions on vigour in the context of avolition or avolitional schizophrenia. Current interventions for avolition include pharmacotherapy and psychosocial interventions. Where vigour is mentioned, it usually refers specifically to the speed of motor reaction (Gold, Strauss, Waltz, Robinson, Brown, & Frank, 2013; Niv, Daw, Joel, & Dayan, 2007; Zénon, Devesse, & Olivier, 2016). Pharmacotherapy has been reported to have limited impact on negative symptoms of schizophrenia, particularly between acute episodes, and may even contribute to secondary negative symptoms (Hanson, Healey, Wolf, & Kohler, 2010).

According to Strauss (2013), few psychosocial interventions have been developed specifically for negative symptoms of schizophrenia. Current approaches include components of cognitive-behaviour therapy, positive psychology and mindfulness. One study found a reduction in avolition-apathy among low-functioning patients with schizophrenia using cognitive therapy to target dysfunctional beliefs (Grant, Huh, Perivoliotis, Stolar, & Beck, 2012). Strauss (2013) reported that the methods for targeting neurocognitive impairment by Grant et al. (2012), such as structuring each session with visual aids, using concise language, frequent summaries, repetition of important points, positive reinforcement, and structuring the home environment, were effective in reducing avolition.

Positive interventions emphasise one's strengths rather than dysfunction or pathology (Rashid, 2009). A pilot study of loving-kindness meditation for negative symptoms in schizophrenia found a reduction in symptoms including avolition, as well as increased positive emotions and psychological recovery (Johnson et al., 2011). A Positive Emotions Program for Schizophrenia (PEPS) pilot study showed a reduction in avolition-apathy and anhedonia-asociality scores on the Scale for the Assessment of Negative Symptoms (SANS) (Favrod et al., 2015).

Considering the enduring challenges posed by avolition and the lack of effective treatments from available standard services for avolition, the study of vigour in the context of schizophrenia was identified as a pertinent need in mental health. A validated invigoration task offers new hope for a population for whom all options have been exhausted.

The invigoration task has potential for various settings. Hence, it need not be limited to the realm of schizophrenia, in which vigour is most compromised. The study of vigour was in itself indicated as a worthy pursuit given that people, in general, tend to have a desire to feel vigorous and perceive vigour as a significant aspect to their affective experiences (Shraga & Shirom, 2009). Vigour can stimulate creativity, proactivity and initiative (Louw, 2014), and it facilitates the procurement of resources necessary for survival (Watson, 2002).

1.1.9 Interventions for inducing vigour

Literature was not found on interventions that induce vigour specifically – not only for schizophrenia or avolition, but in general. Interventions that may be considered in the proximity of vigour are considered next.

1.1.9.1 Interventions for phenomena related to vigour

As with the conceptualisation of vigour, intervention studies that mention vigour are often in a work context. Outside of this body of research, vigour features indirectly in studies for which the running theme appears to be physical activity. These studies have demonstrated that even brief bursts of movement can improve overall mood, including vigour (Abrantes et al., 2012; Lane, Hewston, Redding, & Whyte, 2003; Rokka, Mavridis, & Kouli, 2010). A study on a 10-week dance intervention with people with Parkinson's disease demonstrated improved scores on the Profile of Mood States (POMS), including better scores on the vigour-activity subscale (Lewis, Annett, Davenport, Hall, & Lovatt, 2016).

A search of the literature for intervention studies for related phenomena such as engagement, vitality, resilience and vigour's negative counterpart, burnout, yielded more results. However, as with the conceptualisation of vigour, current research is confined to work-related settings. As with vigour, activity-related interventions feature in the literature. For example, Kinnafick, Thøgersen-Ntoumani, Duda, and Taylor (2014) implemented a simple lunchtime-walking intervention, initially in groups that were led and followed by individual walking, with results indicating an improvement in autonomy, support, subjective vitality and physical activity behaviour.

Engagement and motivation were assessed after intervention among school students, with results showing positive motivation changes on task management, persistence, failure avoidance and other factors (Martin, 2008). Chan (2011) investigated the effectiveness of a gratitude programme for teachers and found that burnout subsided and life satisfaction increased. Anshel and Kang (2007) examined the effect of a 10-week programme in a work context, which focused on replacing negative habits with positive ones, and found improved scores on the Full Engagement Inventory. This intervention is in line with the Taoist notions of

kindling vigour via lifestyle habits. In another study, a job-crafting intervention in Japan found an increase in employee work engagement, as well as in improving job-crafting and decreasing psychological distress (Sakuraya, Shimazu, Imamura, Namba, & Kawakami, 2016). Engagement has further been studied among an older population, with Menichetti and Graffigna (2016) performing the first documented intervention for increasing patient engagement among the elderly.

Research on resilience covered the development of thriving in the face of adversity in particularly challenging contexts. Koen, Du Plessis and Watson (2013) strengthened the resilience of health caregivers involved with HIV/AIDS via an intervention allowing them to be involved in leadership hubs. In a sample of youths, Rosenberg et al. (2015) tested the feasibility of a resilience-promoting intervention in adolescents and young adults with cancer and found a favourable response from the participants. Resilience-promoting interventions have further been carried out with people who have survived natural disasters (Hechanova et al., 2015; Hechanova, Waelde, & Ramos, 2016) and found improvements in the self-efficacy and coping skills in the participants. While most of these studies measured effects upon or shortly after the completion of the interventions, Yu, Lam, Liu, & Stewart (2015) assessed both short- and long-term effects of an intervention programme for the enhancement of resilience in immigrants, with results indicating that such interventions may have persisting benefits over time.

1.1.9.2 Immersive interventions involving virtual reality

A review of virtual reality interventions was included for the consideration of insights rendered by these studies in the development of the invigoration task. Part of this entails incorporating "positive technology", referring to the combination of positive psychology principles and information technology, inclusive of augmented reality (Gaggioli, Riva, Peters, & Calvo, 2017). A pilot study that developed a mood-induction procedure to induce positive emotions such as joy may be one point of reference (Baños et al., 2013). The study incorporated environmental aspects such as colour and lighting, as well as activity content. The activities were guided by narratives eliciting self-statements and self-images and incorporated slow-breathing and mindfulness (discussed later in this chapter).

A new study by Schutte (2019) showed that a virtual reality experience increased curiosity, particularly in terms of "joyous exploration", an aspect of curiosity that is considered to be pleasurable and rewarding (Schutte, 2019). Schutte connected this finding with the broaden-and-build theory described earlier, stating that increased curiosity may result in a broadening and building of resources that may lead to an upward spiral of well-being. The author further

suggested that the outcomes of the study indicate that positive affect, as well as vigour, might be added to the set of characteristics worthy of developing via virtual reality experiences.

The research above indicates a potential for vigour in a therapeutic context, thereby justifying a direct focus on vigour as a worthy pursuit in itself or as change agent. Moving beyond physical activity, tasks with cognitive and emotional components, once established, may potentially be deployed in various kinds of invigoration therapies.

1.1.10 Psychometric assessment of vigour and avolition

Psychometric assessment is a required field in making it possible to adequately understand, measure and address aspects of the human mind. It sees to it that relevant topics are addressed in sufficient depth and completeness, and provides consistency and a standardised language for both researchers and clinicians (Zarin, Young, West, 2005). Clinical uses of measures are vast, including screening, diagnosis, decision-making and planning. Psychometric assessment guides the selection of treatments, monitoring of progress and can inform decisions for the betterment of service delivery.

Without sound scales, it is not possible to properly assess the lack of vigour in patients with schizophrenia. Currently, there are no measures of vigour for a general population or schizophrenia patients available. The closest we have is a scale of vigour in the workplace but, as will be described below, it is limited in its utility owing to its work-related setting.

Measures in the proximity of vigour include the Activation-Deactivation Adjective Checklist (AD ACL) (Thayer, 1986), the UWIST Mood Adjective Checklist (UMACL) (Matthews, Jones, & Chamberlain, 1990), the vitality measure in the Medical Outcomes Study (MOS) 36-Item Short-Form Health Survey (SF 36) (Ware & Sherbourne, 1992) and the vigour subscale of the Utrecht Work Engagement Scale (UWES) (Bakker & Demerouti, 2008).

The AD ACL is a self-rating scale which assesses momentary activation or arousal states on a four-point rating system. There are two core components, namely energetic arousal (including tiredness) and tense arousal (including calmness) (Thayer, 1986). The UMACL was developed as a refinement of existing measures of mood. The scale consists of 29 items divided into three subscales measuring opposites of energetic-tired, nervous-relaxed and pleasant-unpleasant on a similar four-point scale as the AD ACL (Matthews et al., 1990; Matthews, Deary, & Whiteman, 2003). The vitality subscale of the SF 36 includes four items measuring energy and fatigue, with low scores indicating that the person feels tired and worn out, while high scores reflect a state of being full of pep and energy, all of the time during the past four weeks (Ware & Sherbourne, 1992). The vigour subscale of the UWES includes six

items pertaining to vigour which are self-rated on a seven-point Likert scale (Seppälä et al., 2009).

Two widely used scales used for the assessment of avolition are the Scale for the Assessment of Negative Symptoms (SANS) (Andreasen, 2000) and the Positive and Negative Syndrome Scale (PANSS) (Kay, Fiszbein, & Opfer, 1987), which was used for identifying avolition in the study (see Chapter 2). The SANS measures apathy or avolition via three items that all focus on behaviour. The PANSS has one specific item, disturbance in volition, as well as two potentially related items, emotional withdrawal and passive/apathetic social withdrawal (Marder & Galderisi, 2017).

Since the PANSS and SANS were developed over 30 years ago, newer 'second-generation' instruments have been produced, namely, the Brief Negative Symptom Scale (BNSS) (Mucci et al., 2015), the Clinical Assessment Interview for Negative Symptoms (CAINS) (Horan, Kring, Gur, Reise, & Blanchard, 2011), and the Schedule for the Deficit Syndrome (SDS) (Kirkpatrick, Buchanan, McKenney, Alphs, & Carpenter, 2000). The BNSS separates items for avolition in terms of subjective experience and behaviour. The CAINS measures inner experience and behaviour within each item. The SDS calculates real-life motivation as the sum of scores on curbing of interests, a diminished sense of purpose and diminished social drive.

1.2 Problem statement

The pursuit of vigour – be it to open up treatment prospects for patients immobilised by avolition, to offer relief from burnout among caregivers, or simply to boost well-being in general – although appealing, has been unexplored in mental health. A review of literature could not provide the scientific knowledge and understanding required to explain, assess, diagnose or mobilise vigour as a treatment target. It is not possible to investigate vigour in research without a valid instrument. For example, a randomised control trial (RCT) cannot be performed on the effects of an intervention on vigour without an instrument to assess vigour.

It is furthermore not known how vigour may be related to avolition, to positive symptoms or to neurobiological networks. Neither is it known how vigour might be influenced by impediments or enhancement strategies. While vigour may be a desirable attribute and a welcomed resource in the face of depleted options, clinical progress is dependent on the extent to which vigour is formally investigated. Hence, it has not been possible to scientifically and clinically address vigour by the means available prior to this study. Meanwhile, avolition continues to persist in patients with schizophrenia in the absence of alternative interventions once patients have been optimally treated.

The study of vigour prompts a positive pursuit of enquiry in the field of mental health, rather than seeking the alleviation of the negative or quashing that which is absent (e.g., avolution). Studying vigour is meant to buildon the positive or that which is present. In this way, studying vigour progresses from existing work on the related concepts of avolution, inertia, anergia and amotivation. Vigour is taken as the positive inverse, at least in part, of these existing concepts. The assumption is not that vigour would be an entity independent of these related inverse concepts, but conceptual overlap is assumed to be a given. This pursuit of building principally on the positive rather ameliorating the negative, is consistent with recovery models and positive psychiatry

Drawbacks to current instruments concern their limited focus and scope in capturing vigour and its related concepts. There are no instruments for the measurement of vigour apart from a single instrument that is confined to occupational vigour (i.e., the Shirom-Melamed Vigor Measure). Similarly, there are no instruments specifically for avolution, apart from items that capture avolution in existing scales. The need for an instrument to measure vigour in schizophrenia is particularly merited considering the importance of avolution and the anticipated importance of vigour in schizophrenia. This prompted the following two-fold problem statement:

First, there was a need for a valid and reliable scale for the assessment of vigour. There is a paucity of research on vigour, and even less when it comes to its psychometric assessment. There was a single instrument available, the Shirom-Melamed Vigor Measure (SMVM), which has been validated specifically for an occupational setting and conforms to the limited scope and detail of its authors' tri-faceted conceptualisation of vigour. Without a valid and reliable scale of vigour, it would indeed be impossible to accurately and competently assess the extent of vigour and monitor changes.

Second, there was a need for a valid and reliable invigorating task, at least for providing a point of departure for a new field targeting vigour and bringing about the development of therapeutic tasks and interventions for various contexts. One population that particularly seems to lack vigour is that of avolitional schizophrenia. While vigour per se in this population had not been studied prior to this study, the deficit in vigour has been evident conceptually from the nature of avolution and its descriptions. Current interventions for treating avolition are limited in their effectiveness, and avolitional schizophrenia continues to predict poor treatment outcomes (Marder & Galderisi, 2017).

Considering the shortcomings of current interventions for avolution, we identified the development of a valid and reliable invigorating task as important for subsequent studies. An invigoration task that is valid and reliable can address not only the pathology of avolition in

schizophrenia but also the pursuit of improving vigour as part of well-being in this and other populations.

1.3 Aim of the study

Following on the two-fold problem statement, the dual aim of this study was to examine the validity and reliability of

a) an instrument for the measurement of vigour; and

b) an invigorating task based on therapeutic techniques of guided-imagery and cognitive-behaviour therapy

in remitted but avolitional schizophrenia patients.

1.4 Potential value of the study

The potential value of this study, thus, lies broadly in its contribution to a better understanding of vigour and in its provision of a basis for the development of interventions to induce vigour. This study hence bodes well not only for research, in expanding on our knowledge and generating foundations, but also for its therapeutic potential and impact.

Given the recent interest in researching positive health, this study may motivate development within the positive psychology paradigm, which refers to the study of positive aspects of human experience and seeks to ascertain the building blocks for creating a life worth living (Peterson & Park, 2014). Its interest moves beyond alleviating illness, towards attaining optimal well-being (Seligman & Csikszentmihalyi, 2014; Strümpfer, 2005). Vigour would be well suited to this field of research, considering that it is well-versed in concepts related to vigour, such as motivation, engagement, fulfilment, thriving, vitality and resilience. Vigour holds similar relevance to 'psychofortology' (in contrast to psychopathology), which is synonymous with positive psychology in that it refers to the science of psychological strengths (Wissing & Van Eeden, 2002). Some concepts that have been identified in psychofortology include the sense of coherence, locus of control, self-efficacy, hardiness, potency, and learned resourcefulness (Strümpfer, 1990).

In addition to benefits to the psychological paradigm, the study holds the potential to enrich the field of psychometric assessment. In part, it does so by the provision of an original scale, with sound psychometric properties, for the measurement of a construct that is only partially captured in existing measures. This may offer momentum for expansion, via other scales, to refine, adapt or focus the original, such as translating it into different languages or adapting it to different pathologies or age groups.

Research may also potentially branch out towards diverse contexts. For instance, in sport psychology, vigour may be incorporated in the assessment of performance outcomes, or, in educational psychology, a scale for assessing vigour in the classroom may render helpful insights that pertain to optimal learning. In addition to significance to psychometric assessment, data analysis from the development of the scale alone may facilitate an improved understanding of the concept of vigour. As with avolition, vigour is a high-order concept. Hence, a clear demarcation would be challenging to attain but, at least as a start, an analysis of the scale's properties yields insights into distinct and overlapping concepts.

A valid and reliable instrument can advance the study of vigour in determining where the needs are. It may be used in screening to identify individuals who would most benefit from invigoration. While this study was implemented in avolitional schizophrenia, screening need not be confined to this population. With further development, this may extend to specific psychiatric settings, various conditions (e.g., mood disorders) and healthy communities. A validated instrument for vigour has utility for tracking changes in vigour and examining the effectiveness of different interventions, which in turn may be used as a guide for further management.

The significance of this particular population being chosen for the study stands in its tackling of the problem at its worst end. In researching vigour in avolitional schizophrenia, a population where vigour is most compromised, and in demonstrating a shift there, it stands to reason that the scale and task address vigour at its core. The instrument and the invigoration task in this study offer help not only to avolitional schizophrenia but they may be harnessed too for other, more volitional populations where vigour is more easily shifted. Hence, this research has the potential for being extended to specific interventions for people with avolitional schizophrenia and, once studied appropriately, to other populations, including healthy individuals interested in becoming more invigorated for enhanced well-being.

Therapeutically, an invigoration task, once validated, has potential uptake in various kinds of therapies, approaches and techniques. Two of these are cognitive-behaviour therapy and guided imagery, which informed the two main components of the invigoration task. Others may incorporate technological advancements, such as virtual reality and neurofeedback. Recent studies have already demonstrated that patients with schizophrenia can learn to control brain activity, which in turn facilitates changes in the perception of emotions and modulates network connectivity (Ruiz et al., 2013).

1.5 Theoretical considerations for the invigoration task

In addition to the literature reviewed earlier, which covered theory on the concepts of vigour and avolition as well as intervention strategies, the components described below contributed

to informing the invigoration task design. This, in turn, made possible the creation of a task that is well suited for augmenting the approaches comprising it.

1.5.1 Practitioner-patient relationship

A good practitioner-patient relationship has been widely documented for its impact on positive outcomes, regardless of therapeutic approach (Anderson, Crowley, Himawa, Holmberg, & Uhlin, 2016). Studies of empirically-based, standardised therapies reveal that even the most standardised procedures show variability in effect sizes, with the 'therapist effect' playing an inevitable role (Norcross & Lambert, 2018). This is relevant even where the contact with the patient is minimal (King, Orr, Poulsen, Giacomantonio, & Haden, 2017), as may be the case with the invigoration task in this study. Person-centred principles were considered for this component, whereby patients are treated with empathy, warmth and unconditional positive regard (Farber, Suzuki, & Lynch, 2018).

Skills required for the practice of person-centred principles include active listening and emotional interviewing. Active listening refers to the process of attunement to what the patient is communicating, taking note of verbal and non-verbal cues and probing where indicated. Motivational interviewing may be seen as a kind of active listening, where the practitioner respects that change is to come from the patients themselves, rather than being imposed, and techniques aimed at eliciting self-motivating statements are used (Rollnick & Miller, 1995).

1.5.2 Cognitive-behaviour therapy

Cognitive-behaviour therapy (CBT) is an empirically-based and widely researched form of therapy. It deals with one's thinking, emotions and behaviour as interrelated components in affecting one's mental health. CBT holds that cognitive processes maintain distress; hence, change in cognition, in turn, creates change in emotions and behaviour (Corey, 2009). Psychological distress may be considered an exaggeration of normal human functioning, with faulty information processing being a prime cause for such exaggeration. Regular repetition of maladaptive patterns of thinking, feeling and behaving reinforces these and solidifies unhelpful core beliefs.

Prominent figures considered in designing the task included Ellis, Beck, and Padesky and Mooney (Ellis, Padesky, & Beck, 2005; Padesky & Mooney, 2012). Ellis was considered for taking note of rigid beliefs elicited by the participants, such as, "I must". Beck's work was considered for its emphasis on empirically based treatment protocols, as well as its contributions towards understanding the role of faulty information processing and cognitive distortions in mental health issues, all amenable by the effectual working through and restructuring of such cognitive processes.

Therapy is structured, present-centred, time-limited, with clear goals and treatment plans, as well as the active involvement of both therapist and patient. Typically, this entails psychoeducation, the use of homework tasks, role-plays, behavioural experiments, tracking via self-monitoring charts and systematic restructuring of old patterns. There is an active component of learning, practice, repetition and subsequent restructuring. An established, standardised, measurable invigoration task may be incorporated into CBT, either as a CBT-informed invigoration exercise in itself or as a tool within a broader intervention. The practice component included small, consistent efforts towards increasing vigour and the practice of self-invigoration, taken up as 'homework'.

1.5.3 Strengths-based CBT (SB-CBT)

Strengths-based CBT is a new branch of CBT that incorporates a person's existing strengths at each stage of therapy. An example of such strengths would be a patient battling financially who has the innate tendency to use whatever food scraps or leftovers may be in the house, allowing for a meal to be available despite lack of resources. This may be identified as an ability to be creative, and once taken heed of, the patient's newfound strength may be kindled, practised and capitalised on (Padesky & Mooney, 2012). It would be sensible to consider SB-CBT in furthering the outputs of this study. Its structure and empiricism (inherent to CBT), coupled with the interest in strength and well-being, bode well for the positive psychology prospects mentioned earlier. This kind of CBT was reviewed for its inclusion of the value of a persons' own strengths in potentially increasing their vigour.

1.5.4 Imagery

Mental imagery refers to the experience of perception, be it 'seeing', 'hearing' or 'moving' in the 'mind's eye' (Holmes & Matthews, 2010). A new study referred to mental imagery as a "motivational amplifier" to promote activities (Renner, Murphy, Ji, Manly, & Holmes, 2019). It involves numerous sensory faculties and cognitive abilities, and it affects a person physically, mentally and biochemically. Research in cognitive neuroscience shows that mental imagery engages the same substrates as perception in much the same sensory modality (Blackwell, 2019; Kosslyn, Ganis, & Thompson, 2001). This means that one responds to the imagery as though it is happening in real life.

The scientific literature further indicates that repeated rehearsal of an image can make it more vivid and plausible, and it has been postulated that it may increase the subjective sense of likelihood (Blackwell, 2019). Imagery thus holds potential for stimulating behaviour. Blackwell (2019) suggested that imagery may be incorporated into interventions intended to encourage someone to engage in particular behaviours. One suggestion was to develop and rehearse

an imagery script incorporating both the process of moving towards the desired outcome and the consequent reward from this.

Imagery and CBT approaches go hand in hand. Sometimes, imagery exercises are used as part of a CBT intervention, while cognitive processes are typically a fundamental aspect of imagery-based interventions. Techniques may be cognitive or motivational, as well as general or specific and internal or external (McMorris and Hale, 2006). A commonly practised imagery is guided imagery, which entails a therapist guiding the process of image-creation to reach a desired therapeutic goal. Specific targets include relaxation, pain management, and rehearsal for situations, to name a few, often indicated for mood disorders or addictions. An experimental study on guided imagery targeting the lack of motivation in psychotic patients showed that it significantly improved anticipatory success (Cox, Jolley, & Johns, 2016). The authors concluded that guided imagery could help in shifting cognitive processes that underlie negative symptoms in schizophrenia (Cox et al., 2016).

Literature on imagery from sport psychology was also considered for its documented motivational effects on various performance-based populations (Callow, Hardy, & Hall, 2001; Blankert and Hamstra, 2017; Quinton, Cumming, & Williams, 2018; Simonsmeier & Buecker, 2017; Conroy & Hagger, 2017; Ritchie & Brooker, 2018). Athletes would imagine vividly practising and successfully carrying out certain sports activities and gaming strategies, which in turn improved their performance. Studies have also shown the positive impact on motivation, focus and confidence (Turan, Disçeken, & Kaya, 2019), which further contributed to imagery becoming a central component of the task.

In sum, imagery may be useful not only for psychopathology, but also for fostering well-being and adaptive behaviour, such as kindling motivation (Sherman, Gangi, & White, 2010; Solbrig et al., 2017). The recognition in the literature that further research in mental imagery may serve to establish innovative treatment tasks as building blocks resonates strongly with the premises of this thesis.

1.5.5 Mindfulness

While CBT techniques and some of the invigoration task's objectives are change-driven, mindfulness refers to acceptance rather than change (Crane et al., 2017). Mindfulness, a concept that has gained increasing popularity both in literature and in mainstream media, has been described as the practice of conscious, non-judgmental focus on and awareness of the present moment (Kabat-Zinn, 2015; Langer & Ngnoumen, 2017). There has been a confluence of mindfulness with cognitive science. A distressing situation may be tackled from the angle of challenging faulty thinking associated with the experience, while mindfulness would call for merely noticing the situation with radical acceptance. Both approaches may help

attain positive outcomes; hence, mindfulness and CBT have been interrelated in research and practice.

1.5.6 Savouring

Savouring refers to the process underlying one's capacity to attend to, appreciate and enhance positive experiences (Bryant & Veroff, 2017). This has an inevitable overlap with mindfulness, but there is an important distinction; Savouring entails more than merely experiencing pleasure; it also entails conscious attention to or meta-awareness of the experience of pleasure. Savouring involves the deliberate use of a set of cognitive and behavioural strategies through which people regulate their positive feelings in response to specific positive events (Smith & Bryant, 2017). Bryant and Veroff (2017) suggest that one can *choose* to enhance the likelihood that savouring will occur in future by invoking cognitive and behavioural processes to set up conducive conditions for savouring to occur.

A study in a population of schizophrenia patients found that the patients were less likely to mentally rehearse savouring (Cassar, Applegate, & Bentall, 2013). The authors noted that patients had reduced self-efficacy and they rated everyday tasks as more difficult to master than healthy controls, which could explain the lack of social engagement and everyday functioning associated with negative symptoms. They further suggested that there is a need to develop cognitive-behavioural savouring and self-efficacy interventions for patients experiencing the negative symptoms of schizophrenia.

In light of the above, it is easier to see how an established, standardised and validated invigoration task could potentially have uptake in a diverse range of approaches and vigour-enhancing strategies, ranging from a task in itself that is invigorating, to a component of a particular therapeutic approach such as CBT. If taken to neurofeedback training, one may even tailor the task within a recreational gaming context, where a patient, for instance, learns to drive forward the image of a car on a screen. A new study has demonstrated this with children using a toy car (Zhang, Jadavji, Zewdie, & Kirton, 2019); this may be applied to invigoration training. For the scope of this study, the aim was to provide a starting point, from which clinicians and investigators in relevant fields may harness interest and develop further initiatives.

1.6 Conclusion

This introductory chapter provided an overview of the study, highlighting literature that informed the problem statement. In sum, vigour may be considered desirable, but the lack thereof causes serious problems, particularly for patients who are constrained by their avolition. Avolition in schizophrenia persists after acute episodes and causes marked

impairment in functioning. It is difficult to treat compared to positive symptoms, and a dilemma arises in treatment approaches in that some vigour is a prerequisite to treatment, yet it is lacking in this population. Prior to this study, vigour had not been examined scientifically in this population, partly owing to the lack of a scale. Therapeutic tasks were similarly not available. This study hence developed a scale to measure vigour and an invigoration task, and assessed these for validity and reliability. Apart from the avolitional population, this task may potentially be applied to other populations. The study was carried out in an avolitional population in order to address vigour at its core, thereby enhancing validity and development potential for its implementation in other populations.

The methodology for the development and validation of the new scale and invigoration task is articulated in Chapter 2.

CHAPTER 2

Methodology

This chapter describes the methodology for the development and validation of the new instrument and the invigoration task. It describes the two-fold aim, corresponding objectives and the design. Within the design, the population, sampling method, sample size, data collection method, descriptive and confounding variables, and measures are described. The development of the new instrument and the task are presented, the procedures followed for data collection are outlined, and relevant ethical aspects are considered.

2.1 Aim and objectives

The dual aim of this study was to examine the validity and reliability of

a) an instrument for the measurement of vigour; and

b) an invigorating task based on therapeutic techniques of guided-imagery and cognitive-behaviour therapy

in remitted but avolitional schizophrenia patients.

In pursuing the aim, the objectives of the study were:

>   a) *to develop a scale to assess vigour, namely the VAS;*
>   b) *to examine the content validity of the VAS;*
>   c) *to examine the concurrent validity of the VAS;*
>   d) *to examine the discriminant validity of the VAS;*
>   e) *to examine the internal consistency of the VAS;*
>   f) *to examine the split-half reliability of the VAS;*
>   g) *to examine the test-retest reliability of the VAS;*
>   h) *to examine the standard error of measurement (SEM) of the VAS;*
>   i) *to develop an invigoration task;*
>   j) *to examine the validity of the invigoration task;*
>   k) *to examine the effect size of the invigoration task; and*
>   l) *to examine the reliability of the invigoration task.*

2.2 Research design

The study was designed for the quantitative validation of a psychometric instrument and an intervention presented in detail in sections 2.7 and 2.8 respectively. The instrument was called the Vigour Assessment Scale (VAS) and the intervention, an invigoration task.

The design for examining the validity and reliability of the VAS is premised on statistical comparisons between the VAS and other measuring instruments, and among items within the VAS. The items of the VAS were developed through a process of conceptual analysis, followed by an investigation of it being valid and reliable by various kinds of validity and reliability testing as captured in the objectives of the study. Given the variety of methods and interpretations of validity and reliability terms, this study adhered to using these operationalised terms as described in the subsequent paragraph. These descriptions clarify the intentions of the objectives and facilitate appropriate interpretation. How the objectives were achieved by analysing the data is described in the data analyses section of this chapter (see section 2.10).

Content validity refers to the extent to which the content of the VAS covers the content of vigour and its aptness for doing so. Concurrent validity in this study refers to the extent to which the VAS correlated with instruments measuring constructs approximate to vigour, these being work-related vigour, personal growth and initiative, and behaviour activation. Procrastination and fatigue were included as well, as inverse approximations of vigour. Discriminant validity in this study refers to the extent to which the VAS as a measurement of vigour captured vigour as distinct from concepts with which it may potentially be conflated, namely, procrastination, fatigue, depression, behaviour inhibition and activation, personal growth and initiative, and anxiety. Internal consistency refers to the coherence among the items and components of the VAS. Split-half reliability referred to the internal cohesion of the halves of the instrument that it was split into, as well as by correlations between the respective halves. Test-retest reliability referred to the extent to which the VAS measured consistently over time, and SEMs informed reliability through confidence intervals of the consistent measurement error invoked by the VAS.

The invigoration task was theoretically informed and developed into two main components, these being imagery and cognitive components. To examine its validity, a proof-of-concept quasi-experimental one-group sequentially-repeated pre-test/post-test design was followed, with two sequential interventions over four points in time. The proof-of-concept design was meant to precede a randomised controlled trial (RCT), which examined within-subject change following two sequential interventions a month apart.

This design informed the validity for the invigoration task, that is, the extent to which the task did what it was supposed to do. The design was complemented by an examination of the magnitude of change induced by the task as reflected by effect sizes.

Reliability of the task refers to the extent to which the task consistently did what it was supposed to do. The study was designed to address this by examining whether statistically significant changes were induced by the task on more than one occasion, as well as whether measurements of vigour were correlated between the task sessions.

2.3 Population

The population of interest for this study consisted of outpatients with remitted but avolitional schizophrenia. The reason for the inclusion of remitted patients in the study was to make the population more specific, having avolition without the potential confounders of acute-phase symptoms and of treatment responses. Patients with acute-phase symptoms were further excluded to prevent harm, owing to their potential psychological vulnerability. The stability of their condition and being on the same medication for three months also aided in averting a confounding effect of medication on changes in their vigour.

Since their avolitional condition rendered participants less likely to change in vigour than healthy participants, the consideration was that inducing a change in vigour despite their difficulty in this domain may add to the substantive validity of the invigoration task. In addition, participants with comorbid disorders, as well as individuals with a positive substance history for three months or less prior to recruitment, as by self-report or recorded in the clinical notes, were excluded to minimise the risk of these for confounding the results.

2.3.1 Inclusion criteria

To be eligible to participate in this study, the following criteria had to be met:

1. Individuals aged 18 years and older.
2. Individuals with remitted but avolitional schizophrenia as defined by the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5). Remission was defined operationally as not being in the active phase of schizophrenia as per DSM-5. Avolitional schizophrenia was defined on the PANSS with a rating of 3 or more on the G13-item (disturbance of volition) on the scale, indicating a mild to extreme "disturbance in the wilful initiation, sustenance, and control of one's thoughts, behaviour, movements, and speech." In addition, a minimum total score of 10 was required for the sum of items G13, N4 (passive/apathetic social withdrawal) and N2 (emotional withdrawal) on the PANSS (Kay et al., 1987).

3. Individuals who were stable. Stability was indicated by medication dosages remaining unaltered for the preceding three months of receiving treatment, as self-reported or recorded in the medical notes.
4. Individuals who had voluntarily signed the informed consent form before the conducting of study-specific procedures.

2.3.2 Exclusion criteria

Individuals meeting any of the exclusion criteria listed below were excluded from participation in the study:

1. Individuals in the acute phase of schizophrenia as defined in the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5)
2. Individuals with significant comorbid psychiatric disorders
3. Individuals with a positive substance history for three months or less preceding recruitment to the study, as self-reported or recorded in the medical notes
4. Individuals with unstable or significant medical disorders that may confound the assessment of the psychiatric diagnosis, or hamper participation
5. Individuals with present or past head injury with neurological sequelae or causing loss of consciousness
6. Individuals meeting the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5) criteria for intellectual disability

2.4 Sampling method and sample size

A convenience sample comprised patients from the outpatients' department (OPD) at Weskoppies Hospital. Patients who presented at OPD were recruited during the period that they were scheduled to attend their monthly follow-up appointments. The hospital scheduled appointments on specific days, demarcated according to diagnosis, with potential participants for this study being scheduled on Wednesdays and Thursdays. On a weekly basis, the researcher consulted with other clinicians at the hospital about potentially suitable patients for recruitment into the study. The names were added to a list of potential participants, along with their appointment dates, which were obtained from the OPD schedule. Potentially eligible participants were approached in person on the respective days and invited to participate in the study. Those who were willing and met the criteria for inclusion were enrolled for the study.

A review study on practices for determining sample sizes for newly-developed patient-reported outcome measures concluded that an *a priori* sample size determination is rarely justified, particularly owing to a lack of scientifically sound recommendations (Anthoine, Moret, Regnault, Sébille, & Hardouin, 2014). However, some theoretical considerations may

nonetheless be suggestive. Accordingly, the scale validation component of our study adhered to the recommendation that a minimum of five observations per instrument item would be required for the purposes of an Exploratory Factor Analysis (Williams, Onsman, & Brown, 2010). The VAS consisted of 48 items, thereby suggesting a sample size of 240. In the end, a sample size of 242 was attained.

As is custom in calculating the sample size for the task validation within a pre-test/post-test design, the chance for a Type I error (i.e. falsely finding statistical significance) was set at 5% (α=0.05) and the chance of a Type II error (i.e., falsely missing a statistical significance) was set at 20% (β=0.2); i.e., power of 80%). With these values, the minimum sample size was calculated to be 19 to detect a large effect size of 0.7, and 67 to detect a small effect size of 0.35. In the end, the sample size for the task validation was 70.

2.5 Descriptive and confounding variables

Descriptive variables refer to demographic characteristics used to describe the population, and confounding variables were variables that were considered as potentially distorting the results. Data on the following variables describing the general characteristics of the population were collected:

a) Age
b) Gender
c) Highest level of education
d) Major life-altering events during the preceding month

2.6 Existing measures

The study utilised measures that were included for their suitability in defining the sample and validating the new instrument. The Positive and Negative Syndrome Scale (PANSS), Calgary Depression Scale for Schizophrenia (CDSS) and the Staden Schizophrenia Anxiety Rating Scale (S-SARS) were administered by the researcher, whereas the others were self-report. These measures and their suitability for meeting the objectives of the study are described next.

2.6.1 Positive and Negative Syndrome Scale (PANSS)

The PANSS was selected for its suitability in defining the sample of this study. It is reportedly one of the most widely used and well-established instruments for the measurement of symptom severity in patients with schizophrenia (Galderisi, Mucci, Buchanan, & Arango, 2018; Kay et al., 1987; Shafer & Dazzi, 2019). It is also merited for being administered in the form of

a structured interview, given that clinician-rated instruments are considered as the gold standard for assessing negative symptoms (Luther, Fischer, Firmin, & Salyers, 2019).

The PANSS consists of 30 items comprising Positive, Negative and General Psychopathology subscales (Marder & Kirkpatrick, 2014). Each item is rated on a Likert scale between 1 and 7, with higher scores reflecting more severe psychopathology. For the purposes of this study, three of the items were rated, namely, disturbance of volition ("disturbance in the wilful initiation, sustenance, and control of one's thoughts, behavior, movements, and speech"), emotional withdrawal ("Lack of interest in, involvement with, and affective commitment to life's events"), and passive/apathetic social withdrawal ("Diminished interest and initiative in social interactions owing to passivity, apathy, anergy, or avolition"). As required by the PANSS instructions, these rating were informed by an interview with a patient as well as with the patient's family when available, and medical records. These served to ensure that the sample was sufficiently avolitional as part of the inclusion criteria for the study. For the purposes of this study, these three items are referred to as Avolitional PANSS.

