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Work Environment Impact Scale: Testing the psychometric properties of the Swedish version

Authors: Elin Ekbladh^{1,4}, Chia-Wei Fan², Jan Sandqvist¹, Helena Hemmingsson¹,
Renée Taylor³

- 1 Linköping University, Faculty of Health Sciences, Department of Social and Welfare Studies, Sweden.
- 2 University of Illinois at Chicago, College of Applied Health Sciences, Department of Occupational Therapy, 1919 W. Taylor St. (MC 811), Chicago, IL 60612
- 3 University of Illinois at Chicago, College of Applied Health Sciences, Department of Occupational Therapy, 1919 W. Taylor St. (MC 811), Chicago, IL 60612; 2nd Affiliation Linköping University, Faculty of Health Sciences, Department of Social and Welfare Studies, Sweden
- 4 Correspondence should be directed to Elin Ekbladh, Linköping University, Faculty of Health Sciences, Department of Social and Welfare Studies, SE-601 74 Norrköping, Sweden, e-mail: Elin.Ekbladh@liu.se, phone number: +46 11 36 31 82, fax number: + 46 11 363189

Abstract

Background: The Work Environment Impact Scale (WEIS) is an assessment that focuses on the fit between a person and his or her work environment. It is based on Kielhofner's Model of Human Occupation and designed to gather information on how clients experience their work environment.

Objective: The aim of this study was to examine the psychometric properties of the Swedish version of the WEIS assessment instrument.

Method: In total, 95 ratings on the 17-item WEIS were obtained from a sample of clients with experience of sick leave due to different medical conditions. Rasch analysis was used to analyze the data.

Results: Overall, the WEIS items together cohered to form a single construct of increasingly challenging work environmental factors. The hierarchical ordering of the items along the continuum followed a logical and expected pattern, and the participants were validly measured by the scale. The three occupational therapists serving as raters validly used the scale, but demonstrated a relatively high rater separation index, indicating differences in rater severity.

Conclusion: The findings provide evidence that the Swedish version of the WEIS is a psychometrically sound assessment across diagnoses and occupations, which can provide valuable information about experiences of work environment challenges.

Keywords: vocational rehabilitation, assessment, Model of Human Occupation (MOHO), occupational therapy

Introduction

The assessment of individuals' work ability is an important part of the process of returning to work [1-3]. Work ability assessments aim to help people with disabilities to find, return to, or remain in work [4]. In order to understand a client's work ability, personal factors, as well as environmental factors need to be accounted for since the client's work ability depends on the dynamic interaction between the client and his or her environment [1-9]. More knowledge about factors causing long-term sick leave, and about what facilitates a return to work after long-term sick leave, is needed [10]. To obtain such knowledge, valid assessment tools are essential for identifying efficacious intervention strategies, and putting useful findings into practice is the ultimate goal [2, 11]. In order to select appropriate and relevant assessment instruments, professionals need to know the purpose of the assessment as well as its strengths and limitations [2]. Assessment instruments estimating work ability often lack theoretical underpinnings; this underlines the need for such assessment instruments and grounded evaluation [13]. This is essential since assessment instruments based on theoretical models have the advantage that they create conditions that are conducive to valid interpretations of assessment results and yield intervention strategies [14]. Since work experiences are related to the interaction between the person and the work characteristics, models and assessments of work and health need to consider the fit between each unique person and the characteristics of his or her work environment [15].

