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Vigour as a marker of positive mental health among social media respondents

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ABSTRACT

Background: Quantitative research on vigour as a therapeutically responsive marker of positive mental health, has become possible by virtue of the validation of the Vigour Assessment Scale (VAS). Considering that its validation and therapeutic responsiveness were examined in an avolitional schizophrenia population, using the VAS outside these constraints requires that its psychometric properties be investigated in a more general non-clinical population.
Method: Social media respondents ($n = 787$) were recruited on social media through snowball sampling and data were obtained for statistical analyses through an online questionnaire comprising the VAS and measures of work-place vigour, active involvement in personal growth, behavioural activation, procrastination, and fatigue.
Results: Convergent validity was confirmed in moderate to strong positive correlations between the VAS and measures approximate to vigour including physical strength ($r = 0.805$), cognitive liveliness ($r = 0.676$), planfulness ($r = 0.61$), and intentional behaviour ($r = 0.595$). Discriminant validity was evident in negative correlations with procrastination ($r = -0.593$) and fatigue ($r = -0.786$). The VAS showed good internal consistency (Cronbach $\alpha = 0.951$), split-half reliability ($r = 0.892$), test-retest reliability ($r = 0.861$), and a low standard error of measurement of 3.73 within a theoretical range of 82 points. Exploratory factor analysis yielded a clear two-factor structure.
Limitations: Results are limited to willing participants who responded through social media.
Conclusions: Vigour may now be measured clinically as an indication of positive mental health and well-being. It may also be further investigated for its relations to other parameters of health, personality, and the efficacy of professional and self-enhancing interventions that aim for the cultivation of vigour.

1. Introduction

Although vigour is commonly taken as a desirable psychological attribute of individuals and a feature of positive mental health and well-being (Vaillant, 2012), empirical research has only recently become possible by means of a measuring instrument of vigour, that is, the Vigour Assessment Scale (VAS) that showed strong psychometric properties (Dlagnekova et al., 2021). Convergent validity was found in moderate to strong correlations ($r = 0.662$ to 0.714) with measures approximate to vigour. Discriminant validity was found in lower and/or inverse correlations with depressive features ($r = -0.371$), anxiety ($r = -0.243$, behaviour inhibition ($r = -0.030$), procrastination ($r = -0.622$), and fatigue ($r = -0.615$). Internal consistency was good with a Cronbach's alpha coefficient of 0.82, a strong correlation ($r = 0.82$) for test-retest reliability, and a standard error of measurement of 5.31 within a theoretical total score range of 82 points.

However, the VAS was validated in an avolitional schizophrenia outpatient population, meaning it requires further validation in a non-clinical and more general population for which both vigour and other psychological features are not so constrained. While the Shirom-Melamed Vigour Measure (SMVM) exists for non-clinical settings (Shirom, 2003), its design specifically for occupational contexts limits its utility beyond the workplace.

Vigour in the workplace has been considered the antithesis to burnout and exhaustion (Shirom, 2011). Also in negative terms, the lack of vigour may be associated with the clinical symptoms avolition, anergia, inertia, amotivation and difficulties with effort, persistence and energy (Dlagnekova et al., 2021; Marder and Galderisi, 2017; Rector

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et al., 2005; Treadway et al., 2015). In contrast, vigour is a phenomenon that is relevant also to non-clinical populations and bears semblance with positive psychological terms including motivation and curiosity (Gallagher and Lopez, 2007; Garland et al., 2010). Vigour may furthermore be associated with creativity, proactivity, taking initiative (Louw, 2014) and the procurement of resources necessary for survival (Watson, 2007). It invokes conceptual connotations with resilience (Clinton et al., 2017), vitality (Ryan and Frederick, 1997), thriving (Spreitzer et al., 2005), and engagement (Shirom, 2011).

Further than being an appealing and virtuous attribute to which one may aspire, vigour may be responsive to self-improvement and psychological interventions. In a clinical population, vigour was found to be responsive to a brief psychological intervention in a quasi-experimental proof-of-concept study, evidenced by large statistical effect sizes, that lasted no less than a month, despite the 70 participants suffering profound and persistent difficulties with avolition (Dlagnekova and Van Staden, 2024). Quantitative studies in non-clinical populations may likewise show that vigour is susceptible to efforts aiming for its cultivation and a worthwhile target for psychological interventions. Indispensable in these future studies will be an instrument that measures vigour validly and reliably in a non-clinical population.