2.6.2 Shirom-Melamed Vigor Measure (SMVM)

This instrument was selected for inclusion owing to its being the only instrument found in literature that was designed to measure vigour. It was intended for an entirely different context to our study, but the SMVM was nonetheless useful in validating the new instrument. Specifically, the SMVM was used for concurrent validity testing in this study.

The SMVM is a 12-item self-report scale on a seven-point Likert scale, measuring vigour in a work-related context (Shirom, 2003). It comprises three subscales of physical strength, emotional energy and cognitive liveliness, respectively. Respondents are requested to indicate the frequency of experiencing each of the feeling states described during the last 30 days.

A study in a convenience sample of 512 South African employees reported that the SMVM is a reliable measure of well-being at a financial institution (Derman, 2008). Derman demonstrated the instrument's construct, content and factorial validity, as well as high Cronbach alpha coefficients. Cronbach alpha coefficient was 0.948 on the 12 items, and between 0.941 and 0.946 on iterative item reliability analysis. On the subscales, the SMVM yielded a Cronbach alpha of 0.951 for physical strength, 0.883 on cognitive liveliness and 0.937 on emotional energy.

2.6.3 Personal Growth and Initiative Scale (PGIS)

The PGIS was selected for its use in concurrent and discriminant validity testing of the VAS. It is a nine-item scale in a Likert-type format, measuring an individual's active involvement in

changing and developing as a person (Robitschek, 1998). Internal consistency was found to be adequate (α=0.90), as was the test-retest reliability correlation (r=0.74) after a period of two months (Robitschek, 1998).

The scale was further developed into a 16-item PGIS II Scale. This newer version comprises four subscales, namely readiness for change (RC), planfulness (Plan), using resources (UR), and intentional behaviour (IB) (Robitschek et al., 2012). The first-order four-factor structure demonstrated adequate goodness-of-fit indices. Test-retest reliability indices were adequate, ranging from 0.73 (UR) to 0.81 (Plan), as was internal consistency (RC, $α$=0.83, Plan, $α$=0.84, UR, α=0.80 and IB, $α$=0.89) (Robitschek et al., 2012). Given that this version delineated specific cognitive and behavioural dimensions, the present study selected the newer version of the PGIS.

2.6.4 Behavioral Inhibition/Behavioral Activation Scales (BIS/BAS)

The BIS/BAS is a 24-item scale in a Likert-type format, which measures an individual's sensitivity to two motivational systems, captured by four sub-scales (Carver & White, 1994). Behaviour inhibition is captured by one subscale, and it includes all items describing reactions to the anticipation of punishment, non-reward and novelty. Behaviour activation is comprised of the remaining three subscales, referring to drive, fun-seeking, and reward responsiveness (Carver & White, 1994). Drive has to do with the persistent pursuit of goals. Fun-seeking reflects the desire for new rewards as well as the spontaneous, in-the-moment pursuit of rewards. Reward responsiveness consists of items that focus on positive responses to consummatory or anticipatory reward.

The scale was assessed in a sample of 732 college students, with the factors cumulatively accounting for 49% of the overall variance (Carver & White, 1994). Cronbach alpha values ranged between 0.66 and 0.76 for each factor (BIS, $α$=0.74, Reward Responsiveness, $α$=0.73, Drive, $α$=0.76 and Fun Seeking, $α$=0.66). Test-retest reliability in 113 subjects after eight weeks was found, with correlation coefficients of moderate strength (these are 0.66 for BIS, 0.66 for Drive, 0.59 for Reward Responsiveness, and 0.69 for Fun Seeking). In addition, convergent and discriminant validity was demonstrated on the BIS/BAS subscales when correlated with several measures of similar and dissimilar constructs.

The factor structure found by Carver and White was supported by the findings of Jorm et al. (1999), except for some reward responsiveness items that did not load unequivocally on the expected factors. Nonetheless, the authors appraised it as a valid and practical instrument.

The BIS/BAS has also been administered among people with schizophrenia, which yielded findings suggesting a link between BIS scores and social motivation (Barch, Yodkovik, Sypher-

Locke, & Hanewinkel, 2008; Horan, Green, Kring, & Nuechterlein, 2006; Strauss, Wilbur, Warren, August, & Gold, 2011). Specifically, low scores correlated with low social motivation, and another study found that this was the case with scores that were either extremely low or extremely high (Reddy et al., 2014).

In the present study, the BIS/BAS was used for both concurrent and discriminant validity testing of the VAS, being theoretically informed by neurological models of motivation relevant to both avolition and vigour. This means that the measurements by the BIS/BAS had been anticipated as overlapping with vigour to some extent, yet distinct in other respects. Specifically, its emphasis on motivational systems was anticipated as related to vigour. Items from the BIS subscale and the fun-seeking aspect of the BAS were anticipated as different from vigour, e.g., item 13 of the BIS, "I feel pretty worried or upset when I think or know somebody is angry at me" (BIS) or item 15 of the Fun Seeking subscale, "I often act on the spur of the moment".

2.6.5 Procrastination Scale (Proc Scale)

The General Procrastination Scale (Proc Scale) of Lay (1986) is a 20-item true-false measure of dispositional levels of procrastination. Participants are asked to respond to items such as, "I generally delay before starting on work I have to do". Items are rated on a Likert scale ranging from 1 to 5, for which higher scores reflect more procrastination.

Subsequent studies have found two-factor structures, with various descriptions. These include Tendency to Postpone Tasks and Getting Tasks Done on Time (Mariani & Ferrari, 2012), Delay and Procrastination factors (Argiropolou & Ferrari, 2015), and Frequency of Procrastination and Reasons for Procrastination factors (Yockey & Kralowec, 2015). A recent study identified a five-component structure of the instrument, namely good planning, delaying, doing things in the last minute, well time management and poor time management (Hasanagic & Ozsagir, 2018). Lay (1986) reported a Cronbach alpha of 0.82 for the instrument, Ferrari (1989) measured the test-retest reliability as 0.8, and Hasanagic and Ozsagir (2018) reported a Cronbach alpha of 0.71.

The present study included the instrument for its utility in assessing both concurrent and discriminant validity of the VAS. Its concurrence was hypothesised in as much as procrastination was anticipated as inversely related to vigour. That is, when someone is procrastinating, he or she may have a lack of vigour. Procrastination was also anticipated as dissimilar from vigour in that someone may potentially lack vigour even when not procrastinating.

2.6.6 Fatigue Assessment Scale (FAS)

This instrument was selected for its utility in measuring both the concurrent and discriminant validity of the VAS. It is a 10-item scale assessing symptoms of chronic fatigue, on a 5-point Likert scale ranging from 'never' to 'always' (Shahid, Wilkinson, Marcu, & Shapiro, 2011). Although the scale was not specifically designed for patients with schizophrenia, it has been reported to be a valid and reliable scale among various other populations, including construction workers, women with breast problems and mothers of infants and young children (De Vries, Steeg, & Roukema, 2010; Dunning & Giallo, 2012; Zhang et al., 2015).

Although it measures two kinds of fatigue, the analyses from these studies support a one-factor structure, explaining between 53% and 67% of the variance. Internal consistency is good, with alpha ratings between 0.88 and 0.90, as was test-retest reliability at a one-month interval ($r=0.88$). Pearson correlations between the FAS and subscales of the other fatigue questionnaires ranged between 0.61 and 0.78 (Michielsen, De Vries, & Van Heck, 2003). Discriminant validity testing has been demonstrated in the FAS when compared to depressive symptoms, neuroticism and state anxiety (De Vries et al., 2010).

For concurrent validity testing, it was anticipated that fatigue would imply a lack of vigour. For discriminant validity testing, fatigue was anticipated as dissimilar from vigour in that, for example, much vigour may induce fatigue.

2.6.7 Calgary Depression Scale for Schizophrenia (CDSS)

The CDSS was developed to assess depressive features in patients with schizophrenia (Perkins, Stroup, & Lieberman, 2000). It consists of nine items typical of depressive symptoms, with each item including interview questions and descriptive anchor points (Perkins et al., 2000). A score of five or higher indicates the risk for a comorbid major depressive disorder (Addington, Addington, & Maticka-Tyndale, 1993).

Comparisons between the CDSS and other standard measures of depression have demonstrated that the CDSS is valid for rating the severity of depressive symptoms, with intraclass correlation coefficients ranging between 0.8 and 0.9 (Addington, Addington, & Maticka-Tyndale, 1994; Addington, Addington, Maticka-Tyndale, & Joyce, 1992; Addington, Addington, & Schissel, 1990). The CDSS has also been found to distinguish accurately between the negative symptoms of schizophrenia and extrapyramidal side effects in outpatients (Addington, et al., 1994; Addington, Addington, & Atkinson, 1996). Internal consistency has been measured in several studies of outpatients, yielding Cronbach alpha coefficients between 0.7 and 0.9 (Addington et al., 1990).

In our study, the CDSS was selected for its suitability in a schizophrenia population. It was used for discriminant validity testing of the VAS, in which the assessment of vigour was to be discerned from depressive features.

2.6.8 Staden Schizophrenia Anxiety Rating Scale (S-SARS)

The S-SARS is a clinician-rated instrument for the assessment of specific and general anxiety symptoms in patients with schizophrenia (Naidu, Van Staden, & Van der Linde, 2014). The specific anxiety subscale consists of persecutory and nihilistic anxiety, perceptual anxiety, anxiety attacks, situational anxiety and obsessive-compulsive anxiety. The general anxiety subscale consists somatic anxiety, psychomotor and cognitive agitation, worry and fear, control-related anxiety and impairment from anxiety. The interview guide of the S-SARS informs the ratings, each with six narrative anchor points to indicate severity.

Although still relatively new, the instrument is considered to have promising psychometric properties (Temmingh & Stein, 2015). This study selected the S-SARS for discriminant validity testing of the VAS, in which the assessment of vigour was to be discerned from anxiety in specifically the schizophrenia population.

2.7 The Vigour Assessment Scale (VAS)

The VAS is a 48-item self-report scale compiled by the researchers, consisting of items indicating vigour and items indicating lack of vigour. The VAS, along with scoring instructions, is included in Appendix A. Most items were self-developed as described below in section 2.7.1, based on a conceptual examination of the concept of vigour. Additional items were selected from existing scales that contain items pertaining to vigour and its related concepts. These were the PGIS, UWES, BIS/BAS and Proc Scale from which items wereadapted to capture vigour. The items were formulated to capture both the presence and the absence of vigour. The development of the VAS is presented next, followed by a description how the VAS was used during the different points of assessment in this study.

2.7.1 Development of the Vigour Assessment Scale (VAS)

Several publications outlining steps in developing a new measure were reviewed to inform the development process of the VAS (Boateng, Neilands, Frongilo, Melgar-Quiñonez, & Young, 2018; Carpenter, 2018; Fayers & Machin, 2015; Hinkin, Tracey & Enz, 1997; Kyriazos & Stalikas, 2018). Accordingly, the first step was to identify the construct for measurement and research this in the current literature. First, the term 'vigour' was searched, and the definitions were categorised in a table. Terms that were synonymous, as per the Oxford English Dictionary as well in academic, social sciences literature, were subsequently added for consideration. Next, terms that were, at face value, in contrast with vigour were incorporated.

Once this conceptual analysis had been completed, the researchers cross-referenced existing measures to specific terms.

Initially, 51 items were generated and grouped into two opposite categories, thereby indicating the presence (Category B) or absence (Category A) of vigour. Each item is rated in a four-point Likert scale format, according to the experience of the person over the last seven days (1 = None of the time, 2 = Sometimes, 3 = Often, 4 = Most of the time). The Likert-scale format was chosen in order for participants to be able to indicate the magnitude as well as the direction in their responses (Sullivan, 2009). The total score is calculated by subtracting the subtotal of Category A (absence of vigour) from the subtotal of category B (presence of vigour).

The wording of the items was tailored to the target population, both in its sentence construction and in its content, with the aim of creating clear items to which participants would be able to relate. The inclusion of "the past 7 days" in each item was to facilitate the sustained, accurate interpretation of the temporal parameter of the items, for a measure of state vigour (rather than trait, for instance).

The VAS was piloted with two participants, who fulfilled the sample criteria, and the instrument was revised thereafter. Upon review of the pilot, three of the items were removed, and items of the two categories were mixed to prevent a response set (Sullivan, 2009).

2.7.2 Versions of the Vigour Assessment Scale (VAS) for each point of assessment

Given that the VAS was administered during various timepoints and hence was used for various statistical analyses, the VAS was given arbitrary labels to facilitate a clear discernment among the sets of data during the data analysis process. These are presented in Table 2.1 below:

Table 2.1 Summary of the points of assessment in the study				
Scale validation		**Task validation**		
Measured using:		**Measured using:**		
i-VAS	**r-VAS**	**a-VAS**	**am-VAS**	**ama-VAS**
Initial **V**igour **A**ssessment **S**cale	**R**epeat of **V**igour **A**ssessment **S**cale	**A**nticipatory **V**igour **A**ssessment **S**cale	**A**fter one **M**onth **V**igour **A**ssessment **S**cale	**A**fter one **M**onth **A**nticipatory **V**igour **A**ssessment **S**cale

The original VAS instrument measuring vigour over the preceding week, administered as the first self-report measure	Identical to the i-VAS, except that its point of application is after all self-report measures are completed	Items are reworded to future tense, "Over the *next* 7 days" to measure anticipated vigour levels	Identical to the i-VAS, except that its point of application is at the one-month follow-up mark	Identical to the a-VAS, except that its point of application is after the second task

2.8 The invigoration task

The theoretical underpinnings of the invigoration task, presented in the previous chapter, were applied to the task design. This is described below, followed by a description of the task, and guidelines on overcoming common hurdles that may be encountered in the schizophrenia population.

2.8.1 Theoretical underpinnings applied to the task design

The theoretical underpinnings relevant to the task (see section 1.5) served to set the background from which the task was practically developed. Visualisation principles were adapted to the task, where the imagery was tailored to invigorate participants. Guidelines with script suggestions were consulted in designing the visualisation protocol (Hagger, 2017). The relational style was accordingly person-centred, following humanistic principles. The task provided a balance of structure and space for the participants to bring forth that which was important to them. The practitioner followed the participant as far as possible and prioritised their agency-taking over compliance (Constantino, Romano, Coyne, Westra, & Antony, 2018). This relational context was considered throughout the task design and its execution, taking care to incorporate active listening and motivational interviewing, bearing in mind that empathic understanding may only be considered valid when it is experienced as such by the participant (Norcross & Lambert, 2018).

In line with CBT principles, the task was designed to target the problem of avolition, but with emphasis on stimulating vigour. The task sessions were structured, standardised and time-limited, focusing on immediate improvement in participants' vigour. The clinician-researcher served as assistant to the participant in becoming aware of self-talk. The aim was for participants to actively work on telling themselves more helpful thoughts in pursuit of employing self-authored invigorating cognitive styles and beliefs. In line with a person-centred approach, Strengths-based CBT was incorporated in eliciting that which invigorates a particular person. This also served to facilitate increased ownership and participation in the treatment, opening up avenues that would not have been visible through a more prescriptive

task. A handout was created for the homework component of CBT for participants to take home and use as a guide for practising the task on their own. Pre- and post-task measurements were made, which served to examine change in vigour.

The task design incorporated mindfulness in both the imagery and the CBT task components. While mindfulness involves an open state of awareness with deliberate attention to all aspects of ongoing experience, the task also entailed a mindful awareness of ongoing experience but with a more delineated attentional focus (i.e., a kind of focused mindfulness). The visualisation component calls for a sharpened awareness of the imagery in its different sensory modalities. Mindful visualisation requires intentional focus (as opposed to avolition) and conscious awareness (rather than mindless experience), as can be seen in some meditative practices. The calmness of this state sets the stage for vivid sensory simulations, involving many of the same neural pathways involved in actually experiencing the situation that is imagined. The cognitive component also calls for mindfulness in that participants were prompted to become aware of their self-talk, radically accepting this as being the case at the moment, without judgement but instead with full acknowledgement of their thinking being so. This was followed by becoming aware of elements in their thinking that would need to change in order to increase their vigour, as well as an awareness of their own particular strategies for cognitive invigoration. Thereafter, mindfulness practice was to be continued by participants doing the task on their own as part of the "homework".

2.8.2 Description of the task

The researcher engaged each participant in "the invigoration task" during two sessions spaced one month apart with "homework" in between. There were two main components to the task during each of the sessions, namely an imagery component and a cognitive component. Each session first used imagery to invoke vigour, followed by a cognitive restructuring phase. The imagery component invited two imageries: one pertaining to the *state* of being inspired or motivated, and the other imagery was *action*-based (imagining oneself on the go). The duration of each session was approximately 20 minutes.

The sessions commenced after participants had completed all the self-rated questionnaires. An attitudinal stance was designed to invoke as much vigour during the sessions as possible. Accordingly, sessions began with an encouraging opening, with a linguistic style appropriate to specifically invoking this.

> *Now we get to the fun part!*

The opening served as a re-focus from the potentially tiresome assessments, towards an expectation of a rewarding experience consistent with stimulus-reward principles of

behavioural theory. This was followed by setting the scene for what vigour might look like in their day-to-day lives. Participants were guided and prepared to be more readily able to identify with experiences congruent to vigour, thereby familiarising them with vigour. This formed the foundation for the task, launching the activities that followed.

> *You know when you just can't wait to get out there and get going and move and just get on with things? Where you feel a spring in your step and a refreshing burst of energy? That is what vigour's about…*

Once it was clear that participants grasped the 'feel' of the concept of vigour, the course of the sessions was described. The description also served as part of an invitation to the sessions, which may in itself be activating.

> *I would like us to tune into a set of two exercises, and what we're aiming for is to facilitate and nurture that oomph/vooma in your life. First, we will go into an imaginary invigorating situation and then we'll do a fun activity to launch your vigour and get you going.*

2.8.2.1 Imagery component

Upon accepting the invitation, participants were, through the use of mobilising words, primed to become active in creating imagery. The sense of togetherness was included, akin to a travel partner, to assist participants with becoming immersed into the imagery while continually engaging with the practitioner.

> *So let's jump into this fantasy together and imagine a situation in which you want to be...specifically where you're very inspired and motivated. Close your eyes if that will help you imagine it. When you have an image in your mind's eye, say, "Yes!"*

Participants were given the opportunity to generate a subjectively invigorating image. Some participants required prompting to do so.

> *Imagine starting something with excitement...where you just can't wait to get into it/being motivated/being really into something that you want to do.*

Once participants had an image in mind, they were asked to convey the event or situation that they had imagined, with prompts to heighten awareness or mindfulness of the full spectrum of sensory stimuli that comprised the image.

> *I'm curious to hear what is happening?*

Participants would first relate their spontaneous narrative of the imagery, after which they were assisted in adding vividness to this by creating an awareness of the different senses. The

prompts to add more awareness details, nonetheless, maintained an attitude of encouragement to elaborate spontaneously.

And what do you see?

Here, attention was given to the visual aspect of the imagery. They would describe people, objects, colours and details that would build on the imagery. Some would describe what they were seeing through their own eyes in the scenario, others conveyed seeing themselves through the eyes of those around them. Descriptions limited to a detached/third-person perspective were followed up with prompts to become more engaged with the imagery.

And what's that like?

Participants expanded on their experiences of the image, typically starting out with short responses, e.g., "nice" or "good". They were encouraged to elaborate on their descriptions, with energetic acknowledgement and validation of that which was conveyed as subjectively important or meaningful to participants.

I can hear the purpose and meaning in _____!

What do you hear?

In the same manner, participants created the audible aspects of the image by noticing sounds, chirps, voices, and so on.

Next, attention was focused on the mood and emotional experiences of the image as well as any tactile sensations.

What do you feel?

Interestingly, the ambiguity of the word 'feel' often steered towards the tactile, olfactory (even gustatory) rather than emotive, e.g., "I feel the fresh mint". In those instances, follow-up questions guided participants to the remaining aspects of feeling.

The researcher continually followed participants closely in being in tune with their subjective narratives, using active listening and appropriate exclamations.

Oh wow!

It is indeed refreshing to feel _____!

Once the first imagery component has been built to the full in terms of setting, motivation, feeling, the second imagery component was invited. Taking the task to the next level, the focus was on vigour in action.

Let's imagine similarly you doing something with excitement...where you're 'on the go'. What do you imagine?

When relating the situation, further awareness was again encouraged by:

What do you feel?

If they had difficulty feeling, they were prompted to try.

Try to...feel it more...feel it (the situation) grooming this excitement.

What are you doing?

Some participants would have already covered activity during the preceding questions to some extent. At this point, the *action* undertaken by the participants was the focus of the imagery. This part of the image was important in mobilising participants to take authorship and ownership in creating their own vigour, by focusing on doing something invigorating.

2.8.2.2 Homework for the imagery component

Once participants had completed the imagery task, their efforts were affirmed and they were encouraged to perform the task on their own after the session.

Clearly, we've created an image here. Would you be able to create a similar image on your own?

Participants who were hesitant or uncertain were assisted.

Let's see what you could do to try it.

This was followed by the assignment of homework. Homework is typically a CBT term and part of common CBT practice, inclusive of visualisation and mindfulness tasks. The aim was for participants to generalise the imagery generated to their real-world experiences and to reinforce the gains of the task in practising on their own.

May I ask you to do some homework? I would like you to try and create a similar image once a day until I see you next month (session 1) /as often as possible (session 2). What time of day would suit you best? Maybe in the morning? This would be a great start to the day, wouldn't it?

Assistance was given with deciding on the logistics for doing the homework such as time of day, to facilitate momentum, ease and flow in carrying out the task. Leading questions were posed to encourage 'buy-in' from participants for the homework being a desirable activity, owing to the potential desirable gains from doing this.

The homework was also posed as something simple and attainable.

> *All you need to do is to imagine yourself in this invigorating image in terms of three things, namely, "What do you see?", "What do you feel?", and "What do you do?".*

The three questions would serve as a reminder of the main steps followed in creating the imagery during the session. These were printed on a laminated handout and given to participants to take home (see Appendix C).

> *For your convenience, we've created a script with a guide for you [hand them the script].*

The script also served as a tangible reminder of the potential gains attained during the session.

Participants were generally embracing of the suggestion that they practise this exercise at home. For the more reluctant participants, they were encouraged to try anyway.

> *Even if it's just for fun*

The assignment of homework concluded the imagery component of the task. Next, the cognitive component was introduced as the means by which cognitive patterns were restructured to be (more) invigorating and the imagery exercises mobilised into invigorated activity.

2.8.2.3 Cognitive component

> *Now, we are going to mobilise a "launchpad" in your head for you to take action in your life and do more of the things you want to do.*

Once participants understood the action-based rationale for the "launchpad", psychoeducation was provided on the role of thinking in taking action, including inner dialogue, beliefs and core assumptions. This was followed by guidelines for optimal self-talk.

> *How do you get going and take action? Well, you, like all people, are believing in what you tell yourself. You can take action by telling yourself realistic but new stuff by which to take action and do more of the things you want to do. You, like all people, usually listen to what you tell yourself to do. So, tell yourself things you would like to believe and things you would like to obey. We are talking about doing the small things you want to do and also the larger things you want to do. The next steps for you are to begin with the smaller things that will build up to doing what matters a lot to you.*

Emphasis was placed on small, consistent and workable goals for self-talk that are set up for success by virtue of their feasibility.

After introducing and explaining the cognitive component's principles, participants were directed to the back of the laminated handout they received earlier, titled 'Invigoration Launchpad'. The handout contained the cognitive component's main points that were followed during the session (see Appendix C).

First, participants were asked to ask themselves the following:

> *What do I tell myself now about doing what I want to do now?*

This question aims to create mindfulness about one's current, unaltered process of self-talk. For most participants, focusing attention on what they were telling themselves was a novel experience, as it would typically be automatic and buried beneath awareness. This provided a cognitive baseline from which restructuring could begin to take place.

Participants were given a chance to respond first, then volunteer anything additional. Sometimes they simply responded, whereas others took some time to do so. There were rare instances where participants would come to their own insights by merely saying out loud what they were telling themselves. For most, however, guidance was needed before proceeding to the next question.

Focusing on the moment (keeping with mindfulness practice) aimed to foster real-time cognitive restructuring. The language was phrased and rephrased in a simple manner, toned towards the pursuit of rewards (in the spirit of vigour). The onus was placed on the participant's efforts at self-invigoration, to encourage an internal locus of control and, in doing so, to empower them to achieve themselves. Responses were elicited and discussed where necessary, to ensure that participants were on track. Typically, the first few responses elicited ample opportunity to develop insights into cognitive distortions. Rather than 'distortions', which implies judgement values (right/wrong), phrasing was normalised along the lines of, 'unhelpful thinking styles'. For example, one participant stated the following: "I must go out and make a success". Through discussion, the participant realised that the word "must" was unhelpful owing to rigid expectations, and that idea of success was unattainable. In learning what to do instead, the next question was posed.

> *How do I need to change what I tell myself now to take action now in my life and do now more of the things I want to do?*

Now that participants had more of a grasp on the role of self-talk and the generally unhelpful self-talk taking place, attention was brought to the 'how' of optimal self-talk. Borrowing from the example above, the participant could replace "must" with something more helpful, such as "can't wait to", "plan to", "intend to", "am starting to" and so on. Where participants were stuck, guidance was given, but it was done so conservatively and collaboratively.

2.8.2.4 Homework for the cognitive component

Next, participants were encouraged to tell themselves helpful affirmations whenever possible, and they were taken through the list provided in the Launchpad. Some phrases were more relevant than others to any given participant, and some of the phrasings would be adapted to the personal context.

> *So, tell yourself activating things as many times as you want every day. Here are some examples for you to use. Take the ones that speak to you best and repeat them as often as possible.*

Participants were guided through the list, then encouraged to get active right away, with a reminder that reaping the benefits is up to them and that these are within reach with consistent practice.

> *So, take action! You can make your dreams come true by taking small steps towards them during the course of every day, right away.*

Next, homework was assigned.

> *Carry this sheet with you and read it as many times as possible, every day [stop the sentence here at session two] for the next few weeks till I see you again. Do what these slogans say, because you can choose what you tell yourself.*

The cognitive strategies generated the possibility of vigour and were consolidated with an encouraging concluding remark.

> *Alright! You just got a number of tips now on how to think in a way where you can have much more oomph/vooma/zing/vigour. These tips are seedlings that can germinate (grow) stronger every day.*

2.8.3 Overcoming hurdles in task sessions

During the task sessions, there were certain recurrent hurdles encountered. These are described below and accompanied by suggestions for working through them.

2.8.3.1 Being fixated on attainment status rather than attainment process

Participants may focus on the pursuit of an end goal and may depend on the attainment thereof in order to experience vigour. Where this may be the case, they are reminded that the focus is on bringing life to the invigorated experience that happens during the active *pursuit/doing* (rather than passive *having*). For example, a participant visualises that he has become a successful jazz performer and has brought ample imagery to light while constructing this, but battles to do so when considering the process that it entails. He vividly hears the buzz

emanating from the audience, appreciates the decorum on stage, feels the shape of his instrument, smells his polished shoes. He feels energised, hopeful, capable and immersed. He is playing tunes that he loves and singing from the heart. This seems to be disconnected from his experience in the room at OPD as his image is 'out there', to be experienced 'someday'. Here, one may guide the participant to imagine placing their hand on their instrument while singing from the heart on the bench at home, to visualise the act of polishing their (existing) shoes to pristine condition, inviting the neighbour to come by and listen to a tune…with the aim of presently bringing to life the feelings of energy, hope, ability and flow that he described in his initial end-goal imagery.

2.8.3.2 Overcoming the hurdle of unfeasibility (imagery component)

It may happen that participants visualise something that is not possible. For example, a childless participant may imagine playing with her children. Here, one may probe into the act of playing and expand on this. It also may be that the participant dreams of a big house, an ideal partner, substantial income, fame and so on. As with 1), the focus should be on identifying the subjective experience of the participant as they imagine being in this situation, and then abstracting it from the unfeasible end goal. Once this has been done, the participant is refocused towards the experience itself and brought to the 'here and now'. One elderly participant was lamenting his lost fitness, imagining he could regain his active, youthful body. This was clearly not going to be possible to the extent that he longed for, but he was willing to imagine the act of caring for his body and sculpting it to be a little stronger than it was yesterday…and then a little stronger than that. He reshaped his imagery to include him picking up bricks outside his home, working through the messy pile and visualising it becoming more sorted out, and at the same time, his body being respected for the growth it can attain.

2.8.3.3 Overcoming the hurdle in constructing an image (imagery component)

This can happen more often in highly avolitional participants. They may respond with "I don't know". This can be probed by asking them about anything that they found curious/interesting/exciting lately. If they are still unable to connect with the task, one may probe around information that has already been gathered about the participant or make comments on observations that were made during the process thus far. For example, a participant who was battling with the task was given a comfort break, during which he took out a muffin. Afterwards, the researcher casually inquired about his experience of the snack, to which he said he enjoyed it but would rather have eaten something without raisins. This led to a chat around the topic of baking and formed the basis of his imagery, which entailed the design and creation of blueberry muffins at his placement (or raisin-free muffins to begin with).

The scope was relatively humble, but it was appropriate to his level of functioning and was still in line with the principles of kindling some vigour.

2.8.3.4 Overcoming the hurdle of understanding how self-talk influences one's state of mind (the cognitive component)

This can quickly be addressed by using metaphors, especially ones that are applicable to the person's day-to-day context. For instance, a participant who does gardening work at their placement may be guided using a gardening metaphor. "Imagine you had to mow the lawn, and usually you mow along the same path. It would be easy to maintain, wouldn't it? Now, imagine you left that area for a while and tried to mow a part of the lawn that was usually left to grow out. There would be shrubs, and tough grass and the mower would struggle to get through. This would be the case over the first couple of tries. However, after persisting with mowing along this path, over time, you may find that it becomes easier and easier. What do you think happens to the two parts of the garden that you mowed? (Elicit that the first area was easy to do because it was habitually done over and over. When left alone, it would slowly grow out. Meanwhile, the new area that is tended to becomes increasingly smoother and easier to work on.) Just as the garden gets reshaped by your repeated actions, so does one's state of mind. You have the ability to do the 'gardening' in your mind, so to speak."

2.8.3.5 Overcoming the hurdle of deciding on the content of the appropriate self-talk change and/or action (cognitive component)

This can be due to poverty of thought and/or difficulty that the participant experiences in connecting with the pointers outlined in the task. Participants can be reminded of the imagery they had previously created and prompted to describe their thought process and self-talk. Helpful self-talk should then be highlighted to the participant and consolidated with context-specific prompts. For example, a vision of becoming more educated may be accompanied with self-talk along the lines of, "I am walking on a path to gaining new skills". Change that may be helpful could entail the development of awareness of one's attitude towards the vision and noting unhelpful self-talk. The creation of a schedule that incorporates small learning opportunities each day would serve as a sensible action towards the pursuit of learning.

2.8.3.6 Overcoming the hurdle of pacifying thought patterns

Participants typically hold assumptions that have kept them in a passive, disempowered state. Examples that were elicited during this study include the following: "I am a schizophrenic. There is nothing more to it"; "I don't have money so I can't go for what I want"; "Nobody wants to date a mentally ill person"; "I can't do anything to make things better"; "I must first get a house before I can start"; "I am just stuck here". It is appropriate to help the participant identify

cognitive errors at play and offer some alternatives as starting points for them to build on. Once again, this is highly influenced by the level of functioning of each patient. It is important to remain attuned to the dialogue with each participant so that one does not infantilise (assuming a much lower level of functioning, which can be patronising) or intimidate (presume that the participant ought to know CBT principles).

Usually, at the follow-up session, difficulties with the cognitive section have become more apparent to the participant and can be followed up for refinement. It is not uncommon for participants to alter the activating phrases in B) and even to add phrases that have been instrumental in sculpting helpful patterns. Some may seem odd, but as long as they serve to aid the pursuit of vigour, they should be respected and encouraged. Examples of mantras volunteered included, "Go as the sunflower – it looks towards the sun"; "I add beats to my song with each breath that I draw"; "I am fantastic elastic, stretching like a panther"; "Yesterday was 23. Today is 23 plus one" (they had been adding one each day); "Brick by brick will do the trick"; "I see the angel inside the stone and chip away to release her"; "Treat thoughts like Facebook friend requests"; "I am ready"; "Try to bury me; I am a seed!"; "Pop bad thoughts like bubble-wrap"; "Just try, start small, just try anyway"; and "I'm a Gogo but I Go, Go!" (here 'gogo' means granny, creating a play on words to encourage movement despite old age).

2.9 Data collection procedure

The data were gathered by the researcher in the following sequence, as indicated by Figure 2.1 and the steps below:

1. Clinicians were consulted at the hospital on a weekly basis about potentially suitable patients for recruitment into the study.
2. Provisionally eligible participants were invited to participate in the study and give written informed consent.
3. Following participants giving written informed consent to participate in the study, the interview-based measures were administered. These were the S-SARS, CDSS and the three selected items on the PANSS.
4. Those participants who were assessed as suitable for enrolment were invited to complete the VAS first and the other self-rating scales (SMVM, PGIS, BISBAS, Procrastination Scale and FAS).
5. The first 75 participants were enrolled exclusively for the VAS-validation component to collect data needed for the test-retest reliability testing. The enrolled participants subsequently participated in both the scale and the task validation when they were willing to do so.

5.1 Participants enrolled only in the VAS validation completed the VAS for a second time.

    5.2.1   Participants enrolled in the task validation completed the invigoration task, and then completed the VAS, reworded for anticipated vigour. For its use immediately after the invigoration task, the wording of VAS items was adjusted to replace each item's specification "during the past 7 days" with the patient's anticipated effect of the invigoration task "during the next 7 days" (see Table 2.1).

    5.2.2   About four weeks later, participants were invited to participate in the same task, which was preceded and concluded by the VAS as in 5.2.1.

Participants were recruited consecutively for both the VAS and task components of the study. Steps 1 to 5 were repeated until the required sample sizes for the respective components were reached. The procedures for each participant required between 45 minutes and two hours to complete, with an additional 40 minutes to an hour for each participant who completed the follow-up sessions a month later. Thus, in total, data collection required between 45 minutes and three hours per participant.

