



Reliability and Validity of the Work and Well-Being Inventory (WBI) for Self-Employed Workers: Test Norms of Employees Are Not Suitable for Entrepreneurs

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Abstract

Purpose Sickness absence and work disability can be a major burden for society and for both employees and self-employed workers. Validated tools for assessing the psychosocial risk factors of long-term disability, for matching effective interventions and for deciding when to resume work can be of great value. However, no validated tools exist for self-employed workers. The purpose of this study is to adjust and to validate the Work and Wellbeing Inventory (WBI) for entrepreneurs. **Methods** The sample consisted of 676 self-employed workers with a private disability insurance policy. Three groups were distinguished: business owners, liberal professions and doctors and paramedics. Reliability, construct validity and concurrent validity of the WBI were examined. Scale scores were calculated for each group of self-employed workers and compared with the scores of a representative group of 912 Dutch employees to test the adequacy of the existing (employee) test norms. **Results** The WBI for the self-employed showed good to excellent reliability figures. The construct validity and the concurrent validity of the WBI could be confirmed. Overall, the self-employed scored higher on job satisfaction, social support at work and perfectionism (diligence) and had fewer mental health problems compared to employees. Self-employed workers should not be treated as one group, as there were important differences between entrepreneurs, liberal professions and doctors and paramedics. **Conclusions** The reliability and validity of the WBI were confirmed. Important differences in the scores of employees and the self-employed were revealed. In addition, the group of self-employed workers appeared to be rather heterogeneous.

Keywords Screening tool · Return to work · Occupational health care · Self-employed

Introduction

Absenteeism and work disability can be a major burden for the employee, the employer and society as a whole [1]. Prevention of future or long-term sick leave is therefore an important theme for research and practice. For occupational physicians working at the interface of health and working environment it is important to have a good insight into the

causes of absenteeism and work disability. Over the years, many studies have shown that medical diagnosis plays only a minor role in the actual cause, but also in the duration of sick leave. Many other factors related to the demography and characteristics of the person, the social environment and the working environment will usually also play an important role [2–4]. In addition to this development, the Work and Welfare Inventory (WBI; in Dutch: VAR-2) has been created and continuously improved to support the occupational physician in screening for risk factors for long-term or future sick leave. The WBI fits well with the concept of the biopsychosocial model of illness and has proven to be a valid and reliable instrument for this screening [5].

In recent years, many other instruments have been developed to assess disability [6]. According to Gray et al., these instruments can be divided into three main categories: (1) instruments with a predictive purpose; designed to detect workers with a long-term disability risk; (2) instruments with a discriminatory purpose; designed to classify workers

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or patients in certain clusters to ensure proper indication of interventions; and (3) instruments with an evaluative purpose to help decide whether and when an employee can return to work [6]. The WBI covers these three categories and is fully developed from the clinician's perspective. The WBI includes topics that are understood as risk factors or 'causes' of long-term absenteeism. The WBI is increasingly used by professionals in occupational health practice in the Netherlands.

The research into instruments for the assessment of incapacity for work focuses mainly on employees with a paid job with a fixed or flexible employment contract. In recent decades, however, there has been a stable increase in the number of entrepreneurs in Europe [7]. Self-employed or entrepreneurs can be small business owners, self-employed without employing others or liberal professions. In the euro zone (19 countries), 15% of people of working age meet the criteria of self-employment [8]. According to the national statistical office of the Netherlands (CBS), in the first quarter of 2018 there were 9,051,000 persons of working age. Of these, 7,212,000 were employed and 1,442,000 were self-employed. One in five have disability insurance [9]. The number of self-employed workers is increasing, but little is known about the influence of the various forms of self-employed on health, work ability and well-being at work. Entrepreneurs generally remain outside the scope of occupational health care, unless they are covered by disability insurance and are entitled to sickness benefit. Information on the number of claimants as a percentage of the total insured population is generally considered sensitive information by insurance companies. In one study it was found that 20% of the insured persons had filed an insurance claim for incapacity for work due to medical problems [10]. Data from incapacity insurers is the only objective way to study absenteeism due to illness. Without these data, researchers must rely on self-reporting data, which entails a risk of bias.

Risk assessment models and derivative instruments support a good evaluation of the psychosocial context and the risk of long-term disability. However, medical advisors working for insurance companies now use instruments designed entirely for employees, as there are no instruments for the self-employed. The question is whether the standards for self-report instruments in occupational health care for employees and entrepreneurs are the same. In a recent study, Warr found similar job demands, but a higher degree of job satisfaction for entrepreneurs compared to employees [11]. Protass and Thompson found that entrepreneurs experience more work pressure and more autonomy compared to employees [12]. These findings imply that the well-being of entrepreneurs differ from those of employees and that the use of inaccurate test norms can lead to erroneous assessments by medical advisors. Another problem is that the content of some work and wellbeing topics does not

apply to entrepreneurs, such as questions about colleagues and supervisors. In summary, to date there are no suitable occupational health care tools with specific test norms or items for entrepreneurs.

The purpose of this study was to adapt and validate the WBI for entrepreneurs so that in future research we can further investigate the WBI with regard to predicting long term work disability. First, we have adapted some items of the WBI in such a way that the content is suitable for entrepreneurs. Secondly, the reliability and validity of the WBI version for entrepreneurs was investigated. Thirdly, a direct comparison was made between employees and entrepreneurs to determine whether and to what extent the current test norms of the WBI should be adapted. Finally, it was examined whether it is justified to treat the group of entrepreneurs as one group or not.

Methods

Sample

In the Netherlands, self-employed persons who want protection against the financial risks of incapacity for work are not covered by public insurance, but must apply for private disability insurance. Because of the rules of their professional organizations, legal and medical professionals are usually obliged to take out disability insurance. People with a higher income and people who work in liberal professions are more likely to be insured against incapacity for work. A smaller proportion of entrepreneurs have taken out insurance. Two private disability insurers took part in this study. The two private disability insurers (A and B) differ to a certain extent in the type of the intended customers. Insurance company A focuses mainly on white-collar workers, while insurance company B focuses mainly on blue-collar workers and owners of small businesses. Insurance companies A and B together provide a reasonable reflection of the population of the self-employed in the Netherlands.