To address this need, this study examined the validity and the reliability of the VAS among social media respondents. This population was chosen owing to the extensive use of social media nowadays by which these platforms have become more representative of the broader population, meaning data so obtained may be more generalisable than a geographically defined population or when sampling from specific groups as is often in done in validation studies among students (Vosloo and Van Staden, 2023). The study investigated the convergent and discriminant validity, internal consistency, split-half reliability, test-retest reliability, structural reliability, and the standard error of measurement of the VAS, and its association with age, gender and highest level of education.

2. Materials and methods

The study followed a quantitative research design that replicated in a non-clinical social media population an earlier study that had been conducted in a clinical population. This involved statistical comparisons between the VAS and other instruments in examining how well the VAS measured that which it was supposed to measure (i.e., its validity), and the extent of its consistency and accuracy in measuring vigour (i.e., its reliability).

2.1. Participants and procedures

In a quantitative design, the population comprised social media respondents. Inclusion criteria required that individuals were aged 18 years or older, and that they voluntarily provide digital informed consent on an online consent form prior to their participation. Participants were recruited from the general public using the social media platforms of Facebook, Instagram, LinkedIn, and WhatsApp. Snowball sampling was applied by utilising the build-in social networks of these platforms, requesting participants to recruit their friends, family and other contacts. The minimum sample size was set at 540, using the guide of obtaining data from a least 5 participants per item in the VAS that we quadrupled with the view to mitigate the potential influence of recruitment bias (i.e., $27 \times 5 \times 4 = 540$)(Anthoine et al., 2014). From the social media platforms, participants were directed to the Qualtrics platform on which informed consent was obtained for participation in the study, and which guided the completion of a composite questionnaire that captured all variables and measuring instruments. The VAS was administered twice, that is, before and after completing the other measuring instruments. The names of the measuring instruments were not revealed to participants in the composite questionnaire, as to avert these influencing responses on specific items of these instruments. Data were collected anonymously between December 2021 and November 2023. All procedures and the digital informed consent document had been approved by the legally sanctioned <removed for blinded review> before the study commenced.

2.2. Variables and measures

The age, gender and highest level of education of participants were recorded. The following measures were utilised:

The Vigour Assessment Scale (VAS) is a 27-item self-report instrument that resulted from a process of refinement using an exploratory factor analysis of an initial 48-item scale (Dlagnekova et al., 2021). The scale comprises items indicating the presence (Category I) and the absence of vigour (Category II). The items from these two categories are interspersed to prevent acquiescence bias. Each item is rated on a four-point Likert scale according the frequency pertaining during the preceding seven days (none of the time = 1; sometimes = 2; often = 3; most of the time = 4). The subtotal of category II (measuring the absence of vigour) is subtracted from the subtotal of category I (measuring the presence of vigour) in calculating a total score that can range theoretically between −13 to 68. Its psychometric properties in an avolitional schizophrenia outpatient population have already been summarised above.

The Shirom-Melamed Vigour Measure (SMVM) is the only other existing measure of vigour, but its scope of formulation and measurement is specific to work-place vigour. It is a 12-item self-report scale, utilising a seven-point Likert scale to gauge vigour within a work-related context (Shirom, 2003). The measure encompasses three subscales—physical strength, emotional energy, and cognitive liveliness. Participants are prompted to indicate the frequency of experiencing each described state during the preceding 30 days. For its reliability, the SMVM was reported to yield a Cronbach's alpha of 0.948 across the 12 items, with a range of 0.941 to 0.946 on an iterative item exclusion analysis. The subscales demonstrated robust internal consistency, with reported Cronbach's alphas of 0.951 for physical strength, 0.883 for cognitive liveliness, and 0.937 for emotional energy.

The Personal Growth and Initiative Scale PGIS-II in its 16-item version measures the active involvement in one's personal growth (Robitschek et al., 2012). It exhibits a first-order four-factor structure that comprises the subscales Readiness for Change (RC), Planfulness (Plan), Using Resources (UR), and Intentional Behaviour (IB). Test-retest reliability coefficients were reported as ranging from 0.73 (UR) to 0.81 (Plan). Internal consistency was also strong across subscales, with alpha coefficients of 0.83 for RC, 0.84 for Plan, 0.80 UR, and 0.89 for IB.