Figure 2.1 Data collection process
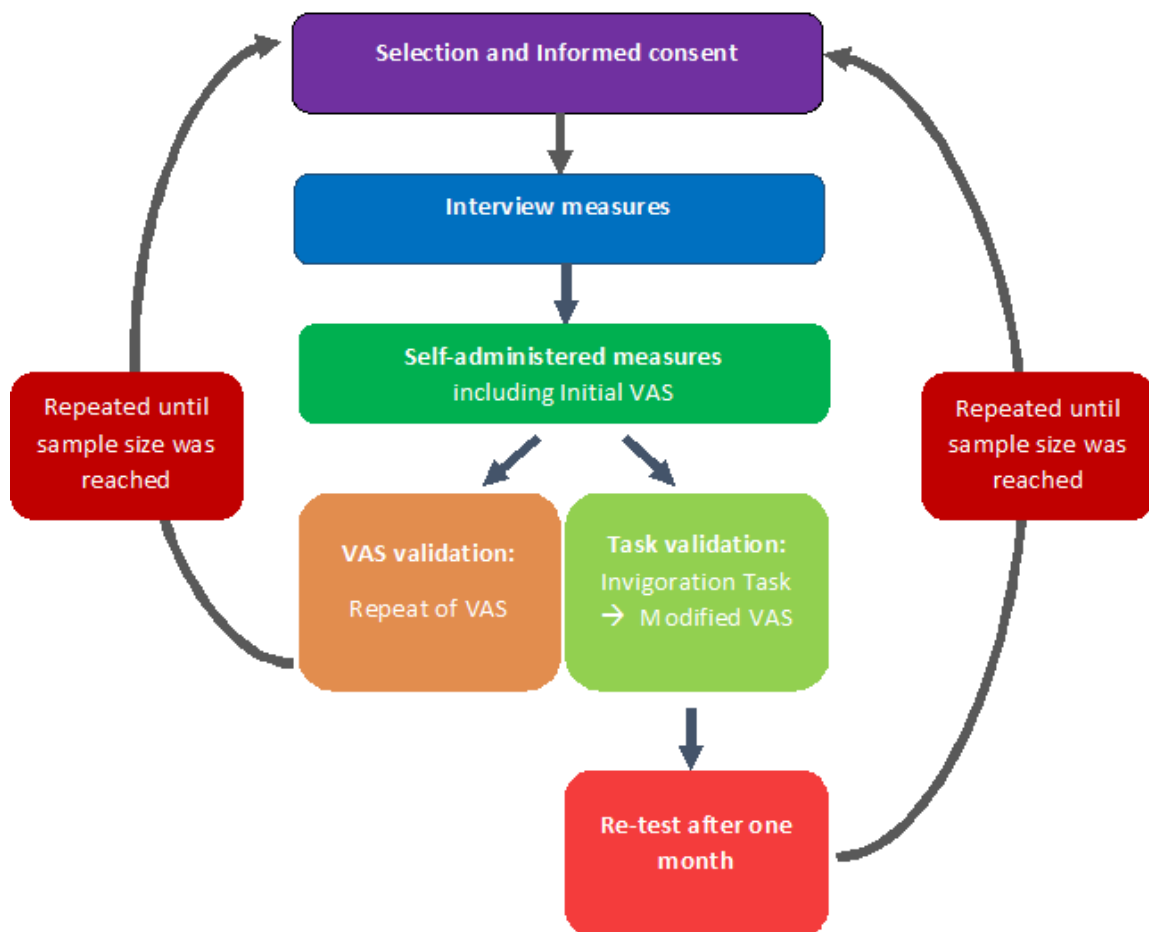
2.10 Data analyses

The Statistical Package for Social Sciences (SPSS) was used for analysing the data. For examining the validity of the VAS, the following statistical testing was done: For concurrent validity, parametric correlations were examined between the i-VAS and respectively, the SMVM, the PGIS, the BIS/BAS, the FAS and the Procrastination Scale using Pearson correlations. Values of correlation coefficients were interpreted by convention as follows: <0.3 being a weak correlation; between 0.3 and 0.7 being moderate correlation, >07 being a strong correlation.

Discriminant validity of the VAS was analysed by means of paired t-tests between the i-VAS totals and the totals on the Procrastination Scale (Proc Scale), Calgary Depressive Symptoms Scale (CDSS), Staden Schizophrenia Anxiety Rating Scale (S-SARS), Personal Growth and Initiative Scale (PGIS), Behavior Inhibition Scale/Behavior Activation Scale (BIS/BAS) and Fatigue Assessment Scale (FAS). No predictive validity was tested owing to the absence of a gold standard for vigour.

For examining the reliability of the VAS, the following statistical calculations were carried out: Cronbach alpha coefficient, Spearman-Brown coefficient, Guttman split-half coefficient and standard error of measurement (SEM) margins. Internal consistency was measured on the full VAS, on sequential item deletion and the instrument categories (A and B). Test-retest reliability was examined by calculating the correlation between the first and the second time on the same day that the VAS was applied.

Tests of normality, namely the Keiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity an Exploratory Factor Analysis (EFA), were conducted on the i-VAS in order to identify the underlying factor structure of the VAS. This resulted in the 'Core VAS', comprising 27-items that were found to be closest to the core of the construct, which was subsequently tested using the same analytic procedures.

For examining the validity of the invigoration task, paired t-tests were performed by comparing the various VAS ratings before and after the invigoration tasks and effect sizes were calculated. This was done for both occasions, about four weeks apart. The "before" ratings of the two occasions were also compared to mitigate the potential difference between the actual effects and the effects the patient anticipated of the invigoration tasks (reflected in the modification of the VAS for the "after" ratings). In addition to testing for statistical significance, the effect sizes were calculated for the invigoration task. For examining the reliability of the invigoration task, validity results being consistent on two occasions were used for an inference of consistency as well as the correlations between measurements at the four time points of assessment. As with the validation of the VAS, the analyses for the task validation were run a second time, using the Core VAS.

Statistical analyses were performed by the researcher, supported by the supervisor, in consultation with statisticians at the UP Department of Statistics. The statisticians advised on the usage and assumptions pertaining to specific statistical tests and they performed the statistical calculations. The results of the data analysis for the VAS and the invigoration task are presented in chapters 3 and 4 respectively.

2.11 Ethical considerations

The study was approved by the PhD Committee of the School of Medicine at the University of Pretoria for its scientific integrity and degree purposes. Ethics approval was obtained from the Faculty of Health Sciences Research Ethics Committee of the University of Pretoria (See Appendix E). In addition to the Declaration of Helsinki, the following ethical considerations were adhered to in the study:

2.11.1 Informed consent, capacity and voluntarism

Participants were given a written description of the study such that they would be able to make an informed decision regarding participation. This entailed providing participants with sufficient information to be able to make an informed decision, placing no undue influence on them and enrolling only those individuals who have the capacity to consent (Christopher & Dunn, 2015; Van Staden, 2015; Beauchamp, 2015). An informed consent document captured the consent, and they were requested to sign this if they were willing to participate. Patients were screened through assessment for the capacity to consent to the research. No assumptions of capacity or incapacity were made regarding the participants based solely on their characteristics or the nature of their illness. Participation was voluntary, and participants were free to withdraw from the study at any point, thereby respecting their right to dignity and the principle of respect for personal autonomy.

2.11.2 Justice for participants

Justice refers to the ethical obligation of the researchers to give to each person that which is due to them (Mita & Ndebele, 2014). In following this principle, no research participant was subjected to injustice through their participation, or their declining to participate. In addition, permission to conduct the study was obtained from the Chief Executive Officer (CEO) of Weskoppies Hospital (see Appendix D).

2.11.3 Non-maleficence and beneficence

The investigators strived to ensure that there would be no harm to research participants resulting from their participation in the study (Beauchamp, 2015; Chi, Horn, & Kruger, 2014). The study held no foreseeable physical, social or economic risk to participants. Minimal psychological risk was anticipated, but provisions were made nonetheless whereby any anxiety or concern in participants would have been addressed and, if so desired by the patient, referred to the patient's managing clinical team.

2.11.4 Privacy and confidentiality

All data were secured and treated with strict confidentiality (Kruger, Ndebele, & Horn, 2014). Partial anonymity of the data was ensured by using codes instead of names to represent each participant. No reporting revealed the identity or identifiable particulars of any specific participant.

CHAPTER 3

Description of the sample and results for the scale validation

This chapter describes the sample and presents the results for the first component of the study, i.e., the scale validation. The results comprise validity and reliability testing on the Initial Vigour Assessment Scale (i-VAS) and an Exploratory Factor Analysis (EFA) on the i-VAS. The EFA resulted in the Core VAS, a 27-item version of the VAS that retained only those items that were closest to the construct of vigour. Validity and reliability results on the Core VAS are accordingly presented as well.

For the validity of the new instrument, concurrent validity testing was done by means of Pearson correlations between the i-VAS totals and the totals on the Shirom-Melamed Vigor Measure (SMVM), Personal Growth and Initiative Scale (PGIS), Behavior Inhibition Scale/Behavior Activation Scale (BIS/BAS), Procrastination Scale (Proc) and Fatigue Assessment Scale (FAS). Discriminant validity was calculated by means of paired t-tests between the i-VAS totals and the totals on the Procrastination Scale (Proc Scale), Fatigue Assessment Scale (FAS), Calgary Depressive Symptoms Scale (CDSS), Personal Growth and Initiative Scale (PGIS), Behavior Inhibition Scale/Behavior Activation Scale (BIS/BAS) and Staden Schizophrenia Anxiety Rating Scale (S-SARS).

The reliability of the VAS was tested in terms of Cronbach alpha coefficients, Spearman-Brown coefficients, Guttman split-half coefficients and standard error of measurement (SEM) margins. Internal consistency was investigated on the full scale and on sequential item omissions. Split-half reliability was examined on a sequential split-half, as well as split-half on the positive (B) and negative (B) VAS categories. Test-retest reliability was examined using correlations between the first time the VAS was administered (i-VAS totals) and the second time (Repeat of VAS; r-VAS totals).

3.1 Description of the sample

The sample consisted of 242 outpatients with remitted but avolitional schizophrenia, from the outpatient department at Weskoppies Hospital. Of these, 112 qualified for test-retest reliability as they subsequently completed the Repeat of Vigour Assessment Scale (r-VAS), while 54 participants did not return for the retest. The second component, addressed in the next chapter, consists of a further 76 participants who underwent the invigoration task and completed the Anticipatory Vigour Assessment Scale (a-VAS). A summary of the points of

assessment used in this study is presented once again in Table 3.1, and an overview of the data collection process can be seen in Figure 3.1, with the scale validation component appearing in blue.

Figure 3.1 Data collection process after recruitment
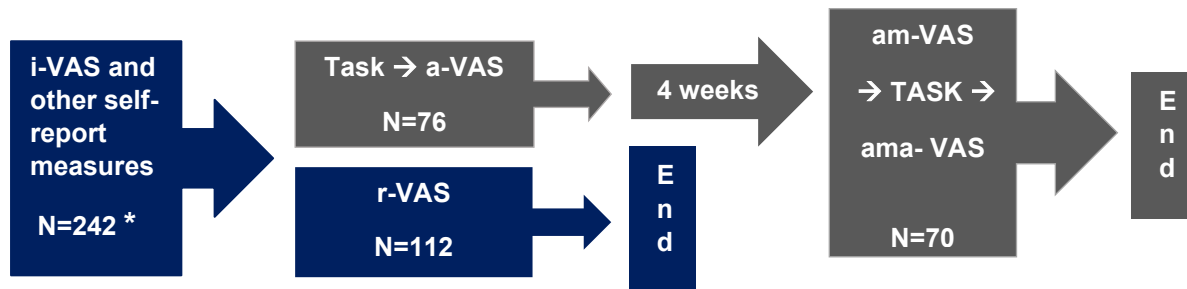
* 54 participants completed this phase only

Table 3.1 Summary of the points of assessment in the study				
Scale validation*		**Task validation**		
Measured using:		**Measured using:**		
i-VAS	**r-VAS**	**a-VAS**	**am-VAS**	**ama-VAS**
Initial **V**igour **A**ssessment **S**cale	**R**epeat of **V**igour **A**ssessment **S**cale	**A**nticipatory **V**igour **A**ssessment **S**cale	**A**fter one **M**onth **V**igour **A**ssessment **S**cale	**A**fter one **M**onth **A**nticipatory **V**igour **A**ssessment **S**cale
The original VAS instrument measuring vigour over the preceding week, administered as the first self-report measure	Identical to the i-VAS, except that its point of application is after all self-report measures are completed	Items are reworded to future tense, "Over the *next* 7 days" to measure anticipated vigour levels	Identical to the i-VAS, except that its point of application is at the one-month follow-up mark	Identical to the a-VAS, except that its point of application is after the second task

* i-VAS is also used in the task validation (see Chapter 4)

As indicated in Table 3.2, there were 176 males (72.72%) and 66 females (27.27%). The majority of the participants had completed Grade 10 (39.20%) or Grade 12 (38.43%). The mean age of the sample was 37, with a standard deviation of 10.6.

Table 3.2 Descriptive statistics of the sample's demographics					
		Frequency		**Per cent (%)**	
Gender	Male	176		72.72	
	Female	66		27.27	
Highest level of education (HLOE)	Grade 8	15		6.20	
	Grade 10	95		39.26	
	Grade 12	93		38.43	
	Postgraduate	39		16.12	
				95% confidence limits	
Age	Mean	37.4	36.0	38.7	

The mean score of the Initial Vigour Assessment Scale (i-VAS) was 12.02, with 95% confidence intervals between 8.81 and 15.24 (see Table 3.3). The standard deviation for the i-VAS was 25.42, and the variance was 646.27. Two tests of normality were performed, with a Shapiro-Wilk statistic (W) of 0.99 (Pr<W), a p-value of 0.44 and a Kolmogorov-Smirnov statistic (D) of 0.04 (Pr > D), p-value >0.15, hence a normal distribution was assumed. The range of the total i-VAS scores was between -51 and 74. Visually, the pattern is also in accordance with a normal distribution, as illustrated in Figure 3.2 by the curved shape of the figure, and in Figure 3.3 by the dots and circles being in close proximity to the central line. These results warranted the use of parametric statistical tests.

Figure 3.2 Distribution plot for Initial Vigour Assessment Scale (i-VAS)
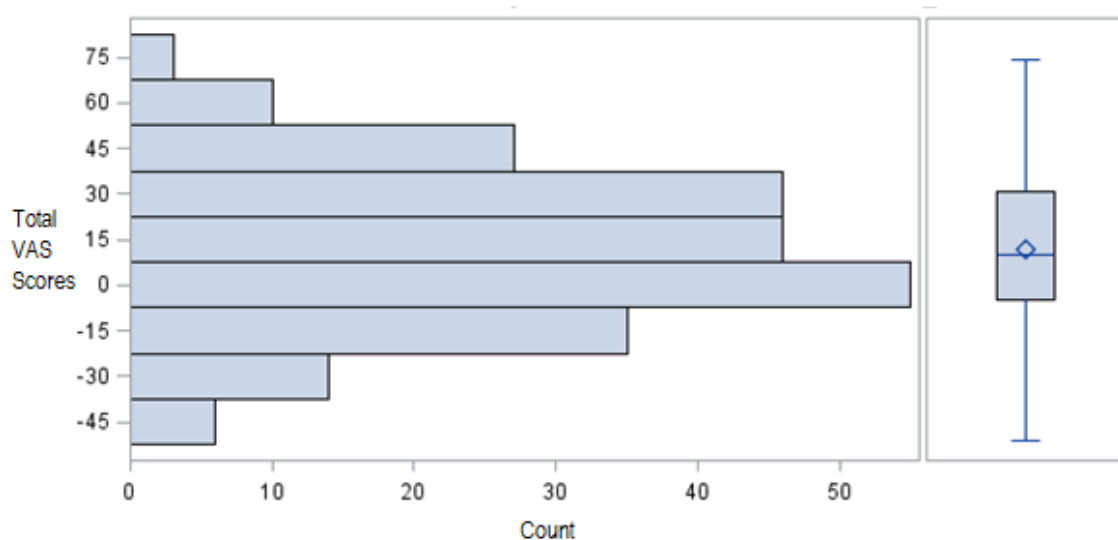
Figure 3.3. Probability plot for the Initial Vigour Assessment Scale (i-VAS)
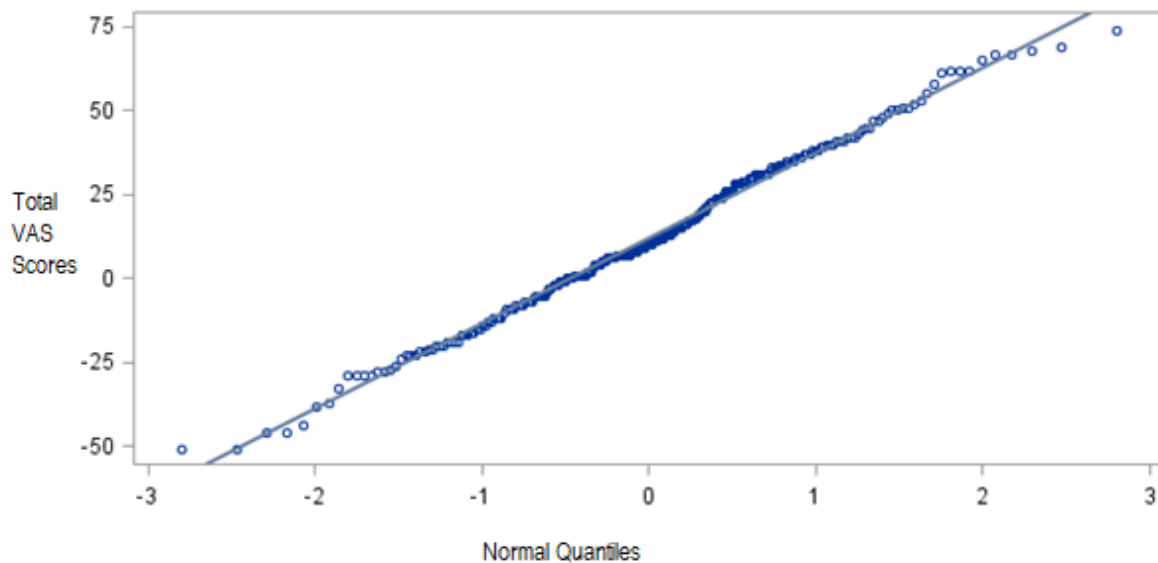
3.2 Descriptive statistics for the instruments other than the Initial Vigour Assessment Scale (i-VAS)

Table 3.3 presents the results of the total scores for the various instruments other than the i-VAS. The premise behind the inclusion of the three items on the Positive and Negative Symptom Scale (Avolitional PANSS) should be born in mind in the interpretation of the mean score, as these were a function of the inclusion criteria for the study. As was stated in the methodology, qualifiers for avolition were set via the prerequisite of a minimum collective score of 10 on the three subscales and a rating of at least a moderate severity on the avolitional subscale. These inclusion criteria thus meant the minimum total score for the three items was 10, which ranged to the theoretical maximum of 21. The mean score of 13.76 and the lower value of the 95% confidence interval being 13.38, suggest rather unequivocally that the sample was avolitional.

Table 3.3 Descriptive statistics for the i-VAS and existing instruments			
Instrument	**Total mean (SD)**	**95% CI**	
Initial VAS (i-VAS)	12.02 (25.42)	8.81	15.24
Avolitional Positive and Negative Symptom Scale (Avolitional PANSS)	13.76 (3.01)	13.38	14.14
Shirom-Melamed Vigor Measure (SMVM)	51.20 (16.77)	49.07	53.31
Personal Growth and Initiative Scale-II (PGIS - II)	39.59 (13.66)	37.86	41.32

Behaviour Inhibition/Behaviour Activation Scale (BIS/BAS)	49.95 (11.55)	48.49	51.42
Procrastination Scale (Proc Scale)	56.64 (12.17)	55.1	58.2
Fatigue Assessment Scale (FAS)	24.96 (8.70)	23.86	26.06
Staden Schizophrenia Anxiety Rating Scale (S-SARS)	2.26 (4.67)	1.66	2.85
Calgary Depressive Symptoms Scale (CDSS)	1.33 (2.78)	0.98	1.69

The total mean score on the Shirom-Melamed Vigor Measure (SMVM) in our sample was slightly lower compared to that (57.35) of a South African sample of 512 employees (Derman, 2008). Similarly, the Personal Growth and Initiative Scale (PGIS-II) mean scores of the sub-categories (RC=3.7, Plan=3.6, UR=2.9, IB=3.1) were lower than those in a sample of 2 149 Brazilian participants (RC=3.7, Plan=3.6, UR=4.0, IB=4.0) (Freitas et al., 2018).

The Behavior Inhibition/Behavior Activation Scale (BIS/BAS) results produced a total mean score that was significantly lower than the means reported in other studies. Accordingly, this suggests that the sample was less sensitive to cues for potentially rewarding or aversive outcomes (Carver & White, 1994; Johnson, Turner, & Iwata, 2003; Van der Laan, Barendse, Viergever, & Smeets, 2016; Ganesh, Kandasamy, Sahayaraj, & Benegal, 2018; Vandeweghe et al., 2016).

On the Procrastination Scale (Proc Scale), the mean score was similar to that (58.76) in a sample of 681 university students (McCloskey & Scielzo, 2015). The Fatigue Assessment Scale (FAS) resulted in a mean that is higher than that (20.5) in a sample of 560 women with breast problems (De Vries et al., 2010).

Scores on the Staden Schizophrenia Anxiety Rating Scale (S-SARS) and the Calgary Depressive Symptoms Scale (CDSS) were low, indicating that this sample endorsed 'questionably present' levels of anxiety, and 'mild' depressive features, with a score of three and below indicating the absence of a depressive disorder (Rekhi, Ng, & Lee, 2018). Once again, the exclusion criteria for this study are of relevance, given that participants were not included in the study if they exhibited a comorbid condition (including depression or anxiety) that could distort results.

3.3 Validity of the Vigour Assessment Scale

The VAS was assessed for concurrent validity to determine whether the instrument measured what it was supposed to measure, as compared to the SMVM, PGIS, BIS/BAS, Proc Scale

and FAS. The VAS was also assessed for its discriminant validity to determine whether it measured something different to what the SSARS, CDSS, BIS/BAS, PGIS and FAS measure.

3.3.1 Concurrent validity

There were statistically significant correlations ($p<0.001$) of moderate to strong degree between the VAS and all existing instruments for which concurrent validity was measured. These correlations mean that the VAS measured what it was supposed to measure in comparison with the SMVM, PGIS, BIS/BAS, Proc Scale and FAS. As shown in Table 3.4, a correlational analysis yielded a strong positive correlation between the VAS and the SMVM. This correlation was the strongest of all the scales, as can be expected given that the SMVM provides a measure of vigour (even though intended for a very different setting). There was a moderate positive correlation with the PGIS. The VAS showed moderate negative correlations with the BIS/BAS, Proc Scale and FAS.

Table 3.4	Correlations of Vigour Assessment Scale (VAS) with Shirom-Melamed Vigor Measure (SMVM), Personal Growth and Initiative Scale (PGIS), Behavior Inhibition Scale/Behavior Activation Scale (BIS/BAS), Procrastination Scale (Proc Scale) and Fatigue Assessment Scale (FAS)						
n=242		i-VAS	SMVM	PGIS	BISBAS	Proc Scale	FAS
i-VAS	Pearson correlation	1	0.714**	0.662**	-0.470**	-0.656**	-0.684**
SMVM	Pearson correlation	0.714**	1	0.751**	-0.656**	-0.534**	-0.562**
PGIS	Pearson correlation	0.662**	0.751**	1	-0.592**	-0.529**	-0.492**
BISBAS	Pearson correlation	-0.470**	-0.656**	-0.592**	1	0.318**	0.262**
Proc Scale	Pearson correlation	-0.656**	-0.534**	-0.529**	0.318**	1	0.618**
FAS	Pearson correlation	-0.684**	-0.562**	-0.492**	0.262**	0.618**	1
** Correlation is significant at the 0.01 level (2-tailed).							

3.3.2 Discriminant validity

Dependent t-tests were used to examine discriminant validity on five pairs of instruments, namely the i-VAS with the Proc Scale, FAS, CDSS, PGIS, BIS/BAS and S-SARS (see Table 3.5). There were statistically highly significant differences ($p<0.001$) between the i-VAS and all five measures investigated. This indicates that the observable differences are not accounted for by random variation but instead reflect unequivocally the discriminant validity of the VAS, where even the 95% CI for the differences between the means are far from 0 (0 means no difference between the means).

Table 3.5	Paired t-tests between the i-VAS and the Proc Scale, FAS, CDSS, PGIS, BIS/BAS and S-SARS						
n=242	Mean difference	Standard error	95% CI of the difference		t (df=241)	Significance (2-tailed)
			Lower	Upper		
i-VAS and Proc Scale	-44.65	2.24	-49.05	-40.42	-20.03	<0.001
i-VAS and FAS	-12.93	2.06	-16.99	-8.88	-6.29	<0.001
i-VAS and CDSS	10.69	1.72	7.31	14.07	6.22	<0.001
i-VAS and PGIS	-27.56	1.24	-30.01	-25.12	-22.21	<0.001
i-VAS and BIS/BAS	-37.48	2.10	-41.62	-33.35	-17.85	<0.001
i-VAS and S-SARS	9.77	1.74	6.34	13.20	5.61	<0.001

3.4 Reliability of the VAS

Reliability was assessed by Cronbach alpha values, Spearman-Brown coefficient, Guttman split-half coefficient and standard error of measurement (SEM) margins. These are presented in Table 3.6.

Table 3.6 Cronbach Alphas for the tests on the reliability of the VAS					
Type of reliability	Scale/items used	Number of participants	Number of items	Cronbach's alpha	SEM
Internal consistency	i-VAS	242	48	0.8	7.01
Internal consistency on sequential item omission	i-VAS	242	48	0.79–0.81	N/A
Internal consistency on instrument categories	Positive items of the i-VAS	242	25	0.94	4.15
	Negative items of the i-VAS	242	23	0.88	4.37
Split-half reliability	Consecutive items 1-24 of i-VAS	242	24	0.61	4.93
	Consecutive items 25-48 of i-VAS	242	24	0.75	4.94

Test-retest reliability	i-VAS	112	48	0.77	7.39
	r-VAS	112	48	0.80	7.31

The internal consistency, as measured by Cronbach's alpha coefficient, resulted in a high coefficient for the i-VAS inclusive of all 48 items. Cronbach alphas were also calculated by sequentially omitting each item in turn for its effect on the Cronbach alpha, and the alphas remained close to 0.8. Overall, the new instrument was assessed to have good internal consistency. Internal consistency testing was further examined using Exploratory Factor Analysis (see section 3.5).

For split-half reliability testing of halves comprising the first 24 (1–24) items of the i-VAS and the remaining 24 (25–48) items, the Cronbach alpha values for each half were lower, which is in keeping with the theoretical expectation that instruments comprising fewer items result in lower Cronbach alpha values. The correlation between the halves (0.56) was adjusted using the Spearman-Brown formula as well as the Guttman correlation formula, producing strong correlations (r=0.72 and 0.71 respectively). Cronbach coefficients for the split-half reliability on the positive and negative VAS categories were also good, with a moderate correlation (r=-0.5) between the two categories. This suggests good split-half reliability.

Test-retest reliability was analysed on 112 participants who repeated the VAS (r-VAS) (but did not participate in the invigoration task). There was a strong correlation of 0.77 between the i-VAS and the r-VAS, suggesting good test-retest reliability.

Standard error of measurement (SEM) values for the VAS inclusive of all 48 items were approximately seven (see Table 3.6), meaning that the observed scores are within seven points of the true scores. Observed scores are the scores as obtained from the test-takers, which is differentiated from true vigour (that is, the vigour that would be subject to measurement error). Thus, SEM analyses provide a calculation of how close observed scores are to true vigour. A seven-point figure is not much considering the theoretical range of the VAS (a minimum of -51 to a maximum of 74). For instance, a participant with an observed VAS score of 40 would have a true score ranging between 33 and 47. This seven-point SEM is subject to 68% certainty, based on the usual way in which a SEM is calculated, i.e., using one standard deviation. In terms of internal consistency, the instrument is consistent in the sense that the total observed score consistently measured what it was supposed to do, plus or minus seven points on the total score, thereby suggesting good consistency.

3.5 Exploratory Factor Analysis (EFA)

An Exploratory Factor Analysis (EFA) was conducted on the i-VAS to discover separable dimensions that represent theoretical constructs within the domain of vigour (Floyd &

Widaman, 1995). The procedure was exploratory owing to the absence of *a priori* expectations regarding the internal structure of the VAS. Hence, the analysis was used to discover latent variables that underlie the VAS. In pursuit of this aim, the analysis focused on the communalities of the measured responses or the variance that VAS items share with the latent variables underpinning, and in theory causing, responses. The exploratory procedures used in the EFA process for the study are depicted in Figure 3.4 (Taherdoost, Sahibuddin, & Jalaliyoon, 2014). The steps below were revisited and repeated until a clear factor solution was produced.

Figure 3.4 Exploratory Factor Analysis process

1. Evaluate data suitability for EFA
2. Select factor extraction method
3. Select Factor retention method
4. Select rotational method
5. Interpret and label the factors
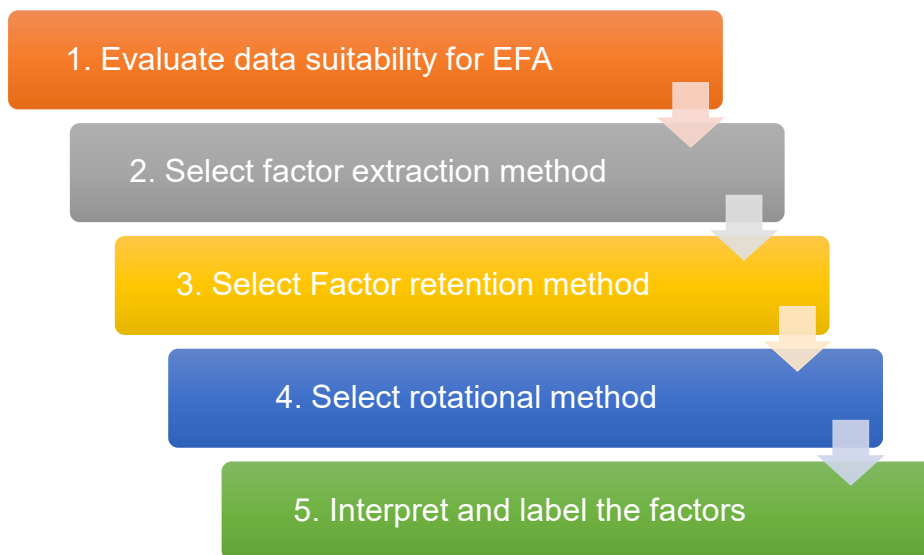
Two tests were carried out as a minimum prerequisite standard for conducting an EFA. First, in assessing whether the sample size was sufficient for an EFA, the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) test was conducted. This test measures whether each factor predicts enough items. The value ranges between zero and one, with the sample being adequate if the value of the KMO is greater than 0.5. For the VAS, the KMO correlation was 0.9, indicating that the sample size was sufficient.

The second test, namely, Bartlett's Test of Sphericity, was carried out to test for correlation adequacy. It tests the null hypothesis that the correlation matrix is an identity matrix (an identity matrix is one wherein the correlations between the variables are all zero). The Bartlett's Test of Sphericity was statistically significant (approximate chi-square = 5335.80, df = 1128, $p<0.001$), meaning that the VAS items are significantly related, hence it was justified to reject the null hypothesis and appropriate to proceed with the EFA.

Before reporting the results of the EFA, an overview of the concept of communalities is worth mentioning, given its prominence in the analysis. A communality refers to the extent to which a variable correlates with all other variables (Mvududu & Sink, 2013). In this case, it refers to the extent to which a particular VAS item correlated with all the other VAS items. A communality is calculated by squaring the factor loadings for an item and adding up the results. Considering that factor loadings are correlations, where a correlation between a VAS item and a factor, squared loadings are thus shared variance. Hence, the sum of the squared loadings for VAS items produces the communalities or the amount of variance in an item that is captured by all the factors (Osborne, Costello, & Kellow, 2008). Taking this to the level of factors, the sum of squared loadings of a factor produces the amount of variance in all items captured by a factor, known as the eigenvalue (Field, 2000).

The communalities presented in Table 3.7 serve as the starting values in the EFA process. The table contains initial communalities, with extracted communalities in the adjacent column. Extraction communalities represent the proportion of variation accounted for by the retained factors. At this point of the analysis, SPSS uses the Keiser criterion by default, regardless of the number of factors retained by this solution. In Table 3.7, it can be seen that these factors account for 40.3% of the variation in VAS item 1, 56.1% of the variation in VAS item 2 and so on. Mainly, the initial communalities offer an initial assessment of the data followed up with the extracted communalities that are based on Principal Axis Factoring.

Table 3.7 *First set of communalities extracted from Principal Axis Factoring*		
	Initial principal components estimates	Extraction from principal axis factoring
VAS 1	0.429	0.403
VAS 2	0.518	0.561
VAS 3	0.489	0.515
VAS 4	0.525	0.513
VAS 5	0.479	0.406
VAS 6	0.442	0.420
VAS 7	0.493	0.449
VAS 8	0.566	0.522
VAS 9	0.497	0.427
VAS 10	0.518	0.449
VAS 11	0.518	0.432
VAS 12	0.561	0.548

VAS 13	0.383	0.608
VAS 14	0.452	0.386
VAS 15	0.544	0.600
VAS 16	0.563	0.563
VAS 17	0.394	0.306
VAS 18	0.657	0.617
VAS 19	0.658	0.718
VAS 20	0.552	0.572
VAS 21	0.617	0.649
VAS 22	0.582	0.588
VAS 23	0.582	0.572
VAS 24	0.508	0.408
VAS 25	0.492	0.533
VAS 26	0.608	0.623
VAS 27	0.406	0.296
VAS 28	0.620	0.614
VAS 29	0.366	0.242
VAS 30	0.612	0.597
VAS 31	0.533	0.522
VAS 32	0.512	0.480
VAS 33	0.446	0.422
VAS 34	0.641	0.548
VAS 35	0.431	0.436
VAS 36	0.607	0.621
VAS 37	0.532	0.477
VAS 38	0.610	0.586
VAS 39	0.511	0.510
VAS 40	0.634	0.610
VAS 41	0.518	0.493
VAS 42	0.505	0.421
VAS 43	0.437	0.568
VAS 44	0.563	0.555
VAS 45	0.272	0.279
VAS 46	0.481	0.458
VAS 47	0.452	0.359
VAS 48	0.650	0.684

Principal Axis Factoring (PAF) was the selected extraction method for its utility in determining the latent structure or factors underlying the original variables (Williams et al., 2010). PAF

sought the least number of factors that could account for correlations between the VAS items and latent variables. The process of PAF begins with Principal Components Analysis (PCA) by breaking down the total variation, where the sum of all components creates a total of 100% of the variance. PCA drafts an estimate of the number of factors that would be extracted based on PAF. PCA clumps together all kinds of variance, which poses the limitation of presuming that each VAS item is perfectly reliable, thus overlooking sources of variance that may influence observed figures (Finch, 2013). PAF addresses this shortcoming and takes the process a step further. It does so by excluding any variation that is unique to each item and by breaking down instead only shared variance and error variance (Williams et al., 2010).

Accordingly, as shown in Table 3.7, an initial communality is not produced as "1" for each item but rather as values representing the amount of each item's variance accounted for by the rest of the items. Parsimony is reduced in this manner, but representativeness is optimised. It means that the PCA yielded 0.429 for VAS item 1 (following the default Keiser criterion set by SPSS), but this did not take into account individual or error variance. For this reason, the extracted communality for VAS item 1 as per PAF is a lower value of 0.403 because it retains only common variance, thereby providing a stricter and more representative account.

The first set of communalities accounted for by extracted factors ranged between a modest 0.242 (i.e., about 24% of the variance in VAS item 29 is accounted for) and high loading 0.718 (i.e., about 72% of the variance in VAS item 19 is accounted for). At this beginning stage, the lower communality values provided clues as to items that are better excluded as they contribute less to representing the latent variables, as turned out to be the case (see below) with VAS item 27 (0.296), VAS item 45 (0.279) and VAS item 29 (0.242).

The next step after extraction was to select criteria for deciding on the number of factors to retain. The aim was to retain enough factors to represent the data while eliminating weakly correlated items adequately. The Kaiser Criterion was applied, whereby factors with an eigenvalue greater than 1.0 were retained. This pattern is represented visually in the Cattel Scree Plot, where the "elbow" begins to reach a breaking point close to weaker factors.

Factor rotation was applied to gain a more interpretable and simple solution (akin to rotating the view of a map). Factor rotation alters the pattern of the factor loading, allowing it to be more clearly differentiated. Rotation helps by maximising high item loadings while minimising low ones and is presented in a Pattern Matrix. An oblique rotation method was selected (Oblimin with Kaiser Normalisation) as it allows for factors to be correlated.

Cross-loading items were removed, as VAS items were assessed for the unique relationship between each factor and the items, thus removing relationships that were shared by multiple factors. In addition to removing cross-loadings, items that did not meet the minimum threshold

for correlation were removed (Yong & Pearce, 2013). As per convention, item loadings less than 0.3 were removed from the Pattern Matrix. After previous exclusions and rerunning of rotations, the process of subsequent factor refinement was repeated in the same manner until a simple solution was reached.

Eleven factors were initially identified in this way. VAS items 29, 17, 24, 8, 11, 9, 1, 10 and 23 were excluded at this point, owing to their low loadings. Extraction and rotation were run again, producing ten factors with the exclusion of VAS items 7 and 47 for loading less than 0.3. In the same manner, VAS items 33 and 27 were excluded, followed by VAS items 6 and 14. A seven-factor solution was produced, but this time VAS item 3 was excluded owing to cross-loading on two factors (0.354 and 0.359 respectively).