We invited 8000 people of insurance company A, and 2370 people of insurance company B to take part in the survey. Previous experiences with e-mail surveys among the clients of company A showed a response rate of about between 5 and 10%. Thus, we expected a final study sample between 500 and 1000 participants. The principal aim of this study was the generation of test norms. Norms should be based on a representative sample of the underlying population although there are no strict guidelines about minimum required samples sizes.

The policyholders were invited to fill in the WBI by e-mail. Participation in the survey was voluntary and anonymous. The completed questionnaires were only accessible to the researchers (L.V. and F.S.) and not to the professionals

of insurance companies A and B. The non-respondents were not reminded to complete the questionnaire. At the end of the questionnaire, the participants were asked whether they were prepared to complete the list again in 2 weeks' time (in order to determine the retest reliability). After 2 weeks, the people who gave their consent were invited again to fill in the questionnaire. We divided the sample into three groups: B. entrepreneurs (owners of small and medium-sized enterprises and workers working for themselves), L. liberal professions and M. doctors and paramedics. The European Commission defines the liberal professions as follows: "The liberal professions include lawyers, notaries, engineers, architects, doctors, dentists and accountants. They all need special training in the arts or sciences and their activities are usually closely regulated by national governments or professional organizations" [13]. Although, according to the European Commission's definition, doctors are part of the liberal professions group, we have treated them as a separate group, because their daily activities in the Netherlands are much more regulated in terms of fixed working hours than in the other liberal professions.

Measures

The WBI [5] is a multidimensional screening tool that is used within occupational health care and rehabilitation. The WBI has 82 items distributed over 13 scales. These 13 scales are divided over 5 domains. The *domains* and their underlying scales and number of items are: *Support*: Social support at home (5); Social support at work (5); Job satisfaction (7); and Control (5); *Stressors*: Life stressors (8) and Job strain (8); *Coping*: Avoidance (8) and Perfectionism (9); *Symptoms*: Stress (6); Fatigue (4); Anxiety (5) and Depression (6); *Disability*: Illness behavior (7). The response categories for the symptoms are: 'not', 'sometimes', 'often' and 'almost'. The respondent is asked to judge how often each symptom has bothered him or her during the last week. The response categories for the other scales are: 'not', 'somewhat', 'mostly' and 'fully.' The respondent has to judge each item to which extent he or she agrees with it. The conceptual background, features of the WBI, model and summary of the scales have been described in more detail in a previous article [5].

Some examples of items: 'There are people in whom I can confide and they listen' (Social support at home); 'I get along well with my manager or supervisor' (Social support at work); 'I thoroughly enjoy my work' (Job satisfaction); 'I can plan my working day the way I want to' (Control); 'Major changes have occurred in my private life in the past year' (Life stressors); 'I need to work very hard in order to finish my daily tasks' (Job strain); 'I wait a long time before I express my irritations' (Avoidance); 'People who cut corners irritate me a lot' (Perfectionism); 'Become easily annoyed

or irritated (Stress)'; 'Feeling tired after minimal activity' (Fatigue); 'Feeling nervous' (Anxiety); 'Having no interest in anything (Depression)'; and 'It is not sensible to continue to work with my symptoms' (Illness behavior).

Alpha ranges between 0.78 and 0.89 for employees and between 0.79 and 0.88 for patients [5]. Several features of test validity have previously been studied including outcome measures such as clinical diagnosis, future sickness absence in samples of healthy workers, and return to work in absent employees and rehab patients [5].

The concurrent validity of the WBI scale 'social support at work' cannot be investigated for the self-employed since there is no such scale available for this group. For each scale a concurrent scale has been sought that must meet two criteria: (1) the latent construct of the external measure must resemble the corresponding WBI-scale as close as possible; (2) the external measure must be well-validated. In case of equal measures we chose the shortest version to limit the respondents' burden. The concurrent validity of the other 12 WBI scales was investigated in the sample of self-employed people using the following instruments:

- (a) **Multidimensional Scale of Perceived Social Support (MSPSS)**: The MSPSS [14] was used as a parallel test for WBI-scale 'social support at home.' The MSPSS is a 12-item scale and includes three factor groups: family, friends and significant others. The MSPSS demonstrates good psychometric properties [15].
- (b) **Overall Job Satisfaction (single item)**: This single item was used as a parallel test for WBI-scale job satisfaction on a seven-point Likert-scale, ranging from 1 (strongly disagree) to 7 (strongly agree). The internal consistency of the item measuring satisfaction with one's job as a whole, is estimated between $r_{xx} = 0.73$ and $r_{xx} = 0.90$ and its concurrent validity is $\alpha = 0.92$ relative to the Job Satisfaction Survey (JSS) [16]. Thus, this single item may provide a good estimate of overall job satisfaction.
- (c) **Job Content Questionnaire (JCQ)**: The Dutch version of the JCQ was used for the measurement of job strain and control [17]. We used the JCQ 'psychological demands' scale as a parallel test for the WBI-scale 'job strain' and the JCQ 'decision latitude' scale was used as a parallel test for WBI-scale 'control'. The JCQ has been developed to test the job-demand-control-support (JDC-S) model and has dominated occupational research on occupational stress [18].
- (d) **Satisfaction with Life Scale (SWLS)**. There are no scales available that measure life events and daily hassles in one scale as WBI-scale 'life stressors' does. However, we hypothesize a negative relationship with life stressors and one's satisfaction with life. SWLS is a 5-item scale designed to measure global cognitive

judgments of one's life satisfaction (not a measure of either positive or negative affect) [19]. Participants indicate how much they agree or disagree with each of the 5 items using a 7-point scale that ranges from 7 strongly agree to 1 strongly disagree. The SWLS is shown to be a valid and reliable measure of life satisfaction [20]. In addition, the high convergence of self- and peer-reported measures of subjective well-being and life satisfaction provide strong evidence that subjective well-being is a relatively global and stable phenomenon, not simply a momentary judgment based on fleeting influences [21].

