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The validity of a therapeutic invigoration task in avolitional schizophrenia outpatients

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Abstract

Background and Objectives: Avolition is associated with much morbidity and functional impairment in schizophrenia patients. Vigor may be taken as, in part, the inverse of avolition, but it has not been investigated as a therapeutic pursuit before. To this end, a therapeutic invigoration task was developed drawing on cognitive-behavioral and guided imagery therapies. This study investigated the validity and reliability of a therapeutic invigoration task in avolitional residual phase schizophrenia outpatients.

Methods: In a proof-of-concept quasi-experimental one-group sequentially repeated pretest/posttest study design, patients ($n = 76$) participated in a structured invigoration task that was repeated after 1 month ($n = 70$).

Results: Patients' vigor during the preceding 7 days measured on the Vigor Assessment Scale increased highly significantly in anticipation of the subsequent 7 days on both occasions with respectively very large (Cohen's δ with Hedges' correction [δ] = 1.46) and large ($\delta = 1.04$) effect sizes. The anticipated vigor after the first occasion was partially consummated during the subsequent month in that vigor during the 7 days preceding the second occasion was lower than participants had anticipated but still significantly higher than at baseline ($p < 0.001$; $\delta = 0.70$). Repeating the task a month later, together with homework,

had a cumulative effect as indicated by a very large effect size ($\delta = 1.61$).

Conclusion: Results suggest that the invigoration task did what it was supposed do, and did so consistently, in patients with avolitional residual schizophrenia. These results warrant a subsequent randomized controlled trial to establish the efficacy of the invigoration task.

KEYWORDS

avolition, cognitive-behavioral therapy, negative symptoms, psychotherapy, residual schizophrenia, treatment, vigor

1 | INTRODUCTION

Avolition has been considered the core negative symptom of schizophrenia (Strauss et al., 2021) and may account for various negative symptoms (Foussias & Remington, 2010). Behaviorally, avolition concerns the reduction in self-initiated and purposeful acts, fewer activities in work, recreation or leisure, as well as diminished social engagement (Carpenter & Buchanan, 2017; Messinger et al., 2011). Avolition is a major problem for individuals with schizophrenia owing to persistent loss in motivation to initiate or persevere in goal-directed behavior, even after they have been clinically stabilized (Barch & Dowd, 2010). 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 et al., 2010). The presence of avolition in the residual phase of schizophrenia renders these individuals vulnerable to poor psychosocial outcomes in the long term (Foussias et al., 2009; Marder & Galderisi, 2017).

Avolition impacts negatively on psychotherapy and limits its feasibility, notwithstanding previously reported psychotherapeutic gains in schizophrenia. Psychosocial and cognitive-behavioral interventions typically target positive symptoms (Kane et al., 2019). A systematic review of various kinds of psychotherapies in treatment-resistant schizophrenia, most of which were cognitive-behavioral, found that there was significant improvement in positive symptoms whereas negative symptoms remained a challenge (Polese et al., 2019) or for which results were tentative at best (Thonon et al., 2020). It may not be surprising that interventions mostly target positive symptoms, considering the impeding effects of avolition on a person's capacity for active participation in therapy sessions.

Considering the challenges posed by avolition and the limitations of current treatments for avolition, new treatment approaches should be examined. Vigor may be taken as, in part, the inverse of avolition, which has not been investigated as a therapeutic pursuit before (Dlagnekova et al., 2021). Vigor is a concept congruent with positive psychology terms of motivation, engagement, vitality, and curiosity. Vigor may be associated with creativity, proactivity, taking initiative, and the procurement of resources necessary for survival (Louw, 2014; Watson, 2002).

Vigor may be a sensible pursuit in a full course of psychotherapy but may also be taken up as a therapeutic task. The modest scope of a task as an intervention offers the advantages of requiring fewer resources and that vigor may be examined as a specific focus rather than being complicated by the multiple concurrent changes that are relevant for a full course of psychotherapy. Tasks in schizophrenia have been examined in assessments and neuro-cognitive training (Gold et al., 2013; Krawczyk et al., 2020; Moritz et al., 2020; Niv et al., 2007; Strauss et al., 2016; Zénon et al., 2016), but these do not include a focused therapeutic task that targets vigor specifically. Closest to examining an invigoration task in the schizophrenia population have been studies concerning the speed of response

and the role of social motivation in cognitive-reward interaction tasks (Fulford et al., 2018). Results of the latter suggested that participants were more motivated by the practitioner's encouragement in task sessions than by nonsocial incentives.