The initial solution produced is presented in Table 3.8. The table contains two sets of data. On the left, the eigenvalues produced from the initial PCA are presented. As was mentioned above, the PCA solution provided the starting point for the number of factors to be retained as per the Kaiser criterion. In this case, there were 11. Hence, 11 factors were retained on the right-hand side of the table. PCA breaks down all variation. For this reason, the 48 rows reflect each of the 48 VAS items, all adding up to 100% of the total variation. On the right, the sum of squared loadings was derived from the PAF approach. Here, only the common variance was included, and there are 11 rows for the 11 factors retained, alongside the percentage of variance and cumulative percentage of variance columns. As can be seen, the initial 11-factor solution explains 50.339% of the total common variance in the VAS scores. The column containing the rotated sums of squared loadings spread the eigenvalues more evenly across the 11 factors but still add up to the same total eigenvalues.

	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings[a]
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	13.140	27.375	27.375	12.674	26.403	26.403	7.600
2	4.525	9.428	36.803	4.010	8.353	34.756	4.320
3	1.906	3.970	40.773	1.450	3.020	37.776	5.594
4	1.499	3.123	43.896	1.046	2.178	39.955	2.878
5	1.354	2.821	46.717	0.895	1.864	41.819	7.057
6	1.326	2.762	49.479	0.824	1.716	43.534	4.052
7	1.262	2.629	52.108	0.733	1.526	45.061	2.203
8	1.217	2.534	54.643	0.669	1.395	46.455	3.668

Table 3.8   Total Variance Explained for the initial rotation

9	1.147	2.390	57.033	0.657	1.369	47.825	1.399
10	1.092	2.276	59.309	0.620	1.292	49.117	5.810
11	1.048	2.184	61.493	0.587	1.222	50.339	4.802
12	0.999	2.082	63.575				
13	0.997	2.076	65.651				
14	0.908	1.892	67.543				
15	0.882	1.838	69.381				
16	0.825	1.719	71.100				
17	0.802	1.671	72.771				
18	0.753	1.570	74.341				
19	0.726	1.512	75.852				
20	0.680	1.416	77.268				
21	0.653	1.360	78.628				
22	0.627	1.306	79.934				
23	0.610	1.271	81.205				
24	0.592	1.233	82.438				
25	0.567	1.181	83.619				
26	0.536	1.117	84.737				
27	0.508	1.058	85.795				
28	0.497	1.035	86.830				
29	0.487	1.015	87.845				
30	0.465	0.970	88.815				
31	0.455	0.949	89.763				
32	0.412	0.858	90.622				
33	0.406	0.846	91.468				
34	0.398	0.829	92.296				
35	0.392	0.816	93.113				
36	0.349	0.728	93.841				
37	0.337	0.702	94.542				
38	0.317	0.661	95.204				
39	0.303	0.632	95.835				
40	0.297	0.619	96.455				
41	0.264	0.550	97.005				
42	0.250	0.521	97.526				
43	0.246	0.512	98.039				
44	0.232	0.484	98.522				
45	0.188	0.391	98.914				
46	0.184	0.383	99.297				
47	0.176	0.368	99.665				

48	0.161	0.335	100.000				
Extraction method: Principal Axis Factoring							
a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.							

The process of extraction and rotation was repeated until the sixth extraction and rotation resulted in a simple structure that comprised six factors, thereby concluding the factor refinement process of the EFA. From the original 48 items, 28 were retained. The last set of communalities extracted from PAF in Table 3.9 indicate that the most robust VAS item was VAS item 19, with an extracted communality of 0.708, while the weakest item was VAS item 43 with an extracted communality of 0.221. These communalities mean that VAS item 19 did most of the work to represent the six factors, with 71% of the variance in this item being accounted for by them. In contrast, VAS item 43 did not represent the six-factor solution very well, with only 22% of co-variation with the underlying six factors.

Table 3.9	*The sixth set of communalities extracted from Principal Axis Factoring*	
	Initial	Extraction
VAS 2	0.429	0.383
VAS 4	0.408	0.394
VAS 12	0.479	0.538
VAS 16	0.481	0.452
VAS 18	0.577	0.525
VAS 19	0.595	0.708
VAS 20	0.455	0.418
VAS 21	0.578	0.680
VAS 22	0.526	0.564
VAS 25	0.425	0.530
VAS 26	0.553	0.657
VAS 28	0.584	0.598
VAS 30	0.554	0.614
VAS 31	0.365	0.427
VAS 32	0.457	0.445
VAS 34	0.566	0.539
VAS 35	0.342	0.395
VAS 36	0.526	0.528
VAS 37	0.384	0.405
VAS 38	0.566	0.611
VAS 39	0.471	0.559

VAS 40	0.595	0.612
VAS 41	0.416	0.485
VAS 42	0.426	0.421
VAS 43	0.273	0.221
VAS 44	0.503	0.498
VAS 46	0.372	0.344
VAS 48	0.528	0.548
Extraction method: Principal Axis Factoring		

Table 3.10 presents the sixth Pattern Matrix preceded by similar pattern matrices and exclusions of items. This final one represents the most refined structure at this point. It provides a view of the clusters of items based on their correlations with each factor. Accordingly, six clusters can be seen, highlighted in blue.

The first cluster had the highest eigenvalue, constituted by VAS items 12, 34, 36, 40, 42, 28, 18, 32, 44, 38, 16 and 22. There were cross-loadings on VAS items 28, 38, 16 and 22.

Table 3.10 Pattern Matrix for the VAS for the sixth extraction and rotation						
	Factor					
	1	**2**	**3**	**4**	**5**	**6**
VAS 12	0.701	0.016	0.038	0.056	0.079	-0.218
VAS 34	0.685	0.015	-0.101	-0.028	-0.017	-0.010
VAS 36	0.669	-0.061	-0.146	0.018	0.034	0.126
VAS 40	0.597	0.034	-0.008	0.195	-0.055	-0.197
VAS 42	0.531	0.056	-0.153	-0.096	-0.153	0.117
VAS 28	0.477	0.110	-0.044	0.012	-0.308	-0.208
VAS 18	0.470	-0.084	0.067	0.166	-0.204	-0.136
VAS 32	0.446	-0.016	-0.058	0.074	-0.255	0.145
VAS 44	0.348	0.135	-0.029	0.248	-0.295	-0.023
VAS 39	0.182	0.644	0.018	-0.041	0.086	0.221
VAS 41	0.055	0.620	0.068	0.101	0.058	0.092
VAS 35	-0.150	0.493	0.192	-0.002	-0.228	0.023
VAS 19	0.062	0.133	0.813	0.009	0.036	-0.024
VAS 21	-0.045	0.009	0.778	0.037	-0.059	0.123
VAS 46	0.112	0.107	-0.407	0.123	-0.178	-0.002
VAS 48	0.141	-0.023	-0.157	0.574	-0.090	-0.012
VAS 38	0.354	-0.175	-0.046	0.531	0.038	-0.051
VAS 4	0.192	-0.016	-0.019	0.421	-0.174	-0.012

VAS 43	-0.140	0.192	0.039	0.403	0.062	0.040
VAS 16	0.345	-0.187	-0.045	0.359	-0.036	-0.019
VAS 26	-0.086	-0.001	-0.196	0.053	-0.754	-0.049
VAS 30	0.225	0.090	-0.052	-0.188	-0.624	-0.156
VAS 22	0.323	-0.272	0.147	0.050	-0.489	0.123
VAS 2	0.081	0.005	-0.039	0.251	-0.388	-0.119
VAS 20	0.025	-0.227	-0.103	0.299	-0.368	0.038
VAS 25	-0.017	-0.010	0.257	-0.059	-0.007	0.601
VAS 31	0.009	0.189	-0.014	0.035	0.036	0.551
VAS 37	-0.136	0.253	-0.006	0.111	0.113	0.393
Extraction method: Principal Axis Factoring Rotation method: Oblimin with Kaiser Normalization						

Factor 1 was distinctly greater than the rest, which is also evident in the Scree Plot (see Figure 3.5).

Figure 3.5 Scree Plot of the EFA on the VAS
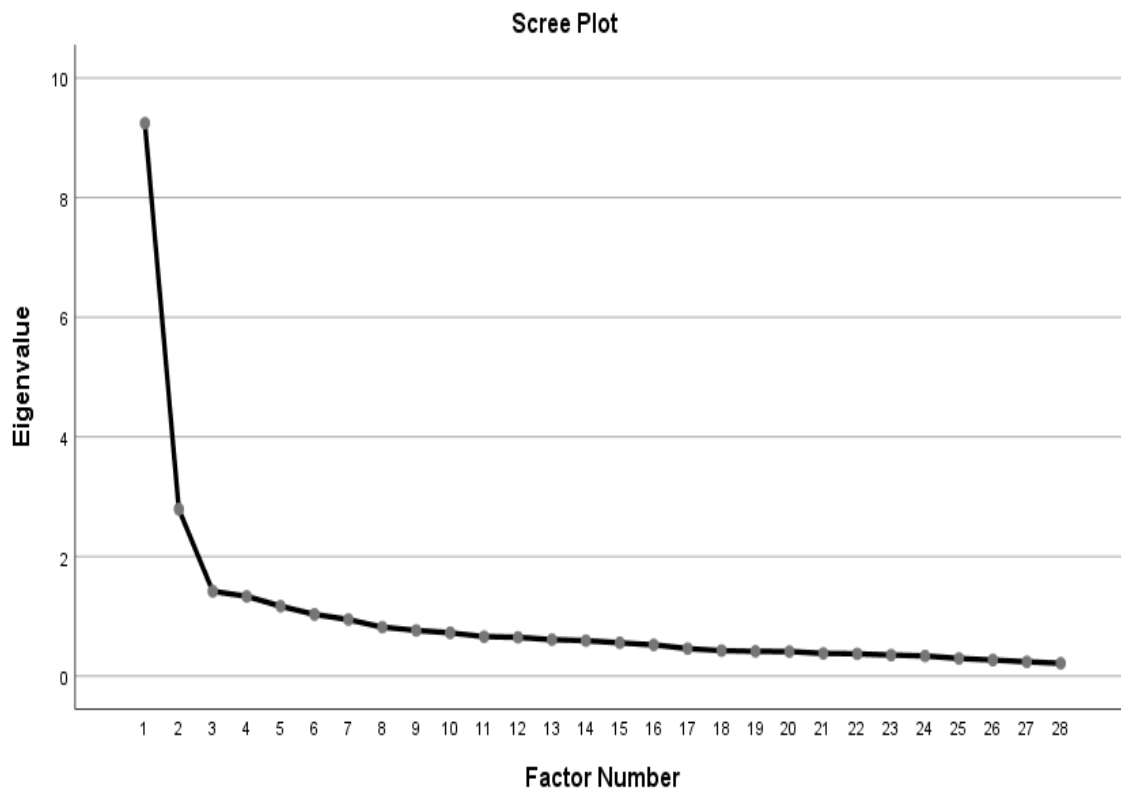
Table 3.11 illustrates how well the six-factor model explains the constructs under investigation. The leftmost section of this table shows the variance explained in the initial solution, where six factors have eigenvalues above 1.0, suggesting that six latent variables are associated with

vigour. Together, these six factors account for 61% among the remaining 28 items of the total variation in these items. From the second section of the table showing the variance explained by the extracted factors before rotation, it is evident that the cumulative variance explained by these six factors accounts for 50.354% of the variability, which is slightly less than in the initial solution but is more representative as it only breaks down common variance. According to Mvududu and Sink (2013), a good factor solution explains most of the variance (50–75%) with the fewest possible factors; hence, the solution produced in this case may be considered acceptable.

Table 3.11 Total Variance Explained for the sixth extraction and rotation

Factor	Eigenvalues based on PCA			Extraction sums of squared loadings			Rotation sums of squared loadings*
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	9.244	33.015	33.015	8.773	31.332	31.332	7.108
2	2.792	9.972	42.988	2.283	8.152	39.484	2.751
3	1.419	5.068	48.056	0.976	3.487	42.971	4.189
4	1.334	4.764	52.820	0.838	2.991	45.962	3.103
5	1.169	4.175	56.994	0.698	2.494	48.456	5.283
6	1.031	3.683	60.677	0.532	1.898	50.354	2.664
7	0.946	3.377	64.055				
8	0.818	2.923	66.977				
9	0.764	2.729	69.707				
10	0.723	2.583	72.290				
11	0.660	2.356	74.646				
12	0.648	2.314	76.960				
13	0.609	2.176	79.135				
14	0.592	2.116	81.251				
15	0.556	1.987	83.238				
16	0.522	1.865	85.102				
17	0.460	1.642	86.744				
18	0.427	1.524	88.268				
19	0.414	1.479	89.747				
20	0.411	1.467	91.214				
21	0.380	1.357	92.570				
22	0.373	1.331	93.901				

23	0.352	1.258	95.159				
24	0.336	1.202	96.361				
25	0.296	1.057	97.418				
26	0.269	0.962	98.380				
27	0.239	0.854	99.234				
28	0.214	0.766	100.000				

Extraction method: Principal Axis Factoring

* When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

Next, factors were interpreted and allocated labels. The similarities in the contents of the items when considered together (excluding cross-loading items, marked in blue) were used to derive the labels of the factors, presented in Table 3.12.

Table 3.12 Six factors interpreted

Factor	VAS items	Name
1	12 During the past 7 days, I felt energised to do my work or tasks 16 I have been excited during the past 7 days about doing things 18 I have been really into my tasks or work during the past 7 days 22 During the past 7 days, I have been going for the things I want 28 I was active in doing my tasks and work during the past 7 days 32 The tasks I have been doing during the past 7 days have purpose and meaning 34 I have been eager to do tasks during the past 7 days 36 I have been highly driven during the past 7 days 38 I have been doing creative things during the past 7 days 40 I have felt inspired to do my tasks or work during the past 7 days 42 I have pushed through and persevered with my tasks or work during the past 7 days even when it got tough 44 During the past 7 days, I have attempted to improve things in my life	*Task Drive*
2	35 I have had difficulty in coming to decisions on what to do during the past 7 days 39 During the past 7 days, I have been postponing decisions that had to be made 41 During the past 7 days, I have been back and forth in my mind on what to do	*Indecisiveness*
3	19 During the past 7 days, I have been uninterested to speak to others. 21 During the past 7 days, I have been uninterested in the company of other people 46 During the past 7 days, I have returned communications like phone calls, messages and e-mails without delay	*Social Disinterest*

4	4 I have initiated new plans during the past 7 days	*Creative*
	16 I have been excited during the past 7 days about doing things	*Efforts*
	38 I have been doing creative things during the past 7 days	
	43 During the past 7 days, I have been interested in my personal	
	hygiene or grooming less than other people are	
	48 I have taken an interest in new things during the past 7 days	
5	2 I have been active and on the move during the past 7 days	*Active*
	20 I made choices and went for them during the past 7 days	*Mobilisation*
	22 During the past 7 days, I have been going for the things I want	
	26 I have taken action during the past 7 days to reach my goals	
	28 I was active in doing my tasks and work during the past 7 days	
	30 During the past 7 days, I have been pursuing my daily goals	
6	25 I have been slow in doing everyday activities during the past 7 days	*Torpidity*
	31 I have felt weak when doing ordinary things during the past 7 days.	
	37 During the past 7 days, I have delayed before starting on work or	
	tasks I had to do	

Factor 1 seems to deal with having the get-up-and-go to pursue tasks and was named Task Drive. Factor 2 has a common theme of battling to make decisions, hence being named Indecisiveness. The third factor pertains to the interpersonal domain, characterised by disinterest in others. Factor 4 deals with the pursuit of renewal and novelty. It does, however, contain a problematic item, namely VAS item 43. As was mentioned earlier, this was the item with the lowest communality, thus the weakest of the remaining items. During data collection, it was marked as a particularly cumbersome item owing to it being prone to misinterpretation. Specifically, respondents seemed to interpret it to mean the opposite by missing the "less" in the sentence. In addition, this item did not seem to fit with Factor 4. For this reason, it was decided to delete this item from the VAS scale. Factor 5 has the cognitive component of decision-making, coupled with the behavioural aspect of actively following through on decisions that have been made. Lastly, Factor 6 speaks to the lack of vigour regarding a low-energy disposition.

The Factor Correlation Matrix in Table 3.13 presents how the factors are related to each other. The more distinct the factors, the less they correlate. Factors 2 and 4 have little in common with each other owing to a weak correlation. This is similarly the case with factors 4 and 6, indicating that they are rather distinct. On the other hand, factors 1 and 5 have a moderate correlation and are hence considered as rather similar.

.

Table 3.13 Factor Correlation Matrix						
Factor	1	2	3	4	5	6
1	1.000	-0.230	-0.443	0.352	-0.566	-0.217
2	-0.230	1.000	0.327	0.053	0.130	0.410
3	-0.443	0.327	1.000	-0.176	0.285	0.292
4	0.352	0.053	-0.176	1.000	-0.285	-0.033
5	-0.566	0.130	0.285	-0.285	1.000	0.197
6	-0.217	0.410	0.292	-0.033	0.197	1.000
Extraction method: Principal Axis Factoring						
Rotation method: Oblimin with Kaiser Normalization						

The last step of the EFA was carried out with the exclusion of item 43. The final communalities in Table 3.14 indicate that the most robust VAS item was still VAS item 19, with a marginally higher extracted communality of 0.714, while the weakest item was VAS item 2 with an extracted communality of 0.363. This means that VAS item 19 did most of the work to represent the six factors, with 71.4% of the variance in this item being accounted for by them. Conversely, VAS item 2 is weakest in representing the six-factor solution, as it has the lowest percentage (36%) of co-variation with the underlying six factors.

Table 3.14 The last set of communalities extracted from Principal Axis Factoring for the Core VAS		
	Initial	Extraction
VAS 2	0.000	0.363
VAS 4	0.407	0.438
VAS 12	0.478	0.536
VAS 16	0.481	0.454
VAS 18	0.573	0.527
VAS 19	0.595	0.714
VAS 20	0.455	0.425
VAS 21	0.578	0.680
VAS 22	0.521	0.549
VAS 25	0.424	0.556
VAS 26	0.550	0.666
VAS 28	0.583	0.607
VAS 30	0.547	0.600
VAS 31	0.362	0.419
VAS 32	0.454	0.441

VAS 34	0.566	0.546
VAS 35	0.342	0.398
VAS 36	0.525	0.547
VAS 37	0.381	0.402
VAS 38	0.547	0.583
VAS 39	0.464	0.552
VAS 40	0.592	0.616
VAS 41	0.405	0.477
VAS 42	0.416	0.400
VAS 44	0.499	0.497
VAS 46	0.349	0.366
VAS 48	0.524	0.544
Extraction method: Principal Axis Factoring		

Table 3.15 presents the final Pattern Matrix after the exclusion of VAS item 43. Compared to the previous Pattern Matrix, this one is much clearer in factor loadings, with only one item loading across two factors. The six clusters appear highlighted in blue. The first cluster had the highest eigenvalue, comprising VAS items 34, 36, 12, 42, 28, 40, 18 and 32, with a cross-loading with Factor 5 on VAS item 40.

Table 3.15 Pattern Matrix^a of the Core VAS						
	Factor					
	1	**2**	**3**	**4**	**5**	**6**
VAS 34	0.672	-0.005	-0.092	-0.029	0.016	-0.017
VAS 36	0.666	-0.076	-0.133	0.027	0.054	0.132
VAS 12	0.625	0.006	0.047	0.075	0.120	-0.220
VAS 42	0.507	0.053	-0.148	-0.155	-0.007	0.087
VAS 28	0.487	0.076	-0.033	-0.300	0.047	-0.199
VAS 40	0.469	0.060	0.017	-0.008	0.335	-0.209
VAS 18	0.415	-0.086	0.086	-0.164	0.249	-0.116
VAS 32	0.400	0.004	-0.045	-0.213	0.187	0.136
VAS 39	0.176	0.650	0.007	0.064	-0.106	0.179
VAS 41	0.006	0.642	0.066	0.070	0.066	0.062
VAS 35	-0.154	0.506	0.178	-0.206	-0.023	0.006
VAS 19	-0.010	0.167	0.774	0.053	-0.004	-0.024
VAS 21	-0.110	0.055	0.738	-0.025	0.047	0.130
VAS 46	0.031	0.150	-0.380	-0.122	0.275	-0.036

VAS 26	-0.027	-0.019	-0.177	-0.697	0.125	-0.030
VAS 30	0.287	0.047	-0.058	-0.602	-0.114	-0.155
VAS 22	0.295	-0.247	0.147	-0.420	0.192	0.128
VAS 2	0.075	0.001	-0.011	-0.321	0.294	-0.084
VAS 48	-0.033	0.058	-0.095	0.036	0.739	-0.006
VAS 38	0.191	-0.110	0.004	0.126	0.655	-0.033
VAS 4	-0.002	0.069	0.026	-0.051	0.647	-0.024
VAS 16	0.217	-0.141	-0.005	0.043	0.500	-0.005
VAS 20	-0.060	-0.182	-0.067	-0.269	0.464	0.054
VAS 44	0.260	0.168	-0.002	-0.223	0.364	-0.032
VAS 25	0.036	0.001	0.233	-0.017	-0.118	0.624
VAS 31	0.007	0.234	-0.018	0.048	0.022	0.518
VAS 37	-0.152	0.296	-0.004	0.131	0.078	0.374
Extraction method: Principal Axis Factoring Rotation method: Oblimin with Kaiser Normalization						
a. Rotation converged in 17 iterations.						

Table 3.16 once again illustrates how well the six-factor model explains the constructs under investigation. Together, these six factors account for 62% (1% higher) among the remaining 27 items of the total variation in these items. From the second section of the table, showing the variance explained by the extracted factors before rotation, it is evident that the cumulative variance explained by these six factors accounts for 51.508% of the variability, which is an increase of 1.15%.

	Eigenvalues based on PCA			Extraction sums of squared loadings			Rotation sums of squared loadings*
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	9.237	34.212	34.212	8.767	32.471	32.471	6.705
2	2.688	9.955	44.167	2.194	8.126	40.597	2.491
3	1.381	5.115	49.282	0.954	3.535	44.132	3.495
4	1.231	4.558	53.840	0.785	2.908	47.040	4.323
5	1.161	4.301	58.141	0.675	2.499	49.539	6.291
6	1.018	3.771	61.911	0.532	1.969	51.508	2.626
7	0.819	3.032	64.943				
8	0.789	2.921	67.864				

Table 3.16 Total Variance Explained for the Core VAS

9	0.754	2.791	70.655				
10	0.662	2.452	73.107				
11	0.650	2.406	75.513				
12	0.625	2.317	77.829				
13	0.597	2.210	80.039				
14	0.562	2.083	82.122				
15	0.546	2.022	84.144				
16	0.510	1.890	86.034				
17	0.452	1.673	87.707				
18	0.418	1.550	89.257				
19	0.414	1.532	90.788				
20	0.387	1.433	92.221				
21	0.375	1.388	93.610				
22	0.353	1.306	94.916				
23	0.347	1.284	96.200				
24	0.297	1.099	97.299				
25	0.273	1.011	98.311				
26	0.241	0.894	99.205				
27	0.215	0.795	100.000				

Extraction method: Principal Axis Factoring

* When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

The remaining six factors were re-assessed for more precise labels as provided by the latest figures (see Table 3.17).

Table 3.17 Six factors interpreted after removing VAS item 43		
Factor	**VAS items**	**Name**

1	34 I have been eager to do tasks during the past 7 days
	36 I have been highly driven during the past 7 days
	12 During the past 7 days, I felt energised to do my work or tasks
	42 I have pushed through and persevered with my tasks or work
	   during the past 7 days even when it got tough
	28 I was active in doing my tasks and work during the past 7 days
	40 I have felt inspired to do my tasks or work during the past 7 days
	18 I have been really into my tasks or work during the past 7 days
	32 The tasks I have been doing during the past 7 days have
	   purpose and meaning
		Task Drive

2	39 During the past 7 days, I have been postponing decisions that had to be made 41 During the past 8 days, I have been back and forth in my mind on what to do 35 I have had difficulty in coming to decisions on what to do during the past 7 days	*Indecisiveness*
3	19 During the past 7 days, I have been uninterested to speak to others. 21 During the past 7 days, I have been uninterested in the company of other people 46 During the past 7 days, I have returned communications like phone calls, messages and e-mails without delay	*Social Disinterest*
4	26 I have taken action during the past 7 days to reach my goals 30 During the past 7 days, I have been pursuing my daily goals 22 During the past 7 days, I have been going for the things I want 2 I have been active and on the move during the past 7 days	*Active Mobilisation*
5	48 I have taken an interest in new things during the past 7 days 38 I have been doing creative things during the past 7 days 4 I have initiated new plans during the past 7 days 16 I have been excited during the past 7 days about doing things 20 I made choices and went for them during the past 7 days 44 During the past 7 days, I have attempted to improve things in my life	*Creative Efforts*
6	25 I have been slow in doing everyday activities during the past 7 days 31 I have felt weak when doing ordinary things during the past 7 days. 37 During the past 7 days, I have delayed before starting on work or tasks I had to do	*Torpidity*

Task Drive accounted for most of the variance explained by the factors extracted, hence it is the predominant factor of the scale. It highlights the role of innate motivation towards the pursuit of, active engagement in, and achievement of tasks that are deemed to be subjectively meaningful. As shown in Table 3.18, Task Drive is moderately related to Creative Efforts and,

to a milder extent, to Active Mobilisation. Creative Efforts describes vigorous intent, whereas Active Mobilisation captures vigour on the go.

Indecisiveness appears to be distinct from Active Mobilisation. Indecisiveness is closely related in content to the PANSS avolitional scale as well as the Procrastination Scale. Indecisiveness is also distinct from Social Disinterest and addresses the lack of desire to engage socially. It is not clear why item 46, "During the past 7 days, I have returned communications like phone calls, messages and e-mails without delay" featured as it did in that while it relevantly pertains to interpersonal communication, it comes from Category B (see Table 3.17). It could be that this item has limited validity owing to the resource limits of patients, with many of them lacking the financial means or resources to communicate via telephone or email. Alternatively, this item could have been generally misinterpreted, perhaps by missing the word "without".

Torpidity relates conceptually on content-assessment to lassitude, referring to the difficulty in getting started or slowness in initiating or performing everyday activities. Similarly, it relates to listlessness, referring to a general lack of interest. Listlessness also features in the HAMD on the section assessing occupational functioning, although it is coupled with indecision and vacillation. The grouping in the HAMD is consistent with the moderate correlation found between Indecisiveness and Torpidity in the VAS.

Table 3.18 Factor Correlation Matrix for the Core VAS						
Factor	Task Drive	Indecisiveness	Social Disinterest	Active Mobilisation	Creative Efforts	Torpidity
Task Drive	1.000	-0.162	-0.359	0.457	0.618	-0.218
Indecisiveness	-0.162	1.000	0.273	0.077	-0.107	0.402
Social Disinterest	-0.359	0.273	1.000	0.188	-0.343	0.259
Active Mobilisation	0.457	0.077	0.188	1.000	-0.451	0.191
Creative Efforts	0.618	-0.107	-0.343	-0.451	1.000	-0.200
Torpidity	-0.218	0.402	0.259	0.191	-0.200	1.000
Extraction method: Principal Axis Factoring						
Rotation method: Oblimin with Kaiser Normalization						

3.6 Second round of statistical analysis on the Core VAS

Statistical analysis on the Core VAS, as yielded by the EFA, was done to examine its final validity and reliability. To this end, only the remaining 27 items were included in the analysis:

VAS 2, 4, 12, 16, 18, 19, 21, 20, 22, 25, 26, 28, 30, 31, 32, 34, 35, 36, 37, 38, 39, 40, 41, 42, 44, 46, and 48. These 27 retained items and their derived categories (A being the negative phrased items and B the positively phrased items) are presented in Table 3.19 below. See also Appendix B for the Core VAS for future use.

VAS item	Content	Category
	Table 3.19 The Core VAS comprising the 27 remaining VAS items after EFA	
2	I have been active and on the move during the past 7 days	B
4	I have initiated new plans during the past 7 days	B
12	During the past 7 days, I felt energised to do my work or tasks	B
16	I have been excited during the past 7 days about doing things	B
18	I have been really into my tasks or work during the past 7 days	B
19	During the past 7 days, I have been uninterested to speak to others	A
20	I made choices and went for them during the past 7 days	B
21	During the past 7 days, I have been uninterested in the company of other people	A
22	During the past 7 days, I have been going for the things I want	B
25	I have been slow in doing everyday activities during the past 7 days	A
26	I have taken action during the past 7 days to reach my goals	B
28	I was active in doing my tasks and work during the past 7 days	B
30	During the past 7 days, I have been pursuing my daily goals	B
31	I have felt weak when doing ordinary things during the past 7 days	A
32	The tasks I have been doing during the past 7 days, have purpose and meaning	B
34	I have been eager to do tasks during the past 7 days	B
35	I have had difficulty in coming to decisions on what to do during the past 7 days	A
36	I have been highly driven during the past 7 days	B
37	During the past 7 days, I have delayed before starting on work or tasks I had to do	A
38	I have been doing creative things during the past 7 days	B
39	During the past 7 days, I have been postponing decisions that had to be made	A
40	I have felt inspired to do my tasks or work during the past 7 days	B
41	During the past 7 days, I have been back and forth in my mind on what to do	A
42	I have pushed through and persevered with my tasks or work during the past 7 days even when it got tough	B
44	During the past 7 days, I have attempted to improve things in my life	B
46	During the past 7 days, I have returned communications like phone calls, messages, and e-mails without delay	B
48	I have taken an interest in new things during the past 7 days	B

The mean score of the Core Vigour Assessment Scale (Core VAS) was 29.40, with 95% confidence intervals between 27.3 and 31.4. The standard deviation was 16.27, and the variance was 264.60. These results show that the standard deviation was considerably lower than in the first round of analysis (25.42 as reported in section 3.1 and Table 3.3), with similar results

for the variance (compared to 646.27). The mean score was considerably higher on the Core VAS, which should be expected given that the items of the Core VAS were more from Category B, that is, the positively phrased items.

A normal distribution was assumed for the Core VAS as well, as can be seen in Figure 3.6 from the histogram indicating a bell-shaped distribution, as well as the Q-Q plots of the quantiles in Figure 3.7. The boxplot in Figure 3.6 is symmetrical, with the median line at approximately the centre of the box, with symmetric whiskers that are slightly longer than the subsections of the centre box, thereby indicating that the data come from a normal distribution.

Figure 3.6 Distribution plot for the Core VAS
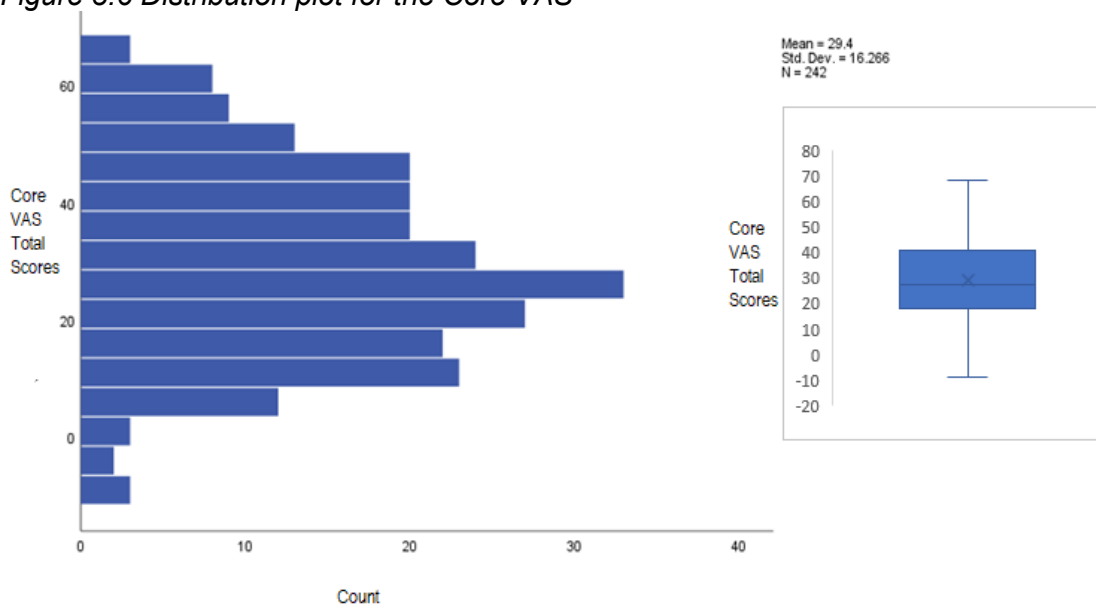
Figure 3.7 Probability plot for the Core VAS
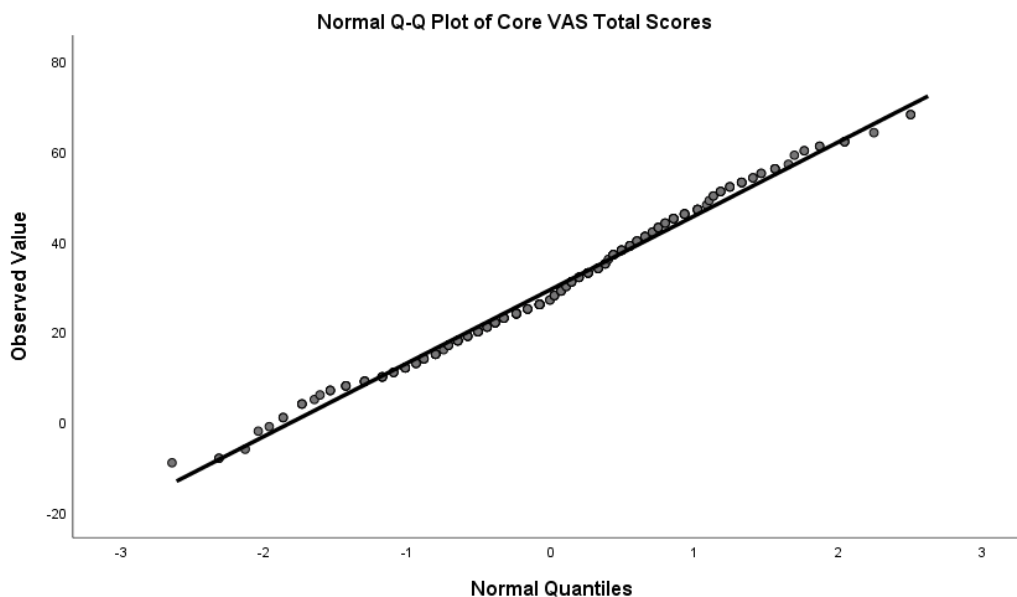
3.6.1 Concurrent validity

There were moderate to strong statistically significant correlations (p<0.001) between the Core VAS and all existing instruments for which concurrent validity was measured, as had been the case for the i-VAS. Thus, the Core VAS also measured what it was supposed to measure, in comparison with the SMVM, PGIS, BIS/BAS, Proc Scale and FAS. As is shown in Table 3.20, a correlational analysis again yielded a strong positive correlation of the VAS with the SMVM, a moderate positive correlation with the PGIS, and moderate negative correlations with the BIS/BAS, Proc Scale and the FAS.

Table 3.20 Correlations of the Core VAS with the Shirom-Melamed Vigor Measure (SMVM), Personal Growth and Initiative Scale (PGIS), Behavior Inhibition Scale/Behavior Activation Scale (BIS/BAS), Procrastination Scale (Proc Scale) and Fatigue Assessment Scale (FAS)							
n=242		Core VAS	SMVM	PGIS	BISBAS	Proc Scale	FAS
Core VAS	Pearson correlation	1	0.717**	0.662**	-0.499**	-0.622**	-0.615**
SMVM	Pearson correlation	0.717**	1	0.751**	-0.656**	-0.534**	-0.562**
PGIS	Pearson correlation	0.662**	0.751**	1	-0.592**	-0.529**	-0.492**
BIS/BAS	Pearson correlation	-0.499**	-0.656**	-0.592**	1	0.318**	0.262**
Proc Scale	Pearson correlation	-0.622**	-0.534**	-0.529**	0.318**	1	0.618**
FAS	Pearson correlation	-0.615**	-0.562**	-0.492**	0.262**	0.618**	1
** Correlation is significant at the 0.01 level (2-tailed)							

3.6.2 Discriminant validity

Dependent t-tests examined discriminant validity on five pairs of instruments, namely the Core VAS with the Proc Scale, FAS, PGIS, BIS/BAS, CDSS and S-SARS (see Table 3.21). There were statistically highly significant differences (<0.001 – p=0.003) between the Core VAS and each of these.