- (e) Temperament and Character Inventory (TCI): The 'harm avoidance' (HA, 15 items) and 'persistence' (PS; 15 items) scales of the Dutch adaptation of the TCI were used as parallel tests for WBI-scales 'avoidance' and 'perfectionism' respectively [21]. The TCI is based on Cloninger's biosocial model of personality development which includes four temperament and three character dimensions that are independently heritable, manifest early in life and plays role in habit formation [22]. In the Dutch national sample, $\alpha=0.85$ for HA and $\alpha=0.72$ for PS [18]. HA is closely related to the BIG-5 factor 'neuroticism' and PS to BIG-5 factor 'conscientiousness.' The TCI has been widely studied.
- (f) Depression Anxiety Stress Scale (DASS): The depression, anxiety and stress scales of the 21-item version of the Dutch adaptation of the DASS were used as parallel tests for the corresponding WBI-scales [23]. Participants rated the extent to which they had experienced each symptom over the previous week on a four point Likert scale ranging from 0 (did not apply to me at all) to 3 (applied to me very much, or most of the time). Theoretically, the DASS corresponds with the tripartite model of anxiety and depression [24]. The psychometric properties of the DASS have been shown to be suitable for use in an occupational health care setting [25].
- (g) Short Form Health Survey Vitality Subscale (SF36): The SF36 vitality subscale includes 4 items; 2 about fatigue and 2 about energy [26]. For the SF vitality subscale $\alpha=0.87$ and construct validity has been supported by factor analysis [27].

Adaptation of the WBI for Self-Employed Workers

The first step in making the WBI suitable for the self-employed was to check for the presence of the word 'job' in the current items and replace it by 'work'. For example, 'My job is very demanding' was replaced by 'My work is very demanding.' One item of the job satisfaction scale 'I am satisfied with the terms and conditions of my job' was rewritten as 'I am satisfied with my income.' Next, the WBI-scale 'social support at work' was entirely revised since all items are about colleagues and supervisor or manager. Although one can discuss the usefulness of a social support scale for self-employed people, we find it worthwhile to keep this scale. After all, most self-employed people work with others for a longer period of time. Cooperation with others can be positive and inspiring, but can also be a source of conflicts and negative emotions. New items were formulated in more general terms. The old (for employees) and new (for self-employed) items of the WBI social support scale are shown in Fig. 1.

Statistical Analyses

Representativeness of Sample

The extent to which the sample is representative for the population (companies A and B) was investigated with a one-sample t-test for age and the binomial test for sex. It was also investigated whether age and gender influence the scores of the WBI scales. The relation between age and scale scores was investigated with Pearson r . The relation between gender and scale scores was investigated with ANOVAs. Level of significance was set at $p < 0.004$ because of 13 comparisons (0.05/13).

Reliability

Cronbach's alpha values were calculated first. Values of 0.70–0.90 were considered acceptable [28]. The reproducibility (test–retest reliability) of the WBI was tested by calculating the Intraclass Correlation Coefficients (ICC) in a subsample of 150 persons of the sample of insurance company A. The time between the first and second test administration was 14 days. Unlike Pearson's (r), ICC accounts for

Original items of WBI social support scale	Adapted WBI social support scale (for self-employed workers)
I get along well with my manager or supervisor	I get along well with the people at work
My colleagues support me	I feel supported by the people with whom I work together
I feel valued by my colleagues	I feel valued by the people with whom I work together
I feel valued by my manager or supervisor	Contact with people at work is good
My manager or supervisor understands my circumstances	

Fig. 1 Original WBI social support scale (for employees) and the adapted social support scale for the self-employed

both consistency of performances from test to retest (within-subject change), as well as change in average performance of participants as a group over time (i.e., systematic change in mean). For the calculation of ICC a two-way mixed model with absolute agreement was used. ICC of 0.40–0.75 were considered fair, while $ICC > 0.75$ were considered excellent [28].

Finally, we regressed each scale onto the other scales and calculated the explained portion of variance (R^2). Since Cronbach's alpha is an estimate of the proportion of the total variance of a scale that is error free, and R^2 is the proportion of the total variance that the scale shares with the other scales, the difference between alpha and R^2 is an estimate of the unique variance of the scale [29]. Since multiple variables (12 scales) were included in the model, we used the adjusted- R^2 statistic. The unique variance provides insight into the degree to which the scales tap unique or shared latent constructs.

Construct Validity

The WBI has been constructed by several theories resulting into the WBI model which specifies the relationships between the five domains of the WBI (support, stressors, person/coping, symptoms and disability) [5]. We tested the construct validity of the WBI for self-employed workers in terms of the equality of the WBI domains' relations among employees and the self-employed. First, because the scales do not have the same number of items, the scores of the scales were converted into z-scores and for each person the average z-score of the corresponding scales of the domain was calculated. Partial correlations were calculated between each domain. The partial correlation corrects for the shared variance with the other three domains in each pair of correlations and provides a more specific impression how two domains relate. Although the level of WBI scores of self-employed workers may differ from those of employees, we have no reason to suspect that the WBI-model is not applicable to self-employed workers. Thus the null hypothesis was tested that the nature of the relationships among the five WBI-domains was equal in employees and self-employed workers. We calculated Fisher's z' to test the equality of the partial correlations among employees and self-employed workers. The Fisher r -to- z transformation is a way to transform the sample distribution of Pearson's r so that it becomes normally distributed: $z' = 0.5[\ln(1+r) - \ln(1-r)]$. Since the analysis aims at determining whether correlations do not differ we run the risk to commit a type 2 error, i.e. the error of falsely finding no differences between correlations. The risk of committing a type 2 error increases if the level of significance (α) is small, that is $p < 0.05$ or even smaller. Therefore, we set alpha at a conservative level of $p < 0.10$ to conclude that the correlations of the two samples are unequal.