Interventions aiming specifically to induce vigor in patients with schizophrenia have not yet surfaced in literature. The closest interventions have not been specific to schizophrenia and are limited to work-related settings (Abrantes et al., 2012; Kinnafick et al., 2014; Lane et al., 2003; Lewis et al., 2016; Rokka et al., 2010). Vigor may nonetheless be implicitly pursued in, for example, bodily oriented psychological interventions (Priebe et al., 2013; Savill et al., 2015).

To address this need for an intervention, a therapeutic task was designed to induce vigor by drawing on the principles of cognitive-behavior therapy and guided imagery. Whether this task is efficacious will require it being tested in a randomized controlled way. A preceding proof-of-concept study that first establishes that the intervention is valid and reliable may serve to justify resources for a full efficacy study. Moreover, an efficacy study may be stronger by building on a proof-of-concept study that has first investigated whether the intervention does what is supposed to do and whether it does so consistently, before the randomized controlling in an efficacy study for potential confounding factors.

For these reasons, this study aimed to examine the validity and reliability of a therapeutic invigorating task in avolitional schizophrenia outpatients in the residual phase. The study population was specified as being avolitional schizophrenia in the residual phase as to warrant the intervention yet exclude the influence of positive symptoms.

2 | METHODS

2.1 | Design and participants

Vigor was set as the outcome criterion in a proof-of-concept quasi-experimental one-group sequentially repeated pretest/posttest study design (see Figure 1). Participants were outpatients with avolitional schizophrenia in the residual phase, recruited and conveniently sampled while attending for routine prebooked follow-up appointments. The outpatient services are situated at a large public sector psychiatric hospital in Pretoria, South Africa, to which all participants had previously been admitted. This is a referral hospital from other hospitals when their services and facilities are inadequate, providing thus for more challenging patients within a catchment population of about four million people. About 1200 outpatients attend here each month for whom less specialized services elsewhere would be inadequate. In liaison with the treating psychiatrists, potential participants were approached over a period of 7 months twice weekly by one of us (AD) Few declined, usually owing to time constraints in catching transport back home.

For inclusion, participants needed to be at least 18 years of age, diagnosed with schizophrenia in partial remission as defined by the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5). The partial remission qualifier was further specified by the DSM-IV definition of the residual phase (which is not defined in DSM-5) whereby nonremitting features were restricted to “only negative symptoms or by two or more symptoms listed in Criterion A present in an attenuated form,” thus excluding the potential confounding effects of acute phase symptoms. The initial working diagnosis made by the clinical team was verified for each of the diagnostic criteria and the specifiers before inclusion.

Avolition was defined on the Positive and Negative Syndrome Scale (PANSS), requiring a rating of 3 or more on item G13 (disturbance of volition) and a minimum score of 10 for the sum of items G13, N4 (passive/apathetic social withdrawal) and N2 (emotional withdrawal) (Kay et al., 1987). The G13 item labeled “disturbance of volition” and described as a “disturbance in the willful initiation, sustenance, and control of one's thoughts, behavior, movements and speech” was not taken as a sufficient criterion for avolition considering this item's overlap with ambivalence and the results of a two-factor model in which it clustered both with expressive deficits (reflecting a

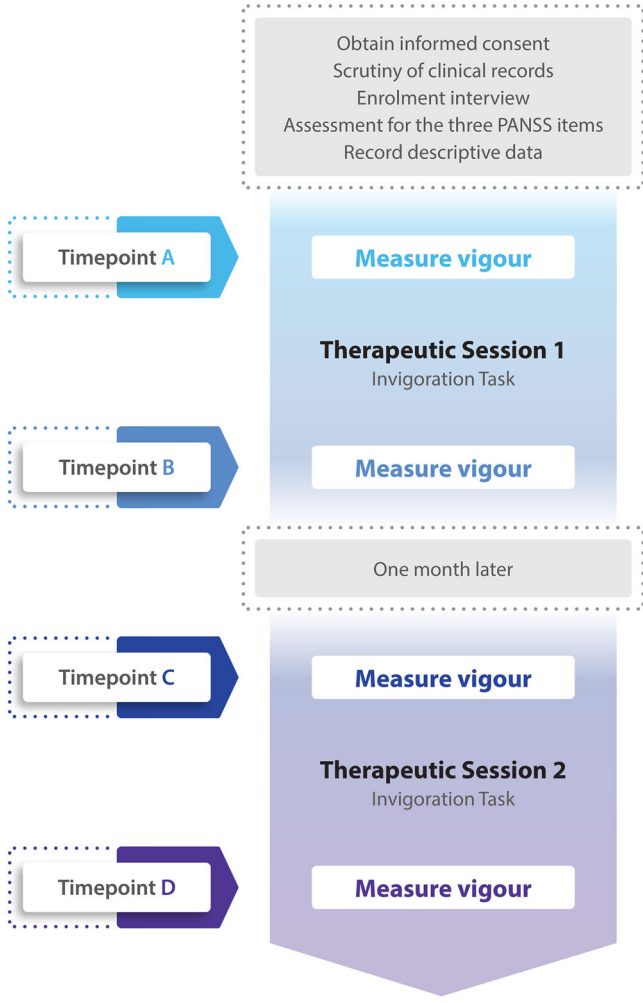

FIGURE 1 Diagram of the study design and process.