Table 3.21 Paired t-tests between the Core VAS and the Proc Scale, FAS, CDSS, PGIS, BIS/BAS and S-SARS						
n=242	Mean difference	Standard error	95% CI of the difference		t (df=241)	Significance (2-tailed)
			Lower	Upper		
Core VAS and Proc Scale	-27.26	1.65	-30.51	-24.0	16.51	p<0.001
Core VAS and FAS	4.44	1.46	1.57	7.31	3.04	p=0.003

Core VAS and CDSS	28.06	1.12	24.85	30.28	24.96	p<0.001
Core VAS and PGIS	-10.19	0.81	-11.78	-8.60	-12.64	p<0.001
Core VAS and BIS/BAS	-20.11	1.57	-23.20	-17.02	-12.82	p<0.001
i-VAS and S-SARS	27.14	1.16	24.85	29.43	23.37	p<0.001

3.6.3 Reliability of the Core VAS

The reliability of the Core VAS was assessed by Cronbach alpha values, the Spearman-Brown coefficient, the Guttman split-half coefficient and standard error of measurement (SEM) margins, as presented in Table 3.22.

Table 3.22 Cronbach alphas for tests on reliability for the Core VAS				
Type of reliability	**Scale/items used**	**Number of items**	**Cronbach's alpha**	**SEM**
Internal consistency	Core VAS	27	0.82	5.09
Internal consistency on sequential item deletion	Core VAS	27	0.80 – 0.84	N/A
Split-half reliability	Consecutive items 2, 4, 12, 16, 18, 19, 21, 20, 22, 25, 26, 28, 30, 31 of the Core VAS	14	0.66	3.63
	Consecutive items 32, 34, 35, 36, 37, 38, 39, 40, 41, 42, 44, 46, 48 of the Core VAS	13	0.72	3.55
Test-retest reliability	Core VAS	27	0.80	5.38
	Core VAS	27	0.82	5.31

The internal consistency, as measured by Cronbach's alpha coefficient, resulted in a slightly higher coefficient for the Core VAS (0.82) than for the 48-item VAS (0.8). Cronbach alphas were also calculated by sequentially omitting each item in turn for its effect on the Cronbach alpha, but the coefficients all remained 0.8 and above. Split-half reliability on the first 14 items of the Core VAS and the remaining 13 items yielded similar Cronbach alphas (0.66 and 0.72)

to the 48-item instrument (0.61 and 0.75). The correlation between the halves was 0.7, with excellent Spearman-Brown and Guttman split-half coefficients (0.82 for both). Test-retest reliability improved as well, with an excellent correlation of 0.80 between the forms. Standard error of measurement (SEM) scores were lower on all tests. This means the total Core VAS score has a measurement error of 5.09, rather than the 7.01 obtained for the 48-item VAS. These results confirm that the Core VAS is more internally consistent than the 48-item scale, as one would expect from a scale that was refined through EFA.

3.7 Conclusion

This chapter was about the validation of the new instrument, for which results demonstrated robust psychometric properties. Specifically, concurrent and discriminant validity, internal consistency, split-half reliability and test-retest reliability were all very good. An EFA on the VAS resulted in six factors. The EFA made possible an identification of those items that were not close to the core of vigour so that they could be discarded. From this, the Core VAS was derived comprising 27 items. A subsequent analysis on the Core VAS congruently showed improved validity and reliability, even though the validity and the reliability of the 48-item scale were also good. These results warrant further use of the Core VAS, as available in Appendix B. In the next chapter, the results on the validation of the invigoration task are provided.

CHAPTER 4

Results for the invigoration task

This chapter presents the results for the second component of the study, concerning the invigoration task. It reports on the validity and reliability of the task. The validity results inform on whether the task did what it was supposed to do, that is, to invigorate. The reliability results inform on whether the task did so consistently.

The task was performed on two occasions, a month apart, and entailed "homework" in between. Vigour was assessed at four points in time. These were before and after the first participation in the task, and again before and after the second time. No major life events that may have confounded task results were reported in this sample.

Table 4.1 presents the four points of assessment before and after each occasion of participation in the task. The "before" assessment on the two occasions assessed vigour during the week preceding the task using the VAS in its standard version. The "after" assessments on the two occasions assessed the anticipated vigour for the week to come, using the VAS in its adapted version whereby each item is phrased looking forward instead of backward. The four main points of assessment are referred to as "Pre-task One" or point A, "Post-task One" or point B, "Pre-task Two" or point C, and "Post-task Two" or point D respectively.

The validation testing was to examine whether the task brought about a change between the four points of assessment. The four points of assessment allow for comparisons in six pairs, which were as follows:

Pair 1: Pre-task One and Post-task One (A and B). This comparison examined whether the task did what it was supposed to do by changing vigour before and immediately after the first participation in the task.

Pair 2: Pre-task One and Pre-task Two (A and C). This comparison examined whether the task (and "homework") did what it was supposed to do by changing vigour from the baseline before the first participation in the task to a month later before repeating the task. The comparison also reflects whether the task did what it was supposed to do in a lasting way.

Pair 3: Post-task One and Pre-task Two (B and C). This comparison did not directly examine whether the task (and "homework") did what it was supposed to do but tracked the extent of change between anticipated vigour after participation in the task for the first

time and the resultant vigour in the week preceding participation in the task for the second time.

Pair 4: Pre-task Two and Post-task Two (C and D). This comparison examined whether the task did what it was supposed to do at a second occasion by changing vigour before and immediately after participation in the task for a second time a month later.

Pair 5: Post-task One and Post-task Two (B and D). This comparison examined whether the task did what it was supposed to do by changing anticipated vigour cumulatively from participating in the task the first time to completing it for the second time. In other words, this comparison examined whether the effects of participation in the task for the second time exceeded the effects of participation in the task the first time.

Pair 6: Pre-task One and Post-task Two (A and D). This comparison examined whether the task did what it was supposed to do by changing vigour between baseline and after completion of the task for a second time (inclusive of the "homework") a month later – that is, between the start and end points, involving participation in the task on two occasions a month apart, including "homework".

There were 76 participants for the first comparison, 70 of whom participated in the task for a second time and for whom data were used for further comparisons. For validity, the various mean scores at each point of assessment are presented, followed by results on the paired t-tests between the six pairs described earlier, after which effect sizes are presented. For reliability, validity results are used to infer consistency, and results on correlations between the changes brought about for each pair are presented. As for the VAS validation presented in the previous chapter, the analyses were run for a second time using the Core VAS.

4.1 Validity of the invigoration task

This section presents the results on whether the task did what it was designed to do, and whether it did so across the various points of comparison. Comparisons are introduced descriptively via the means, followed by a report on how those means compared statistically.

Table 4.1 presents the results of the total VAS scores for each point of assessment. The mean scores changed at each timepoint. The highest mean score was achieved right at the end and participants began with the lowest mean score. For all subsequent assessments, the mean scores were higher than at baseline.

Table 4.1 Descriptive statistics for total VAS scores				
Point of assessment	**N**	**Total mean (SD)**	**95% CI**	
Point A: Pre-task One	76	12.78 (23.65)	7.37	18.18
Point B: Post-task One	76	40.00 (20.51)	35.31	44.69
Point C: Pre-task Two	70	28.10 (19.70)	23.40	32.80
Point D: Post-task Two	70	49.95 (11.55)	48.49	51.42

On further analysis of differences in the mean values, comparisons were made by paired t-tests in order to determine whether they were statistically significant. As can be seen in Table 4.2, all t-tests were statistically significant. First, with Pair 1, the mean for Pre-task One was compared to the mean of Post-task One (points A and B), and results showed that participants had significantly more vigour after completing the task. Similarly, with Pair 4, the t-test at the follow-up event, comparing the mean difference between Pre-task Two and Post-task Two (points C and D), produced a statistically significant mean difference in a positive direction. This means that on both occasions, with zero probability of chance alone, participants' vigour levels were different after undergoing the invigoration task. In addition, it means that this was a positive difference, in the direction of more vigour.

If one considers the Pre-task One point of assessment as the baseline for the task being done, then Pre-task Two is likewise the baseline for the second time. A paired t-test between the two baselines (Pair 2; points A and C) showed a statistically significant difference, with participants' vigour scores being higher at the second baseline. This may indicate remaining effects of introducing a task to participants from the first encounter to the second. Another consideration made at this point was that the task may have reflected participants' efforts during the month, where they practised the task on their own.

In Pair 5 (points B and D), Post-task One was compared to Post-task Two, and there was a statistically significant difference. This means that the task had cumulative effects on anticipated vigour from participating in the task the first time to the second time. In Pair 3 (points A and C), the Pre-task Two mean score was lower than the Post-task One mean, although it was still significantly higher than at Pre-task One. This could indicate either a difference between a person's anticipated and actual vigour, or it could mean that there was a setback in vigour. Lastly, a paired t-test on Pre-task One and Post-task Two (Pair 6; points A and D) was statistically significant as well, indicating that, compared to the extent of initial baseline vigour, participants reported significantly more vigour at the end of the process.

Point of assessment	Instrument	Mean difference	Std. error mean	95% CI of the mean difference		t (df=69)	Significance (2-tailed)	Effect size
				Lower	Upper			
Pair 1: *Comparison between* **Pre-task One** *and* **Post-task One** *N=76*	i-VAS	28.01	2.09	23.86	32.20	13.44	p<0.001	**1.60 (very large)**
	a-VAS							
Pair 2: *Comparison between* **Pre-task One** *and* **Pre-task Two** *N=70*	i-VAS	16.40	2.26	11.89	20.91	7.25	p<0.001	**0.87 (large)**
	am-VAS							
Pair 3: *Comparison between* **Post-task One** *and* **Pre-task Two** *N=70*	a-VAS	-11.61	1.92	-7.78	-15.45	6.04	p<0.001	**0.72 (medium)**
	am-VAS							
Pair 4: *Comparison between* **Pre-task Two** *and* **Post-task Two** *N=70*	am-VAS	20.43	1.81	16.82	24.03	11.31	p<0.001	**1.35 (very large)**
	ama-VAS							
Pair 5: *Comparison between* **Post-task One** *and* **Post-task Two** *N=70*	a-VAS	8.81	2.06	4.70	12.93	4.27	p<0.001	**0.51 (medium)**
	ama-VAS							
Pair 6: *Comparison between* **Pre-task One** *and* **Post-task Two** *N=70*	i-VAS	36.83	2.70	31.46	42.20	13.68	p<0.001	**1.64 (very large)**
	ama-VAS							

Table 4.2 Results on validity testing for invigoration task using paired samples t-test

Following the reporting above indicating that the changes were statistically significant, an analysis was done to ascertain the extent of those changes, as reflected in the calculation of effect sizes. In interpreting effect sizes, the threshold categorisations of Cohen (1988) and Sawilowsky (2009) were used. They suggest that sizes of 0.2 to <0.5 are small, 0.5 to <0.8 are medium, 0.8 to <1.2 are large, 1.2 to <2.0 are very large, and 2.0 and above are huge.

Accordingly, in terms of the initial plot with the main comparisons, there was a very large increase from baseline vigour levels after participants underwent the first invigoration task (Pair 1), with an effect size of 1.6. The effect size at the one-month follow-up remained large compared to baseline (Pair 2). There was a medium decline in vigour levels at Pre-task Two after completion of the first task (Pair 3). The effect size was once again very large after the second task (Pair 4).

The invigorating effect after the second task compared to the effect after the first task was still medium (Pair 5). The effect on vigour after the second task was very large in comparison to baseline vigour (Pair 6). The effect size increased progressively, cumulating in a very large overall effect size of 1.64. The effect sizes between the various points of comparison are also presented visually in Figure 4.1.

Figure 4.1 Changes in VAS total mean scores (with effect sizes)
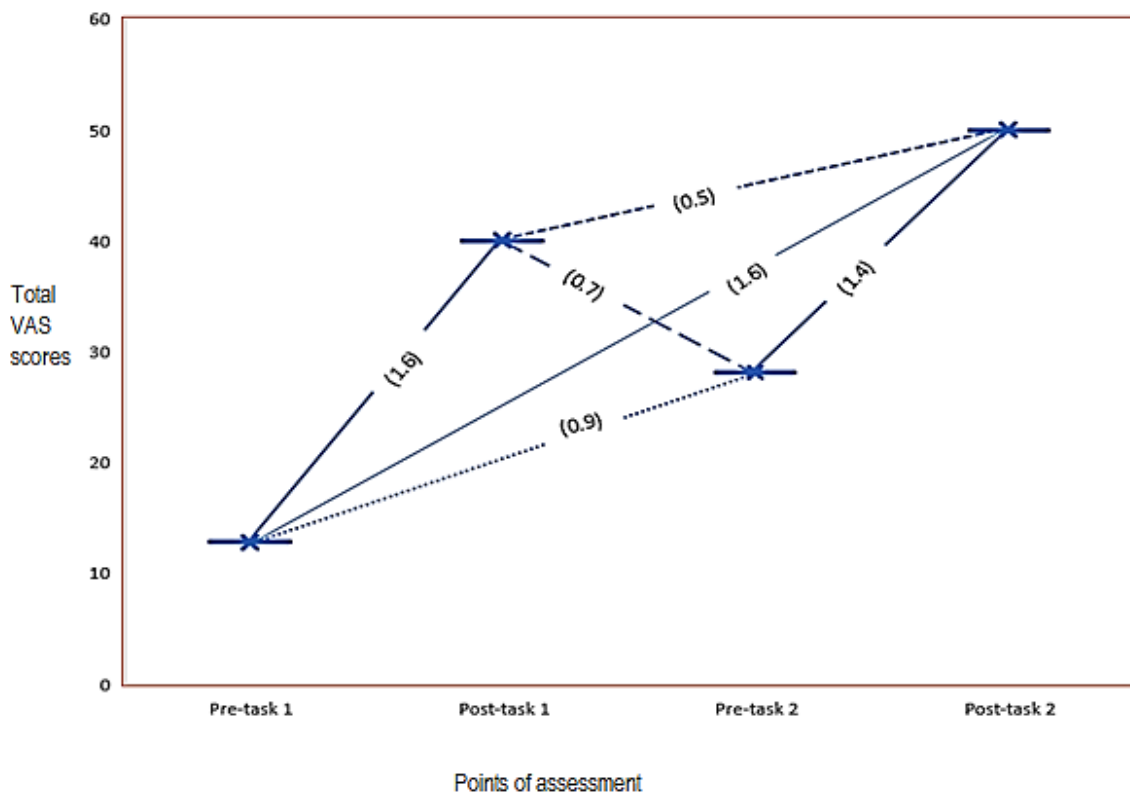
4.2 Reliability of the invigoration task

The preceding section was on the validity, that is to say, it was to test whether the task did what it was supposed to do. This section reports the results on whether the task did what it was supposed to do *consistently*. In other words, with the validity established that the task indeed brought about change, the aim of this section was to see whether the changes brought about by the task were delivered consistently. To this end, reliability may be inferred from the validity results, given that there were significant changes of significant sizes on both occasions of performing the task.

Another indirect manner of assessing reliability was to look at the correlations between the two points in the pairs assessed. Among these, the result for Pair 5 is probably most indicative of task consistency. As reported in Table 4.3 below, all correlations were statistically significant ($p<0.001$) and of at least a moderate degree, thereby indicating consistency of the task. Consistency of the task performance is also evident in Figure 4.1. Specifically, the parallels and symmetry between the lines visually illustrate consistency between the various pairs assessed.

Table 4.3 Results on paired samples correlations as an indicator of consistency	
Point of assessment	**Correlation coefficient**
Pair 1: Correlation between Pre-task One and Post-task One	0.69
Pair 2: Correlation between Pre-task One and Pre-task Two	0.62
Pair 3: Correlation between Post-task One and Pre-task Two	0.68
Pair 4: Correlation between Pre-task Two and Post-task Two	0.69
Pair 5: Correlation between Post-task One and Post-task Two	0.61
Pair 6: Correlation between Pre-task One and Post-task Two	0.43

4.3 Results for the invigoration task as measured by the Core VAS

In Chapter 3, it was established that the VAS holds sound psychometric properties for various kinds of validity and reliability. It was also established that the instrument was improved after performing the EFA, retaining only those items that were closest to the core of the VAS. The analyses on the invigoration task were subsequently run a second time, with the task being

measured by the refined, 27-item instrument, i.e. the Core VAS. The premise was that comparing the two sets of results may account for some measurement error or where changes were brought about by "noise" of VAS items more peripheral to the core of vigour. As can be seen in this section, the second round of analyses yielded results that were different, specifically for the comparison between the baseline vigour before performing the task a month apart.

4.3.1 Validity of the task as measured by the Core VAS

The mean scores changed for each of these comparisons, with the highest mean score once again being achieved right at the end (see Table 4.4). The results differed on the first and third points of assessment, however, with the lowest vigour recorded at Pre-task One and Pre-task Two.

Table 4.4 Descriptive statistics for total vigour scores as measured by the Core VAS					
Point of assessment	**N**	**Total mean (SD)**	**95% CI**	
Point A: Pre-task One	76	29.55 (15.36)	25.90	33.00
Point B: Post-task One	76	40.00 (20.51)	35.40	44.60
Point C: Pre-task Two	70	28.10 (19.70)	23.40	32.80
Point D: Post-task Two	70	48.50 (18.58)	44.10	53.00

On further analysis of differences in the mean values, five of the six t-tests were statistically significant (see Table 4.5). The results showed once again that there was a significant rise in participants' vigour after completing the first task, as well as a significant increase after completing the second task. There was again a significant decrease in vigour at the one-month follow-up measurement and a significant increase between the starting point and the final point of assessment. The difference in this analysis was that mean scores between Pre-task One, and Post-task One did not differ significantly. This means that the effects of the invigoration task at the one-month follow-up session were no longer visible and vigour had returned to the level it had been at the first baseline.

The changes across the four points of assessment are presented visually in Figure 4.2. At Pre-task One, the box is the smallest compared to the others, and the range is relatively narrow, indicating that the group generally displayed similar profiles in their vigour at the beginning of the study. Post-task One showed the greatest variability, meaning that participants had various responses to the intervention, although most measured considerably higher on vigour after undergoing the task for the first time. The decline to baseline at Pre-task Two can be seen by

the median being close to that of the first point of assessment, although this group showed greater divergence in responses than at the baseline. At Post-task Two, the median is visibly at its highest, and the scores are clearly highest compared to the rest of the groups. It is also evident in the box plot being the highest, as well as by the bottom whisker of this group being the highest one. Compared to the post-task changes at the first session, the change at the second session was considerably more similar across the participants.

Figure 4.2 Box and whisker plot for the invigoration task
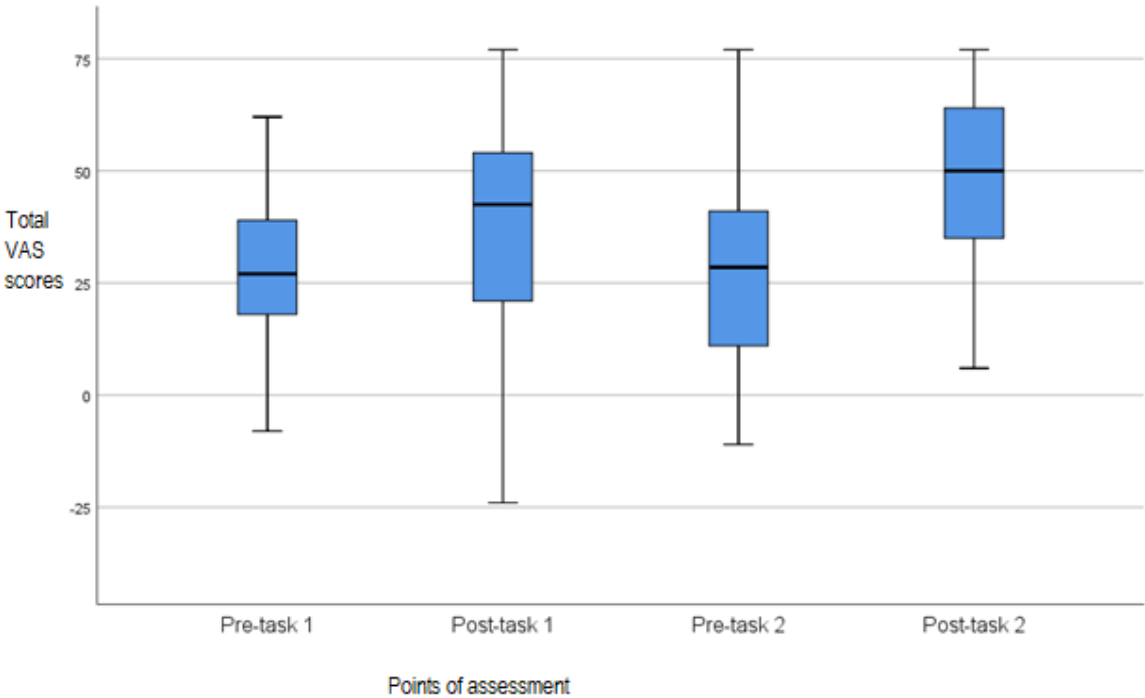
In addition to assessing the changes in mean values, effect sizes for the statistically significant changes were also calculated for a second time. There was a medium increase from baseline vigour levels after participants underwent the first invigoration task (Pair 1), with an effect size of 0.7. The invigorating effect at the follow-up visit compared to the effect in the first visit was also medium (Pair 5), and there was a medium drop in vigour levels at Pre-task Two compared to anticipated vigour levels after completing the first task. The effect on vigour after the second task was very large in comparison to the first baseline vigour (Pair 6).

Point of assessment	Instrument	Mean difference	Std. error mean	95% CI of the mean difference		t	Significance (2-tailed)	Effect size
				Lower	Upper			
Pair 1: *Comparison between **Pre-task One** and **Post-task One** N=76*	*i-VAS*	10.45	1.71	7.04	13.86	6.10 (df=75)	p<0.001	**0.70 (medium)**
	a-VAS							
Pair 2: *Comparison between **Pre-task One** and **Pre-task Two** N=70*	*i-VAS*	-0.61	2.00	-4.60	3.38	-0.31 (df=69)	p=0.76	**0.04 (insignificant)**
	am-VAS							
Pair 3: *Comparison between **Post-task One** and **Pre-task Two** N=70*	*a-VAS*	-11.61	1.92	-15.45	-7.78	-6.04 (df=69)	p<0.001	**0.72 (medium)**
	am-VAS							
Pair 4: *Comparison between **Pre-task Two** and **Post-task Two** N=70*	*am-VAS*	20.43	1.81	16.82	24.03	11.31 (df=69)	p<0.001	**1.35 (very large)**
	ama-VAS							
Pair 5: *Comparison between **Post-task One** and **Post-task Two** N=70*	*a-VAS*	8.81	2.06	4.70	12.93	4.27 (df=69)	p<0.001	**0.51 (medium)**
	ama-VAS							
Pair 6: *Comparison between **Pre-task One** and **Post-task Two** N=70*	*i-VAS*	19.81	2.22	15.39	24.24	8.93 (df=69)	p<0.001	**1.07 (very large)**
	ama-VAS							

Table 4.5 Results on validity testing for invigoration task as measured by the Core VAS

Figure 4.3   *Mean changes (with effect sizes) as measured by the 48-item VAS and the Core VAS*

Mean changes (with effect sizes) by the 48-item VAS and the Core VAS
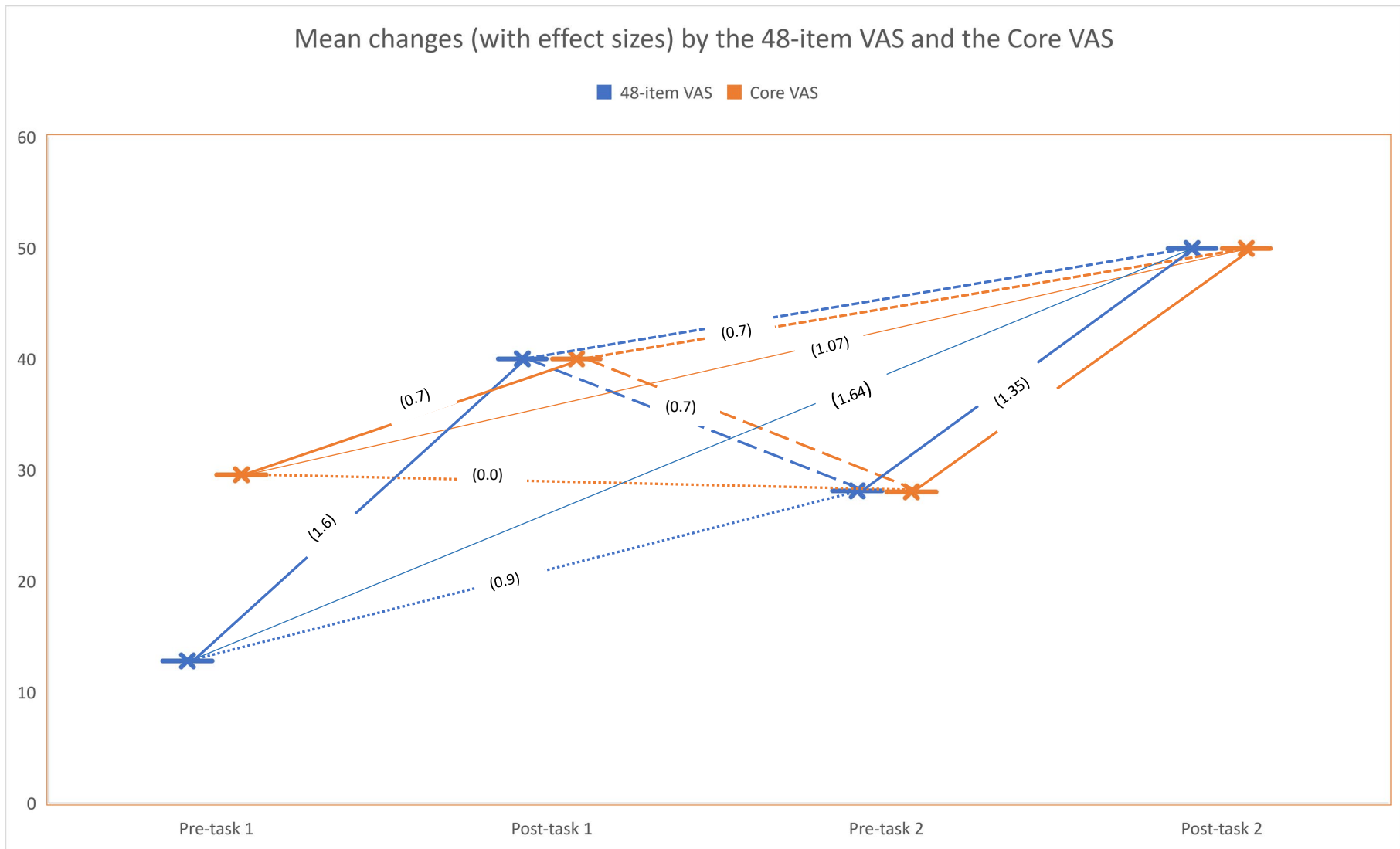
■ 48-item VAS   ■ Core VAS

Figure 4.4 Effect sizes by the 48-item VAS and the Core VAS
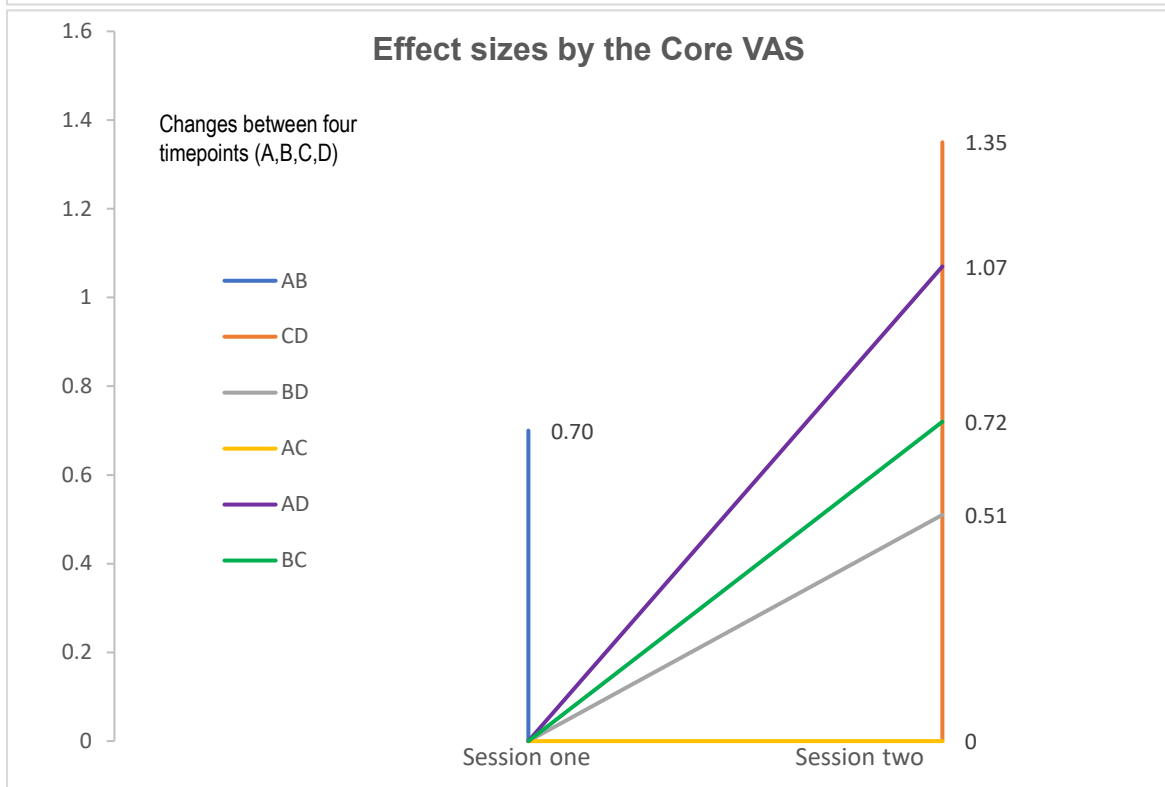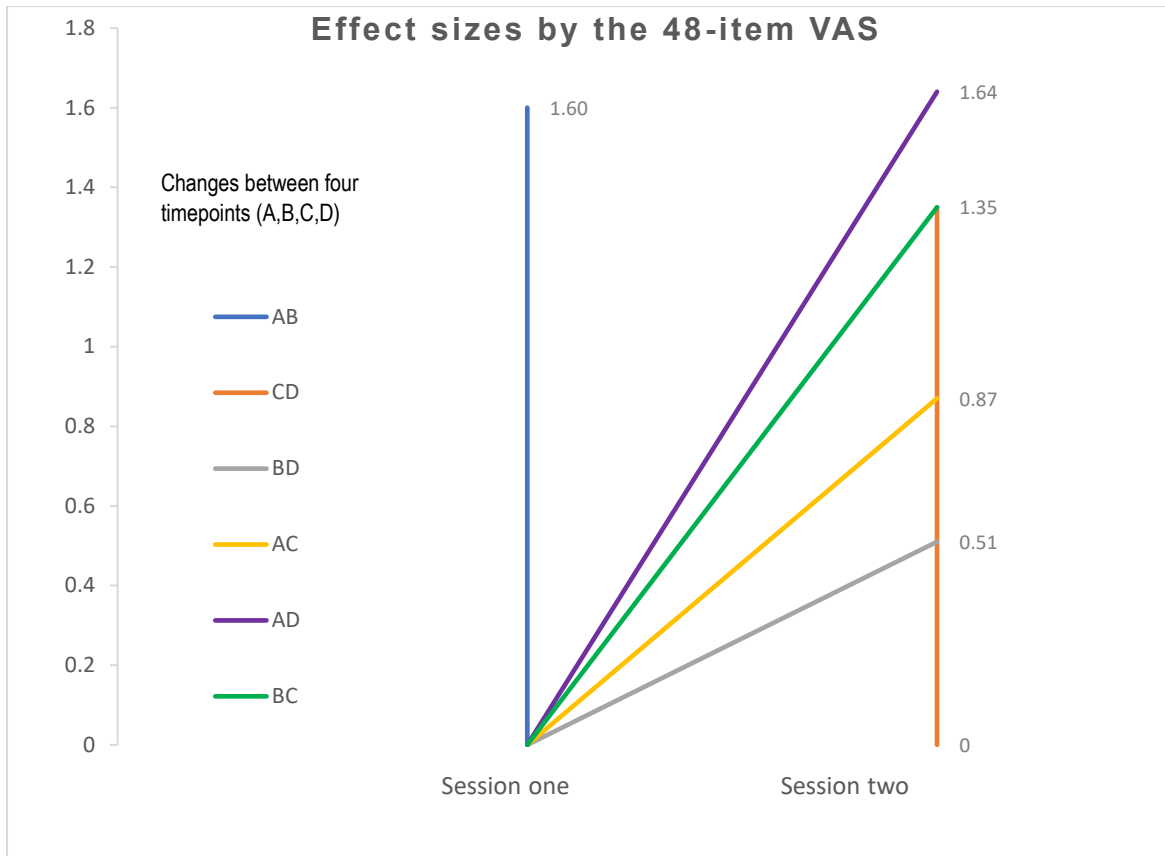
Figure 4.5 Effect sizes by the 48-item VAS and the Core VAS – overlay
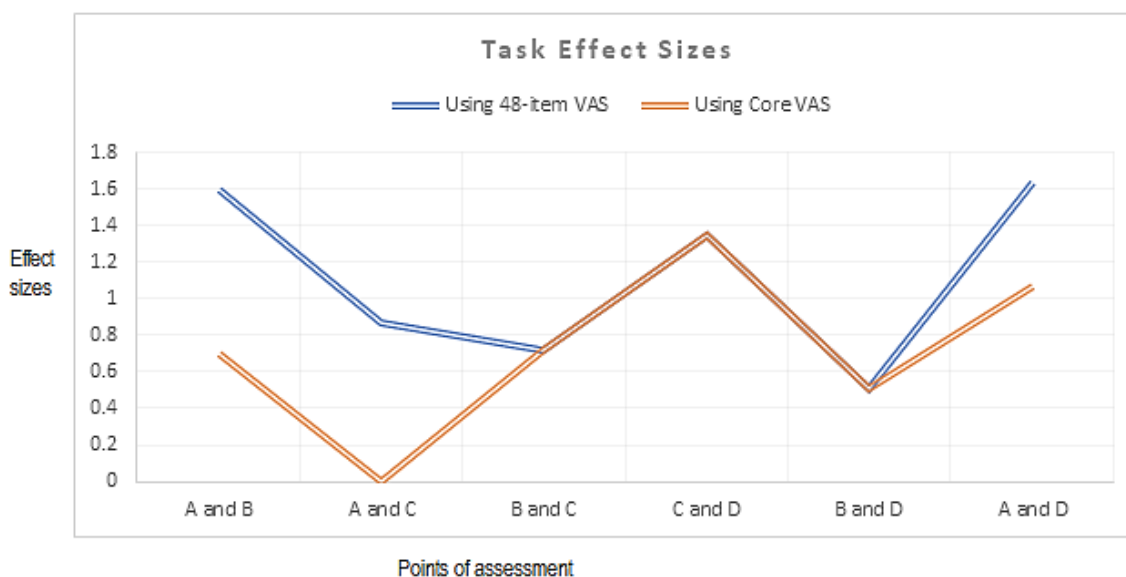
4.3.2 Reliability of the invigoration task as per the Core VAS

The results on reliability testing were similar in this round of analysis (see Table 4.6 and Figure 4.6). Once again, all correlations were statistically significant ($p<0.001$) and of at least a moderate degree, thereby indicating consistency. Among these rather indirect indications of task consistency, the result for Pair 5 is probably most indicative.