Since the test is two-sided p -values will vary between 0.0 and 0.50 where a p -values lower than 0.10 suggests that the correlations are likely unequal and p -values between 0.10 and 0.50 suggests we have no reason to conclude that the correlations are unequal.

Concurrent Validity

The concurrent validity was examined for the WBI-scales except for WBI-scale 'social support at work' because no similar external questionnaires were available for self-employed people. For the remaining 12 WBI-scales parallel measures were chosen and correlations (Pearson's r) were calculated between the external measures and the WBI-scales. We hypothesized that the correlation (Pearson's r) between each WBI-scale and the parallel measure surpasses the correlations between the parallel measure and the other WBI-scales. The parallel instruments were administered in different subsamples resulting in different samples sizes for these instruments.

Testing the Suitability of the WBI Employees Norms for Self-Employed Workers

For each group of the self-employed (business owners [B], liberal professions [L] and medical practitioners [M]) scale scores were calculated using the norms of the national normative sample of employees ($n = 912$), which is a representative sample of Dutch employees of different branches [5]. Women make up 53% of the sample of employees. The average age is 42.4 years ($SD = 11.0$). There are separate norms for each gender. T-scores were calculated using the WBI scale's means and standard deviations of employees. A T-score is a standardized score (z-score) with a mean of 50 and a standard deviation of 10. Since the sample of employees has a mean of $T = 50$ and a standard deviation of 10 for each WBI scale, we would expect the same figures if the sample of employees and the sample of self-employed are the same. The equality of the two samples was tested using the one-sample t-test. The hypothesis was tested that each sample of self-employed workers has a mean of $T = 50$ on each scale. Since 13 scales are compared alpha was set at $p < 0.004$ ($0.05/13$). Next, it was investigated to what extent the scale averages of the three samples of self-employed workers (B, L and M) are the same. This was investigated with an ANOVA for each scale whereby alpha was set at $p < 0.004$. If a significant overall group difference was observed multiple comparisons were made with Fisher LSD ($B \times L$; $B \times M$; $L \times M$).

The next step is to determine the effect of any differences between the employee sample and the self-employed samples would be on the scoring categories. Statistical differences in samples do not mean that the scores

automatically effect the allocation of raw scores to scale categories. For the WBI (in addition to the calculation of a T-score) raw scores are transformed into scale scores using five categories: low (< 5th percentile), below average (5th–20th percentile), average (20th–80th percentile), above average (80th–95th percentile) and high (> 95th percentile). To establish the match between the scoring categories of the employee sample and the self-employed sample, we first established for each individual the scale category using the employees norms. Second, we calculated norms for each group of self-employed workers (B, L and M) and established for each subject the allocated scale category using these norms. Next, for each scale the exact match (percentage of agreement) between all individual scores (in terms of scoring categories) was calculated as well as Cohen's kappa. There are no guidelines on what percentage of agreement is satisfactory. Thus, quite arbitrary we set the percentage of exact match for each scale at 90%. In addition, kappa should exceed 0.80 (strong level of agreement) [30].

Results

Response Rate and Sample Characteristics

Of the 10,370 e-mail invited participants 5.1% ($n = 529$) loss appeared because of e-mail bounces. We received 676 filled in questionnaires back, leading to a response rate of 6.9%. The median time between test en retest (subsample of 150 persons) was 14 days (range 10–29 days). The sample characteristics are shown in Table 1. The number of business owners ($n = 106$) was lower compared to liberal professions ($n = 273$), and to medical practitioners ($n = 297$). This was partly due to a slightly lower response rate of business owners, but mostly due to the lower prevalence of business owners in the biggest population (insurance company A; $n = 8000$) compared to the other population (insurance company B; $n = 2370$). The three samples of self-employed workers were equal in terms of age, but not with regard to sex: men were clearly more prevalent among business owners ($X^2 = 34.1$; $p < 0.001$).

Representativeness of Sample

The sample (43.1% female) did not differ significantly from population A (45.6% female, Table 1) (binomial test; $p = 0.098$, one-tailed). However, the percentage of women in population B (19.5%, Table 1) was significantly lower compared to out sample (binomial test; $p = 0.000$, one-tailed). The mean age of the sample ($M = 46.8$; $SD = 9.3$) was higher than the mean age of population A (44.6; $SD = 10.2$) ($t = 6.2$; $p < 0.001$) and the mean age of population B (45.0; $SD = 9.0$) ($t = 5.1$; $p < 0.001$). However, age had little influence on the 13 WBI-scale scores. There appeared to be one low statistical significant correlation ($r = -0.15$; $p < 0.001$) between age and WBI-scale Fatigue. On the other hand, performed ANOVAs showed a more pronounced influence of gender. Females with a liberal profession or medical background appeared to experience less job control and higher levels of life stressors, job strain and stress symptoms (p 's < 0.004). Because of the possible gender bias, comparisons between the three groups of self-employed workers were carried out separately for men and women.

Reliability

Table 2 shows the internal consistency (alpha), stability (test–retest reliability; ICC and 95% CI of ICC) and the unique variance of each scale. All scales surpassed the minimum value of 0.70 for alpha, and 12 out of 13 alpha's were above 0.80. The stability of the WBI was excellent since ICC for all scales was close to or above 0.90. The control scale demonstrated the lowest amount of shared variance (23%) and the stress scale the highest (62%).

Construct Validity

Table 3 demonstrates the pattern of partial correlations between the WBI-domains. The pattern of partial correlations between the WBI domains is largely the same in employees and self-employed: for 2 out of 10 correlations the null hypothesis, which assumes equal correlations between variables for the two samples, could not be confirmed. For the other 8 correlations we have no reason to reject the hypothesis of equal correlations between samples.