The Work Environment Impact Scale (WEIS) is an assessment instrument that focuses on this fit between a person and his or her work environment. It is designed to gather information on how clients experience their work environment [16]. The WEIS is theoretically based on the Model of Human Occupation (MOHO) [7], which is a model

that seeks to explain humans' occupational performance and occupational participation by understanding the motivation for occupation, how people organize their occupation into everyday patterns, and how objective capacity and the subjective experience of performing occupations contribute to performance capacities. These interacting factors are understood in conjunction with how the surrounding physical and social environment influences occupational performance and occupational participation [7]. The first version of the WEIS was developed in the USA in 1997 [17] and it was subsequently translated and adapted to a Swedish context. The data in this study are based on the second version of the Swedish WEIS [18]. In the early development of the WEIS, the psychometric properties of the assessment instrument were investigated [17,19]; since then, the assessment instrument has been developed further. It is used in vocational rehabilitation practice as an assessment tool for identifying rehabilitation needs and explains the unique client's perception of his or her work environment. Thereby it also provides valuable information in the development of rehabilitation plans in order to support the client to sustain or return to work. The WEIS has been identified as a usable tool in vocational rehabilitation [20-23], but no further psychometric investigations on the assessment have been undertaken, which indicates the need for further scrutiny of the psychometric properties of the WEIS.

Rasch measurement methods were used in the current study in order to examine the psychometric properties of the Swedish version of the WEIS on the basis of the following research questions:

- 1) Do the WEIS items demonstrate evidence of internal scale validity, that is, form a valid unidimensional measure of the construct of work environmental impact?

- 2) Does the hierarchical ordering of the WEIS items support construct validity of the scale by following an expected pattern of increasingly challenging environmental impacts along a continuum?
- 3) Do the WEIS ratings of people with experience of sick leave demonstrate valid patterns?
- 4) Do the WEIS items target and reliably separate the distribution of clients into different levels of experienced work environment challenges?
- 5) Do the raters validly administer the WEIS scale and do they demonstrate acceptable rater severity?

Methods

Approval for this study was obtained from the ethical research committee at the Faculty of Health Sciences at Linköping University, Sweden.

The WEIS assessment

The WEIS is designed to gather information on how clients perceive their work environment [16]. It consists of a semi-structured interview related to 17 items, which are rated by a therapist on a rating scale. The WEIS interview yields qualitative information about the client's perceptions of how factors in the work environment support or interfere with the client's work performance, satisfaction and wellbeing, that is, the fit between the person and his or her work environment. The interview focuses on the client's unique perceptions of opportunities and constraints in the work environment related to physical spaces, social groups, objects and tasks. The same environment has different impacts on different individuals [7] and the WEIS yields the client's subjective

perceptions of his or her work environment and is not an objective assessment of the work environment per se. The WEIS rating scale has four values: A value of '1' implies that the item strongly interferes, '2' implies that the item interferes, '3' implies that the item supports, and '4' implies that the item strongly supports work performance, satisfaction and wellbeing [16].

Participants

In a larger project, of which the present study is a part, various types of written and verbal data concerning work and life situations were collected from workers on four occasions between spring 2004 and autumn 2006. The data analyzed for the present study consisted of a total of 95 WEIS ratings provided at baseline and two-year follow-up on a sample of 53 workers with experience of sick leave due to different medical conditions. All 53 workers were rated with the WEIS at baseline. At two-year follow-up those workers who still had a workplace to relate to (n=33) i.e. those who were neither unemployed (n=18) nor had a disability pension (n=2) were rated with the WEIS. The workers' mean age was 43 years (SD 11), and 34 (64%) were women. The two most common diagnosis groups among the workers as reasons for taking sick leave were diseases of the musculoskeletal system and mental, behavioural disorders (Table 1). The most common occupational groups represented among the workers were service and shop sales workers (Table 2).

[Insert Table 1 and Table 2 about here]

Raters

Data were collected by three Swedish occupational therapists (in this study, referred to as raters A, B and C). They all had sound knowledge of the MOHO and the WEIS. At baseline, rater A interviewed 25 subjects, while raters B and C interviewed 15 and 13 subjects, respectively. At the follow-up, rater A interviewed 18 subjects and rater B interviewed 15. In addition, the three participating occupational therapists rated the same three videotaped WEIS interviews each, which linked the WEIS ratings to each other. Thus, in total, 95 ratings were included in the study.