Table 4.6 Results on paired samples correlations as an indicator of consistency	
Point of assessment	**Correlation coefficient**
Pair 1: Correlation between Pre-task One and Post-task One (A and B)	0.69
Pair 2: Correlation between Pre-task One and Pre-task Two (A and C)	0.56
Pair 3: Correlation between Post-task One and Pre-task Two (B and C)	0.68
Pair 4: Correlation between Pre-task Two and Post-task Two (C and D)	0.69
Pair 5: Correlation between Post-task One and Post-task Two (B and D)	0.61
Pair 6: Correlation between Pre-task One and Post-task Two (A and D)	0.40

Figure 4.6 Paired samples correlations by the 48-item VAS and the Core VAS
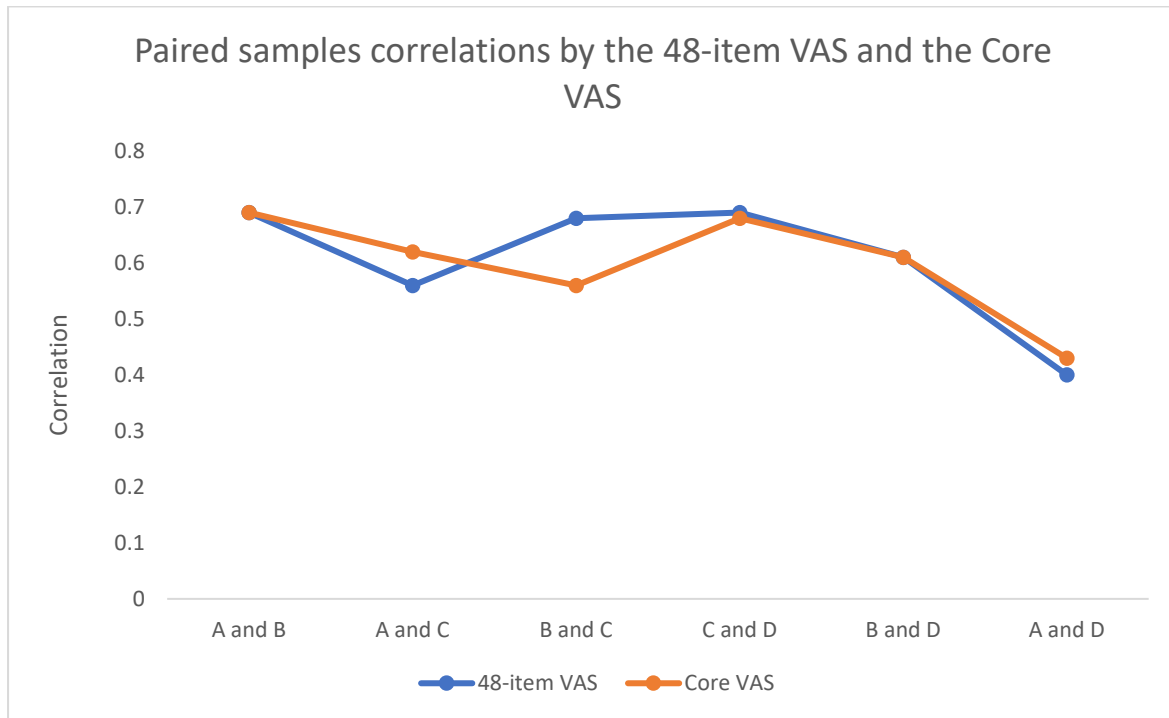
4.4 Conclusion

This chapter presented the results for the validation of the invigoration task, with robust indicators supporting its validity and consistency. As with the VAS in the previous chapter, analyses were done using both the 48-item VAS and the Core VAS. Both instruments confirmed that the task did what it was supposed to do, that is, to invigorate, with large effects. Both instruments also confirmed that it performed so consistently across the various timepoints. Comparing the results from the two instruments showed that vigour followed the same direction of change for all pairs assessed, with the exception of the effects between point A and point C. With the Core VAS having retained only those items most closely related to the core of vigour, it seems that the effect of the task performed the first time did not sustain to point C. In the next chapter, the results of this and the preceding chapter are appraised and applied for clinical practice and further research.

CHAPTER 5

Appraisal of the study

The study produced and validated a new instrument to measure vigour, the VAS, as well as an imagery-cognitive invigoration task in a sample of remitted but avolitional schizophrenia patients. This is the first instrument for the assessment of vigour in a psychiatric population and one of the first to assess vigour at all, preceded by a single scale, the SMVM, that was designed for a non-clinical occupational setting. The VAS and the invigoration task were informed theoretically and developed for optimal use in the specific population. The instrument underwent a process of refinement, initially having 51 items and resulting in a 27-item Core VAS. The VAS was used to assess a therapeutic invigoration task that was performed during two sessions about one month apart with "homework" in between.

In the preceding two chapters, the results have been presented for the VAS and the task, respectively. In this chapter, the main results are interpreted, the methodological strengths and limitations by which the results were derived are appraised, and applications and implications for further practice and research are considered.

5.1 Appraisal of the results

The study produced a scale by which to measure vigour in patients with remitted but avolitional schizophrenia. It also examined an invigoration task in this population for its validity and reliability.

A valid and reliable scale to assess vigour (i.e., the VAS) was yielded by means of content development and testing of concurrent and discriminant validity, reported in Chapter 3. This means that the VAS measured what it was supposed to measure, and it did so reliably. In the absence of an instrument that could serve as a gold standard for the measurement of vigour in validating the VAS, the validity was instead established by examining its concurrence with existing instruments of similar kind and its discriminant ability to discern vigour from dissimilar concepts. Reliability of the VAS was shown in Chapter 3 by examining its internal consistency and inter-item associations, split-half reliability, test-retest reliability and standard error of measurement. Reliability was additionally informed by the six factors yielded by the EFA. Briefly, the factors are Task Drive (having the get-up-and-go to pursue tasks), Indecisiveness (battling to make decisions), Social Disinterest (lack in social vigour), Creative Efforts

(cognitive vigour; vigorous intent), Active Mobilisation (vigour on the go) and Torpidity (lassitude, listlessness, passiveness).

Regarding the invigoration task, results of its validity and reliability testing (reported in Chapter 4) showed that the task did what it was supposed to do with a significant effect on the vigour of participants. The task did what it was supposed to do consistently on two occasions a month apart. This validity and reliability testing provided proof of concept for the task, which warrants further investigation of its efficacy in a randomised controlled trial.

5.1.1 Yielding of a valid scale to assess vigour

The VAS is the first instrument to measure vigour in this population and one of the first to measure vigour in general. With validity established, the instrument contributes to a better understanding of the construct of vigour. Validity was established in various ways, first by deriving the content validity of the items, which was congruent with and augmented by concurrent and discriminant validity testing. Demonstrating concurrent and discriminant validity in this way is the most robust method of demonstrating validity in the absence of a gold standard (Bannigan & Watson, 2009).

Concurrent validity was demonstrated by significant correlations between the VAS and five instruments that measure existing constructs closest to vigour. For all five, the VAS measured what it was supposed to measure. This means vigour, as measured by the VAS, was found to correlate with work-related vigour, personal growth, behaviour activation, procrastination and fatigue as measured respectively by the SMVM (r=0.72), PGIS (r=0.66), BIS/BAS (r=-0.5), Proc Scale (r=-0.62) and FAS (r=-0.62). All correlations were at least of moderate degree. As expected, the strongest correlation among these was a positive correlation between the VAS and the SMVM, as the latter is also a measure of vigour, although in an occupational setting rather than among patients with avolitional schizophrenia. The negative correlations with the Proc Scale and FAS respectively were also as one may anticipate, by which fatigue and procrastination are associated with the inverse of vigour.

On discriminant validity, the study demonstrated that the VAS as a measurement of vigour captured vigour as being distinct from procrastination, fatigue, depression, behaviour inhibition/behaviour activation, personal growth and initiative, and anxiety, as assessed by the Proc Scale, FAS, CDSS, BIS/BAS, PGIS and S-SARS respectively. This was demonstrated by finding statistically significant differences on t-tests between the VAS and the respective instruments (p<0.001 to 0.003). This discriminant validity means that the VAS measured vigour as distinct from fatigue, depression, behaviour inhibition/behaviour activation, personal growth and initiative, and anxiety. When thus using the VAS in clinical practice or research, its discriminant validity means that the patient's vigour would be measured without it being

conflated with fatigue, depression, behaviour inhibition/behaviour activation, personal growth and initiative, anxiety, or the absence of procrastination.

5.1.2 Yielding a reliable scale to assess vigour

This study yielded an instrument that is reliable in its measurement. The VAS thus measures consistently. The reliability of the VAS was established by virtue of the various kinds of reliability testing, these being its internal consistency and internal factor structure, split-half reliability, test-retest reliability and standard error of measurement (SEM).

Internal consistency was consistently excellent for sequential item deletions, with Cronbach alpha coefficients all above 0.8. This means that there was coherence between the items, with each item of the VAS contributing to the measurement of the same construct, i.e., vigour.

The factor analysis of the VAS demonstrated internal consistency by providing details of the internal structure of the VAS and went beyond internal consistency testing by considering the clustering of items and progressively eliminating "noise" that would undermine consistency. That is, through an exploratory factor analysis (EFA), the VAS was refined by identifying and removing "noisy" items from the set of core items measuring vigour.

The subsequent Core VAS is a refined instrument for which 51.5% of the cumulative variance was explained by the extracted six factors as per Principal Axis Factoring (PAF), with 32.5% accounted for by the first factor alone (Task Drive = 32.5%; Indecisiveness = 8%; Social Disinterest = 3.5%; Active Mobilisation = 3%; Creative Efforts = 2.4%; Torpidity = 2%). This is generally taken as a good outcome for a new instrument's reliability testing, as per the 50–75% cumulative variance recommended (Mvududu & Sink, 2013). Notably, given that Principal Components Analysis (PCA), as articulated in Chapter 3, extracts cumulative variance that is inclusive of "noisy" unique variance and error variance, we excluded the result on PCA from this appraisal. Thus, in refining the results by means of Principal Axis Factoring (PAF), the process of refining the results by only considering cumulative variation, a pure result of 51.5% was satisfactory (Fabrigar, Wegener, MacCallum, & Strahan, 1999; Mvududu & Sink, 2013; Yong & Pearce, 2013). While the VAS demonstrated internal consistency in various ways before being refined by the EFA, the EFA process produced six clear clustering of items, with at least three moderate-to-strong loadings per factor, as recommended for strong factor internal consistency (Mvududu & Sink, 2013).

A further way of examining reliability was through split-half reliability testing, which was done in two ways. The one was by dividing the VAS in half and measuring internal cohesion of each half as an indication of internal consistency, and the other was by means of correlations between the two halves. The division was carried out in two ways as well, first by splitting the

VAS consecutively in the middle, and second by splitting it by category of positive (Category B) and negative (Category A) items. The latter was done only for the pre-EFA VAS owing to the unequal number of positively and negatively phrased items that remained in the Core VAS. The positive-negative categories of the pre-EFA VAS resulted in Cronbach alpha coefficients of 0.88 and 0.94, with a moderate correlation between the forms (r=-0.47, .p<0.001). The Core VAS split-half Cronbach alpha coefficients were between 0.66 and 0.72 with a significant correlation between the forms (r=0.7) and Spearman-Brown and Guttman Split-Half coefficients above 0.8 (r=0.82 for both).

A further examination of reliability was through test-retest reliability. This indicated that the VAS measured consistently over time. This consistency over time was demonstrated by a strong correlation (r=0.80) between the test and re-test measurements.

Calculating the SEM informed on the reliability of the VAS by providing the confidence intervals of the consistent measurement error invoked by the VAS. The results showed that there was minimal error attributable to the VAS itself, meaning that the new instrument consistently produced only a small amount of error (5.38 points or less for total scores, with 68% certainty in a range of 77, between -9 and 68) in its measurements. Hence, save for other kinds of error (random and unknown), the VAS has produced not only highly consistent scores but also scores that are consistently very close to the "true" scores (that is, the theoretical score that would have been obtained had it been possible to eliminate all measurement errors).

5.1.3 Yielding a valid invigoration task

This study yielded proof of concept for a new task in that it was found to be both valid and reliable. The task did what it was supposed to do as shown by statistically significant (p<0.001) differences in VAS scores obtained before and after the task. The effect sizes (see Figures 4.3 and 4.4) indicated that the task produced changes that were at least of a medium (d=0.51) and up to very large extent (d=1.64).

Although the task has been shown to have positive effect within participants, as is suitable to a proof of concept study, the effect of the task should be examined further in a randomised experimental design to establish its efficacy more securely. The reason is that a common factor other than the task itself might have invoked the change, which may be controlled for through randomisation.

Applying the VAS may itself be a potential common factor that invoked the change rather than the task (see the section below on the research design), especially applying those VAS items that are less reliable. For this reason, the analyses on the effects of the task were also performed by using the Core VAS (i.e., the 27-item refined VAS). The results confirmed, as

for the full scale, that on both occasions the task increased vigour statistically significantly (p<0.001). The largest effect size was between the points before the task had been performed for the first time and after the task was performed for the second time a month later (d=1.64). This suggests that the effect of the task might have been cumulative.

However, by the shortened instrument, the vigour attained after the first task had seemingly not been sustained up to the next month as there was no statistically significant difference between the pre-task assessments a month apart (p=0.76). Nonetheless, the gain after the second task, as indicated by the effect size (d=1.35; p<0.001), was larger than for the first time (d=0.7, p<0.001). This suggests that the homework did not have an effect on the vigour, other than perhaps priming participants for a larger effect when performing the task the second time. It may also be that participants did not actually do the homework.

These results bring into question whether the effects of the task are lasting. Pending further research to examine this, the validity of the task is thus constrained to it having a non-lasting effect. Nonetheless, a suggestion of potential for lasting change may be seen in the effect being larger after the task was performed the second time (thus, having a cumulative effect). However, to invoke a lasting effect, the task may need to be repeated more frequently and with rigorous checks on the homework being actually done.

The difference in the results yielded by the pre-EFA VAS and the shortened Core VAS may suggest that the apparently sustained change, i.e., the difference between point A and point C as measured by the pre-EFA VAS (see Figure 3.3 and Figure 3.4), could be attributed to the unrefined items of the VAS that do not speak to vigour specifically but to non-core aspects of vigour that changed between points A and C.

5.1.4 Yielding a reliable invigoration task

The results indicate that the invigoration task consistently did what it was supposed to do. This was assessed by measuring the consistent performance of the task on two occasions. This constitutes a proxy parameter to demonstrate consistency. Using this proxy was a feasible manner for assessing the reliability of a task, which differs from the reliability testing of a measuring instrument. Assessing the reliability of a measuring instrument is relatively straightforward (for example, see above for the ways in which this was done for the VAS), but doing so for a task is more complicated. The closest to testing the reliability of a task is to do a test-retest of the task, thus with participants doing the task twice. The consistency of the task doing what is supposed to do was deduced from the statistically significant changes, with significant effect sizes, obtained for both occasions when the task was performed. An indirect suggestion of consistency is found in the moderate correlation (r=0.61, p<0.001) of vigour between the values obtained each time after the tasks had been performed.

Some studies claim to examine reliability, but the examinations are instead of validity. For example, a recent review reported, "Psychosocial interventions are a valid and reliable intervention for improving the cognitive and behavioural outcomes in school-aged children" with reference to the statistical significance of the changes (Kean, 2018). In our study, results in terms of statistically significant changes that are sometimes taken to be indications of reliability are accounted for in terms of validity (see above).

The testing of the validity and the reliability of a task, specifically, is often not done. This proof-of-concept approach is skipped, and efficacy studies are done instead. A proof-of-concept approach, however, affords a better understanding of the within-subject validity and reliability properties of the task. In our proof-of-concept study, constructing the invigoration task and demonstrating its validity and reliability afforded a more secure basis upon which a further randomised study can build.

5.2 Appraisal of methodological strengths and limitations

The quality of the attained results may be considered in terms of the extent to which the methodology from which they stem was sound. Accordingly, this section considers the strengths and limitations of the methods used in the study. Various strengths and limitations apply in this study producing a valid and reliable scale as well as a task that does what it is supposed to do, rendering adequate proof of concept that may next be subjected to an RCT.

The development of the instrument and the task was theoretically informed and tuned to the selected population, which was suitable for the purpose of the task in that it addressed vigour in a population where vigour is unequivocally needed. The quantitative design for the validation of the new instrument utilised methods for assessing validity and reliability in the absence of a gold standard for vigour, which afforded results on the psychometric properties of the instrument. These properties are dependent on the selection of appropriate instruments to which the new instrument was compared, as well as on the suitability of the statistical tests that were performed. The same applies for the task results being subject to appropriate design, the suitability of the VAS for assessing outcomes as well as the strengths and limitations of the statistical comparisons between the various timepoints. The sample sizes for both the instrument and the task are considered for their adequacy to ensure that statistical tests would be unlikely to produce statistical errors.

5.2.1 Appraisal of the research design

The quantitative validation of the instrument holds merit for the variety of validation methods used in the development and examination of the new instrument. Cumulatively, the various kinds of validity and reliability examined elicited the psychometric properties in more detail.

The relatively high number of candidate items included in the initial instrument afforded a thorough EFA process through which a refined scale could be produced. An inherent limitation in the study design was the absence of a gold standard against which the VAS could be assessed, due to the absence of existing scales to measure vigour in schizophrenia. This was countered by the examination of concurrent and discriminant validity in relation to appropriate instruments.

The design for the invigoration task was suitable for establishing proof of concept by examining within-subject changes through the pre-test/post-test design. The design being quasi-experimental permitted for gathering data whereby participants served as their own "controls" by comparing measurements of vigour before and after the intervention.

A core strength of the design is that it made possible the examination of within-subject change across two interventions at four timepoints. Having four instead of two timepoints restricted the potential confounding influence of a factor that would pertain across the points in time. For example, an event or influence that occurred once between Pre-task One and Post-task One (points A and B) had to occur also between Pre-task Two and Post-task Two (points C and D) if that factor, rather than the intervention, invoked the change. The once-off influence of a confounder was thus excluded. However, this does not exclude the possibility of different confounders operating between points A and B or points C and D at the respective times, having such confounding influence.

A common confounder may nonetheless pertain across the time points. An example of a common confounder is the influence of the instrument measuring vigour, which itself might have invoked change. One way in which the instrument measuring vigour might have invoked the apparent change could be attributed to a difference in measuring vigour during the preceding week and the anticipatory vigour for the week subsequent to the task performance. Such potential effect invoked by the instrument itself would pertain between points A and B and points C and D but is less likely for the statistical difference found between points A and C a month apart.

Another common potential confounding factor worth considering in this kind of design is a spontaneous change in vigour that would not have been brought about by the intervention, but would have happened regardless. This possibility could not be excluded in this study because there was no control group, but the likelihood was nonetheless reduced by including only participants whose condition was stable, specifically in respect of avolition, and who had no change in their medication for at least three months preceding. Furthermore, the task was not designed to reduce unwanted symptoms. Reducing unwanted symptoms would have been more susceptible to spontaneous change. Instead, the task was designed to invoke something

(i.e., vigour) that was lacking. A spontaneous change would thus have meant a spontaneous accrual of vigour, which is less likely in people who were not pursuing the elimination of an unwanted symptom and were admitted to the study only if their avolition was stable for at least three months.

These limitations to the design followed in our study on the invigoration task may be overcome by an RCT. An RCT would involve a between-subject rather than a within-subject controlled design. Moreover, randomisation to either an intervention or no-intervention group would make for a proper experimental design, reducing the chance of a confounding effect such as the potential factors mentioned above.

5.2.2 Appraisal of the population and sampling

The study achieved its aim of researching vigour in a population that was most compromised in vigour, thus tackling an examination of vigour at its core. The population was defined by rigorous inclusion and exclusion criteria, which served to select appropriate members of the population and facilitate internal validity. The minimum cut-off value for avolition ensured that all participants were at least moderately avolitional. Since the avolitional condition of the participants rendered them less likely to change in vigour than healthy participants, the changes induced in vigour, despite the participants' difficulty in this domain, enhanced the substantive validity of the invigoration task.

Regarding sampling from the selected population, the hospital setting from where participants were recruited was suitable in providing access to eligible participants, and the venue was equipped with administrative personnel and members from various disciplines who were available for information and assistance. There was a comprehensive filing system inclusive of full patient records and follow-up schedules, accompanied by a digital database, all of which aided suitable sampling through the application of the inclusion and exclusion criteria.

The research setting was constrained by the conditions being of an ordinary clinic setting, with the usual challenges in that the environment is at times rather disruptive. These challenges were mitigated by the clinical skills and experience of the investigator in this environment. An advantage of this setting was that the data were collected in a real-world setting, where participants were observed in real-time. Participants encountered ample challenges, which provided learning opportunities for developing vigour in relatively usual circumstances as compared to controlled settings, thereby supporting the ecological validity of the invigoration task. On the other hand, results on the validity and reliability of the task are limited, given that this was not an RCT. This is an inevitable challenge in scientific research and may be mitigated by demonstrating both internal and external validity via several studies with different settings that apply the inclusion and exclusion criteria. The realness of this context was congruent with

the actual end-point of the research, which is to move from proof of concept to an efficacy trial and subsequently an effectiveness trial (Singal, Higgins, & Waljee, 2014).

A further limitation is that the majority of the sample (72.7%) were male. While this kind of gender ratio is consistent with prevalence data and previous research (Foussias et al., 2009), the results may be different among females.

As this setting and the patients that it serves may hold some peculiarities, the sample may potentially be dissimilar to the defined population as a whole in ways not transparent in this study. If so, probability assumptions pertaining to the statistical testing may not hold. Thus, the convenience sample obtained in the study comes with this limitation, but it may be overcome at least in part by performing replication studies on the VAS and the invigoration task elsewhere, and by doing a multi-centre RCT on the invigoration task.

5.2.3 Appraisal of the sample size

The sample size was sufficient for both the scale validation and the invigoration task. For the instrument validation, the sample size (n=242) was meeting the aim for doing an explorative factor analysis requiring no less than five participants for each scale item. Moreover, tests for normality of frequency distributions and sampling adequacy were done, which supported sample size sufficiency for statistical testing.

For the task validation, the sample size of 70 was larger than the target set at 67 in order to secure the required power to examine the internal validity of the task. The adequacy of the sample size is further supported by the moderate to large effect sizes that were found.

Sample size concerns the chance of making a Type II error, that is, not to reject a false null hypothesis, also known as a false negative finding. In other words, too small a sample size would have relevance for the negative findings of our study, that is, where statistical significance was not achieved. For both the scale and the task validation, the main findings were statistically significant, meaning that a Type II error would be irrelevant. In contrast, providing the sample is normally distributed for parametric tests, sample size has no direct bearing on a potential Type I error, that is, to reject a true null hypothesis. This potential error is thus applicable to the statistically significant findings in our study. A five percent threshold for the probability of this (i.e., $p < 0.05$) was applied, and the probability of this error is reported for each specific finding of statistical significance using a p-value.

5.2.4 Appraisal of the processes by which the scale and the task were developed

The development of the VAS holds merit for its being informed by recommended practices for the development and validation of scales in health, social and behavioural research (Boateng et al., 2018; Morgado, Meireles, Neves, Amaral, & Ferreira, 2017). The VAS was developed to adequately encompass the content of vigour, doing so by producing two categories, one with positive and one with negative valence. Category B covered vigour and facets congruent with vigour, and category A contained facets that are in dissonance with vigour. This kind of approach to content validity can be seen in the manner that other established instruments have been created, such as the PANSS, which covers not only positive but negative symptoms as well. The preliminary processes, before the formal data collection of the VAS, entailed theoretical analyses before psychometric analyses. As a result, item contents and their order and display format were refined, so that a theoretically optimal version of the instrument could be presented to participants when formal data collection commenced. The instrument development continued after data were gathered, using the first round of data analyses to produce the improved Core VAS.

Similarly, the task was developed in application of appropriate theoretical principles, which rendered a task that may be applied within the fields from which it was informed. Standardising the task procedurally and laying out the description of it in detail provided the guidelines necessary for others to deploy the task both clinically and for replication in research. Although structured, these user guidelines provide the flexibility needed for the task to be adequately relatable and individually adaptable. The task explicitly catered for the hurdles that may be expected in this population (see Section 2.8 for a description), and these were phrased in terms of vigour.

A strength of both the VAS and the invigoration task was that they were developed simultaneously with consideration of each other as well as of the specific population. This strengthened the probability of attaining a good contextual fit. The task was created with the aim of accruing vigour in respects similar to those that the VAS was measuring. The items of the VAS were accordingly considered for inclusion in the metaphorical invigoration launchpad of the visualisation component of the task as well as for its mobilisation through the cognitive component. For example, the use of activating words in both the VAS and the task description served to prime the vivid immersion in the imagery and for the anticipation of and drive for vigorous pursuit. Similarly, the emphasis on reachable vigour by means of a seven-day period in the VAS resonates with the cognitive component of the task with a focus on small, consistent, attainable pursuits within the person's everyday/immediate/imperfect context.

Thus, the task was constructed using the various aspects of vigour as captured by the VAS, thereby addressing therapeutically the various aspects of vigour rather than only a few.

The wording of the scale items and its instructions were specially constructed for this population (see section 2.7.1), although further inquiry (qualitative or quantitative) on this may provide clarity on the extent to which the VAS was understood. The items of the VAS that were exposed by the EFA as rather removed from the core, and which were dropped from the Core VAS, may have been poorly understood, in addition to the possibility that they were unrelated to vigour. Nonetheless, the results of good validity and reliability of the VAS would not have been attainted had the understanding of the wording been poor.

5.2.5 Appraisal of the measuring instruments

The PANSS was selected for identifying avolitional participants as it has been used extensively and frequently for over thirty years in the assessment of negative symptoms (Luther et al., 2019). In recent literature, limitations of the PANSS have been highlighted, including that it provides "poor assessment of the avolition-apathy domain" (Galderisi et al., 2018). The CAINS and BNSS are recommended instead, as they may provide a better assessment of negative symptoms. While these instruments may be used in future studies instead of the PANSS as inclusion criterion for avolitional patients, the PANSS was selected as further research on these instruments was due at the time of examining their validity (Kring, Gur, Blanchard, Horan, & Reise, 2013; Kumari, Malik, Florival, Manalai, & Sonje, 2017)

The instruments for the validation of the VAS were selected with the aim of providing approximations to the concept of vigour against which the scale could be validated. The SMVM, PGIS, BIS/BAS, Proc Scale and FAS were selected for their suitability in assessing the VAS, in that they were, at face value, related to the concept of vigour either positively or negatively. This was confirmed by the VAS showing statistically significant correlations with each of these. The SMVM had been found in literature to be the best suited instrument for measuring vigour and turned out to have the strongest correlation among the selected instruments with the VAS. The moderate correlation with the PGIS was also not surprising, particularly in light of the subcategories descriptively resembling vigour (specifically its Readiness for Change, Planfulness, Using Resources and Intentional Behaviour domains).

The positive and negative correlations between the VAS and the instruments were congruent with the hypothesised relations among the instruments, supporting the particular selection of instruments in the study. That is, the SMVM and PGIS were positively correlated not only with the VAS but also with each other. Similarly, the BIS/BAS, Proc Scale and FAS were correlated negatively with the VAS and positively with each other. That the selected instruments correlated with each other to at least a moderate degree, implies that the selection of

instruments comprised a set that shared a commonality against which the VAS could be compared for congruence.

The statistically significant differences on all paired t-tests between the VAS and the SSARS, CDSS, PGIS, BIS/BAS and FAS suggest that they were well suited for the discriminant validity testing of the VAS. The CDSS and SSARS were validated specifically for the schizophrenia population, which makes for a further strength. The other instruments are for more general use, but future studies may utilise other instruments should a question arise about population-specific parameters. Furthermore, future studies may also investigate the discriminant validity of the VAS to discern vigour from other constructs as measured by other measuring instruments.

5.2.6 Appraisal of the data collection and the statistical analyses

The data collection process required consideration of potential threats to the validity of the VAS and the invigoration task, and measures to mitigate possible confounding variables. The recruitment process and criteria aided in standardising the sample of participants so that sample variation would not distort changes in vigour levels. Similarly, the data collection protocol structured the process to optimise similarity in each participant's environmental and procedural conditions in order to prevent variation in procedures from skewing results

Statistical analyses had been subject to appropriate testing for assumptions before proceeding, thereby securing the integrity of the results. Sampling adequacy for the EFA of the VAS was established by the Keiser-Meyer-Olkin (KMO) test of sampling adequacy and Bartlett's Test of Sphericity. The data complied with both, which made exploring the latent structure of the instrument warranted. The EFA was an appropriate way to refine the scale, and the various iterations of the scale in the EFA process facilitated a refined factor structure in the end. The EFA thus afforded a refinement process of more sophistication than a process to determine item redundancy merely on correlations of each item to the total score and Cronbach alpha calculations.

The data analyses for both the scale and the invigoration task were performed for a second round using the Core VAS after the EFA process. The second round of analyses rendered even better results for the validity and reliability testing of the scale and the task. This suggests that the EFA process got rid of "noise" in the measurements irrespective of whether the "noise" originated from the instruments (internally) or externally.

Factor analysis, while generally considered central to measurement testing, has also been criticised, particularly for the subjective nature of the decision-making process. For rexample, decisions pertaining to rotation and retention, are made by researchers, with criteria often

being pragmatic rather than theoretical (Williams et al., 2010). Furthermore, factor analyses and all of the psychometric validation and reliability testing should not be taken as proxies for the usefulness of an instrument, for validity and usefulness are distinct. While this study addressed validity and reliability, a future study may examine the VAS specifically for its practical usefulness.

A sensible follow-up statistical analysis might measure which factor(s) of the Core VAS were most responsive to change in order to tailor the task accordingly. For example, if the analysis reveals that the Creative Efforts factor shifted significantly, while the Active Mobilisation factor did not, invigoration strategies could attune to targeting Creative Efforts. A further follow-up might examine the existing data set, as well as data from future studies, for which items conform to "trait" and "state" characteristics. Results may then be utilised to tailor the task in ways that would result in more lasting effects.

5.3 Applications and implications for clinical practice and research

Whereas previous studies have focused on avolition in negative terms, this study has approached the difficulty from the positive side, (i.e. vigour), and in doing so, has articulated vigour as a clinical and a research topic.

Applications relate to how the VAS and the task may be deployed in the schizophrenia and other clinical as well as healthy populations. In the schizophrenia population, applications include the potential for vigour to alleviate the burden of schizophrenia and to address vigour within comorbid conditions such as depression and addiction. More generally, the importance of vigour in the approach of the recovery movement to schizophrenia are considered, along with suggestions for augmenting treatment targets in terms of vigour, drawing on the VAS for purposes of assessment and by incorporating the invigoration task into treatment programmes. Potential applications of the VAS and the task in other populations are subject to research. These concern the RCTs required to verify the findings of this study, validating the VAS and task in other populations, developing and adapting the task contents and format for use in new interventions and further investigating the concept of vigour.

Applications of the VAS and the task are presented next and connections between vigour and negative symptoms of schizophrenia are hypothesised. The potential of vigour to improve the circumstances of patients with schizophrenia is considered for various domains. The VAS and the task are considered for other populations, and applications and implications for vigour going forward are suggested.

5.3.1 Applications of the VAS

The VAS, being validated, may be used for diagnostic purposes, to assess the extent of vigour and for setting therapeutic targets. Therapeutic targets, irrespective of the means by which they may be pursued (e.g., medication, psychotherapy, dietetics) can be assessed by the VAS for the extent of their impact on vigour. More generally, assessment using the VAS would enhance the awareness for possible uptake for diagnostic purposes, within approaches to treatment, and by adding new treatment targets. Using the VAS diagnostically means here that vigour is itself a diagnostic target examined clinically to know its extent or when it changes rather than referring to diagnosis in its classificatory sense.

For these purposes, the VAS may now be used in the population of patients with stable avolitional schizophrenia for which it was validated. The VAS may be potentially useful in various other populations, subject to further study on whether it is valid and reliable for those populations. These may be both clinical and non-clinical populations, be it for the assessment of vigour, generating targets for intervention for those populations, or measuring outcomes in terms of vigour and as related to other outcomes.

Further study may examine schizophrenia patients in the acute phase, for example, rather than people who are stable as in this sample, in order to see the extent of vigour and potential change in vigour for them. Studies in clinical populations for whom vigour may be a sensible clinical target diagnostically or therapeutically may include patients with depression, cognitive impairment, enduring fatigue, other psychiatric and bodily conditions that impact negatively on vigour, and people with an unhealthy sedentary lifestyle.

Given that most people can identify with the prospect of having more vigour, as well as the common susceptibility towards burnout, it is not surprising that vigour had initially been examined in an occupational context. In the healthcare profession, for example, where burnout has been reported an epidemic (Lemaire & Wallace, 2017), vigour may indeed be a sensible target for balancing work with life and for the prevention and treatment of burnout. This resonates with Task Drive being the main factor of the VAS, with the emphasis of Task Drive being on aspects of occupational functioning. Hence, the VAS also has potential in an occupational setting to help those at work to re-establish vigour in their lives.

Further non-clinical populations may include people whose life goals have been eroded, those who live in unstimulating circumstances, pensioners experiencing a lack of vigour owing to disability or old age, and individuals who simply wish to enhance their vigour as a virtue worthy of pursuit. Although we do not foresee substantive difficulties with the validity and reliability of the VAS in these other populations (providing someone has capacity to apply the VAS),

whether such population would come with a confounding influence on the validity and reliability of the VAS would need to be researched.

5.3.2 Applications of the invigoration task

Having a valid and reliable invigoration task for which there is preliminary evidence of having a significant effect, this task may be added to standard services that currently have little to offer for vigour or the lack thereof. There is a need to expand the therapeutic toolkit, so to speak, given the limited efficacy of current treatments for avolition in schizophrenia. The prospect of invigoration may be particularly important for people who remain stuck after having been optimally treated with the usual means. In other words, even with preliminary evidence of effect, it may be sensible to use the invigoration task for patients where vigour is needed after the usual options have been exhausted. However, while the task tentatively expands the toolbox of services, for it to become part of standard services, it should first be subjected to an RCT. In future, subject to RCTs verifying these findings, the task may be incorporated into standard services for the common problem of avolition, but then phrased in the positive term of vigour even if avolition and vigour are not the precise inverse of each other.

The task may augment psychotherapeutic interventions when incorporated into, for example, a CBT programme. This may make the invigoration task more effective when better supported and better integrated in a broader therapeutic context. As for CBT, the invigoration task would align well with therapeutic interventions that utilise mindfulness approaches and/or guided imagery. The invigoration task may add further substance to these established interventions by being more targeted and specific to vigour than a general CBT, mindfulness or guided imagery approach. This is to say, by incorporating the invigoration task into these specific therapeutic interventions, the task augments the therapeutic targets and skill set of these interventions. Incorporating the invigoration task will be congruent and well-aligned with these interventions, owing to its being informed and guided by their theoretical principles, but it would be targeted better. Owing to its prescriptive nature, the invigoration task would fit with therapeutic interventions that are prescriptive, but would not fit well as part of non-prescriptive therapies such as psychodynamic and analytically oriented therapies (which are not commonly used in schizophrenia anyway), unless the task is utilised as a therapeutic intervention parallel to and distinct from a non-prescriptive therapy.

Another therapeutic intervention in which the invigoration task may be taken up sensibly and in a potentially vigour-enhancing way, is neurofeedback. Visual and auditory technology in immersive therapies creates a virtual reality for purposes of neurofeedback. Virtual reality may assist with the immersion required for vivid imagery of vigour, while neurofeedback may be generated in observing and experiencing the immediate impact of small steps taken in the

invigoration task, thus amplifying and priming a cumulative response. The combination of imagery, cognitive techniques and tangible "results" holds promise to ignite and fuel the actual experience and actualisation of vigour.

Existing interventions with positive targets for schizophrenia may be developed to incorporate vigour. An example might include the Loving-Kindness Meditation intervention, referenced in Chapter 1, for patients with schizophrenia and prominent negative symptoms, which sought to increase positive affect and to assist patients in flourishing again and decreasing negative symptoms (Johnson et al., 2011). As the programme incorporated self-compassion and mindfulness exercises, implementing the invigoration task from this study may incorporate these two aspects by virtue of the focused mindfulness and non-judgmental acceptance elements of the invigoration task. In addition to this, the task would serve to activate and mobilise patients by developing vivid imagery and cognitive strategies for invigoration.

Similarly, a recent Cognitive-Enhancement Therapy intervention for patients with schizophrenia targeting improved perspective-taking, information-processing and social functioning, and reduced neurocognitive and social deficits, may be adapted to incorporate the invigoration task (Schutt, 2017). A newly-published abstract reported the implementation of this programme in a community sample, with significant improvements in affective flattening, avolition-apathy, anhedonia-asociality and attention (Faith, Racette, Penrod, Jarvis, & Rempfer, 2019), which are well in line with the aim of the invigoration task

While these potential applications of the invigoration task are relevant for schizophrenia, being the population for which the invigoration task (as proof of concept) has been shown to be valid and reliable in our study, one may further hypothesise that the invigoration task may potentially be efficacious in other populations when used as a distinct intervention for increasing vigour or when used in combination with other psychotherapeutic or self-improvement interventions. Whether this hypothesis holds true needs to be investigated in RCTs.