Table 1 Sample characteristics

	Population (company A) ($n = 8000$)	Population (company B) (2370)	Total sample ($n = 676$)	Business owners ($n = 106$)	Liberal professions ($n = 273$)	Medical practitioners ($n = 297$)
Female sex (%)	45.6	19.5	43.1	21.7	39.9	53.5
Age in years, M (SD)	44.6 (10.2)	45.0 (9.0)	46.8 (9.3)	47.8 (9.2)	46.5 (8.5)	46.8 (10.1)
Medically disabled (off work), n (%)			34 (5.0)	7 (6.6)	13 (4.8)	14 (4.7)

Table 2 Reliability parameters of the WBI-scales

WBI scale	Number of items	Cronbach's Alpha	Test–retest reliability (ICC) ^a	95% CI ^a	Shared variance (R ²)	Unique variance ^b
Support						
Social support at home	5	0.77	0.92	0.90–0.95	0.26	0.51
Social support at work	5	0.83	0.89	0.85–0.92	0.42	0.41
Job satisfaction	7	0.80	0.94	0.92–0.96	0.46	0.34
Control	5	0.89	0.92	0.89–0.94	0.23	0.66
Stressors						
Life stressors	8	0.80	0.94	0.91–0.96	0.32	0.48
Job strain	8	0.84	0.92	0.88–0.94	0.46	0.38
Person/coping						
Avoidance	8	0.86	0.90	0.86–0.92	0.32	0.54
Perfectionism	9	0.84	0.91	0.88–0.94	0.26	0.58
Symptoms						
Stress	6	0.84	0.87	0.84–0.92	0.62	0.22
Fatigue	4	0.83	0.91	0.88–0.93	0.62	0.21
Anxiety	5	0.81	0.87	0.82–0.91	0.58	0.23
Depression	6	0.82	0.94	0.92–0.96	0.52	0.30
Disability						
Illness behavior	7	0.89	0.90	0.87–0.93	0.54	0.35

^aSubsample (n = 150) of total population (n = 676); Pearson's *r*

^bUnique variance = Cronbach's alpha minus R²

Table 3 Partial correlations^a between the WBI domains^b of self-employed workers and employees

WBI domain	Support	Stressors	Person/coping	Symptoms	Disability
Support		0.08 (0.16)	0.07 (0.50)	−0.20 (0.11)	−0.08 (0.28)
Stressors	−0.13 (0.16)		0.30 (0.33)	0.31 (0.41)	0.17 (0.06)
Person/coping	0.07 (0.50)	0.32 (0.33)		0.24 (0.42)	−0.05 (0.12)
Symptoms	−0.26 (0.11)	0.32 (0.41)	0.23 (0.42)		0.54 (0.04)
Disability	−0.05 (0.28)	0.09 (0.06)	−0.11 (0.12)	0.60 (0.04)	

Between brackets the *p*-value of the difference between each pair of correlations of employees and self-employed samples

Correlations upper right side: employees (n = 912); Correlations bottom left side: self-employed workers (n = 676)

^aEach correlation between two domains is controlled by the other three domains

^bSum of the standardized scores of the domains' corresponding scales

Disability seems in terms of magnitude slightly different related to stressors and symptoms; stressors have a slightly weaker relationship and symptoms have a slightly stronger relationship with disability in self-employed workers compared to employees.

Concurrent Validity

Table 4 shows the concurrent validity of the WBI for self-employed workers. The correlation between each WBI-scale and its parallel (external) measure is bold. Eleven of the 12 external measures had the highest correlation with the

corresponding WBI scale. TCI Harm avoidance appeared to correlate higher with WBI anxiety than with WBI avoidance. A strong correlation was measured for WBI depression and DASS depression which implies that these two scales measure about the same construct.

Testing the Suitability of the WBI Employees Norms for the Self-Employed

Table 5 shows (in bold) for each subsample of self-employed workers the scales of which the mean score differs significantly ($p < 0.004$) from employees (n = 912).

Table 4 Concurrent validity of the WBI scales; correlations (Pearson) between the WBI scales and the parallel measures

Questionnaires	Sample size (n)	Work and Wellbeing Inventory (WBI) scales															
		SSH	SSW ^a	SAT	CTL	LST	JOB	AVO	PER	STR	FAT	ANX	DEP	ILL			
Support																	
Mult. Scale of Perceived Social Support ^a	93	0.68*	0.16	0.04	0.14	-0.28*	0.25	-0.18	-0.05	-0.31*	-0.33*	-0.26	0.28*	-0.28*			
Single item job satisfaction	144	0.01	0.58*	0.86*	0.36*	-0.25*	-0.27*	-0.32*	0.05	-0.37*	-0.32*	-0.56*	-0.57*	-0.42*			
JCQ (decision latitude)	90	0.00	0.31*	0.10	0.74*	0.01	-0.16	-0.12	0.08	0.06	-0.16	-0.08	-0.08	-0.18			
Stressors																	
Satisfaction with Life Scale	93	0.52*	0.25	0.39*	0.26	0.52*	-0.33*	-0.33*	-0.14	-0.44*	-0.46*	-0.43*	-0.38*	-0.45*			
JCQ-Psychological demands	90	-0.05	-0.26	-0.15	-0.50*	0.23	0.62*	0.07	0.28*	0.15	0.37*	0.18	0.10	0.38*			
Person/coping																	
TCI-Harm avoidance	152	-0.38*	-0.32*	-0.47*	-0.25*	0.27*	0.31*	0.46*	0.11	0.46*	0.44*	0.58*	0.44*	0.39*			
TCI-Persistence	152	-0.12	-0.14	0.05	-0.06	0.13	0.33*	0.04	0.66*	0.05	0.07	0.18	0.11	0.11			
Symptoms																	
DASS-Stress	115	-0.24*	-0.14	-0.29*	-0.29*	0.55*	0.51*	0.49*	0.18	0.71*	0.64*	0.69*	0.56*	0.48*			
SF36-Vitality	144	0.13	0.42*	0.45*	0.22*	-0.29*	-0.39*	-0.34*	-0.03	-0.65*	-0.79*	-0.52*	-0.56*	-0.68*			
DASS-Anxiety	115	-0.24	-0.24*	-0.38*	-0.16	0.52*	0.40*	0.41*	0.14	0.53*	0.49*	0.64*	0.44*	0.54*			
DASS-Depression	115	-0.50*	-0.31*	-0.45*	-0.28*	0.54*	0.31*	0.46*	-0.04	0.58*	0.59*	0.62*	0.91*	0.49*			
Disability																	
WAI (single item)	144	-0.04	0.24*	0.44*	0.11	-0.20	-0.06	0.29*	0.20	-0.46*	-0.45*	0.36*	-0.37*	-0.68*			