The Behavioural Activation Scale (BAS) is part of the Behaviour Inhibition and Activation Scale with items in a four-point Likert format (Carver and White, 1994). The BAS comprises three subscales: Reward Responsiveness (RR), Drive (D), and Fun Seeking (FS). The reported Cronbach's alpha values range from 0.66 to 0.76 (RR, $\alpha = 0.73$; D, $\alpha = 0.76$; FS, $\alpha = 0.66$).

The General Procrastination Scale (Proc) is a 20-item true-false measure of dispositional levels of procrastination (Lay, 1986). Items are rated on a Likert scale ranging from 1 to 5, for which higher scores reflect more procrastination. Cronbach's alpha was reported at 0.82 (Lay, 1986) and 0.71 (Hasanagic and Ozsagir, 2018) and test-retest reliability was found at 0.8 (Ferrari, 1989).

The Fatigue Assessment Scale (FAS) measures fatigue on ten items on a 5-point Likert scale ranging from 'never' to 'always' (Shahid et al., 2011). Internal consistency was reported at 0.9 and Pearson correlations between the FAS and similar scales ranged between 0.61 and 0.78 (Michielsen et al., 2003). Test-retest reliability was reported at 0.88 and discriminant validity was demonstrated by a significant amount of variance in FAS scores, surpassing that explained by depressive symptoms, neuroticism, and state anxiety (De Vries et al., 2010).

2.3. Statistical analyses

Since some participants did not complete all the measures, data were analysed for the maximum number of participants (*n*) who contributed data for the particular analysis as indicated in the results section. For potential associations with the VAS, point bi-serial correlation testing was used to examine gender, a Spearman's rho correlation was calculated for age, and an analysis of variance was performed for the highest level of education. Upon confirming that data followed a normal distribution, convergent validity was examined by calculating Pearson's correlation coefficients to determine the extent to which the VAS converged with existing measures for which convergence may be expected (Anthoine et al., 2014). These were the SMVM and PGIS-II for which strong positive correlations were hypothesised. For discriminant validity, Pearson's correlation coefficients were calculated between the VAS and each of the BAS, the Proc and the FAS, for which correlations were hypothesised to be no more than of moderate positive strength or be negative. The strength of correlation coefficients was defined as follows: $r < 0.20$ is negligible; $0.20 < r < 0.40$ is weak; $0.40 < r < 0.60$ is moderate; $0.60 < r < 0.80$ is strong; and $r > 0.80$ is very strong (Van Staden et al., 2022).

For testing the internal reliability of the VAS, Cronbach alpha coefficients were calculated, reflecting the internal consistency among the items. This was done for the full scale and each of its two parts. Cronbach alpha coefficients of >0.7 and 0.9 were respectively defined as good and excellent. For split-half reliability, the VAS was split between the first consecutive 14 and the subsequent 13 items and the parts so derived were compared using a Spearman's rank correlation test, Spearman-Brown coefficient, and the Guttman coefficient. Pearson's correlation testing was used for test-retest reliability, and the Standard Error of Measurement (SEM) was calculated as the product of the standard deviation and the square root of 1 minus the reliability coefficient. Since a confirmatory factor analysis was deemed premature considering the change in population from the previous study on the VAS, an exploratory factor analysis was performed to test the structural reliability of the VAS. To this end, category II items of the VAS were reverse coded. Principal axis factoring was used for which Oblimin rotation with Kaiser normalization was applied. Guiding principles in factor identification were a threshold Eigenvalue of 1.0, factor loadings of >0.3, and parsimony in the interest of generalisability (Preacher et al., 2013). SPSS version 28 was used for the statistical analyses.

3. Results

3.1. Descriptive features

The gender, highest level of education and age of the 787 participants are presented in Table 1. Among a preponderance of female participants, gender correlated significantly but of negligible strength with the VAS. The average age of participants was 36.02 years, with a standard deviation of 12.29, suggesting diversity in age. Education levels were predominantly high, with 80.7 % of participants who obtained graduate or postgraduate qualifications. The age and the highest level of education were not significantly associated with the VAS scores.

The mean scores with their 95 % confidence intervals for the various scales are provided in Table 2. The relatively wide standard deviation of 16.84 on the VAS mean score of 30.45 highlights the heterogeneity of the sample in terms of vigour, which is consistent with the variety expected in a general population where individuals' vigour is expected to vary owing to various psychosocial factors.