Procedure

The study population was derived from the Swedish Social Insurance Board register. The study included all employed workers aged between 20 and 60 in a Swedish municipality (with about 130,000 inhabitants), who, on one specific day in 2004, were on sick leave for a period of between 60 and 89 days in length, this sick leave involved not attending at least 50% of a full-time work schedule. In total, 130 individuals were asked to participate in the study via a mailed letter and one reminder. Of these, 53 (41%) agreed to participate. The WEIS interviews are commonly accomplished by face-to-face interviewing, but in this study, telephone interviews were used for practical and economic reasons. However, interviewing by telephone worked well since it generated usable information and the impression is that the participants responded honestly and were willing to share their perceptions of their work environment by telephone.

Data analysis

To investigate the validity of the WEIS, many-faceted Rasch analysis was carried out using the FACETS 3.68.1 computer program. The WEIS ratings are ordinal but the Rasch analysis converts the ordinal ratings into interval measures [24]. The validity

measures of the WEIS were tested by fit statistics. Fit statistics included the mean square standardized residual (*MnSq*), that is, the ratio between observed and expected scores, and the standardized mean square (*ZSTD*), which indicates the significance of the *MnSq*. The ideal value for the *MnSq* is 1.0 and values above 1.4 associated with a *ZSTD* value of 2 or higher indicate a misfit, namely, an internal validity problem of the scale. Items with *MnSq* lower than 0.6 associated with *ZSTD* lower than -2.0 are not considered as misfitting, but they do not yield much information since they are redundant [25,26].

The WEIS has been developed with the intention that the 17 WEIS items delineate a single construct measuring environmental impact by identifying the fit between a person and his or her work environment. This was investigated by determining whether and how the WEIS items corresponded to a continuum representing the scope of environmental impact, that is, how they formed a single construct, which is conceptualized as unidimensionality. Since 5% of the items are expected to misfit by chance, the data were considered to fit the model when 95% of the items showed acceptable fit [25]. Given that WEIS contains 17 items, all but one item needed to show acceptable fit for acceptable internal scale validity to be identified.

Item calibrations were used to investigate how much of the underlying construct each WEIS item represented. The WEIS items that represent higher calibrations expressed in logits are considered to be more challenging for the fit between the person and his or her work environment than those with lower calibrations; namely, items with lower calibrations are less challenging than those with higher calibrations [25,27]. The construct validity of the scale was also assessed by examining if the WEIS items were

calibrated across the continuum in a logical manner. Furthermore, the number of different levels of environmental fit that the items could clearly discriminate was investigated by item separation statistics. The higher separation value, the more precise is the measurement [28].

By examining the pattern of each client's rating of the items, the person's response validity was investigated. If clients experienced less negative environmental impact for the less challenging items than for the more challenging items, they were said to fit the expectations of the measurement model. This enabled determination of whether the environmental impact upon the client was validly measured.

An assessment instrument that validly separates clients into many levels is sensitive. Person separation statistics refer to the number of different levels among the clients that the items can clearly discriminate. In Rasch analysis, items and clients can be calibrated on the same continuum, which in this study made it possible to determine whether items were appropriately targeted to the levels of the characteristics of the clients, that is, ceiling and floor effects of the scale. Finally, rater separation statistics were used to examine how lenient or severe each rater was when scoring the rating scale [25]. While differences in rater severity are not a threat to validity, they do affect the score that a client receives. Thus, the lower the rater separation, the less a client's score is affected by who is doing the rating. Ideally, a scale should demonstrate high item and person separation and low rater separation [17].

The WEIS ratings were treated as independent data in the analysis owing to the fairly long period of time between the measures and the fact that almost half of the

participants had changed work tasks or workplace between the two measures, which would likely have affected the fit between the person and his or her work environment.