The correlation between each WBI-scale and its parallel (external) measure is underlined

SSH social support at home, SSW social support at work, SAT job satisfaction, CTL control, LST life stressors, JOB job strain, AVO avoidance,

PER perfectionism, STR stress, FAT fatigue, ANX anxiety, DEP depression, ILL illness behavior

* $p < 0.01$

^aFor the WBI scale 'social support work' (SSW) scale there is no existing external questionnaire available with items suitable for self-employed workers

Table 5 Mean T-scores of the self-employed male and female samples based on and compared with the norms of the Dutch national Wellbeing Inventory (WBI)-sample of employees

WBI scale	Business owners (B) (n = 83)			Liberal professions (L) (n = 164)			Medical practitioners (M) (n = 138)			η^2	Differences between business owners (B), liberal professionals (L) and medical practitioners (M) ^b
	Mean	SD	95% CI ^a	Mean	SD	95% CI ^a	Mean	SD	95% CI ^a		
Men											
Support											
Social support at home	52.2	9.7	(50.1–54.3)	51.3	10.0	(49.7–52.8)	50.8	10.3	(49.1–52.6)	0.00	
Social support at work	54.0	9.5	(51.9–56.0)	54.4	8.2	(53.1–55.7)	54.1	8.1	(52.8–55.5)	0.00	
Job satisfaction	54.9	7.9	(53.2–56.7)	55.1	7.7	(53.9–56.3)	54.9	7.6	(53.7–56.2)	0.00	
Control	58.8	9.6	(56.7–60.9)	60.0	7.7	(58.8–61.2)	47.9	10.4	(46.2–49.7)	0.27*	M < B & M < L
Stressors											
Life stressors	47.3	7.6	(45.7–49.0)	46.2	8.1	(44.9–47.4)	47.5	7.4	(46.3–48.8)	0.01	
Job strain	50.8	11.6	(48.3–53.3)	53.1	9.7	(51.7–54.7)	54.0	11.2	(52.1–55.9)	0.01	
Person/coping											
Avoidance	50.5	10.0	(48.4–52.7)	50.7	9.4	(49.2–52.1)	52.7	10.0	(49.3–54.3)	0.01	
Perfectionism	55.8	10.1	(53.6–58.0)	54.2	9.1	(52.8–55.7)	52.7	10.9	(49.1–54.5)	0.01	
Symptoms											
Stress	44.2	9.4	(42.1–46.2)	44.6	8.0	(43.4–45.9)	45.5	8.9	(44.0–47.0)	0.00	
Fatigue	46.3	8.9	(44.3–48.2)	46.7	6.6	(45.7–47.7)	48.0	8.1	(46.6–49.4)	0.01	
Anxiety	45.9	8.9	(43.9–47.8)	46.8	9.3	(45.4–48.3)	47.2	9.2	(45.6–48.8)	0.00	
Depression	46.8	6.5	(45.4–48.3)	47.4	9.0	(46.0–48.8)	48.5	9.7	(46.8–51.1)	0.01	
Disability											
Illness behavior	48.8	12.0	(46.2–51.5)	47.1	7.6	(46.0–48.3)	49.5	9.3	(48.0–51.1)	0.01	
Women											
WBI scale	Business owners (B) (n = 23)			Liberal professions (L) (n = 109)			Medical practitioners (M) (n = 159)			η^2	Differences between business owners (B), liberal professionals (L) and medical practitioners (M) ^b
	Mean	SD	95% CI ^a	Mean	SD	95% CI ^a	Mean	SD	95% CI ^a		
Support											
Social support at home	49.8	11.3	(44.9–54.7)	50.0	10.7	(48.0–52.1)	49.2	12.2	(47.3–51.1)	0.00	
Social support at work	52.8	10.7	(48.1–57.4)	51.6	9.2	(49.8–53.3)	51.3	10.9	(49.6–53.0)	0.00	
Job satisfaction	56.5	6.9	(53.5–59.5)	54.1	8.1	(52.5–55.6)	52.8	9.3	(51.3–54.2)	0.02	
Control	55.3	12.0	(50.1–60.5)	54.1	10.2	(52.2–56.1)	38.9	11.0	(37.1–40.6)	0.34*	M < B & M < L
Stressors											
Life stressors	47.2	6.8	(44.3–50.2)	50.0	9.6	(48.2–51.8)	51.5	10.6	(49.8–53.2)	0.02	
Job strain	48.2	8.1	(44.7–51.7)	57.1	11.5	(54.9–59.2)	57.3	11.9	(55.4–59.2)	0.04*	B < L & B < M
Person/coping											
Avoidance	50.1	12.1	(44.9–45.3)	53.9	11.5	(51.8–56.1)	57.0	11.6	(55.2–58.8)	0.03	

Table 5 (continued)