loss of initiative), as well as the second-factor reflecting social amotivation (but with a lower loading) (Liemburg et al., 2013). Instead, a composite inclusive criterion was adopted as to ensure that participants would be avolitional even when overlapping with other negative symptoms. To ensure that ratings on these items were adequately informed, an interview and observation guide (available from authors) was applied in addition to obtaining information from clinical records, nursing personnel, and family. Participants were further required to be in a stable condition as indicated by unaltered medication dosages during the preceding 3 months, as self-reported and recorded in the clinical notes.

Participants were excluded if they were in an acute phase of schizophrenia as defined by DSM-5, diagnosed with a prominent comorbid psychiatric disorder, and if an illicit substance use or a history of a substance use disorder during the preceding 3 months was self-reported or noted in the clinical records. Further exclusion criteria were the presence of unstable or significant medical disorders, a past head injury with neurological sequelae or causing loss of consciousness, and intellectual disability.

Before data collection, the required sample size was calculated as 67 for detecting an effect size of 0.35 (Cohen's δ) when setting the chance for a Type I error (i.e., falsely finding statistical significance) at 5% and the

chance for a Type II error (i.e., falsely missing statistical significance) at 20% (i.e., power of 80%). In this calculation, a small effect-size that requires a larger sample size, rather than a large effect-size that requires a smaller sample size, was chosen to mitigate the challenges of sample size calculations for a one group proof-of-concept design using standardized effect sizes (Beck, 2013; Lenth, 2001).

2.2 | Variables and outcome instrument

Demographic variables in the study were age, gender, and highest level of education. Major life events and a change in prescribed medication were recorded for the 3 months preceding the study and the month between the two intervention points.

For an outcome instrument, the Vigor Assessment Scale (VAS) was used (Dlagnekova et al., 2021), which is a self-report instrument comprising 27 items, formulated to measure vigor with both positive (being present) and negative (being absent) items. Each item is rated on a four-point Likert scale according to the frequency of the experience during the preceding 7 days (1 = *None of the time*, 2 = *Sometimes*, 3 = *Often*, 4 = *Most of the time*). The total score is calculated by subtracting the subtotal of Category A (absence of vigor) items from the subtotal of Category B (presence of vigor) items. The total score can theoretically range between a minimum of −13 and a maximum of 68, with a standard error of measurement being less than 5.1. To prevent acquiescence bias, the positive and negative items are interspersed on the response sheet. The VAS was designed specifically for use in the schizophrenia population and showed good psychometric properties among 242 participants, as evidenced by its convergent and discriminant validity, internal consistency (Cronbach's $\alpha = 0.82$), split-half ($r = 0.72$) and test–retest ($r = 0.8$) reliability, and a clear six-factor correlational structure being Task Drive, Indecisiveness, Social Disinterest, Active Mobilization, Creative Efforts, and Torpidity.

The VAS was administered before and after the completion of the invigoration task on two occasions a month apart. This means it was administered at four timepoints (A, B, C, and D)—see Figure 1. To assess participants' vigor after completing the task each time (at timepoints B and D), the VAS-items were rephrased from past tense to future tense, capturing thus anticipated vigor as the vigor during the preceding 7 days would not be apt at timepoints B and D, with the content of the items remaining otherwise identical.

Performing the task again a month later ensured that the measuring instruments were identical at points A and C regarding vigor during the preceding 7 days, and identical at points B and D regarding anticipated vigor. The period of a month was also chosen for examining endurance of an effect for at least a month and because it did not incur extra resources and a travel burden for patients who attend monthly for their routine clinical appointments.

2.3 | The imagery-cognitive invigoration task

Each participant was engaged individually by the same therapist (i.e., one of us, AD) in the invigoration task during two sessions spaced 1 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-behavioral component. Each session first used imagery to invoke vigor, followed by a cognitive restructuring and behavioral reinforcement component. The imagery component invited the generation of two images: one pertaining to the state of being inspired or motivated, and the other image was action-based, imagining oneself in vigorous action. The duration of each session was approximately 20 min. Summarized next but with details available from the authors in a supplementary document, are the theoretical underpinnings of the invigoration task, its step-by-step process, the two-sheet guide to participants, and the guide for the therapist to overcome possible hurdles during the task.