In comparison with schizophrenia, where there may be restrictions of vigour inherent to the condition, the potential for invigoration might be even greater in populations where there is no clinical condition. Healthy people may also use the task to pursue vigour as a growth aspect of their personal enhancement, where increased vigour may improve flourishing in a meaningful life.

5.3.3 Connections between vigour and negative symptoms in schizophrenia

Some associated features of schizophrenia appear to mirror the features of vigour as identified by the factor analysis of the VAS. This means that advancing knowledge in the field of vigour may be applicable to the relative understanding of these features, including negative

symptoms. For example, the main factor of the Core VAS, Task Drive, seems to depict the lack of drive in avolition. The factor, Active Mobilisation, resembles the lack of 'vigour on the go' in avolition. It seems that increasing active mobilisation may potentially compensate for long-standing avolition. This is congruent with research on the broaden-and-build theory and affective neuroscience suggesting that building positive upward spirals may partially ameliorate avolition (Garland et al., 2010). Hence, knowing more about the amenability of active mobilisation may potentially yield advancements in clinically addressing the problem of avolition.

The behavioural activation aspects of the factors identified in the VAS, as well as their feature in the task, bring attention to behaviour activation and its potential for avolitional schizophrenia. Behaviour activation has been investigated and applied in the context of cognitive-behaviour therapy for depression. In schizophrenia, CBT techniques have been used as well, although the focus could now be more on negative symptoms and targeting avolition. The impact of behaviour activation on vigour in avolitional schizophrenia could hence potentially become established as a viable component to intervention strategies, much as it has become so for depression. This consideration seems to fit with emerging literature, as was the case in a proof-of-concept study on the potential for behaviour activation targeting mild-to-moderate negative symptoms in schizophrenia (Choi, Jaekal, & Lee, 2016).

The Creative Efforts factor identified in the EFA of the VAS, referring to the cognitive preparation, may partly speak to the role of anticipation of action to attain a reward and the corresponding heightened activity in the brain. Kapur (2003) found that neural deficits in response to reward anticipation are linked to the severity of negative symptoms. Difficulties in reward anticipation have been linked with difficulties in picking up reward-predicting cues, which may, in turn, impede creative efforts and contribute to further apathy.

Indecisiveness, being a further factor of the Core VAS, is included in the assessment of negative symptoms features in the PANSS as well as the Schizophrenia Proneness Instrument (Schultze-Lutter & Koch, 2010). Indecisiveness in schizophrenia has reportedly produced mixed results, and the nature of decision-making deficits is yet to be clarified (Galderisi et al., 2018; Heerey, Bell-Warren, & Gold, 2008). Regardless of the cause of the deficits, improved understanding of the indecisiveness component of the VAS may also yield insights into decision-making in schizophrenia.

It may be that the parallels between the factors of the Core VAS and literature on negative symptoms reflect a conceptual or pragmatic overlap between vigorous characteristics and negative symptoms. The Social Disinterest factor of the Core VAS, for example, may, within

an interpersonal context, be related to Asociality, and Torpidity may reflect the general functional decline evidenced by negative symptoms.

Subject to further research to assess whether negative symptoms and vigour are indeed (inversely) convergent, improving vigour in this population is likely to impact concurrently on the severity of negative symptoms and possibly other symptomological parameters of schizophrenia. If there are similarities, previous studies may be revisited and applied to vigour. For example, invigoration training can be applied to cognitive remediation approaches emphasising intrinsic motivation for improving cognitive deficits. Conversely, literature may be reviewed in schizophrenia with a specific search of terms characterising the VAS factors, and studies that have shown promise may similarly be revisited and refocused.

5.3.4 Vigour for alleviating the burden and comorbidity in schizophrenia

The added scope of targets offered by vigour may alleviate the burden on the patients and their families. It may lead to a more vigorous life, which is a virtuous aspiration by common standards. The task provides the opportunity for patients to build on their positive enabling, or personal agency, which is a common therapeutic goal (Bjornestad et al., 2017; Fowler et al., 2019; Kircher & Leube, 2003; Von der Lippe, Oddli, & Halvorsen, 2019) by training them to invigorate themselves. Although our study suggested that the effects of the task did not last after being performed only once, when repeated, the task may over time activate patients, ideally with them incorporating the invigoration skills on their own. Given the burden posed by difficulty in basic daily activities, even a minimal shift in the direction of vigour may offer relief. The burden on the healthcare system, characterised by economic expenses and shortage of staff, may also be lightened by the task.

Similarly, vigour may alleviate the comorbid depression and addiction found in schizophrenia. Patients who may feel hopeless about their schizophrenia may draw fresh perspectives on their situation by viewing it through the lens of vigour and its potential affordances. The task was specifically designed to activate the person from a 'broaden and build' perspective, such that depressed patients may consider alternatives and build on even minimal baseline vigour.

Addiction in this population may potentially be addressed using the invigoration task. Considering the neurobiology of addiction, the same circuits that are impaired in avolition are implicated in addictive behaviours (Epstein & Silbersweig, 2015; Kareken, 2019; Salamone & Correa, 2012), and this may very well be so for vigour as well. This means that, subject to further investigation, patients may potentially stimulate reward-responses from engaging in the task, thereby offering an alternative to existing addictive tendencies.

5.3.5 Implications for an expanded approach to schizophrenia

Existing means for the attainment of a holistic perspective on a patient's situation may be augmented by introducing vigour to a holistic perspective and therapeutic pursuit. Diagnosing positive strengths as part of attaining a holistic perspective may add vigour to existing positive psychology factors such as well-being, resilience, optimism, wisdom, and social support (Eglit, Palmer, & Jeste, 2018). The provision of the VAS may be considered a response to the need for research to provide clinicians and investigators with a tool-box of validated measures for positive psychosocial factors and outcomes. This study on vigour contributes to the growth of positive psychiatry by considering psychometry of positive aspects within a compromised population, with the vision of supporting and complimenting mainstream psychiatry.

The stance towards schizophrenia in this study is reflected in new research reporting prospects for improving avolition, and associating remission with positive predictive factors (Lange et al., 2019; Nguyen & Jeste, 2019). Similarly, this study has contributed a treatment target that moves beyond mainstream ameliorative practices by implementing a positive focus without romanticising the difficulties of schizophrenia.

The stance towards avolition as something unchangeable does not seem to be the case for vigour. While the study did not demonstrate lasting change, it provides some support to claim that these patients are not impervious to change. This study in vigour, therefore, takes the approach to avolition forward, casting hope for difficulties with avolition. This is in contrast with the current review on the state of affairs by prominent authors on schizophrenia, where it is reported that "Unfortunately, secondary negative symptoms might not be responsive to treatment of their underlying cause" and "No treatments have shown robust efficacy in treating primary and enduring negative symptoms" (Galderisi et al., 2018).

Several recent studies have shown that improvements in schizophrenia have not necessarily been directly linked with changes in symptom severity but rather with positive intervention impacts, such as strengthened resilience, optimism and mastery (Edmonds et al., 2018; Jeste, Palmer, & Saks, 2017). It is, therefore, becoming more apparent that outcomes of schizophrenia may not be as fixed as previously understood. This means that expanded treatment expectations that extend beyond symptom reduction and incorporate positive treatment targets such as vigour may improve the prognosis for these patients. Similarly, rather than attempting to resolve avolition, the VAS and the invigoration task offer something positive instead, which may also lead to improved functioning and quality of life for patients with schizophrenia.

An expanded treatment expectation that includes vigour is well suited to existing targets in approach of the recovery movement for people with schizophrenia. Vigour can augment

existing treatment approaches to the recovery model at its various stages, beginning with improved functioning and quality of life and building up to the broader pursuit of flourishing. Flourishing incorporates one's experience of schizophrenia into the narrated meaning of life (Clifton & Stevens, n.d.), and is related to eudaimonia, whereby well-being surpasses mere pleasure or happiness by encompassing optimal functioning in various domains. Flourishing has been conceptualised as well-being that is derived by several measurable elements, including positive emotions, engagement and flow, positive relationships, meaning and accomplishment (Seligman, 2012). The VAS and the task may be instrumental in the pursuit of flourishing by providing the means for the assessment and attainment of a virtue, i.e. vigour, that facilitate elements of flourishing. Given the applicability of meaning-making through adversity to virtually every human being, espousing one's difficulty with something beneficial has reach not only where morbidity is high, but for the general population as well. We anticipate that invigoration for improved quality of life may be beneficial to those seeking to flourish.

Perhaps, in addition to existing treatments for symptoms, strengthening that which already works, seeing positive psychiatry targets as akin to dormant muscles with potential, may indeed prove pivotal for improving outcomes for this population. This is supported by research shifting perspectives on recovery from schizophrenia to the ability to live a productive and satisfying life despite limitations imposed by symptoms, rather than them resulting from the elimination of symptoms (Bellack, 2006; Nguyen & Jeste, 2019). Nonetheless, the connections drawn in this subsection between vigour and approaches to schizophrenia are made rather tentatively, pending empirical and conceptual support that may emerge from further studies.

5.3.6 Applications and implications for vigour

The factor structure of the VAS in our study resonates with Shirom's tri-faceted conceptualisation of vigour (physical energy, cognitive liveliness and emotional expressiveness). The VAS additionally emphasises purposeful behaviour (or volition) at the core of vigour. Drawing on the factors of the VAS, vigour may be described as an internally-motivated state, with a compelling drive towards the pursuit of, active engagement in, and achievement of tasks (or other qualities) that are deemed to be subjectively meaningful, i.e., internal vigour. Internal vigour encompasses motivation (emotion) as well as creative thought-process, imagery, planning and intent (cognition). Behavioural vigour would accordingly be the immersed, determined, energetic follow-through on the motivations, thoughts, images and intent that encompass internal vigour. Vigour may also be described as a Task Drive, in part mediated by vigorous intent and vigorous active pursuit.

Further research is required for vigour to be further described conceptually, but the factors of the VAS may potentially be placed in a process sequence, depicting how vigour comes about. The establishment of processes regarding vigour may contribute to the development of interventions, in their consideration not only for the content of vigour but also for the process of invigoration. Research in schizophrenia may further examine correlations between vigour and avolition, and vigour and acute symptoms. Further research is also still needed to investigate the aetiology of vigour, the neurobiology of vigour, the course of vigour in various settings, and factors that may enhance or impede vigour.

5.4. Conclusion

The study of vigour holds potential for improving the lives of patients with schizophrenia. This is the first study in this specific domain, which provided a validated measure of vigour and an invigoration task in the population of remitted but avolitional schizophrenia. There is a need for further research to develop further the measurement and the kindling of vigour, to explore the psychological underpinnings of the factors of vigour identified in our study, and to clarify their longitudinal course and impact. Clinicians and researchers may build on this study, supportive of a positive psychiatry movement in an expanded approach to people with schizophrenia.

References

Abrantes, A. M., Friedman, J. H., Brown, R. A., Strong, D. R., Desaulniers, J., Ing, E., ... & Riebe, D. (2012). Physical activity and neuropsychiatric symptoms of Parkinson disease. *Journal of geriatric psychiatry and neurology*, *25*(3), 138–145. https://doi.org/10.1177/0891988712455237

Addington, D., Addington, J., & Atkinson, M. (1996). A psychometric comparison of the Calgary depression scale for schizophrenia and the Hamilton depression rating scale. *Schizophrenia Research*, *19*(2-3), 205–212.

Addington, D., Addington, J., & Maticka-Tyndale, E. (1993). Assessing depression in schizophrenia: The Calgary Depression Scale. *The British Journal of Psychiatry*, *Supplement* (22), 39–44.

Addington, D., Addington, J., & Maticka-Tyndale, E. (1994). Specificity of the Calgary Depression Scale for schizophrenics. *Schizophrenia Research*, *11*(3), 239–244. https://doi.org/10.1016/0920-9964(94)90017-5

Addington, D., Addington, J., Maticka-Tyndale, E., & Joyce, J. (1992). Reliability and validity of a depression rating scale for schizophrenics. *Schizophrenia Research*, *6*(3), 201–208. https://doi.org/10.1016/0920-9964(92)90003-N

Addington, D., Addington, J., & Schissel, B. (1990). A depression rating scale for schizophrenics. *Schizophrenia Research*, *3*(4), 247–251. https://doi.org/10.1016/0920-9964(90)90005-R

All White Background. (n.d.). *Yellow Background Images*. Image. All White Background. Available from: http://www.allwhitebackground.com/yellow-background-images.html [Accessed: 25 November 2019].

Anderson, T., Crowley, M. E. J., Himawan, L., Holmberg, J. K., & Uhlin, B. D. (2016). Therapist facilitative interpersonal skills and training status: A randomized clinical trial on alliance and outcome. *Psychotherapy Research*, *26*(5), 511–529.

Andreasen, N. C. (2000). Scale for the assessment of positive symptoms (SAPS) and Scale for the assessment of negative symptoms (SANS). In American Psychiatric Association & A. J. Rush (Eds.), *Handbook of psychiatric measures* (pp. 498–502). Washington, DC: American Psychiatric Association.

Anshel, M. H. & Kang, M. (2007). Effect of an intervention on replacing negative habits with positive routines for improving full engagement at work: A test of the disconnected values model. *Consulting Psychology Journal: Practice and Research*, *59*(2), 110.

Argiropoulou, M. I. & Ferrari, J. R. (2015). Chronic procrastination among emerging adults: factor structure of the Greek version of the general procrastination scale. *Hellenic Journal of Psychology*, *12*, 85–104.

Anthoine, E., Moret, L., Regnault, A., Sébille, V., & Hardouin, J. B. (2014). Sample size used to validate a scale: a review of publications on newly-developed patient reported outcomes measures. *Health and Quality of Life Outcomes*, *12*(1), 2.

Bakker, A. B., & Demerouti, E. (2008). Towards a model of work engagement. *Career Development International*, *13*(3), 209-223.

Bannigan, K. & Watson, R. (2009). Reliability and validity in a nutshell. *Journal of Clinical Nursing*, *18*(23), 3237–3243. https://doi.org/10.1111/j.1365-2702.2009.02939.x

Baños, R. M., Espinoza, M., García-Palacios, A., Cervera, J. M., Esquerdo, G., Barrajón, E., & Botella, C. (2013). A positive psychological intervention using virtual reality for patients with advanced cancer in a hospital setting: A pilot study to assess feasibility. *Supportive Care in Cancer*, *21*(1), 263–270. https://doi.org/10.1007/s00520-012-1520-x

Barch, D. M. & Dowd, E. C. (2010). Goal representations and motivational drive in schizophrenia: the role of prefrontal–striatal interactions. *Schizophrenia Bulletin*, *36*(5), 919–934. https://doi.org/10.1093/schbul/sbq068

Barch, D. M., Yodkovik, N., Sypher-Locke, H., & Hanewinkel, M. (2008). Intrinsic motivation in schizophrenia: relationships to cognitive function, depression, anxiety, and personality. *Journal of Abnormal Psychology*, *117*(4), 776.

Beauchamp, T. L. (2015). The theory, method and practice of principlism. In J. Z. Sadler, C. W. van Staden, & K. W. M. Fulford (Eds.), *The Oxford handbook of psychiatric ethics* (Vol. 1, pp. 405–422). Oxford, UK: Oxford University Press.

Bellack, A. S. (2006). Scientific and Consumer Models of Recovery in Schizophrenia: Concordance, Contrasts, and Implications. *Schizophrenia Bulletin*, *32*(3), 432–442. https://doi.org/10.1093/schbul/sbj044

Berridge, K. C. (2007). The debate over dopamine's role in reward: The case for incentive salience. *Psychopharmacology*, *191*(3), 391–431. https://doi.org/10.1007/s00213-006-0578-x

Bjornestad, J., Bronnick, K., Davidson, L., Hegelstad, W. ten V., Joa, I., Kandal, O., … Johannessen, J. O. (2017). The central role of self-agency in clinical recovery from first episode psychosis. *Psychosis*, *9*(2), 140–148. https://doi.org/10.1080/17522439.2016.1198828

Blackwell, S. E. (2019). Mental imagery: From basic research to clinical practice. *Journal of Psychotherapy Integration*, *29*(3), 235–247. https://doi.org/10.1037/int0000108

Blankert, T. & Hamstra, M. R. (2017). Imagining success: Multiple achievement goals and the effectiveness of imagery. *Basic and Applied Social Psychology*, *39*(1), 60–67.

Boateng, G. O., Neilands, T. B., Frongillo, E. A., Melgar-Quiñonez, H. R., & Young, S. L. (2018). Best Practices for Developing and Validating Scales for Health, Social, and Behavioral Research: A Primer. *Frontiers in Public Health*, *6*. https://doi.org/10.3389/fpubh.2018.00149

Bryant, F. B. & Veroff, J. (2017). *Savoring: A New Model of Positive Experience*. https://doi.org/10.4324/9781315088426

Callow, N., Hardy, L., & Hall, C. (2001). The effects of a motivational general-mastery imagery intervention on the sport confidence of high-level badminton players. *Research Quarterly for Exercise and Sport*, *72*(4), 389–400.

Carpenter, S. (2018). Ten steps in scale development and reporting: A guide for researchers. *Communication Methods and Measures*, *12*(1), 25–44.

Carver, C. S. & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective

responses to impending reward and punishment: The BIS/BAS Scales. *Journal of

Personality and Social Psychology*, *67*(2), 319–333. https://doi.org/10.1037/0022-

3514.67.2.319

Cassar, R., Applegate, E., & Bentall, R. P. (2013). Poor savouring and low self-efficacy are

predictors of anhedonia in patients with schizophrenia spectrum disorders. *Psychiatry

Research*, *210*(3), 830–834. https://doi.org/10.1016/j.psychres.2013.09.017

Chan, D. W. (2011). Burnout and life satisfaction: Does gratitude intervention make a

difference among Chinese school teachers in Hong Kong?. *Educational

Psychology*, *31*(7), 809–823.

Chi, P. C., Horn, L., & Kruger, M. (2014). Risk-benefit assessment. In M. Kruger, P Ndebele,

& L Horn (Eds.), *Research ethics in Africa* (pp. 63–70). Stellenbosch, WC: African

Sun Media.

Choi, K.-H., Jaekal, E., & Lee, G.-Y. (2016). Motivational and Behavioral Activation as an

Adjunct to Psychiatric Rehabilitation for Mild to Moderate Negative Symptoms in

Individuals with Schizophrenia: A Proof-of-Concept Pilot Study. *Frontiers in

Psychology*, *7*. https://doi.org/10.3389/fpsyg.2016.01759

Christopher, P. P. & Dunn, L. B. (2015). Psychiatric research ethics. In J. Z. Sadler, C. W.

van Staden, & K. W. M. Fulford (Eds.), *The Oxford handbook of psychiatric ethics*

(Vol. 2, pp. 945–957). Oxford, UK: Oxford University Press.

Clifton, S. & Stevens, B. (n.d.). Happiness and Mental Illness: Virtue ethics in Dialogue with

Psychology. *The Heythrop Journal*, *n/a*(n/a). https://doi.org/10.1111/heyj.13122

Clinton, M. E., Conway, N., & Sturges, J. (2017). "It's tough hanging-up a call": The

relationships between calling and work hours, psychological detachment, sleep

quality, and morning vigor. *Journal of Occupational Health Psychology*, *22*(1), 28.

https://doi.org/10.1037/ocp0000025

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Second Edition.

Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.

Cohen, C. I. & Meesters, P. D. (2019). *Schizophrenia and Psychoses in Later Life: New Perspectives on Treatment, Research, and Policy*. Cambridge University Press.

Conroy, D. & Hagger, M. S. (2017). Mental Imagery Meta-analysis. https://doi.org/10.31234/osf.io/d4fjv

Constantino, M. J., Romano, F. M., Coyne, A. E., Westra, H. A., & Antony, M. M. (2018). Client interpersonal impacts as mediators of long-term outcome in cognitive-behavioral therapy integrated with motivational interviewing for generalized anxiety disorder. *Psychotherapy Research*, *28*(6), 861–872.

Corey, G. (2009). *Theory and practice of counseling and psychotherapy*. Belmont, CA: Brooks.

Cox, C., Jolley, S., & Johns, L. (2016). Understanding and treating amotivation in people with psychosis: An experimental study of the role of guided imagery. *Psychiatry Research*, *246*, 387–391.

Crane, R. S., Brewer, J., Feldman, C., Kabat-Zinn, J., Santorelli, S., Williams, J. M. G., & Kuyken, W. (2017). What defines mindfulness-based programs? The warp and the weft. *Psychological Medicine*, *47*(6), 990–999. https://doi.org/10.1017/S0033291716003317

Da Silva, S., Saperia, S., Siddiqui, I., Fervaha, G., Agid, O., Daskalakis, Z. J., … Foussias, G. (2017). Investigating consummatory and anticipatory pleasure across motivation deficits in schizophrenia and healthy controls. *Psychiatry Research*, *254*, 112–117. https://doi.org/10.1016/j.psychres.2017.04.040

Derman, L. (2008). *Organisational energy and individual wellbeing* (Doctoral thesis). Retrieved from http://hdl.handle.net/10210/2550

Deserno, L., Schlagenhauf, F., & Heinz, A. (2016). Striatal dopamine, reward, and decision making in schizophrenia. *Dialogues in Clinical Neuroscience*, *18*(1), 77–89.

De Vries, J., Steeg, A. F., & Roukema, J. A. (2010). Psychometric properties of the Fatigue Assessment Scale (FAS) in women with breast problems. *International Journal of Clinical and Health Psychology*, *10*(1), 125–139.

Dunning, M. J. & Giallo, R. (2012). Fatigue, parenting stress, self-efficacy and satisfaction in mothers of infants and young children. *Journal of Reproductive and Infant Psychology*, *30*(2), 145-159. https://doi.org/10.1080/02646838.2012.693910

Edmonds, E. C., Martin, A. S., Palmer, B. W., Eyler, L. T., Rana, B. K., & Jeste, D. V. (2018). Positive mental health in schizophrenia and healthy comparison groups: Relationships with overall health and biomarkers. *Aging & Mental Health*, *22*(3), 354–362. https://doi.org/10.1080/13607863.2016.1251572

Eglit, G. M. L., Palmer, B. W., & Jeste, D. V. (2018). Overview of measurement-based positive psychiatry. *Nordic Journal of Psychiatry*, *72*(6), 396–403. https://doi.org/10.1080/08039488.2018.1459834

Ellis, A., Padesky, C. A., & Beck, A. T. (2005). Discussion of Christine A. Padesky and Aaron T. Beck, "Science and Philosophy: Comparison of Cognitive Therapy and Rational Emotive Behavior Therapy"/Response to Ellis' Discussion of "Science and Philosophy: Comparison of Cognitive Therapy and Rational Emotive Behavior Therapy". *Journal of Cognitive Psychotherapy*, *19*(2), 181.

Epstein, J. & Silbersweig, D. (2015). The Neuropsychiatric Spectrum of Motivational Disorders. *The Journal of Neuropsychiatry and Clinical Neurosciences*, *27*(1), 7–18. https://doi.org/10.1176/appi.neuropsych.13120370

Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). *Evaluating the use of Exploratory Factor Analysis in psychological research*. 28.

Faith, L., Racette, E., Penrod, M., Jarvis, S., & Rempfer, M. (2019). S101. Effectiveness and implementation of cognitive enhancement therapy in a real-world community program. *Schizophrenia Bulletin*, *45*(Supplement_2), S345–S345. https://doi.org/10.1093/schbul/sbz020.646

Farber, B. A., Suzuki, J. Y., & Lynch, D. A. (2018). Positive regard and psychotherapy outcome: A meta-analytic review. *Psychotherapy*, *55*(4), 411.

Favrod, J., Nguyen, A., Fankhauser, C., Ismailaj, A., Hasler, J.-D., Ringuet, A., … Bonsack, C. (2015). Positive Emotions Program for Schizophrenia (PEPS): A pilot intervention

to reduce anhedonia and apathy. *BMC Psychiatry, 15*(1), 1–8.
https://doi.org/10.1186/s12888-015-0610-y

Fayers, P. M. & Machin, D. (2015). *Quality of life: the assessment, analysis and reporting of patient-reported outcomes*. John Wiley & Sons.

Ferrari, J. R. (1989). Reliability of academic and dispositional measures of procrastination. *Psychological Reports*, *64*(3_suppl), 1057–1058.

Field, A. (2000). *Discovering statistics using SPSS for Windows: Advanced techniques for the beginner*.

Finch, W. H. (2013). Exploratory factor analysis. In *Handbook of quantitative methods for educational research* (pp. 167–186). Brill Sense.

Floyd, F. J. & Widaman, K. F. (1995). Factor analysis in the development and refinement of clinical assessment instruments. *Psychological Assessment*, *7*(3), 286.

Foussias, G., Mann, S., Zakzanis, K. K., Van Reekum, R., & Remington, G. (2009). Motivational deficits as the central link to functioning in schizophrenia: a pilot study. *Schizophrenia Research*, *115*(2), 333–337.
https://doi.org/10.1016/j.schres.2009.09.020

Foussias, G. & Remington, G. (2010). Negative symptoms in schizophrenia: avolition and Occam's razor. *Schizophrenia Bulletin*, *36*(2), 359–369.
https://doi.org/10.1093/schbul/sbn094

Fowler, D., Hodgekins, J., Berry, C., Clarke, T., Palmier-Claus, J., Sacadura, C., … French, P. (2019). Social recovery therapy: A treatment manual. *Psychosis*, *11*(3), 261–272.
https://doi.org/10.1080/17522439.2019.1607891

Fredrickson, B. L., Cohn, M. A., Coffey, K. A., Pek, J., & Finkel, S. M. (2008). Open hearts build lives: Positive emotions, induced through loving-kindness meditation, build consequential personal resources. *Journal of Personality and Social Psychology*, *95*(5), 1045–1062. https://doi.org/10.1037/a0013262

Fredrickson, B. L. & Joiner, T. (2002). Positive emotions trigger upward spirals toward

emotional well-being. *Psychological Science*, *13*(2), 172–175.

https://doi.org/10.1111/1467-9280.00431

Fredrickson, B. L. & Joiner, T. (2018). Reflections on positive emotions and upward spirals.

*Perspectives on Psychological Science: A Journal of the Association for

Psychological Science*, *13*(2), 194–199. https://doi.org/10.1177/1745691617692106

Freitas, C. P. P., Damásio, B. F., Kamei, H. H., Tobo, P. R., Koller, S. H., Robitschek, C., …

Robitschek, C. (2018). Personal Growth Initiative Scale - II: Adaptation and

psychometric properties of the Brazilian version. *Paidéia (Ribeirão Preto)*, *28*.

https://doi.org/10.1590/1982-4327e2806

Fulford, D., Campellone, T., & Gard, D. E. (2018). Social motivation in schizophrenia: How

research on basic reward processes informs and limits our understanding. *Clinical

Psychology Review*, *63*, 12–24.

Gaggioli, A., Riva, G., Peters, D., & Calvo, R. A. (2017). Chapter 18 - Positive technology,

computing, and design: Shaping a future in which technology promotes psychological

well-being. In M. Jeon (Ed.), *Emotions and Affect in Human Factors and Human-

Computer Interaction* (pp. 477–502). https://doi.org/10.1016/B978-0-12-801851-

4.00018-5

Galderisi, S., Mucci, A., Buchanan, R. W., & Arango, C. (2018). Negative symptoms of

schizophrenia: New developments and unanswered research questions. *The Lancet

Psychiatry*, *5*(8), 664–677. https://doi.org/10.1016/S2215-0366(18)30050-6

Ganesh, S., Kandasamy, A., Sahayaraj, U. S., & Benegal, V. (2018). Behavioral activation

and behavioral inhibition sensitivities in patients with substance use disorders: A

study from India. *Indian Journal of Psychiatry*, *60*(3), 346.

Garland, E. L., Fredrickson, B., Kring, A. M., Johnson, D. P., Meyer, P. S., & Penn, D. L.

(2010). Upward spirals of positive emotions counter downward spirals of negativity:

Insights from the broaden-and-build theory and affective neuroscience on the

treatment of emotion dysfunctions and deficits in psychopathology. *Clinical Psychology Review*, *30*(7), 849–864. https://doi.org/10.1016/j.cpr.2010.03.002

Garland, E. L. & Howard, M. O. (2009). Neuroplasticity, psychosocial genomics, and the biopsychosocial paradigm in the 21st century. *Health & Social Work*, *34*(3), 191–199.

Gold, J. M., Strauss, G. P., Waltz, J. A., Robinson, B. M., Brown, J. K., & Frank, M. J. (2013). Negative symptoms of schizophrenia are associated with abnormal effort-cost computations. *Biological Psychiatry*, *74*(2), 130–136. https://doi.org/10.1016/j.biopsych.2012.12.022

Grant, P. M., Huh, G. A., Perivoliotis, D., Stolar, N. M., & Beck, A. T. (2012). Randomized trial to evaluate the efficacy of cognitive therapy for low-functioning patients with schizophrenia. *Archives of General Psychiatry*, *69*(2), 121–127. https://doi.org/10.1001/archgenpsychiatry.2011.129

Groenewoudt, A. C., Rooks, G., & Van Gool, P. J. R. (2019). When problems lead to ideas: The roles of daily vigor and social interactions. *The Journal of Creative Behavior*, *53*(3), 286–297. https://doi.org/10.1002/jocb.179

Gruber, J. (2019). *The Oxford Handbook of Positive Emotion and Psychopathology*. Oxford University Press.

Hagger, M. S. (2017). *Changing Behaviour Using Mental Imagery Manual*.

Hanson, E., Healey, K., Wolf, D., & Kohler, C. (2010). Assessment of pharmacotherapy for negative symptoms of schizophrenia. *Current Psychiatry Reports*, *12*(6), 563–571. https://doi.org/10.1007/s11920-010-0148-0

Hasanagic, A. & Ozsagir, C. B. (2018). The validity exploration of General Procrastination Scale (Lay, 1986). *Epiphany*, *11*(1).

Hechanova, M. R. M., Waelde, L. C., Docena, P. S., Alampay, L. P., Alianan, A. S., Flores, M. J. B., & Melgar, M. I. E. (2015). The development and initial evaluation of Katatagan: a resilience intervention for Filipino disaster survivors. *Philippine Journal of Psychology*, *48*(2), 105–131.

Hechanova, M. R. M., Waelde, L. C., & Ramos, P. A. P. (2016). Evaluation of a group-based resilience intervention for Typhoon Haiyan survivors. *Journal of Pacific Rim Psychology*, *10*.

Heerey, E. A., Bell-Warren, K. R., & Gold, J. M. (2008). Decision-making impairments in the context of intact reward sensitivity in schizophrenia. *Biological Psychiatry*, *64*(1), 62–69. https://doi.org/10.1016/j.biopsych.2008.02.015

Hinkin, T. R., Tracey, J. B., & Enz, C. A. (1997). Scale construction: Developing reliable and valid measurement instruments. *Journal of Hospitality & Tourism Research*, *21*(1), 100–120.

Holmes, E. A., & Mathews, A. (2010). Mental imagery in emotion and emotional disorders. *Clinical psychology review*, *30*(3), 349-362.

Horan, W. P., Green, M. F., Kring, A. M., & Nuechterlein, K. H. (2006). Does anhedonia in schizophrenia reflect faulty memory for subjectively experienced emotions?. *Journal of Abnormal Psychology*, *115*(3), 496.

Horan, W. P., Kring, A. M., Gur, R. E., Reise, S. P., & Blanchard, J. J. (2011). Development and psychometric validation of the Clinical Assessment Interview for Negative Symptoms (CAINS). *Schizophrenia research*, *132*(2-3), 140-145.

Jeste, D. V., Palmer, B. W., & Saks, E. R. (2017). Why we need positive psychiatry for schizophrenia and other psychotic disorders. *Schizophrenia Bulletin*, *43*(2), 227–229. https://doi.org/10.1093/schbul/sbw184

Johnson, D. P., Penn, D. L., Fredrickson, B. L., Kring, A. M., Meyer, P. S., Catalino, L. I., & Brantley, M. (2011). A pilot study of loving-kindness meditation for the negative symptoms of schizophrenia. *Schizophrenia Research*, *129*(2–3), 137–140. https://doi.org/10.1016/j.schres.2011.02.015

Johnson, S. L., Turner, R. J., & Iwata, N. (2003). BIS/BAS levels and psychiatric disorder: An epidemiological study. *Journal of Psychopathology and Behavioral Assessment*, *25*(1), 25–36.

Jorm, A. F., Christensen, H, Henderson, A. S., Jacomb, P. A., Korten, A. E., & Rodgers, B. (1999). Using the BIS/BAS scales to measure behavioural inhibition and behavioural activation: Factor structure, validity and norms in a large community sample. *Personality and Individual Differences, 26*(1)*,* 49–58. https://doi.org/10.1016/S0191-8869(98)00143-3

Kabat-Zinn, J. (2015). Mindfulness. *Mindfulness*, *6*(6), 1481–1483. https://doi.org/10.1007/s12671-015-0456-x

Kapur, S. (2003). Psychosis as a state of aberrant salience: a framework linking biology, phenomenology, and pharmacology in schizophrenia. *American Journal of Psychiatry*, *160*(1), 13–23.

Kareken, D. A. (2019). Missing motoric manipulations: Rethinking the imaging of the ventral striatum and dopamine in human reward. *Brain Imaging and Behavior*, *13*(2), 306–313. https://doi.org/10.1007/s11682-017-9822-8

Kay, S. R., Fiszbein, A., & Opfer, L. A. (1987). The positive and negative syndrome scale (PANSS) for schizophrenia. *Schizophrenia Bulletin*, *13*(2), 261–276. https://doi.org/10.1093/schbul/13.2.261

Kean, J. D. (2018). School-based psychosocial intervention programs - A framework for the treatment of children exhibiting sub-clinical symptoms of ADHD: A systematic narrative review. *Journal of Psychology & Psychotherapy*, *8*(6), 1–6.

King, R. J., Orr, J. A., Poulsen, B., Giacomantonio, S. G., & Haden, C. (2017). Understanding the therapist contribution to psychotherapy outcome: A meta-analytic approach. *Administration and Policy in Mental Health and Mental Health Services Research*, *44*(5), 664–680.

Kinnafick, F. E., Thøgersen-Ntoumani, C., Duda, J. L., & Taylor, I. (2014). Sources of autonomy support, subjective vitality and physical activity behaviour associated with participation in a lunchtime walking intervention for physically inactive adults. *Psychology of Sport and Exercise*, *15*(2), 190–197.

Kircher, T. T. J. & Leube, D. T. (2003). Self-consciousness, self-agency, and schizophrenia. *Consciousness and Cognition*, *12*(4), 656–669. https://doi.org/10.1016/S1053-8100(03)00071-0

Kirkpatrick, B., Buchanan, R. W., McKenney, P. D., Alphs, L. D., & Carpenter Jr, W. T. (2000). Schedule for the deficit syndrome (SDS). In American Psychiatric Association & A. J. Rush (Eds.), *Handbook of psychiatric measures* (pp. 502–504). Washington, DC: American Psychiatric Association.

Koen, M. P., Du Plessis, E., & Watson, F. G. (2013). Exploring leadership hubs as an intervention in strengthening the resilience of health caregivers. *Journal of Psychology in Africa*, *23*(3), 495-499.

Kosslyn, S. M., Ganis, G., & Thompson, W. L. (2001). Neural foundations of imagery. *Nature Reviews Neuroscience*, *2*(9), 635.

Kring, A. M., Gur, R. E., Blanchard, J. J., Horan, W. P., & Reise, S. P. (2013). The Clinical Assessment Interview for Negative Symptoms (CAINS): Final development and validation. *The American Journal of Psychiatry*, *170*(2), 165–172. https://doi.org/10.1176/appi.ajp.2012.12010109

Kruger, M., Ndebele, P., & Horn, L. (2014). *Research Ethics in Africa.* Stellenbosch, WC: African Sun Media.

Kumari, S., Malik, M., Florival, C., Manalai, P., & Sonje, S. (2017). An Assessment of Five (PANSS, SAPS, SANS, NSA-16, CGI-SCH) commonly used symptoms rating scales in schizophrenia and comparison to newer scales (CAINS, BNSS). *Journal of Addiction Research & Therapy*, *8*(3). https://doi.org/10.4172/2155-6105.1000324

Kyriazos, T. A. & Stalikas, A. (2018). Applied Psychometrics: The steps of scale development and standardization process. *Psychology*, *9*(11), 2531.