3.2. Convergent and discriminant validity

Table 3 and Table 4 show the correlation coefficients among the measures. For convergent validity, the VAS showed strong positive correlations with the SMVM and the PGIS-II. Strong positive correlations were found for the subscales of the SMVM measuring physical strength and cognitive liveliness, and the planfulness and intentional behaviour subscales of the PGIS-II. Results for the discriminant validity of the VAS show negative correlations with the FAS and the Proc, and weak correlations with the reward responsiveness and fun-seeking subscales of the BAS.

3.3. Reliability

The reliability test results are presented in Table 5. The Cronbach's alpha coefficient for the VAS was excellent (0.951). Despite the number of items being reduced, which theoretically influences the alpha coefficient to go downwards, this coefficient remained excellent or close to excellent for when the VAS was split in two ways, that is by the sequence of the items in the spilt-half parts, and for the two parts of the VAS as

Table 2
Descriptive statistics for the measuring instruments.

Instrument	n	Mean (SD)	95 % CI	
Vigour Assessment Scale (VAS)	787	30.45 (16.84)	29.29	31.63
Shirom-Melamed Vigour Measure (SMVM)	744	55.61 (13.84)	54.64	56.62
Personal Growth and Initiative Scale-II (PGIS - II)	720	73.39 (15.39)	72.22	74.59
Planfulness		23.64 (6.29)	23.17	24.12
Readiness for Change		19.03 (3.97)	18.75	19.31
Intentional Behaviour		19.28 (4.28)	18.94	19.59
Using Resources		11.44 (3.29)	11.20	11.70
Behaviour Activation Scale (BAS)	705	40.48 (6.30)	40.03	40.93
Drive		11.44 (2.71)	11.23	11.65
Reward-responsiveness		17.33 (3.30)	17.17	17.49
Fun-seeking		11.71 (2.57)	11.54	11.91
Procrastination Scale (Proc)	675	55.17 (15.83)	53.94	56.38
Fatigue Assessment Scale (FAS)	670	26.54 (9.28)	25.86	27.25

SD = Standard Deviation; CI = Confidence Interval.

Table 1
Descriptive characteristics of the sample and statistical associations with the Vigour Assessment Scale.

n = 787		Frequency	Percent (%)	Test statistic	Strength / Probability
Gender	Male	146	18.6	Spearman's rho = 0.125	Negligible $p < 0.001$
	Female	634	80.6		
	Other	7	0.9		
Highest level of education	Grade 8	7	6.2	F = 2.005 (df = 4)	$p = 0.092$
	Grade 10	9	1.1		
	Grade 12	126	16.0		
	University graduate or postgraduate	635	80.7		
	Prefer not to say	10	1.3		
Age	Mean	36.02		Spearman's rho = 0.03	Negligible $p = 0.215$
	Median	33.00			
	Standard deviation	12.29			

Table 3
Pearson's correlation coefficients among the measures.

	Vigour as measured by the VAS	Work-place vigour as measured by the SMVM	Active involvement in personal growth as measured by the PGIS	Behavioural activation as measured by the BAS	Procrastination as measured by the Proc	Fatigue as measured by the FAS
	n = 787	*n* = 744	*n* = 720	*n* = 705	*n* = 675	*n* = 670
VAS	1	0.800	0.660	0.424	−0.593	−0.786
SMVM	0.800	1	0.671	0.454	−0.502	−0.736
PGIS	0.660	0.671	1	0.485	−0.509	−0.575
BAS	0.424	0.454	0.485	1	−0.330	−0.393
Proc	−0.593	−0.502	−0.509	−0.330	1	0.618
FAS	−0.786	−0.736	−0.575	−0.393	0.618	1

Table 4
Pearson's correlation coefficients between the VAS and the subscales of SMVM, PGIS and BAS.

		VAS
SMVM (n = 744)	Physical strength	0.805
	Emotional energy	0.462
	Cognitive liveliness	0.676
PGIS (n = 720)	Planfulness	0.618
	Readiness for change	0.541
	Intentional behaviour	0.595
	Using resources	0.479
BAS (n = 705)	Drive	0.482
	Reward responsiveness	0.305
	Fun-seeking	0.256

Table 5
Reliability testing of the VAS.

