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Work and Health Questionnaire (WHQ): A Screening Tool for Identifying Injured Workers at Risk for a Complicated Rehabilitation

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Abstract *Purpose* Unintentional injuries occur frequently and many of the accident survivors suffer from temporary or permanent disabilities. Although most accident victims recover quickly, a significant fraction of them shows a complicated recovery process and accounts for the majority of disability costs. Thus, early identification of vulnerable persons may be beneficial for compensation schemes, government bodies, as well as for the worker themselves. Here we present the Work and Health Questionnaire (WHQ), a screening tool that is already implemented in the case management process of the Swiss Accident Insurance Fund (Suva). Moreover, we demonstrate its prognostic value for identifying workers at risk of a complicated recovery process. *Methods* A total of 1963 injured workers answered the WHQ within the first 3 months after their accident. All of them had minor to moderate accidental injuries; severely injured workers were excluded from the analyses. The anonymized individual-level data were extracted from insurance databases. We examined construct validity by factorial analyses, and prognostic validity by hierarchical multiple regression analyses on days of work disability. Further, we evaluated well-being and job satisfaction 18 months post-injury in a subsample of 192 injured workers (9.8 %) *Results* Factor analyses supported five underlying factors (*Job Design, Work Support, Job Strain, Somatic Condition/Pain, and Anxiety/Worries*). These subscales were moderately correlated, thus indicating that different subscales measured different aspects of work and health-related risk factors of injured workers. Item analysis and reliability analysis showed accurate psychometric properties. Each subscale was predictive at least for one of the evaluated outcomes 18 months post-injury. *Conclusion* The WHQ shows good psychometric qualities with high clinical utility to identify injured persons with multiple psychosocial risk factors. Thus, the questionnaire appears to be suitable for exploring different rehabilitation needs among minor to moderate injured workers.

Keywords Rehabilitation · Injury · Factor analysis · Screening · Return to work (RTW)

Introduction

Every year, tens of millions of people suffer unintentional injuries leading to general practitioner treatments or to hospitalizations [1]. According to the Centers for Disease Control and Prevention (CDC), unintentional injuries are defined as the resulting injury and the mechanism or cause of the injury were not intended [2]. The occurrence of unintentionally caused medically treated injury episodes in the US was estimated at 37.9 million in 2012. Put succinctly, there were 124 such consultations per 1000 US citizens [3]. In terms of population health metric, the World Health Organization [1] estimated that injuries are responsible for 6 % of all years lived with disability (YLDs). Thus, accidental injuries are frequent and many of the accident survivors are left with temporary or permanent disabilities.

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Given this momentous cost and burden of unintentional injuries, rehabilitation as soon as possible is obviously crucial for compensation schemes and government bodies. One reason is the high costs associated with people unable to work. Although many accident victims recover quickly, a small fraction shows a complicated rehabilitation process. These individuals account for the majority of medical and disability costs [4]. According to the Swiss Accident Insurance Fund (Suva), 66 % of the complete insurance costs were attributed to 2 % of accident victims with a complicated recovery process [5]. Moreover, not only direct costs arise, but also indirect expenses result from economic production losses or worker replacement.

A second reason for the high interest in effective rehabilitation may lie in the alteration of the age composition of the world's population; that is, the ratio of the population within the working age to the population aged 65 or over, appears to shift rapidly toward increased elderly dependency ratios [6]. This not only implies a challenge for publicly funded pensions, but will also result in a serious skills shortage in the 34 member countries of the Organization for Economic Cooperation and Development (OECD). Therefore, it seems crucial to keep workers healthy and motivated at least until they reach retirement age.

However, vocational rehabilitation is not only important for governments and insurance companies, but also for the individual itself. So far many studies have shown the strong association of being employed and improved health, higher self-esteem and increased well-being [7, 8]. Similarly, for most employees, working is a vital part of participating in life, a source of identity and feelings of normality, along with community connectedness [8]. Nevertheless, vocational rehabilitation is not a straightforward process for a significant number of accident victims and long-time sick leaves commonly occur even in cases of minor to moderate injuries [9–12].