WBI scale	Business owners (B) (n = 23)			Liberal professions (L) (n = 109)			Medical practitioners (M) (n = 159)			η^2	Differences between business owners (B), liberal professionals (L) and medical practitioners (M) ^b
	Mean	SD	95% CI ^a	Mean	SD	95% CI ^a	Mean	SD	95% CI ^a		
Perfectionism	56.0	8.2	(52.4–59.6)	58.0	10.2	(56.1–60.0)	56.5	9.8	(54.9–58.0)	0.01	
Symptoms											
Stress	41.4	7.6	(38.9–44.7)	47.8	9.5	(46.0–49.6)	47.8	10.4	(46.2–49.4)	0.03	
Fatigue	44.3	5.2	(42.0–46.5)	50.7	10.6	(48.7–52.7)	50.3	9.9	(49.4–52.5)	0.03	
Anxiety	42.6	6.9	(39.6–45.6)	48.9	9.6	(47.1–50.8)	49.0	10.6	(47.3–49.4)	0.02	
Depression	46.0	3.6	(44.4–47.5)	51.0	11.4	(48.9–53.2)	51.2	11.7	(49.4–53.0)	0.01	
Disability											
Illness behavior	46.4	7.1	(43.4–49.6)	50.0	9.9	(48.1–51.9)	50.3	10.3	(48.7–51.9)	0.01	

In the national WBI-sample of employees (n = 912) raw scores are transformed into standardized T-scores with a mean of 50 and a standard deviation of 10 for all WBI-scales

In bold: all differences are significant at $p < 0.004$

^a $p < 0.004$

^a95% confidence interval of the subgroups' difference from T = 50 (one-sample t-test; test-value = 50)

^bMultiple comparisons (Fishers LSD); results significant at $p < 0.02$ are shown

In each group of self-employed workers 8 or 9 out of 13 WBI scales turn out to have a different mean score in comparison with employees. Some common results that came forward were the self-employed: greater job satisfaction, more happiness in life, more perfectionism traits (diligence), and less psychological distress. However, also some important differences *within* the group of self-employed workers were found. First, we measured a relatively low perceived control (autonomy) for medical practitioners in comparison with business owners and liberal professions. Medical practitioners experience even less control than the average employee. Second, whereas business owners experience about the same amount of job strain compared to employees, liberal professions and medical practitioners experience clearly more job strain. Last, business owners experience clearly less psychological distress in comparison to medical practitioners.

The application of employee test norms to self-employed workers can lead to incorrect clinical interpretations. In about three quarters of cases, the scoring categories do not correspond ("Appendix"). In the group of business owners, the average agreement rate is the lowest.

Discussion

Main Findings

The aim of this study was to adapt and validate the WBI for entrepreneurs. The construct validity and concurrent validity of the WBI could be demonstrated for the self-employed. Another aim was to assess whether the existing test norms of the WBI should be adapted when using this screening instrument to investigate psychosocial risk factors of disability for self-employed workers. We found that in about 25% of the participants an incorrect classification would occur when using the existing test norms for employees. Overall, the self-employed scored higher on job satisfaction and social support at work. They also have fewer mental health problems compared to employees, but generally score higher on perfectionism (diligence). We also found that the self-employed should not be treated as one group, as there were some important differences between entrepreneurs, the liberal professions and the doctor and paramedics. A remarkable finding was that doctors/paramedics scored relatively low on perceived job control compared to both the other types of self-employed and employees. Some items have been adapted so that they also apply to the self-employed in terms of content. The slight changes in item content had no negative effect on the reliability and validity of the WBI. This remained good.

Comparison with Literature

In a previous study an overview was provided of the reliability and validity of the WBI for employees [5]. As in the current study, the concurrent validity of the WBI scales has been examined. It is important for the validity of the WBI for entrepreneurs because until now the WBI and the concurrent measures were only tested in employees. That is, we are not sure whether or not the results may be generalized to the self-employed. Table 4 clearly demonstrates that the WBI scales are able to measure the concepts these scales aim to measure.

A direct comparison of employees and self-employed workers on well-being at work is scarce in the literature. There are a few attempts to develop tools for the assessment of risk factors among entrepreneurs. There is another Dutch study that has previously developed and validated a scale for entrepreneurial job demands [31, 32]. They investigated the relationship between the job demands of job entrepreneurs and work related strain or engagement. They found that both high job demands and low job resources also predicted work related strain for this group of workers. However, high job demands were not related to low work engagement, only having low job resources did. In more detail, they found that work-related strain for this group of workers was related to both less personal and less financially subjective business success. Work engagement was related to higher personal, but not financial subjective business success. Their study group consisted only of persons who founded or owned a private company (older than 1 year) employing less than 250 people. This is rather different from the broader definition of self-employed we use within this study, also including liberal professions and medical professionals.

Abma et al. tested the work role functioning questionnaire on different groups of employees, although they also included medical professionals, all employees were employees in different settings [33]. They found that the questionnaire generally showed good validity and reliability, in line with our study results, the doctors as a group had slightly different scores, especially on the physical job demands. This illustrates the importance of using relevant questionnaires for certain working groups when assessing or predicting work (in)ability.

The low scores of medical professionals on perceived job control is in line with the findings of other studies that examine the underlying reasons for the higher scores of burnout and stress among doctors. For example, Glasheen et al. assessed doctors working in 20 hospitals in the United States and concluded that burnout was more common among doctors who expressed low satisfaction with their personal and family time or with control over their work schedule [34]. Other studies found a poor work-life balance as an important reason for doctors to experience a high workload [35].

Strengths and Limitations

As far as we know, this is the first study that compares the scores of employees with those of entrepreneurs on well-being. We tested the WBI on a large sample of self-employed ($n = 676$) and followed the general guidelines for testing the validity and reliability of health questionnaires [25].