Results

Overall, the results showed good psychometric properties of the Swedish version of the WEIS when used in a heterogeneous group of workers with experience of sick leave. On the basis of infit Mean Square (MnSq) statistics, the WEIS items worked well to demonstrate a single unidimensional construct of the fit between a person and his or her work environment. In Table 3, the fit statistics, calibrations and standard errors for the 17 items of the WEIS are shown. All but one of the 17 WEIS items demonstrated an acceptable fit. Item 7, “supervisor interaction”, exceeded acceptable infit MnSq and Zstd values, with a MnSq of 1.56 and a Zstd value of 3.7.

The items “task demands”, “rewards” and “time demands” reflect aspects of the work environment that are the most challenging environmental factors for work performance, satisfaction and wellbeing, while the items “interaction with others”, “meaning of objects” and “work group membership” are the least challenging. The hierarchy of the WEIS items appeared as expected in view of the results of earlier studies on the WEIS and logical reasoning. The item separation was 4.04, which implies that the WEIS separated the items into at least five different difficulty levels.

Of the 56 participating workers, 52 (93%) demonstrated acceptable fit on the measurement model, indicating that the participants in this study showed valid response

patterns and were adequately measured by the WEIS. The person separation index was 2.71, indicating that the scale can separate the sample into at least three and almost four statistically distinct strata (3.94) (i.e. levels of fit between a person and his or her work environment). Calibrated on the same continuum, the person mean measure was 0.49 (SD 0.71) and the item mean measure was 0.00 (SD 0.53).

Furthermore, the results showed that all three raters fit the Rasch measurement model, which indicates that they used the WEIS rating scale in a valid manner. The rater separation index was 6.69, indicating that differences in rater severity existed.

[Insert Table 3 about here]

Discussion

The aim of this study was to apply Rasch analysis to examine the psychometric properties of the second Swedish version of the WEIS assessment instrument. One advantage of Rasch analysis is that it provides detailed information on several quality aspects of an assessment, such as item fit, unidimensionality and structure of the items.

The finding that only one item did not fit the model indicates that the WEIS scale forms a valid, unidimensional measure of the construct of work environment impact, supporting the internal validity of the WEIS. The items were ordered in a logical manner in the calibration, supporting the construct validity of the scale. Factors in the working environment that were anticipated to be more stressful or challenging (“task

demands”, “rewards” and “time demands”) were calibrated at the upper end of the continuum and less challenging items (“interaction with others”, “meaning of objects” and “work group membership”) were calibrated at the lower end. This ordering followed the same pattern of environmental challenges as found in earlier studies on the WEIS [17,19]. In other studies, task and time demands were also found to be work factors that are strongly associated with psychological ill health and sick leave [29-31] and to constitute a risk for low enthusiasm and low satisfaction about work [32]. The item ‘rewards’ concerns how the worker perceives rewards received for personal effort. Studies have shown that an imbalance between personal effort and received rewards is related to subsequent sick leave [33] and various types of ill health [34-35]. The low calibration of item 10 “interaction with others” and item 6 “work group membership” could be considered surprising since several of the participants in this study had a mental health disability, which typically results in difficulty with social interaction [36]. This could be explained by the fact that the mental health disorders that the participants experienced were to a large extent stress-related and none had a disease with psychotic symptoms; this probably means that social interaction is not a major issue for the participants in this study.

Even though the 56 participants included were heterogeneous concerning their diagnoses and occupations, 93% (n=52) demonstrated response patterns that were consistent with the expectations of the measurement model. This result tentatively suggests that the WEIS scale can be validly used on heterogeneous groups. The WEIS scale also effectively separated participants into three different levels, supporting the assertion that the WEIS can be used as an outcome measure for capturing different levels of experienced work environment challenges. The results from the calibrations of

items and subjects provided evidence that the Swedish WEIS scale was also rather well matched to the study participants' levels.