In general, return to work (RTW) is considered an important and tangible marker of post-injury function, as well as a measure of the effectiveness of rehabilitation programs and injury compensation systems. Functional limitations due to injuries may contribute in various ways to work disability and decreased well-being [13–15], thus resulting in difficulties to reliably predict those at risk for a complicated recovery process. The interest in prediction is based on the argument that early interventions after the injury increase the efficacy of treatment and decrease the cost burden by directing treatment according to the needs of the injured persons [10, 13]. Therefore, the identification of vulnerable accident victims should occur directly after the accident.

Although early identification of such prognostic factors may provide the opportunity to reduce the personal, social, and financial burden of injuries, still little is known about the risk factors of minor to moderate injured persons. Previous research on risk factors primarily focused on severely injured or hospitalized patients [16–18]. Moreover, injured employees are a heterogeneous population and vary in various ways in their physical, emotional, and social functioning [15, 17]. Nevertheless, several studies showed that psychosocial factors (i.e., cognitive appraisal, emotional distress, fear-avoidance beliefs, RTW expectations, posttraumatic symptoms. or social support at work) are predictive for RTW and general well-being of accident victims [e.g., 9–24]. Additionally, there is preliminary evidence for the association between objective (medical) factors, like the injury severity score (ISS), and several rehabilitation outcomes, although to a lesser extent, especially in the long run [9, 20, 21]. In sum, it seems that psychological and social factors are predominantly involved in the process of recovery from unintentional injuries.

Based on the idea of this biopsychosocial nature of RTW [14, 25], a short screening tool is required. The instrument should incorporate various predictive psychological, social, and work-related factors of working disability. Thus, the consideration of such factors might improve the implementation of early preventive rehabilitation interventions. However, there is a lack of effective screening instruments to identify minor or moderate injured workers at risk for a complicated rehabilitation process. There are screening tools for patients with specific (serious) disabilities [26], but our literature review revealed so far no questionnaire for persons with minor to moderate injuries.

Up until now unpublished, Siegenthaler et al. [5, 27] have developed a questionnaire tailored to this heterogeneous population of minor to moderate injured workers. A preliminary item pool was generated from established work- and health-related risk factors in injured persons and available well-known questionnaires ("Appendix"). Their analyses led to the Work and Health Questionnaire (WHQ) with 23 items, which revealed satisfying test criteria and a good predictive value to identify vulnerable workers. The main goal of the WHQ was the reliable identification of persons with a complicated work reintegration in an insurance setting. Today the questionnaire is already implemented as a screening tool in the case management in two main agencies of the Swiss Accident Insurance Fund (Suva).

Study Aims

The aim of our study was twofold. First, we sought to investigate the validity of the WHQ in a large sample of minor to moderate injured employees. Our second purpose was to reexamine the prognostic ability of the WHQ as a screening tool for workers at risk of having a complicated recovery process. As shown, RTW is not as simple as whether or not someone goes back to work. There are many associated factors such as job satisfaction and subjective well-being in general. These issues are not captured when purely counting days of sick leave. Therefore, we also investigated subjective well-being and job satisfaction 18 months after the accident.

Study Design

Participants and Procedure

The participants were consecutively recruited within two main agencies of the Suva between July 2011 and October 2014. The Suva is the largest accident insurer in Switzerland with an average coverage of about 50 % of all employees. All insured persons were eligible for entering the study if they had sufficient German language skills to understand the assessment and if their claim was processed by one of these two agencies that already had implemented the WHQ as a screening tool. The case managers were requested to apply the WHQ as a screening tool within the first 3 months of the accident. In line with our goal to provide a reliable screening tool for minor to moderate injured workers, accident victims were excluded if they were suffering from severe injuries (e.g., head or spinal cord injuries), an occupationally related illness (e.g., pulmonary illness), or a degenerative condition (e.g., rheumatoid arthritis). Initially, 2209 injured persons were contacted after they registered or reregistered their accident and filed their insurance claim. We excluded 246 individuals (11.1 %) from our analyses due to missing information about days of working disability. Thus, the final sample consisted of 1963 persons (88.9 %). All data of this sample were extracted as anonymized patient-level data from administrative insurance databases. This anonymized data were used without explicit consent as these data were routinely administered as part of the insurance system. In accordance with the current laws, ethical standards, and the information that was provided by the Suva to the claimants, we infer from the voluntary return of the WHQ an implicit consent to provide the data.