An important limitation of this study concerns the representativeness of the current sample. Firstly, only 20% of all self-employed persons in the Netherlands have disability insurance. Although we do not know in what way insured self-employed persons with disability insurance differ from self-employed persons without disability insurance, we cannot exclude a bias in this area. This bias may be relevant because ‘dealing with risks’ is present in the new WBI scales and can explain why people choose whether or not to take out insurance. On the other hand, this bias may not be relevant, because the WBI for the self-employed will mainly be used by company doctors who work for insurance companies. The most likely group to which the WBI will be applied therefore corresponds reasonably to the sample of this study. However, caution should be exercised when using the WBI in other situations. Secondly, one can discuss the representativeness of the current sample within the entire population of insured self-employed persons. Indeed, 90% of the invited persons did not respond. However, the results showed that the sample is comparable in terms of gender with the population. And this is important because gender seems to have an impact on some WBI scales in particular. However, the average age of the sample turned out to be higher than that of the population. However, age had little effect on the WBI scales. We can therefore conclude that we can reasonably base the standards for the self-employed on the current sample.

Practical Implications and Further Research

The results of this study illustrate that medical advisors working for insurance companies should not rely on instruments validated only for employees. The results of this study show that the self-employed will score differently and that there is a risk that some variables, such as psychological distress, will be underestimated. Medical advisors should realize that medical professionals in particular may be at risk of incapacity for work if they score low on the perceived job control and high on job strain.

While it makes sense to set separate test norms for the self-employed, more research is needed to find out whether separate test norms for different groups give a more accurate prediction than test norms based on the general population. In the field of occupational health care, prediction models are almost always based on raw or (statistical) transformed data, while practitioners use standardized test results in daily

practice. Which test norms (general population, employees or self-employed) are most appropriate depends on the objective pursued. If the aim is to assess the absolute level of a particular health-related construction (e.g. depression), general population test norms are the most appropriate. However, if the professional wants (for example) to compare an individual entrepreneur with the average entrepreneur, then the entrepreneurial test norms are more appropriate. Such a comparison gives an indication to what extent someone deviates from his own group. Especially prediction models should be based on the test results of the (sub)population for which the model is intended. In short, there are no simple guidelines for which test norms to apply. Much will depend on the specific objective that one pursues. But test results from specific populations (in this case the self-employed) will always give a deeper insight into their characteristics and thus make better assessments and predictions possible.

Although the correlations between the different domains of the WBI of employees and the self-employed hardly differ from each other, we observed that disability had a slightly weaker relationship with stressors and a slightly stronger relationship with symptoms in the self-employed. This suggests that psychosocial factors in the self-employed seem to have a slightly weaker impact on disability compared to employees. At face value this makes sense because the job satisfaction in the self-employed is higher (our results show this) and the self-employed run a greater financial risk if they become ill. We do not know of any other research that can confirm this assumption. Future research will have to show what is true of this.

Conclusion

The reliability and validity of the WBI was confirmed. Important differences in the scores of employees and self-employed workers emerged. Moreover, the group of self-employed workers appeared to be rather heterogeneous. There is now a solid basis to examine the WBI for self-employed workers in future research on predicting long-term disability.

Compliance with Ethical Standards

Conflict of interest Lex Vendrig has developed the WBI (Dutch: VAR-2) and he participates in a project to support the online application of the VAR-2 (project: VAR-2-app). Frederieke Schaafsma and Liesbeth Wijnvoord declare they have no conflicts of interests.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Appendix

See Table 6.

Table 6 Congruence of test results of self-employed people scored^a with employees norms and the self-employed norms

WBI scale	Business owners (n = 83)		Liberal professions (n = 164)		Medical practitioners (n = 138)	
	Match %	Kappa	Match %	Kappa	Match %	Kappa
Men						
Support						
Social support at home	31.3	0.01	75.0	0.59	88.4	0.80
Social support at work	61.4	0.37	76.8	0.56	73.9	0.49
Job satisfaction	63.9	0.37	65.2	0.39	60.1	0.32
Control	26.5	0.02	14.0	0.19	92.8	0.87
Stressors						
Life stressors	86.7	0.74	59.8	0.12	82.6	0.67
Job strain	84.3	0.73	73.1	0.57	42.0	0.33
Person/coping						
Avoidance	92.8	0.88	100.0	1.00	84.8	0.73
Perfectionism	50.6	0.22	66.5	0.45	76.1	0.63
Symptoms						
Stress	75.9	0.61	71.3	0.53	70.3	0.53
Fatigue	48.2	0.13	78.0	0.63	86.2	0.76
Anxiety	68.7	0.44	90.2	0.84	93.5	0.89
Depression	86.7	0.43	97.6	0.87	96.4	0.81
Disability						
Illness behavior	97.6	0.90	92.7	0.66	100.0	1.00
Match % (mean)	67.3		73.9		80.5	
Women						
Support						
Social support at home	95.6	0.93	100.0	1.00	97.5	0.96
Social support at work	87.0	0.79	76.1	0.60	80.5	0.70
Job satisfaction	52.2	0.18	78.0	0.58	76.7	0.61
Control	47.8	0.29	68.8	0.54	18.2	0.08
Stressors						
Life stressors	87.0	0.72	89.0	0.81	80.5	0.66
Job strain	78.3	0.66	51.4	0.14	45.2	0.16
Person/coping						
Avoidance	95.7	0.90	86.2	0.61	54.1	0.29
Perfectionism	56.5	0.24	44.0	0.11	47.2	0.18
Symptoms						
Stress	13.0	0.22	92.7	0.88	100.0	1.00
Fatigue	78.3	0.64	100.0	1.00	100.0	1.00
Anxiety	34.8	0.09	84.4	0.73	91.2	0.83
Depression	78.3	0.65	93.6	0.78	97.5	0.92
Disability						
Illness behavior	87.0	0.45	99.1	0.96	100.0	1.00
Match % (mean)	68.6		81.8		76.0	

In bold: a match above 90% and kappa > 0.80

WBI Wellbeing Inventory

^aRaw scores are assigned into five categories: low (< 5th percentile), below average (5th–20th percentile), average (20th–80th percentile), above average (80th–95th percentile), high (> 95th percentile)

^bSeparate norms for men and women and for each group of self-employed workers (entrepreneurs, liberal professions, medical practitioners)

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