2.3.1 | Theoretical underpinnings of the invigoration task

The task was developed in line with principles of strengths-based cognitive behavior therapy (SB-CBT) (Padesky & Mooney, 2012), mental imagery (Blackwell, 2021; Blankert & Hamstra, 2017; Callow et al., 2001; Kosslyn et al., 2001; Renner et al., 2019; Turan et al., 2019; Wilson et al., 2018), mindfulness (Crane et al., 2017; Kabat-Zinn, 2015), and savoring (Bryant & Veroff, 2017; Cassar et al., 2013). Visualization principles were adapted to the task, where the imagery was tailored to invigorate participants. The task sessions were structured, standardized and time-limited, focusing on immediate improvement in participants' vigor. The task provided a balance of structure and space for the participants to bring forth that which was important to them. The therapist followed the participant as far as possible and prioritized their agency-taking over compliance (Constantino et al., 2018). This relational approach was applied throughout the task design and its execution, deliberately incorporating active listening, motivational interviewing, and the pursuance of the participant experiencing empathic understanding by the therapist (Norcross & Lambert, 2018).

In line with CBT principles, the task was designed to induce vigor in the context of avolitional difficulties. The therapist served as assistant to the participant in becoming aware of self-talk and actively work on telling themselves more helpful thoughts in pursuit of employing self-authored invigorating cognitive styles and beliefs. In line with a person-centered approach (Christodoulou et al., 2016), strengths-based CBT was used in eliciting that which invigorates a particular person. This encouraged increased ownership and participation in the treatment, more so than would have been afforded by a mere prescriptive task.

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 adopted a more delineated attentional focus. The visualization component called for a sharpened awareness of the imagery in its different sensory modalities. Prepared by a state of calmness, the mindful visualization in evoking imagery required an intentional focus concordant with vigor. The cognitive component drew on mindfulness by prompting participants to become aware of their self-talk without judgment but instead with full acknowledgment of their thinking being so. This was followed by becoming aware of elements in their thinking that would need to change with the view to increase their vigor, as well as an awareness of their own particular cognitive strategies for invigoration.

2.3.2 | Procedures of the invigoration task

Premised on an attitudinal stance designed to invoke as much vigor during the sessions as possible, each session began with an encouraging opening, with a linguistic style appropriate to this end. This was followed by setting the scene for what vigor 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 vigor, thereby familiarizing them with vigor. Once it was clear that participants grasped the “feel” of the concept of vigor, the course of the sessions was described further.

By using mobilizing words, participants were primed to become active in creating images. A sense of togetherness was suggested, akin to a travel partner, by which to assist participants with becoming immersed into the imagery while continually engaging with the practitioner. Once participants had an image in mind of where they were inspired or motivated, they were requested to share this with the therapist, after which the therapist assisted in adding vividness to the image by prompting an awareness of their sense experiences in the imagined situation. The prompts maintained an attitude of encouragement to elaborate spontaneously. Once the first imagery component had been built to the full in terms of setting, motivation, and feeling, the second imagery component was invited. At this next level, participants imagined themselves taking vigorous action. Once participants had completed the imagery task, their efforts were acknowledged and they were encouraged to perform the imagery task on their own during homework. This is typical practice in CBT aiming for the generalization of the imagery to

their real-world experiences and to reinforce the gains of the task by practising on their own. A laminated handout guided the homework component, which was headed as "Invigorate with Imagery" and captured the cues with which participants had already been acquainted experientially during the task, prompting as follows: "Imagine yourself in a situation where you'd like to be…."; and then the subsequent questions "what do you see?", "what do you feel?", and "what do you do?".

The cognitive-behavioral component followed next by which cognitive patterns were restructured as to become invigorating and the imagery exercises were mobilized into invigorated activity. After introducing and explaining the cognitive component's principles, participants were directed to the backside of the laminated handout. This side was titled "Invigoration Launchpad." It displayed a picture of a spaceship being launched and contained the cognitive component's main points that were followed during the cognitive-behavioral component of the session. It prompted participants to first "ask yourself" and then to "tell yourself." The former questions were "what do I tell myself now about doing what I want to do now?" and "how do I need to change what I tell myself now to take action now in my life and do more of the things I want to do." Examples from the 12 "tell yourself" instructions were: "I can choose and do choose to tell myself activating things" and "I can and will do more now—I can and will surprise myself."

As homework, participants were requested to carry the handout with them, read it, and follow the prompts as frequently as possible, until their second session 1 month later.