To further examine the prognostic value of the WHQ, we used a subsample of the 1963 participants 18 months post-injury. Data of these 192 participants (9.8 %) were available as the evaluation of the WHQ was the first step to a randomized controlled trial (RCT) [28]. This population-based RCT was designed to evaluate a multidisciplinary rehabilitation intervention for minor to moderate injured workers. All of these injured workers were classified by the WHQ as being at high risk for a complicated rehabilitation process and gave informed consent before the randomization. The voluntary nature of participation and anonymity was guaranteed. At the time of conducting this study, data were available for the two main outcome variables of the RCT, namely well-being and job satisfaction of 192 participants. Of these 192 participants, 64 persons (33.3 %) were initially assigned to the intervention group. Of these, 20 injured workers (10.4 %) finally received short-term coaching as intervention. A total of 44 persons did not participate to the intervention for several reasons (e.g., no time, no interest, no motivation), but agreed to answer the questionnaires. The short-term coaching included a short intervention on the workplace provided by occupational therapists (i.e., workplace assessment to identify work demands and job characteristics, possible work adjustments, and identification of barriers for RTW) and/or a short cognitive behavioral intervention provided by psychotherapists (i.e., problem solving, coping skills, communication skills, and help with psychosocial disturbances).

Measures

Work and Health Questionnaire (WHQ)

In 2007 the WHQ was developed to reliably identify injured workers with a poor prognosis for work reintegration. The primary goal was to provide a supplementary tool that integrated self-report data of the insurees with the experience in case evaluation of the case manager. Employees on sick leave were consecutively recruited within a main agency of the Suva. Inclusion criteria were the experience of an accident resulting in minor to moderate injuries within the past 3 months and the expectation of a complication-free recovery process. During an inclusion period of 2 months, 406 persons of 1433 potential candidates completed a baseline questionnaire with potential predictors of a complicated rehabilitation process. The sample did not differ substantially from the eligible population in terms of age, gender, and socioeconomic variables. The questionnaire considers workplace characteristics, RTW cognitions, pain, PTSD symptoms, worries, and anxiety adopted from well-established measures. After 12 months 274 employees participated in a second assessment with the same questionnaires. Initially, the WHQ was postulated with two subscales. For the *health subscale*, the evaluation of the items resulted in a regression formula with 11 significant predictors to set a cut-off point for a complicated recovery process. The outcome was a delayed return to work or a reassessment of the case manager as a complicated case with prolonged working disability and a regression formula. The early application of this health subscale could identify 34 % of the cases with working disability 12 months post injury with a sensitivity of 49 % and a specificity of 90 %. For the *work subscale* a psychometric evaluation of the initial items resulted in 12 items with good internal consistency (α), accurate item difficulty (P_i), and good item discrimination (r_{jt}) [5, 27]. All items of the WHQ, the corresponding rating scales, and the item origin are displayed in "Appendix".

Days of Working Disability

Up to now, RTW has been defined in many ways [14]. In this study, we measured RTW in terms of days of working disability. Days of working disability were defined as full lost workdays for which claimants received compensation. The number of compensated days was extracted from the database provided by the Suva. We calculated days of full working disability as work absence in days of 100 % working disability on a pro rata basis, with a week off from work equaling 7 days of sick leave. Additionally, we considered RTW as an outcome at the end of the study time by comparing persons who returned back to paid work and persons who did not.

Subjective Well-Being 18 Months After the Injury

Subjective well-being was assessed by the Bern Questionnaire on Well-Being (BQW) [29]. The questionnaire consists of 39 items, which are rated on six-point Likert scales and four-point Likert scales. The BQW yields a profile of six subscales as well as two independent second order factors *life satisfaction* and *negative feelings*. According to Grob et al. [29] the internal consistency for these two dimensions are satisfactory [Cronbachs' $\alpha = 0.82$ (*life satisfaction*) and $\alpha = 0.77$ (*negative feelings*)].