Lane, A., Hewston, R., Redding, E., & Whyte, G. P. (2003). Mood changes following modern-dance classes. *Social Behavior and Personality: an International Journal*, *31*(5), 453–460. https://doi.org/10.2224/sbp.2003.31.5.453

Lange, S. M. M., Meesters, P. D., Stek, M. L., Wunderink, L., Penninx, B. W. J. H., &
Rhebergen, D. (2019). Course and predictors of symptomatic remission in late-life
schizophrenia: A 5-year follow-up study in a Dutch psychiatric catchment area.
Schizophrenia Research, *209*, 179–184. https://doi.org/10.1016/j.schres.2019.04.025

Langer, E. J. & Ngnoumen, C. T. (2017). Mindfulness. In D. S. Dunn (Ed.), *Positive
Psychology: Established and Emerging Issues*.
https://doi.org/10.4324/9781315106304-7

Lay, C. H. (1986). At last, my research article on procrastination. *Journal of Research in
Personality*, *20*(4), 474–495. https://doi.org/10.1016/0092-6566(86)90127-3

Lemaire, J. B. & Wallace, J. E. (2017). Burnout among doctors. *BMJ*, j3360.
https://doi.org/10.1136/bmj.j3360

Lewis, C., Annett, L. E., Davenport, S., Hall, A. A., & Lovatt, P. (2016). Mood changes
following social dance sessions in people with Parkinson's disease. *Journal of Health
Psychology*, *21*(4), 483–492. https://doi.org/10.1177/1359105314529681

Louw, G. J. (2014). Burnout, vigour, big five personality traits and social support in a sample
of police officers: original research. *SA Journal of Industrial Psychology*, *40*(1), 1-13.
https://doi.org/10.4102/sajip.v40i1.1119

Luther, L., Fischer, M. W., Firmin, R. L., & Salyers, M. P. (2019). Clarifying the overlap
between motivation and negative symptom measures in schizophrenia research: A
meta-analysis. *Schizophrenia Research*, *206*, 27–36.
https://doi.org/10.1016/j.schres.2018.10.010

Marder, S. R. & Galderisi, S. (2017). The current conceptualization of negative symptoms in
schizophrenia. *World Psychiatry*, *16*(1), 14–24. https://doi.org/10.1002/wps.20385

Marder, S. R. & Kirkpatrick, B. (2014). Defining and measuring negative symptoms of
schizophrenia in clinical trials. *European Neuropsychopharmacology*, *24*(5), 737–
743. https://doi.org/10.1016/j.euroneuro.2013.10.016

Mariani, M. G. & Ferrari, J. R. (2012). Adult Inventory of Procrastination Scale (AIP): A comparison of models with an Italian sample. *TPM: Testing, Psychometrics, Methodology in Applied Psychology*, *19*(1).

Martin, A. J. (2008). How domain specific is motivation and engagement across school, sport, and music? A substantive–methodological synergy assessing young sportspeople and musicians. *Contemporary Educational Psychology*, *33*(4), 785–813.

Matthews, G., Deary, I. J., & Whiteman, M. C. (2009). *Personality Traits*. Cambridge University Press.

Matthews, G., Jones, D. M., & Chamberlain, A. G. (1990). Refining the measurement of mood: The UWIST mood adjective checklist. *British Journal of Psychology*, *81*(1), 17–42. https://doi.org/10.1111/j.2044-8295.1990.tb02343.x

McCloskey, J., & Scielzo, S. A. (2015). Finally!: The Development and Validation of the Academic Procrastination Scale. *Manuscript submitted for publication*.

McMorris, T., & Hale, T. (2006). *Coaching science: Theory into practice*. John Wiley & Sons.

Menichetti, J., & Graffigna, G. (2016). "PHE in Action": Development and Modeling of an Intervention to Improve Patient Engagement among Older Adults. *Frontiers in Psychology*, *7*, 1405.

Messinger, J. W., Trémeau, F., Antonius, D., Mendelsohn, E., Prudent, V., Stanford, A. D., & Malaspina, D. (2011). Avolition and expressive deficits capture negative symptom phenomenology: Implications for DSM-5 and schizophrenia research. *Clinical Psychology Review*, *31*(1), 161–168. https://doi.org/10.1016/j.cpr.2010.09.002

Michielsen, H. J., De Vries, J., & Van Heck, G. L. (2003). Psychometric qualities of a brief self-rated fatigue measure. *Journal of Psychosomatic Research*, *54*(4), 345–352. https://doi.org/10.1016/S0022-3999(02)00392-6

Mita, K., & Ndebele, P. (2014). Payment of research participants. *Research ethics in Africa: A resource for research ethics committees*, 135-142.

Morgado, F. F. R., Meireles, J. F. F., Neves, C. M., Amaral, A. C. S., & Ferreira, M. E. C.

    (2017). Scale development: Ten main limitations and recommendations to improve

    future research practices. *Psicologia: Reflexão e Crítica*, *30*(1), 3.

    https://doi.org/10.1186/s41155-016-0057-1

Mucci, A., Galderisi, S., Merlotti, E., Rossi, A., Rocca, P., Bucci, P., ... & Maj, M. (2015). The

    Brief Negative Symptom Scale (BNSS): independent validation in a large sample of

    Italian patients with schizophrenia. *European Psychiatry*, *30*(5), 641-647.

Mvududu, N. H. & Sink, C. A. (2013). Factor analysis in counseling research and practice.

    Counseling Outcome Research and Evaluation, *4*(2), 75–98.

    https://doi.org/10.1177/2150137813494766

Naidu, K., Van Staden, W. (C. W.), & Van der Linde, M. (2014). Severity of psychotic

    episodes in predicting concurrent depressive and anxiety features in acute phase

    schizophrenia. *BMC Psychiatry*, *14*(1), 1–7. https://doi.org/10.1186/1471-244X-14-

    166

Najas-Garcia, A., Carmona, V. R., & Gómez-Benito, J. (2018). Trends in the study of

    motivation in schizophrenia: A bibliometric analysis of six decades of research

    (1956–2017). *Frontiers in Psychology*, *9*. https://doi.org/10.3389/fpsyg.2018.00063

NASA. (n.d.). *Launch of NASA's space shuttle Challenger on mission STS-51L at 11:38 a.m.*

    on January 28, 1986. Image. collectSPACE. Available from:

    http://www.collectspace.com/news/news-012516a-challenger-lost-tapes-natgeo.html

    [Accessed: 25 November 2019].

Nguyen, T. T. & Jeste, D. V. (2019). Positive light on schizophrenia and aging: Commentary

    on course and predictors of symptomatic remission in schizophrenia: A 5-year follow-

    up study in a Dutch psychiatric catchment area, by Lange et al. *Schizophrenia*

    Research, *211*, 32–33. https://doi.org/10.1016/j.schres.2019.07.037

Niv, Y., Daw, N. D., Joel, D., & Dayan, P. (2007). Tonic dopamine: Opportunity costs and the control of response vigor. *Psychopharmacology*, *191*(3), 507–520. https://doi.org/10.1007/s00213-006-0502-4

Norcross, J. C. & Lambert, M. J. (2018). Psychotherapy relationships that work III. *Psychotherapy*, *55*(4), 303.

Olivetti, P. R., Balsam, P. D., Simpson, E. H., & Kellendonk, C. (2019). Emerging roles of striatal dopamine D2 receptors in motivated behaviour: Implications for psychiatric disorders. *Basic & Clinical Pharmacology & Toxicology*. https://doi.org/10.1111/bcpt.13271

Osborne, J. W., Costello, A. B., & Kellow, J. T. (2008). Best practices in exploratory factor analysis. *Best Practices in Quantitative Methods*, 86–99.

Padesky, C. A. & Mooney, K. A. (2012). Strengths-based cognitive–behavioural therapy: A four-step model to build resilience. *Clinical Psychology & Psychotherapy*, *19*(4), 283–290.

Perkins, D. O., Stroup, T. S., Lieberman, J. A. (2000). Psychotic disorder measures. In American Psychiatric Association & A. J. Rush (Eds.), *Handbook of psychiatric measures* (pp. 504–507). Washington, DC: American Psychiatric Association.

Peterson, C. & Park, N. (2014). Meaning and positive psychology. *International Journal of Existential Psychology and Psychotherapy*, *5*(1), 7.

Quinton, M. L., Cumming, J., & Williams, S. E. (2018). Investigating the mediating role of positive and negative mastery imagery ability. *Psychology of Sport and Exercise*, *35*, 1–9.

Rashid, T. (2009). Positive interventions in clinical practice. *Journal of Clinical Psychology*, *65*(5), 461–466. https://doi.org/10.1002/jclp.20588

Reddy, L. F., Green, M. F., Rizzo, S., Sugar, C. A., Blanchard, J. J., Gur, R. E., … Horan, W. P. (2014). Behavioral Approach and Avoidance in Schizophrenia: An Evaluation of Motivational Profiles. *Schizophrenia Research*, *159*(1), 164–170. https://doi.org/10.1016/j.schres.2014.07.047

Rekhi, G., Ng, W. Y., & Lee, J. (2018). Clinical utility of the Calgary Depression Scale for Schizophrenia in individuals at ultra-high risk of psychosis. *Schizophrenia Research*, *193*, 423–427.

Renner, F., Murphy, F. C., Ji, J. L., Manly, T., & Holmes, E. A. (2019). Mental imagery as a "motivational amplifier" to promote activities. *Behaviour Research and Therapy*, *114*, 51–59. https://doi.org/10.1016/j.brat.2019.02.002

Ritchie, A. & Brooker, F. (2018). Imaging the future: an autoethnographic journey of using a guided and cognitive-specific imagery intervention in undergraduate release-based contemporary dance technique. *Research in Dance Education*, *19*(2), 167–182.

Robison, A. J., Thakkar, K., & Diwadkar, V. A. (2019). Cognition and Reward Circuits in Schizophrenia: Synergistic, not Separate. *Biological Psychiatry*. https://doi.org/10.1016/j.biopsych.2019.09.021

Robitschek, C. (1998). Personal growth initiative: The construct and its measure. *Measurement and Evaluation in Counseling and Development, 30*(4), 183–198.

Robitschek, C., Ashton, M. W., Spering, C. C., Geiger, N., Byers, D., Schotts, G. C., & Thoen, M. A. (2012). Development and psychometric evaluation of the Personal Growth Initiative Scale–II. *Journal of Counseling Psychology*, *59*(2), 274–287. https://doi.org/10.1037/a0027310

Rokka, S., Mavridis, G., & Kouli, O. (2010). The impact of exercise intensity on mood state of participants in dance aerobics programs. *Studies in Physical Culture and Tourism*, *17*(3), 241–245.

Rollnick, S. & Miller, W. R. (1995). What is motivational interviewing?. *Behavioural and Cognitive Psychotherapy*, *23*(4), 325–334.

Rosenberg, A. R., Yi-Frazier, J. P., Eaton, L., Wharton, C., Cochrane, K., Pihoker, C., ... & McCauley, E. (2015). Promoting resilience in stress management: a pilot study of a novel resilience-promoting intervention for adolescents and young adults with serious illness. *Journal of Pediatric Psychology*, *40*(9), 992–999.

Ruiz, S., Lee, S., Soekadar, S. R., Caria, A., Veit, R., Kircher, T., ... & Sitaram, R. (2013). Acquired self-control of insula cortex modulates emotion recognition and brain network connectivity in schizophrenia. *Human Brain Mapping*, *34*(1), 200–212.

Ryan, R. M. & Frederick, C. (1997). On energy, personality, and health: Subjective vitality as a dynamic reflection of well-being. *Journal of Personality*, *65*(3), 529–565. https://doi.org/10.1111/j.1467-6494.1997.tb00326.x

Sakuraya, A., Shimazu, A., Imamura, K., Namba, K., & Kawakami, N. (2016). Effects of a job crafting intervention program on work engagement among Japanese employees: a pretest-posttest study. *BMC Psychology*, *4*(1), 49.

Salamone, J. D. & Correa, M. (2012). The mysterious motivational functions of mesolimbic dopamine. *Neuron*, *76*(3), 470–485. https://doi.org/10.1016/j.neuron.2012.10.021

Sawilowsky, S. S. (2009). New effect size rules of thumb. *Journal of Modern Applied Statistical Methods*, *8*(2), 26.

Schmitz, T. W., Rosa, E. D., & Anderson, A. K. (2009). Opposing Influences of affective state valence on visual cortical encoding. *Journal of Neuroscience*, *29*(22), 7199–7207. https://doi.org/10.1523/JNEUROSCI.5387-08.2009

Schultze-Lutter, F. & Koch, E. (2010). *Schizophrenia Proneness Instrument: child and youth version (SPI-CY)*. Rome: Fioriti.

Schutt, R. K., Seidman, L. J., Eack, S. M., Deck, B., & Keshavan, M. S. (2017). Adapting cognitive remediation to a group home: A brief report. *Asian Journal of Psychiatry*, *25*, 184–187.

Schutte, N. S. (2019). The Impact of virtual reality on curiosity and other positive characteristics. *International Journal of Human–Computer Interaction*, 1–8. https://doi.org/10.1080/10447318.2019.1676520

Seligman, M. E. (2012). *Flourish: A visionary new understanding of happiness and well-being*. Simon and Schuster.

Seligman, M. E. & Csikszentmihalyi, M. (2014). Positive psychology: An introduction. In M.

Csikszentmihalyi, *Flow and the foundations of positive psychology* (pp. 209–226).

Dordrecht: Springer. https://doi.org/10.1007/978-94-017-9088-8_18

Seppälä, P., Mauno, S., Feldt, T., Hakanen, J., Kinnunen, U., Tolvanen, A., & Schaufeli, W.

(2009). The construct validity of the Utrecht Work Engagement Scale: Multisample

and longitudinal evidence. *Journal of Happiness Studies*, *10*(4), 459–481.

https://doi.org/10.1007/s10902-008-9100-y

Shafer, A. & Dazzi, F. (2019). Meta-analysis of the positive and Negative Syndrome Scale

(PANSS) factor structure. *Journal of Psychiatric Research*, *115*, 113–120.

https://doi.org/10.1016/j.jpsychires.2019.05.008

Shahid, A., Wilkinson, K., Marcu, S., & Shapiro, C. M. (2011). Fatigue Assessment Scale

(FAS). In *STOP, THAT and one hundred other sleep scales* (pp. 161–162). New

York: NY: Springer.

Sherman, D. K., Gangi, C., & White, M. L. (2010). Embodied cognition and health

persuasion: Facilitating intention–behavior consistency via motor

manipulations. *Journal of Experimental Social Psychology*, *46*(2), 461–464.

Shirom, A. (2003). Feeling vigorous at work? The construct of vigor and the study of positive

affect in organizations. In P. W. Perrewe & D. C. Ganster (Eds.), *Emotional and

physiological processes and positive intervention strategies* (Vol. 3, pp. 135–164).

Emerald Group Publishing Limited. https://doi.org/10.1016/S1479-

3555%2803%2903004-X

Shirom, A. (2007). Explaining vigor: On the antecedents and consequences of vigor as a

positive affect at work. In D. L. Nelson & C. L. Cooper (Eds.), *Positive organizational

behavior* (pp. 86–100). SAGE.

Shirom, A. (2011). Vigor as a Positive Affect at Work: Conceptualizing Vigor, Its Relations

with Related Constructs, and Its Antecedents and Consequences. *Review of General

Psychology*, *15*(1), 50–64. https://doi.org/10.1037/a0021853

Shraga, O. & Shirom, A. (2009). The construct validity of vigor and its antecedents: A

    qualitative study. *Human Relations*, *62*(2), 271–291.

    https://doi.org/10.1177/0018726708100360

Simonsmeier, B. A. & Buecker, S. (2017). Interrelations of imagery use, imagery ability, and

    performance in young athletes. *Journal of Applied Sport Psychology*, *29*(1), 32–43.

Singal, A. G., Higgins, P. D. R., & Waljee, A. K. (2014). A primer on effectiveness and

    efficacy trials. *Clinical and Translational Gastroenterology*, *5*(1), e45.

    https://doi.org/10.1038/ctg.2013.13

Smith, J. L. & Bryant, F. B. (2017). Savoring and well-being: Mapping the cognitive-

    emotional terrain of the happy mind. In *The happy mind: Cognitive contributions to

    well-being* (pp. 139–156). Springer, Cham.

Smith, D. V., Clithero, J. A., Boltuck, S. E., & Huettel, S. A. (2014). Functional connectivity

    with ventromedial prefrontal cortex reflects subjective value for social rewards. *Social

    Cognitive and Affective Neuroscience*, *9*(12), 2017–2025.

    https://doi.org/10.1093/scan/nsu005

Solbrig, L., Jones, R., Kavanagh, D., May, J., Parkin, T., & Andrade, J. (2017). People trying

    to lose weight dislike calorie counting apps and want motivational support to help

    them achieve their goals. *Internet Interventions*, *7*, 23–31.

Sonnentag, S. & Niessen, C. (2008). Staying vigorous until work is over: The role of trait

    vigour, day-specific work experiences and recovery. *Journal of Occupational and

    Organizational Psychology*, *81*(3), 435–458.

    https://doi.org/10.1348/096317908X310256

Spreitzer, G., Sutcliffe, K., Dutton, J., Sonenshein, S., & Grant, A. M. (2005). A socially

    embedded model of thriving at work. *Organization Science*, *16*(5), 537–549.

    https://doi.org/10.1287/orsc.1050.0153

Strauss, G. P. (2013). Translating basic emotion research into novel psychosocial

    interventions for anhedonia. *Schizophrenia Bulletin*, *39*(4), 737–739.

    https://doi.org/10.1093/schbul/sbt082

Strauss, G. P., Waltz, J. A., & Gold, J. M. (2014). A review of reward processing and motivational impairment in schizophrenia. *Schizophrenia Bulletin*, *40*(Suppl_2), S107–S116. https://doi.org/10.1093/schbul/sbt197

Strauss, G. P., Wilbur, R. C., Warren, K. R., August, S. M., & Gold, J. M. (2011). Anticipatory vs. consummatory pleasure: what is the nature of hedonic deficits in schizophrenia?. *Psychiatry Research*, *187*(1–2), 36–41.

Strümpfer, D. J. W. (1990). Salutogenesis: A new paradigm. *South African Journal of Psychology*, *20*(4), 265–276.

Strümpfer, D. J. W. (2005). Standing on the shoulders of giants: Notes on early positive psychology (Psychofortology). *South African Journal of Psychology*, *35*(1), 21–45.

Sullivan, L. E. (Ed.). (2009). *The SAGE glossary of the social and behavioral sciences*. Sage.

Taherdoost, H., Sahibuddin, S., & Jalaliyoon, N. (2014). Exploratory factor analysis; concepts and theory. *Advances in Applied and Pure Mathematics*, *375382*.

Temmingh, H. & Stein, D. J. (2015). Anxiety in patients with schizophrenia: Epidemiology and management. *CNS Drugs*, *29*(10), 819–832. https://doi.org/10.1007/s40263-015-0282-7

Thayer, R. E. (1986). Activation-deactivation adjective check list: Current overview and structural analysis. *Psychological Reports*, *58*(2), 607–614. https://doi.org/10.2466/pr0.1986.58.2.607

Turan, M. B., Disçeken, O., & Kaya, M. (2019). The impact of cognitive-based learning and imagery training on tennis skills. *Universal Journal of Educational Research*, *7*(1), 244–249.

Van der Laan, L. N., Barendse, M. E., Viergever, M. A., & Smeets, P. A. (2016). Subtypes of trait impulsivity differentially correlate with neural responses to food choices. *Behavioural Brain Research*, *296*, 442–450.

Vandeweghe, L., Matton, A., Beyers, W., Vervaet, M., Braet, C., & Goossens, L. (2016). Psychometric properties of the BIS/BAS Scales and the SPSRQ in Flemish adolescents. *Psychologica Belgica*, *56*(4), 406.

Van Staden, C. W. (2015). Informed consent to treatment. In J. Z. Sadler, C. W. van Staden, & K. W. M. Fulford (Eds.), *The Oxford handbook of psychiatric ethics* (Vol. 2, pp. 1129–1142). Oxford, UK: Oxford University Press.

Von der Lippe, A. L., Oddli, H. W., & Halvorsen, M. S. (2019). Therapist strategies early in therapy associated with good or poor outcomes among clients with low proactive agency. *Psychotherapy Research*, *29*(3), 383–402. https://doi.org/10.1080/10503307.2017.1373205

Ware Jr, J. E. & Sherbourne, C. D. (1992). The MOS 36-item short-form health survey (SF-36): I. Conceptual framework and item selection. *Medical Care*, 473–483.

Watson, D. (2002). Positive affectivity. *Handbook of positive psychology*, (pp. 106–119).

Williams, B., Onsman, A., & Brown, T. (2010). Exploratory factor analysis: A five-step guide for novices. *Australasian Journal of Paramedicine*, *8*(3).

Wissing, M. P. & Van Eeden, C. (2002). Empirical clarification of the nature of psychological well-being. *South African Journal of Psychology*, *32*(1), 32–44.

Yockey, R. D. & Kralowec, C. J. (2015). Confirmatory factor analysis of the procrastination assessment scale for students. *Sage Open*, *5*(4), 2158244015611456.

Yong, A. G. & Pearce, S. (2013). A beginner's guide to factor analysis: Focusing on Exploratory Factor Analysis. *Tutorials in Quantitative Methods for Psychology*, *9*(2), 79–94. https://doi.org/10.20982/tqmp.09.2.p079

Yu, N. X., Lam, T. H., Liu, I. K., & Stewart, S. M. (2015). Mediation of short and longer term effects of an intervention program to enhance resilience in immigrants from mainland China to Hong Kong. *Frontiers in Psychology*, *6*, 1769.

Zarin, D. A., Young, J. L., & West, J. C. (2005). Challenges to evidence-based medicine. *Social Psychiatry and Psychiatric Epidemiology*, *40*(1), 27–35.

Zénon, A., Devesse, S., & Olivier, E. (2016). Dopamine manipulation affects response vigor independently of opportunity cost. *Journal of Neuroscience*, *36*(37), 9516–9525. https://doi.org/10.1523/JNEUROSCI.4467-15.2016

Zhang, J., Jadavji, Z., Zewdie, E., & Kirton, A. (2019). Evaluating if children can use simple brain computer interfaces. *Frontiers in Human Neuroscience*, *13*. https://doi.org/10.3389/fnhum.2019.00024

Zhang, M., Sparer, E. H., Murphy, L. A., Dennerlein, J. T., Fang, D., Katz, J. N., & Caban-Martinez, A. J. (2015). Development and validation of a fatigue assessment scale for US construction workers. *American Journal of Industrial Medicine*, *58*(2), 220–228. https://doi.org/10.1002/ajim.22411

Appendix A: Vigour Assessment Scale (VAS)

Please circle a rating for each of the following items as they applied in your life during the past 7 days:

	None of the time	Some-times	Often	Most of the time
1. I have had difficulty in getting started with everyday activities during the past 7 days	1	2	3	4
2. I have been active and on the move during the past 7 days	1	2	3	4
3. I have been **uninterested** in doing everyday activities during the past 7 days	1	2	3	4
4. I have initiated new plans during the past 7 days	1	2	3	4
5. During the past 7 days I have felt like giving up when things go wrong	1	2	3	4
6. I have been carrying out my plans during the past 7 days	1	2	3	4
7. It has taken a lot of effort to get going during the past 7 days	1	2	3	4
8. I have been productive during the past 7 days	1	2	3	4
9. I have felt too tired to do anything during the past 7 days	1	2	3	4
10. During the past 7 days, I have been strongly motivated to achieve my goals	1	2	3	4
11. I have been **uninterested** in doing my work, tasks, or hobbies during the past 7 days	1	2	3	4
12. During the past 7 days, I felt energised to do my work or tasks	1	2	3	4
13. During the past 7 days, I have stopped doing activities that I usually do	1	2	3	4
14. I have attempted to make a difference during the past 7 days	1	2	3	4
15. During the past 7 days, I have been postponing tasks until the last minute or left them incomplete	1	2	3	4
16. I have been excited during the past 7 days about doing things	1	2	3	4
17. During the past 7 days, time has disappeared while I did nothing	1	2	3	4
18. I have been really into my tasks or work during the past 7 days	1	2	3	4
19. During the past 7 days, I have been **uninterested** to speak to others	1	2	3	4
20. I made choices and went for them during the past 7 days	1	2	3	4
21. During the past 7 days, I have been **uninterested** in the company of other people	1	2	3	4
22. During the past 7 days, I have been going for the things I want	1	2	3	4
23. I have been listless and passive, not wanting to do things during the past 7 days	1	2	3	4
24. I have initiated contact with friends or family during the past 7 days	1	2	3	4

25. I have been slow in doing everyday activities during the past 7 days	**1**	**2**	**3**	**4**
26. I have taken action during the past 7 days to reach my goals	**1**	**2**	**3**	**4**
27. The feelings of my friends or family members have been **unimportant** to me during the past 7 days	**1**	**2**	**3**	**4**
28. I was active in doing my tasks and work during the past 7 days	**1**	**2**	**3**	**4**
29. During the past 7 days, I have kept on hold the problems and challenges in my life	**1**	**2**	**3**	**4**
30. During the past 7 days, I have been pursuing my daily goals	**1**	**2**	**3**	**4**
31. I have felt weak when doing ordinary things during the past 7 days	**1**	**2**	**3**	**4**
32. The tasks I have been doing during the past 7 days, have purpose and meaning	**1**	**2**	**3**	**4**
33. I have felt incapable of doing usual things during the past 7 days	**1**	**2**	**3**	**4**
34. I have been eager to do tasks during the past 7 days	**1**	**2**	**3**	**4**
35. I have had difficulty in coming to decisions on what to do during the past 7 days	**1**	**2**	**3**	**4**
36. I have been highly driven during the past 7 days	**1**	**2**	**3**	**4**
37. During the past 7 days, I have delayed before starting on work or tasks I had to do	**1**	**2**	**3**	**4**
38. I have been doing creative things during the past 7 days	**1**	**2**	**3**	**4**
39. During the past 7 days, I have been postponing decisions that had to be made	**1**	**2**	**3**	**4**
40. I have felt inspired to do my tasks or work during the past 7 days	**1**	**2**	**3**	**4**
41. During the past 7 days, I have been back and forth in my mind on what to do	**1**	**2**	**3**	**4**
42. I have pushed through and persevered with my tasks or work during the past 7 days even when it got tough	**1**	**2**	**3**	**4**
43. During the past 7 days, I have been interested in my personal hygiene or grooming **less than other people** are	**1**	**2**	**3**	**4**
44. During the past 7 days, I have attempted to improve things in my life	**1**	**2**	**3**	**4**
45. During the past 7 days, I have spent time watching TV or shows on the internet	**1**	**2**	**3**	**4**
46. During the past 7 days, I have returned communications like phone calls, messages and e-mails without delay	**1**	**2**	**3**	**4**
47. During the past 7 days, I have asked people about their feelings	**1**	**2**	**3**	**4**
48. I have taken an interest in new things during the past 7 days	**1**	**2**	**3**	**4**

Scoring instructions: Subtract the total of Category B from Category A

Minimum Score: 25-92= -67

Maximum Score: 100-23= 77

Please circle a rating for each of the following items as they applied in your life during the past 7 days:

	None of the time	Some-times	Often	Most of the time
1. I have been active and on the move during the past 7 days	**1**	**2**	**3**	**4**
2. I have initiated new plans during the past 7 days	**1**	**2**	**3**	**4**
3. During the past 7 days, I felt energised to do my work or tasks	**1**	**2**	**3**	**4**
4. I have been excited during the past 7 days about doing things	**1**	**2**	**3**	**4**
5. I have been really into my tasks or work during the past 7 days	**1**	**2**	**3**	**4**
6. During the past 7 days, I have been **uninterested** to speak to others	**1**	**2**	**3**	**4**
7. I made choices and went for them during the past 7 days	**1**	**2**	**3**	**4**
8. During the past 7 days, I have been **uninterested** in the company of other people	**1**	**2**	**3**	**4**
9. During the past 7 days, I have been going for the things I want	**1**	**2**	**3**	**4**
10. I have been slow in doing everyday activities during the past 7 days	**1**	**2**	**3**	**4**
11. I have taken action during the past 7 days to reach my goals	**1**	**2**	**3**	**4**
12. I was active in doing my tasks and work during the past 7 days	**1**	**2**	**3**	**4**
13. During the past 7 days, I have been pursuing my daily goals	**1**	**2**	**3**	**4**
14. I have felt weak when doing ordinary things during the past 7 days	**1**	**2**	**3**	**4**
15. The tasks I have been doing during the past 7 days, have purpose and meaning	**1**	**2**	**3**	**4**
16. I have been eager to do tasks during the past 7 days	**1**	**2**	**3**	**4**
17. I have had difficulty in coming to decisions on what to do during the past 7 days	**1**	**2**	**3**	**4**
18. I have been highly driven during the past 7 days	**1**	**2**	**3**	**4**
19. During the past 7 days, I have delayed before starting on work or tasks I had to do	**1**	**2**	**3**	**4**
20. I have been doing creative things during the past 7 days	**1**	**2**	**3**	**4**

21. During the past 7 days, I have been postponing decisions that had to be made	**1**	**2**	**3**	**4**
22. I have felt inspired to do my tasks or work during the past 7 days	**1**	**2**	**3**	**4**
23. During the past 7 days, I have been back and forth in my mind on what to do	**1**	**2**	**3**	**4**
24. I have pushed through and persevered with my tasks or work during the past 7 days even when it got tough	**1**	**2**	**3**	**4**
25. During the past 7 days, I have attempted to improve things in my life	**1**	**2**	**3**	**4**
26. During the past 7 days, I have returned communications like phone calls, messages and e-mails without delay	**1**	**2**	**3**	**4**
27. I have taken an interest in new things during the past 7 days	**1**	**2**	**3**	**4**

Scoring instructions: Subtract the total of Category B from Category A

Minimum Score: 19-32= -13

Maximum Score: 76-8= 68

Appendix C: Invigoration task handout

Invigorate with Imagery

Imagine yourself in a situation where you'd like to be...

What do you see?

What do you feel?

What do you do?

Yellow background image: All White Background (n.d.)

INVIGORATION LAUNCH PAD

Ask yourself:

1. "What do I tell myself now about doing what I want to do now?"
2. "How do I need to change what I tell myself now to take action now in my life and do now more of the things I want to do"?

Tell yourself:

1. "I can choose and do choose to tell myself activating things"
2. "I believe what I tell myself and want to charge up and energise what I do by choosing to tell myself activating things and quash the things that I tell myself that hold me back."
3. "I quash thoughts that hold me back in doing what I want to do"
4. "I will do it now rather than later even if I do not feel like doing it now"
5. "I can do more now – I can surprise myself"
6. "I will do more now and will surprise myself"
7. "I am interested in everything that comes my way"
8. "Let's find something interesting to do"
9. "Let's get to know something new"
10. "It does not take that much effort – let's do it and carry on till it's done"
11. "I have more energy and umph than I have thought moments ago"
12. "Even if not fully committed, I will take action bit by bit, everyday"

Rocket launch image: NASA (n.d.)

Appendix D: Approval letter from CEO to conduct the study

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

Weskoppies Hospital facility Research approval

The approval is subject to approval by the Ethics Committee of the University of Pretoria

APPROVAL BY HOSPTAL CHIEF EXECUTIVE OFFICER

I **Mrs. M.A. Mabena** Chief Executive Officer / Superintendent of **Weskoppies Hospital**, hereby agree that this research/evaluation be conducted in **Weskoppies hospital**.

The officer conducting the traiï will be: **Antonia Roos**

Research title: **VALIDITY AND RELIABILITY OF THE VIGOUR ASSESSMENT SCALE (VAS) AND INVIGORATION TASKS IN REMITTED BUT AVOLITIONAL SCHIZOPHRENIA**

Institution: **Weskoppies Hospital**

Supervisor: **PROF C.W VAN STADEN**

HOSPITAL CEO / Superintendent			Date		
Signature	Initial(s)	Surname	Day	Month	Year
	MA	**Mabena**	**13**	**07**	**2017**

Appendix E: Ethics approval certificates

<table>
<tr>
<td>
The Research Ethics Committee, Faculty Health Sciences, University of Pretoria complies with ICH-GCP guidelines and has US Federal wide Assurance.

• FWA 00002567, Approved dd 22 May 2002 and Expires 03/20/2022.

• IRB 0000 2235 IORG0001762 Approved dd 22/04/2014 and Expires 03/14/2020.
</td>
<td>
UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
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Faculty of Health Sciences Research Ethics Committee

27/07/2017

Approval Certificate
New Application

Ethics Reference No: 299/2017

Title: Validity and reliability of the Vigour Assessment Scale and invigoration tasks in remitted but avolitional schizophrenia

Dear Miss Antonia Roos-Dlagnekova

The **New Application** as supported by documents specified in your cover letter dated 8/07/2017 for your research received on the 21/07/2017, was approved by the Faculty of Health Sciences Research Ethics Committee on its quorate meeting of 26/07/2017.

Please note the following about your ethics approval:
*   Ethics Approval is valid for 3 years
*   Please remember to use your protocol number (**299/2017**) on any documents or correspondence with the Research Ethics Committee regarding your research.
*   Please note that the Research Ethics Committee may ask further questions, seek additional information, require further modification, or monitor the conduct of your research.

Ethics approval is subject to the following:
*   The ethics approval is conditional on the receipt of **6 monthly written Progress Reports**, and
*   The ethics approval is conditional on the research being conducted as stipulated by the details of all documents submitted to the Committee. In the event that a further need arises to change who the investigators are, the methods or any other aspect, such changes must be submitted as an Amendment for approval by the Committee.

Additional Conditions:
*   Approval is conditional upon the Research Ethics Committee receiving permissions from CEO of Weskoppies Hospital.

We wish you the best with your research.

Yours sincerely

Dr R Sommers; MBChB; MMed (Int); MPharMed,PhD
Deputy Chairperson of the Faculty of Health Sciences Research Ethics Committee, University of Pretoria

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The Faculty of Health Sciences Research Ethics Committee complies with the SA National Act 61 of 2003 as it pertains to health research and the United States Code of Federal Regulations Title 45 and 46. This committee abides by the ethical norms and principles for research, established by the Declaration of Helsinki, the South African Medical Research Council Guidelines as well as the Guidelines for Ethical Research: Principles Structures and Processes, Second Edition 2015 (Department of Health).

☎ 012 356 3084   ✉ deepeka.behari@up.ac.za / fhsethics@up.ac.za   🖝 http://www.up.ac.za/healthethics
✉ Private Bag X323, Arcadia, 0007 - Tswelopele Building, Level 4, Room 60, Gezina, Pretoria

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Health Sciences Research Ethics Committee

1/02/2018

Approval Certificate
Amendment
(to be read in conjunction with the main approval certificate)

Ethics Reference No: 299/2017

Title: Validity and reliability of the Vigour Assessment Scale and invigoration tasks in remitted but avolitional schizophrenia

Dear Miss Antonia Roos-Dlagnekova

The **Amendment** as described in your documents specified in your cover letter dated 6/01/2018 received on 8/01/2018 was approved by the Faculty of Health Sciences Research Ethics Committee on its quorate meeting of 31/01/2018.

Please note the following about your ethics amendment:
- Please remember to use your protocol number (**299/2017**) on any documents or correspondence with the Research Ethics Committee regarding your research.
- Please note that the Research Ethics Committe may ask further questions, seek additional information, require further modification, or monitor the conduct of your research.

Ethics amendment is subject to the following:
- The ethics approval is conditional on the receipt of **6 monthly written Progress Reports**, and
- The ethics approval is conditional on the research being conducted as stipulated by the details of all documents submitted to the Committee. In the event that a further need arises to change who the investigators are, the methods or any other aspect, such changes must be submitted as an Amendment for approval by the Committee.

We wish you the best with your research.

Yours sincerely

Dr R Sommers; MBChB; MMed (Int); MPharMed; PhD
Deputy Chairperson of the Faculty of Health Sciences Research Ethics Committee, University of Pretoria

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✉ Private Bag X323, Arcadia, 0007 - Tswelopele Building, Level 4, Room 60 / 61, 31 Bophelo Road, Gezina, Pretoria

144