2.3.3 | Overcoming possible hurdles during the invigoration task

A guide had been devised for anticipated hurdles that may be encountered during the sessions (available from the authors). For example, participants may focus on the pursuit of an end goal and may depend on the attainment thereof before experiencing vigor. Where this may be the case, they would be reminded that the focus is on bringing life to the invigorated experience that happens during the active *pursuit/doing* rather than passive *having*. Other possible hurdles included participants who would visualize something that is not possible, difficulties with constructing an image, challenges to understanding the role of self-talk on one's state of mind, difficulty in connecting with the pointers outlined in the task, and being stuck in pacifying thought patterns.

2.4 | Research procedures and ethics approval

Written informed consent to participate in the study was obtained from each participant using a study-specific informed consent document as approved by the research ethics committee. The study was performed in accordance with the 2013-version of the Declaration of Helsinki, and prior ethics approval had been obtained from the legally accredited Faculty of Health Sciences Research Ethics Committee at the University of Pretoria, South Africa.

Willing participants were interviewed and their clinical records were assessed for meeting the inclusion and exclusion criteria. Diagnostic requirements were assessed first, for which a purpose-designed tick sheet was used. To inform observer ratings on selected items of the PANSS (N2, N4, and G13), an interview and observation guide obtained information from the patient, clinical records, nursing personnel, and family. Both of us are well-trained to perform these diagnostic interviews and in applying the PANSS. Demographic and clinical information was then recorded. Participants completed the VAS immediately before doing the invigoration task and again following the session. The task was performed again a month later with the encouragement to do homework in between. Vigor was assessed thus at four points in time before and after each session.

2.5 | Statistical analyses

A one-way analysis of variance was used in comparing the descriptive variables and the total VAS scores. The validation testing examined whether the task brought about a change between the four time points of assessment—see Figure 1. The four points of vigor assessment allow for comparisons in six pairs, which were as follows:

Pair 1: Pretask 1 and posttask 1 (time points A and B). This comparison examined whether the task did what it was supposed to do by a change in vigor before and immediately after the first participation in the task.

Pair 2: Pretask 1 and pretask 1 (time points A and C). This comparison examined whether the task including the "homework") did what it was supposed to do as a change in vigor from the baseline before the first participation in the task to a month later before repeating the task. This comparison also reflects whether the task did what it was supposed to do in a lasting way. This comparison further mitigated the potential difference between the actual vigor during the preceding 7 days and the anticipated vigor respectively before and after the first invigoration task.

Pair 3: Posttask 1 and pretask 2 (time points 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 vigor after participation in the task for the first time and the vigor in the week preceding participation in the task for the second time.

Pair 4: Pretask 2 and posttask 2 (time points C and D). This comparison examined whether the task did what it was supposed to do on a second occasion 1 month later.

Pair 5: Posttask 1 and posttask 2 (time points B and D). This comparison examined whether the task including the homework did what it was supposed to do by changing anticipated vigor 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 or were less than the effects of participation in the task the first time.

Pair 6: Pretask 1 and posttask 2 (time points A and D). This comparison examined whether the task did what it was supposed to do by changing vigor between the baseline and after completion of the task for a second time inclusive of the "homework" a month later.

For examining the validity of the invigoration task, paired *t*-tests were performed and effect sizes were calculated using Cohen's δ with Hedges' correction for each of the abovementioned six comparison pairs, as each comparison addressed a specific aspect of validity. For the effect of the overall intervention across the four assessment points, a multivariate analysis for repeated measures was performed.

While the validity testing of the invigoration task examined whether it had the effect it was supposed to have, the reliability testing examined whether its effect was consistent. This may be inferred from validity results being consistent on the two occasions, a similar extent of changes on both occasions, and rather indirectly, the correlations between measurements at the four time points of assessment. The 27th edition of SPSS was used for the analyses.

3 | RESULTS

3.1 | Descriptive features

Seventy-six participants completed the first task, of whom 70 turned up for the second task a month later. Reasons for the six participants not participating in the second task were that one moved home away from the city, one lacked money to travel, and four missed their appointments and thus exceeded the 1-month window period specified in the study design. Age, gender, and educational characteristics of the participants are presented in Table 1. Vigor scores were not significantly different for gender, age, or highest level of education, even though there were slightly more male participants (56.6%) than females, and most participants (76%) had no more than a high school education. Age did not correlate significantly with vigor (Spearman's $\rho = 0.004$; $p = 0.974$). The

TABLE 1 Descriptive comparisons of vigor.