Job Satisfaction 18 Months After the Injury

Job-related well-being was defined as job satisfaction and was measured by a single item of the Short Job Satisfaction Questionnaire (AZK) [30]: "If there is no change of my work conditions sooner or later, I will look for a new job." The answer was rated on a seven-point Likert scale (1 = *most of the time* to 7 = *never*).

Statistical Analysis

Data analysis was conducted using the R-packages: "car" [31], "lavaan" [32], "psych" [33], and "mi" [34] in the R statistical language [35]. Construct validity can be supported through factor analytic techniques, which confirm the presence of one or more valid unidimensional scales. To analyze the factorial structure of the WHQ, we used the principal axis factoring method of exploratory factor analysis (EFA) and confirmatory factor analyses (CFA).

Preliminary analyses indicated a violation of the assumption of multivariate normality (Mardia's coefficient of kurtosis = 26.50) of the WHQ items. Thus, the robust Weighted Least Squares estimator (WLSMV) was used, which estimates a weight matrix based on the asymptotic variances and covariances of polychoric correlations [36]. Moreover, this estimation method is suggested as the most appropriate method for mixed ordinal and continuous data [36, 37]. A factor loading of each item ≥ 0.5 was used to indicate satisfactory fit of the internal structure. For each of the subscales of the different models item difficulty (P_i) and item discrimination (r_{jt}) were calculated. Moreover, we evaluated internal consistency using Cronbachs' alpha (α) and omega (ω). Omega is seen as less sensitive to violation of the scale reliability (assumption of the essentially τ-equivalent models) and also as a more appropriate index of the extent to which all of the items in a scale measure the same latent variable [38].

It is known that the χ^2 test is sensitive to the sample size and the complexity of the model [36, 37, 39]. Therefore, we reported additional fit measures for the evaluation of the model fit: standardized root mean square residual (SRMR), root mean square error of approximation (RMSEA), and incremental fit indices, namely the comparative fit index (CFI), the Tucker–Lewis index (TLI), and the normed fit index (NFI). Based on the recommendations of Schermelleh-Engel et al. [37] the SRMR and RMSEA should be smaller than 0.05 and NFI, CFI, and TLI values greater than 0.95 could be seen as adequate fit.

To evaluate the predictive validity of the WHQ subscales, we performed separate hierarchical multiple linear regression analyses (MLR) on the four outcome variables: days of working disability, well-being (life satisfaction and negative feelings), and job satisfaction. Based on the current literature, three variables were considered as potential confounders and were included in the first step of each MLR: gender [8, 10, 11, 14, 16, 22], age [9, 15, 17, 18, 23, 24], and type of accident, recreational or work-related [10, 12].

The variable days of working disability was positively skewed (skewness = 3.11, $D = 0.99$, $p < 0.001$) and various outlier tests (e.g., Bonferroni outlier test, Cooks distance, Mahalanobis distances and hat values) indicated some moderate multivariate outliers. Therefore, random $\times$ resampling with 5000 bootstrap samples was performed. This method relaxes the normality assumption and is a well-known method to deal with outliers [40]. Further, we found no evidence of multicollinearity, heteroscedasticity, nonnormal distributions of residuals and autocorrelations in our final regression models.

The discriminatory ability of the five WHQ subscales for RTW was evaluated by comparison of the means between workers returned to work and workers not returned to work. As the group size differs and the variances in the groups are not equal, statistical significance of the mean differences was evaluated by the two-tailed parametric Welch *t* test.

Missing Values

Although the BQW and the AZK were completed by all 192 participants, responses were missing on 37 out of 39 items for the BQW for 39 of those people. The MCAR test [41] indicated that the missing responses were not completely at random [χ^2 (673) = 735.55, $p = 0.05$]. Hence, we used a multiple imputation method based on a Gaussian linear model for addressing these missing responses [34]. For each dimension, the BQW scores for participants with and without missing data were compared and revealed no significant differences between the groups [$t(363) = 0.00$, $p = 1.00$] and [$t(359) = 0.00$, $p = 1.00$]. In addition, eight responses on the AZK from eight different participants out of 192 were missing. Thus, we imputed the missing values with the same algorithm as for the BQW items. There were no significant differences between the groups.