Type of reliability n = 787	Scale/items used	Number of items	Coefficient	Standard Error of Measurement
Internal consistency	VAS	27	Cronbach alpha = 0.951	3.73 (maximum of 82 points)
Split-half reliability	VAS items 1–14	14	Cronbach alpha = 0.916	2.59 (maximum of 43 points)
	VAS items 15–27	13	Cronbach alpha = 0.900	2.65 (maximum of 40 points)
	Correlation between parts	14/13	r = 0.892	–
	Spearman-Brown	14/13	r = 0.943	–
	Guttman	14/13	*r* = 0.942	–
Internal consistency on instrument categories	Category I items of the VAS (vigour present)	19	Cronbach alpha = 0.944	3.96 (maximum of 58 points)
	Category II items of the VAS (vigour absent)	8	Cronbach alpha = 0.878	1.95 (maximum of 25 points)
Test-retest reliability (n = 613)	VAS and its repeat	27	Pearson's r = 0.943 95 % CI = 0.933–0.952	–
	Positive items of the VAS and their repeat	19	Pearson's *r* = 0.931 95 % CI = 0.918–0.943	–
	Negative items of the VAS and their repeat	8	Pearson's *r* = 0.86195 % CI = 0.828–0.887	–

defined by the presence and the absence of vigour phenomena respectively. Similar to the alpha values, the other coefficients were very strong and all higher than 0.861 in comparing the VAS parts, and for a repeat of the VAS in testing its test-retest reliability. The SEM calculated at 3.73 means that the observed total VAS values were within 3.73 from the true values on the theoretical range of 82 points, subject to 68 % degree of certainty as is the usual norm for SEM calculations.

To examine the structural reliability of the VAS through an exploratory factor analysis, two preliminary tests had first been performed: the Kaiser-Meyer-Olkin (KMO) test for sampling adequacy and Bartlett's test of sphericity. The KMO test yielded a result of 0.965, indicating that the sample size was sufficient for the analysis. Bartlett's test showed a significant outcome (with an approximate chi-square value of 12,382.568, df = 351, $p < 0.001$), indicating a significant interrelation among the VAS items and confirming their suitability for factor analysis. The factor analysis of the VAS delineated a two-factor structure, which explained respectively 45.112 % and 7.031 % of the variance, being thus 52.15 % cumulatively. The pattern matrix of the factor loadings is shown in Table 6. Fig. 1 shows a graphic representation of the items clustering on the factor-axes. The two factors so derived were concordant with the two categories of VAS items capturing respectively the presence and the absence of vigour. Congruently, the two factors were labelled vigour-present and vigour-absent. One of the items, "During the past 7 days, I have returned communications like phone calls, messages and e-mails

Table 6
Pattern matrix of the VAS resulting from the factor analysis with a factor correlation coefficient of 0.703.

VAS item	Factor	
	1	2
	Labelled as Vigour-present	Labelled as Vigour-absent
11	0.787	0.005
22	0.758	0.058
5	0.748	0.063
16	0.739	0.084
7	0.739	−0.012
18	0.737	0.121
12	0.725	0.025
9	0.719	0.067
13	0.712	0.029
2	0.695	−0.155
4	0.664	0.115
25	0.663	−0.035
15	0.659	0.024
24	0.623	−0.043
27	0.622	−0.012
3	0.611	0.172
20	0.520	0.019
1	0.514	−0.010
23	0.003	0.716
14	−0.029	0.709
21	0.017	0.706
17	0.021	0.666
6	−0.027	0.650
19	0.115	0.642
10	0.143	0.633
8	−0.020	0.617
26	0.253	0.263

Extraction method: Principal Axis Factoring.
Rotation method: Oblimin with Kaiser Normalization, converged in 4 iterations.