				Vigor between groups at time point A		
n = 76		Frequency	Percent (%)	*F*-statistic	Degrees of freedom	Significance
Gender	Male	43	56.6	0.28	1	$p = 0.599$
	Female	33	43.4			
Highest level of education	Grade 8	1	1.3	0.362	3	$p = 0.781$
	Grade 10	19	25			
	Grade 12	38	50			
	Graduates	18	23.7			
Age: Mean = 35.59 (95% confidence interval: 33.0–38.2)	18–29	29	38.2	1.221	33	$p = 0.278$
	30–39	24	31.6			
	40–49	12	15.8			
	50–59	9	11.8			
	60–69	2	2.6			

composite avolition score on the three PANNS items (mean = 12.25; SD = 2.568) correlated inversely and weakly with the vigor score at baseline (Spearman's $\rho = -0.380$).

Participants were mostly unemployed ($n = 69$; 90.8%), living with their family ($n = 59$; 77.6%), or at an institution of care ($n = 17$; 22.4%). The average number of years since their first psychotic episode was 9.54 (SD = 7.85), and the average number of previous hospital admissions was 2.27 (SD = 1.18). Their antipsychotic medication comprised of a combination of a parenteral depot and an oral compound ($n = 12$; 15.8%), only a parenteral depot ($n = 39$; 51.3%), or only an oral compound ($n = 25$; 32.9%). The most prescribed parenteral depot preparations were flupenthixol decanoate ($n = 28$; 36.8%) and zuclopenthixol decanoate ($n = 19$; 25%). The most prescribed oral antipsychotic medications were olanzapine ($n = 14$; 18.4%), clozapine ($n = 10$; 13.2%), and risperidone ($n = 9$; 11.8%). The anticholinergic, orphenadrine was prescribed for 15 participants (19.7%). No participant received psychotherapy concurrently. Comorbidities were diabetes mellitus ($n = 3$) and hypertension ($n = 1$).

No medication changes were made during the 3 months before the first therapeutic task, nor during the study period. No major life events that could have confounded effects were reported and the condition of all participants remained stable without any safety issues emerging.

3.2 | Validity of the invigoration task

Table 2 presents the means and 95% confidence intervals for the vigor scores for all 76 participants and the 70 who turned up for the second task a month later at each point of assessment. The changes across the four points of assessment are presented visually in Figure 2. For each of the comparison pairs, the differences were statistically significant, as shown in Table 3. Participants' vigor increased significantly from baseline to completing the task a second time with a very large effect size (see Comparison Pair 6), and each time they completed the task with respectively very large and large effect sizes (see comparison pairs 1 and 4). A month after the first task, their vigor declined (see comparison pair 3) but it remained significantly higher than at baseline with a medium effect size (see comparison pair 2). Vigor after the second task was significantly higher than after the first task with a medium effect size (see comparison pair 5). A multivariate model for repeated measures accounting for the changes in vigor across

TABLE 2 Descriptive statistics for Vigor scores before and after the tasks.

Point of assessment	*n*	Total mean (Standard deviation)	95% confidence interval of the Mean	
Time point A: Pretask One	76	29.55 (15.36)	26.14	32.94
	70	28.71 (14.73)	25.33	31.91
Time point B: Posttask One	76	46.66 (13.42)	43.51	49.67
	70	46.16 (13.42)	42.66	49.28
Time point C: Pretask Two	70	38.67 (12.44)	35.66	41.55
Time point D: Posttask Two	70	51.09 (11.31)	48.68	53.39