All three raters used the scale in a valid manner. However, the rather high rater separation index indicated differences in rater severity. Even though this result is based on the ratings of only three raters, it suggests that, in order to be able to compare results of WEIS ratings between different raters, the levels of the four-point rating scale for each item need to be more explicit in the Swedish WEIS manual. After such revision, the psychometric properties would need to be retested. In terms of limitations, this study may have suffered from the relatively small sample size and the few raters. Future studies of this scale should include a larger number of participants assessed by a larger number of raters.

In Sweden the WEIS is used in clinical practice within different settings, such as the primary health care, municipality centers, employment services, and other rehabilitation settings. Usually, it is used in combination with other MOHO-based assessment instruments, such as the interview instrument Worker Role Interview (WRI) [39] and the observational instrument Assessment of Work Performance (AWP) [14]. However these assessments instruments focuses on other aspects of the client's work ability i.e. the WRI focuses on motivational and lifestyle factors and the AWP focuses on work performance skills. The findings in this study further supports that the WEIS can provide valid and reliable contributions concerning the work environmental aspects of work ability which supports future use of the WEIS in clinical practice.

Conclusions

Taken together, the findings provide evidence that the Swedish version of the WEIS is a psychometrically sound assessment across diagnoses and occupations. It provides an instrument for obtaining valuable information about experiences of work environment challenges. However, caution is needed when comparing WEIS rating results between different raters.

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Table 1. Distribution of Diagnoses of Study Participants

	Partici pants
Mental, behavioural disorders (F)	14
Diseases of the nervous system (G)	1
Diseases of the eye and adnexa (H)	1
Diseases of the circulatory system (I)	3
Diseases of the respiratory system (J)	1
Diseases of the digestive system (K)	1
Diseases of the musculoskeletal system and connective tissue (M)	25
Symptoms, signs and abnormal clinical and laboratory findings (R)	1
Injury, poisoning and certain other consequences of external causes (S and T)	6

Note. The diagnoses are recorded according to International Classification of Diseases, ICD 10 [37].

Table 2. Distribution of occupations of the participants included to the study

	Participants
Legislators, senior officials and managers	4
Professionals	7
Technicians and associate professionals	11
Clerks	7
Service workers and shop sales workers	13
Skilled agricultural and fishery workers	1
Craft and related trades workers	2
Plant and machine operators and assemblers	6
Elementary occupations	2

Note. The occupations are recorded according to International Classification of Occupation (ISCO, 88)

[38].

Table 3. WEIS item calibration, Standard Error and Fit Statistics

WEIS item	Item calibrations	Standard Error	Infit	
			Infit MnSq	Zstd
11. Rewards	0.92	0.12	0.82	-1.3
2. Task demands	0.78	0.12	0.77	-1.9
1. Time demands	0.60	0.12	1.07	0.5
7. <u>Supervisor interaction</u>	0.49	0.12	<u>1.56</u>	<u>3.7</u>
12. Sensory qualities	0.44	0.12	1.24	1.8
8. Work role standards	0.31	0.12	0.73	-2.3
9. Work role style	0.03	0.12	0.73	-2.2
4. Work schedule	-0.01	0.12	1.11	0.8
13. Architecture/arrangement	-0.12	0.12	0.96	-0.2
16. Physical amenities	-0.22	0.13	1.23	1.6
15. Properties of objects	-0.24	0.13	1.32	2.1
3. Appeal of work tasks	-0.25	0.13	0.84	-1.1
5. Coworker interaction	-0.30	0.13	0.89	-0.7
14. Ambience/mood	-0.40	0.13	0.87	-0.8
6. Work group membership	-0.42	0.13	0.91	-0.6
17. Meaning of objects	-0.48	0.13	0.98	0.0
10. Interaction with others	-1.14	0.17	1.02	0.1

Note. Items are listed from harder to get high ratings on to easier to get high ratings on.

Item that failed to demonstrate acceptable fit with the measurement model (since it exceeded MnSq > 1.4 with Zstd >2.0 is underlined.