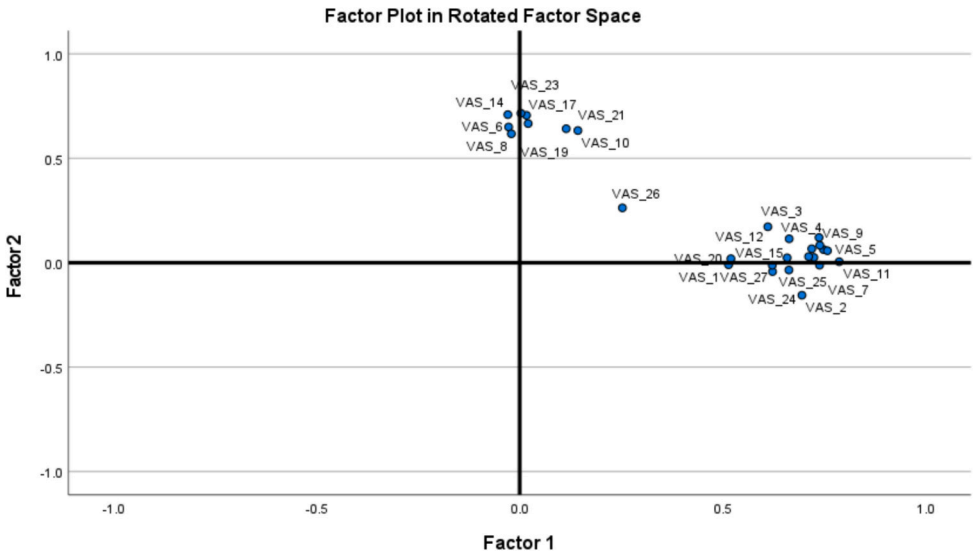

Fig. 1. Clustering of VAS items on a two-factor model.

without delay", although from Category II of the VAS, this item loaded on both factors, and its loadings at 0.253 and 0.263 were just below the 0.3 threshold that is usually used.

4. Discussion

The results of this study confirm the validity and the reliability of the VAS in social media users and thereby the psychometric validation of the VAS is extended from its original clinical context, particularly among patients with remitted but avolitional schizophrenia (Dlagnekova et al., 2021), to a wider non-clinical population.

In the absence of a golden criterion of vigour against which the criterion-related validity of the VAS could be tested, measures approximate to vigour, specifically workplace vigour and active involvement and developing as a person were found to correlate strongly with the VAS in both populations, confirming thus convergent validity. The subscales of these proximate measures of vigour confirmed similarly in that the same pattern of VAS-correlations pertained in both studies, showing that vigour as measured by the VAS correlated strongly particularly with physical strength (to do work), cognitive liveliness, planfulness, and intentional behaviour.

The moderately strong correlation between behavioural activation and the VAS observed in both studies also supports convergent validity, particularly for the drive aspects of behavioural activation. Nonetheless, that this correlation was of moderate strength suggests that behavioural activation is not as proximate to vigour as the other phenomena for which strong correlations were found, and may thus also serve to support the discriminant validity of the VAS. The same may be inferred for the reward-responsiveness and the fun-seeking aspects of behavioural activation for which correlation coefficients were lower than the drive aspect.

Discriminant validity of the VAS was furthermore confirmed in negative correlations with procrastination and fatigue. That these negative correlations were strong may suggest that vigour constitutes partially the opposite of procrastination and fatigue. If so, this may suggest that strengthening vigour as a target of self-development or in a therapeutic process, may reduce procrastination and fatigue. In this process, vigour may be pursued as a positive substitute for procrastination and fatigue. Having a suitable substitute is congruent with insights of positive psychology (Seligman and Csikszentmihalyi, 2000). This addresses the problem with targets formulated in negative terms as these focus on that which is not wanted without being clear on that which is wanted instead (Carr, 2013). Furthermore, the strong negative correlations may suggest that vigour may be a protective and/or prognostic factor that influences against procrastination and fatigue (Henderson et al., 2019; Smolarczyk-Kosowska et al., 2023).

Subject to limitations considered below, concurrent validity of the VAS is suggested by the absence of statistically significant associations of the VAS, or its correlation being of negligible strength, with groups defined by highest level of education, age and gender. In other words, the VAS measured that which it was supposed to measure across these groups.

Whilst these validity results confirm that the VAS was measuring that which it was supposed to measure also in a social media population, the reliability results confirm that the VAS measured consistently. The Cronbach's alpha of 0.951 indicates excellent internal consistency, meaning items coherently measured the same phenomenon. The strong correlations between halves of VAS also indicate consistency between the halves in measuring the same phenomenon, and this consistency of measurement was maintained in the repeated use of the VAS as indicated with a very strong correlation ($r = 0.943$). The standard error of measurement was notably low, meaning that the VAS may be taken to yield a total score differing no >3.73 from the true score among the 82 theoretically possible total scores. This low SEM indicates thus minimal degree of measurement error and that the VAS accurately measures the actual extent of vigour.