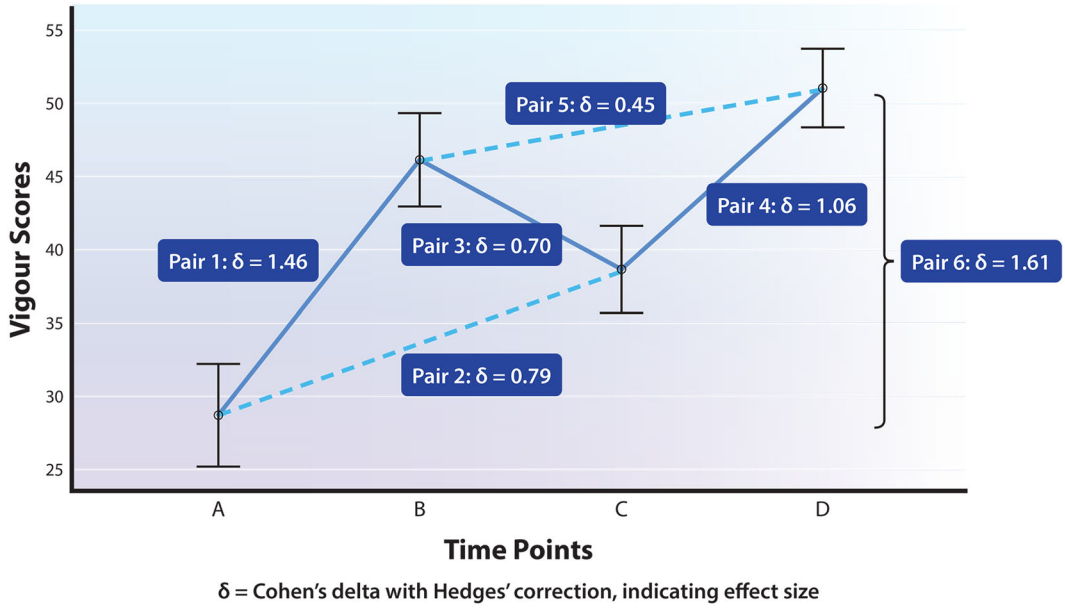

FIGURE 2 Mean vigor scores with 95% confidence intervals.

the four time points of assessment was statistically highly significant ($F = 84.078$, $df = 3$, $p < 0.001$, partial $\eta^2 = 0.79$). It remained highly significant when the composite avolition score was included as covariate in the model ($F = 6.455$, $df = 3$, $p < 0.001$, partial $\eta^2 = 0.23$) in which this covariate did not contribute significantly to the changes in vigor scores ($F = 1.689$, $df = 3$, $p = 0.178$, partial $\eta^2 = 0.071$).

3.3 | Reliability of the invigoration task

The results for testing whether the task performed consistently across the time points are seen in significant increases in vigor scores at both occasions, that the extent of change was similar on both occasions (with differences in the means being respectively 17.11 and 12.41), and indirectly in the statistically significant correlations between each of the measurement points all being of at least a moderate degree (see Table 3).

TABLE 3 Validity testing of the invigoration task as measured by the Vigor Assessment Scale.

Comparisons between points of assessment	Correlation coefficient	Mean difference	Std. error mean	95% confidence interval of the mean difference		t	Significance (two-tailed)	Effect size (Cohen's δ with Hedge's correction)
				Lower	Upper			
Pair 1: Pretask 1 and posttask 1 (timepoints A and B) *n* = 76	0.678	17.11	1.34	14.44	19.77	12.77 (*df* = 75)	$p < 0.001$	1.46 (very large)
Pair 2: Pretask 1 and pretask 2 (timepoints A and C) *n* = 70	0.591	9.96	1.49	6.99	12.98	6.68 (*df* = 69)	$p < 0.001$	0.79 (large)
Pair 3: Posttask 1 and pretask 2 (timepoints B and C) *n* = 70	0.660	−7.48	1.28	−4.94	−10.04	5.86 (*df* = 69)	$p < 0.001$	−0.70 (medium)
Pair 4: Pretask 2 and posttask 2 (timepoints C and D) *n* = 70	0.715	12.41	1.08	10.26	14.56	11.50 (*df* = 69)	$p < 0.001$	1.04 (large)
Pair 5: Posttask 1 and posttask 2 (timepoints B and D) n = 70	0.631	4.93	1.29	2.36	7.50	3.82 (*df* = 69)	$p < 0.001$	0.45 (medium)
Pair 6: Pretask one and posttask 2 (timepoints A and D) *n* = 70	0.459	22.37	1.66	19.07	25.68	13.51 (*df* = 69)	$p < 0.001$	1.61 (very large)

4 | DISCUSSION

The results support the proof of concept for a new therapeutic invigoration task in residual avolitional schizophrenia outpatients in that it did what it was supposed to do (i.e., increase vigor) with large to very large effect sizes, and it did so consistently on two occasions a month apart. The increased vigor observed after the first occasion was sustained for a month at significantly higher levels than baseline. Vigor after the homework and repeating the therapeutic task a month later was significantly higher than it had been after completing the task for the first time. This suggests a cumulative effect, supported by a very large effect size for change in vigor from before the first to completing the task a second time.

Whether the effect of the invigoration task lasts longer than a month remains nonetheless to be established in further research. This may also investigate whether the effect of the invigoration task is affected by the extent to which participants actually do the homework, and by repeating the invigoration task more frequently.

The reliability of the invigoration task was supported by a consistent effect on two occasions. An indirect indication of consistency of the task is found in the moderately strong correlations of vigor between the four time points. Although statistically significant changes after an intervention are sometimes taken to be indications of reliability (see e.g., Kean [2018]), we take these rather to be an indication of validity.

4.1 | Limitations

Although the task has been shown to have a positive effect on vigor within participants as is suitable in a proof of concept design, the effect of the task should be examined further in a randomized experimental design to establish its efficacy more securely (Singal et al., 2014). The reason is that a common factor other than the task itself might have invoked the change in vigor across participants, which may be controlled for through randomization and blinding. Examples are participants' expectations of change, and the abilities and experience of the therapist. How well the therapist succeeded in soliciting commitment from participants in the therapeutic task may have had an effect that was distinct from the therapeutic task itself. One may nonetheless argue that part and parcel of the intervention is the interpersonal involvement of a therapeutically well-trained clinician. From our impressions, the growing experience of the therapist-researcher from one participant to the next did not appear to result in more commitment or vigor, congruent with the standard procedural structure of the invigoration task that included the therapist responding to the hurdles in the process (see above).

This proof-of-concept study affords a better understanding of the within-subject validity and reliability properties of the invigoration task and a focused basis upon which a further randomized study can build (Gartlehner et al., 2006). Furthermore, the examination for potential effects of the therapeutic task was limited to vigor. Its effects on avolition, other negative symptoms, functioning, efforts, and frequency of goal-directed behaviors remain to be examined. Observer ratings of vigorous behavior in future studies may further extend this study that used a self-report measure of vigor, even though the VAS enquires about vigor in action and behavior rather than soliciting a mere reflection on or a sense of whether one is vigorous.

Since the timeframes of the vigor ratings before and after each task were for respectively the preceding and the subsequent 7 days, some of the comparisons (specifically pairs 1, 3, 4, and 6) were dependent on a convergence of anticipatory and consummatory vigor. This limitation had been anticipated by designing the study using a sequentially repeated intervention in the same group of patients, by which some of the comparisons would not be limited in this way. Thereby, the same time frames applied for specifically comparison pairs 2 and 5 for which large and medium effect sizes were found respectively, thus not subject to this limitation.

Results of the study are limited to data from avolitional schizophrenia outpatients at a site that provides for more challenging patients and who were 57% male, which may not be representative of community settings (Riecher-Rössler et al., 2018). The data are also limited to avolitional patients, and baseline vigor scores in the

general schizophrenia population would probably be higher. Higher baseline vigor may leave less room for more, but on the other hand it may stimulate more uptake for and vigor in performing the invigoration task. In another way, avolition was also a limiting factor in a small number of participants, whose avolition was of such a degree that it precluded participation in the study.

4.2 | Future directions

The above-mentioned and other potential influences on vigor other than the invigoration task itself may be addressed in a subsequent randomized controlled trial (RCT). Concurrently to an intervention group, a placebo control group that is blinded for the specific therapeutic outcome, may perform a dummy task that is unlikely to have an effect on vigor. Once efficacy of the invigoration task is so established, the task may be incorporated into standard services for patients with avolitional residual schizophrenia. It may add further substance to established interventions by being more targeted and specific to vigor than a general approach of psychotherapy. The task may nonetheless augment psychotherapeutic interventions when incorporated into, for example, a course of cognitive-behavioral therapy. This may make the invigoration task more effective and lasting when better supported and better integrated in a broader therapeutic context and relationship (Shattock et al., 2018).

This study contributes a treatment target that moves beyond mainstream ameliorative practices by implementing a positive focus without romanticizing the difficulties of schizophrenia. Examining vigor extends existing research in schizophrenia on avolition in the terms of positive psychiatry (Singal et al., 2014), invoking conceptual connotations with resilience (Clinton et al., 2017), vitality (Ryan & Frederick, 1997), thriving (Spreitzer et al., 2005), and engagement (Shirom, 2011). Targeting vigor in schizophrenia exemplifies a positive therapeutic pursuit where the principal focus is not on alleviating the negative and that which is absent, but rather on building upon the positive and strengthening inner resources and that which is present (Bellack, 2006; Eglit et al., 2018; Nguyen & Jeste, 2019). Examining ameliorative effects are not precluded, however. Further research may examine the invigoration task's effect on avolition, other negative symptoms, and functioning.

The stance toward avolition as resistant to change (Strauss et al., 2021) does not seem to be the case for vigor. While lasting change is yet to be demonstrated, the study provides some support to the claim that these patients are not impervious to change. Whether susceptible to an effect of the invigoration task is probably influenced by various factors including the capacity to invoke images. These factors remain to be investigated.

In conclusion, this study provided a validated invigoration therapeutic task in the population of avolitional schizophrenia outpatients. The task holds potential for vigor to alleviate the burden of schizophrenia and to address vigor alongside comorbid challenges. Potential applications of the task in other populations are subject to research including RCTs that may build on the results of this study by validating the task in other populations, and by incorporating and adapting the task contents and format for use within other interventions.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to ethical restrictions as required by the research ethics committee that approved the study.

ETHICS STATEMENT

The study received ethics approval from the Faculty of Health Sciences Research Ethics Committee at the University of Pretoria. All participants gave informed consent captured in an ethically approved study-specific informed consent document.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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