The structural reliability of the VAS was confirmed in a parsimonious two-factor structure that accounted for 52.15 % of the variance, which is within the range of a good result (Mvududu and Sink, 2013). The two-factor model was concordant with the theoretical distinction between items that measure the presence and the absence of vigour respectively. This concordance corroborates the scale's theoretical foundations, indicating that it successfully captures vigour along two intersecting axes as represented in Fig. 1. For one of the 27 items (item 26), this distinction did not hold in the factor analysis and it may not be measuring vigour as reliably as the other items– a case may accordingly be made for its omission. The robust internal structure of the remaining items may be attributed to the preceding study through which items were removed that undermined consistency. Whilst the preceding study identified a six factor structure in a smaller sample from a specific clinical population, the parsimonious two-factor model identified in this study allows better for generalisation and is congruent with a representation of vigour across a non-clinical and more diverse population (Preacher et al., 2013).

4.1. Limitations and future directions

This study extended the population in which the VAS may be used as a valid and reliable instrument to the population of social media users. Although this is a more general population than the clinical population in the preceding validation study, the results may still not apply to those who do not use social media. Differences between users and non-users of social media may potentially influence the performance of the VAS. These include personality differences (Brailovskaia and Margraf, 2016) and the demographic variables of age, education, and gender (Robinson and Martin, 2009).

Within the population of social media users, the study was also subject to some selective sampling as it was dependent on participants willing to respond and participate. Willingness to participate in these kinds of studies are known to be influenced by higher levels of education and female gender (Wilson and Musick, 1997).The same seemingly applied to our study, considering the high preponderance of female and more educated participants, which is common in studies of this kind (Park et al., 2019). Gender correlated only negligibly and level of education was not significantly associated with the VAS in our study, and the relatively large sample size mitigates the risk for a type II statistical error, yet the possibility of missing actual statistically significant associations remains.

Although some selective sampling pertains in most validation studies, the choice of social media respondents averts the selection biases of using student participants as is commonly done in psychometric validation studies, or sampling from a geographical region, a local community or cultural group or economic sector. Nonetheless, subsequent studies should examine whether the VAS measurements are influenced by the factors that determine the use of social media and willingness to participate in study of this kind.

Potential response fatigue resulting from too many or long self-report measures, limited the number of comparative instruments used in our study. Further quantitative investigations may use other measures and extend research into vigour that is henceforth made possible by having available a valid and reliable instrument with which to measure vigour. Much of vigour is yet to be investigated. Examples of research questions concern vigour's relation with well-being and health, personality, temperament, character, other positive psychological attributes, psychological development, interpersonal behavioural patterns, quality of life as well as its familial patterns and longitudinal profile during various stages of the life cycle (Vosloo and Van Staden, 2024). Vigour may also be measured as an outcome in examining the efficacy of psychological interventions aiming for increasing vigour (Dlagnekova and Van Staden, 2024), well-being, personal growth, or as parameter parallel to other therapeutic targets (Van Staden, 2023b; Lotter and Van Staden, 2019). This research on vigour as a desirable feature is made possible by the VAS, and may now contribute to knowledge in a strengths-based positive psychological paradigm (Seligman and Csikszentmihalyi, 2000) and salutogenesis (Mittelmark et al., 2022) in alignment with the contemporary positive mental health movement in psychiatry (Messias et al., 2020) and the promotion of well-being and positive health that has recently been recognised as one of the key constitutive aspects of person-centered medicine (Van Staden et al., 2023) that should feature within the planning part of health consultations (Van Staden, 2023a).

5. Conclusion

This study substantiates the psychometric validity and reliability of the VAS in a non-clinical social media population. It warrants the measuring of vigour clinically as an indication of positive mental health and well-being. Further investigations into vigour afforded by a valid and reliable instrument will address a dearth of scholarly knowledge on the relations of vigour with other parameters of health, personality, other psychological factors, as well as on the efficacy of self-enhancing and professional interventions that aim for the cultivation of vigour during various stages of the life cycle as a positive target in promoting well-being.

CRediT authorship contribution statement

Antonia Dlagnekova: Writing – original draft, Validation, Software, Resources, Project administration, Methodology, Investigation, Data curation, Conceptualization. **Werdie Van Staden:** Writing – review & editing, Visualization, Validation, Software, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

None.

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 owing to ethical restrictions as required by the research ethics committee that approved the study. The measuring instrument is made available as supplementary material.

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Compliance with ethical standards

The study received ethics approval from the legally accredited Faculty of Health Sciences Research Ethics Committee. The study adhered to the stipulations of the 2013 version of the Declaration of Helsinki. All participants gave informed consent captured on an ethically approved study-specific informed consent document.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jad.2024.07.012.

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