Results

Descriptive Statistics

The majority of participants of the final sample were male ($N = 1499$; 76.4 %), and the average age was 46.78 years ($SD = 12.42$). Workplace accidents occurred in 606 (30.9 %) and non-workplace accidents in 1357 persons (69.1 %). On average the employees missed work for 160 days ($SD = 125.71$). At the end of the study period 1807 persons (92.9 %) returned back to paid work, whereas 156 persons (7.1 %) did not. The majority of participants in the subsample ($n = 192$) were men ($n = 130$; 67.8 %) and the average age was 49.48 years ($SD = 11.05$). Most of these injured persons experienced an accident in their leisure time ($n = 144$; 75 %). The samples differed significantly with regard to age [$t(240) = 3.19$, $p < 0.01$] and gender [χ^2 (1, $N = 2153$) = 7.17, $p < 0.001$] but not with respect to the accident type [χ^2 (1, $N = 2153$) = 2.85, $p = 0.09$]. Data concerning marital status, profession, or income were not accessible to us, therefore these variables were not available for analysis.

Construct Validity

We first performed an EFA to explore the dimensional structure of the WHQ. The results of the parallel analysis [42] as well as the very simple structure criterion (VSS) [43] indicated the extraction of five factors, whereas the inspection of the scree plot revealed three factors and the Velicer MAP-Test [44] two factors.

Model Specification

Second, we conducted CFA to establish factorial validity for the measurement model. We fitted the following four models to the data: Model A is a correlated two-factor model, as initially postulated by Siegenthaler et al. [5, 27]; Model B is a correlated three-factor model (*Job Design, Job Strain, Health*); Model C is a correlated four-factor model (*Job Design, Job Strain, Somatic Condition/Pain, Anxiety/Worries*); and Model D is a correlated five-factor model (*Job Design, Job Strain, Work Support, Somatic Condition/Pain, Anxiety/Worries*).

Overall Model Fit

The fit indices for the overall fit for the different models are given in Table 1. Model A has the poorest values, whereas Model D had the best values of the fit indices. The fit indices indicated that Model D significantly decreases the value of χ^2 compared to all other models. However, the χ^2-test remained significant [χ^2 (220, $N = 1963$) = 1420.43, $p < 0.001$]. But all other descriptive fit measures and the incremental fit indices showed that Model D was better than any other model and achieved good model fit. Modification indices of Model D were examined to determine areas of localized strain. No post hoc modifications were made to improve the overall model fit.

Fit of Internal Structure

The standardized parameter estimates ranged for Model A between $\beta = 0.18$ and 0.82; for Model B between $\beta = 0.28$ and 0.82; for Model C $\beta = 0.29$ and 0.84; and for Model D $\beta = 0.29$ and 0.88. Thus, in the final Model D, four items (W6, W8, W9, H6) were only low correlated with the latent structure (Table 1). Unstandardized and standardized factor loadings are given in Table 2. The full Model D is displayed as Fig. 1.

Convergent and Discriminant Validity

The average variance extracted (AVE) is used as an indicator of convergent validity and assesses the amount of variance captured by the construct in relation to the amount

Table 1 Model fit statistic for the different models of the WHQ

Absolute fit indices					Comparative fit indices		
Model	χ^2 (*df*)	χ^2/df	SRMR	RMSEA (90 % CI)	NFI	CFI	TLI
Two factors	3389.0 (229)	14.80	0.080	0.084 (.081–.086)	0.88	0.89	0.88
Three factors	2572.1 (227)	11.33	0.072	0.073 (.070–.075)	0.91	0.92	0.91
Four factors	2158.3 (224)	9.63	0.064	0.067 (.064–.069)	0.92	0.93	0.92
Five factors	**1420.4 (220)**	**6.46**	**0.054**	**0.053 (.050–.055)**	**0.95**	**0.96**	**0.95**

N = 1963, numbers in bold indicate data with the best values of the model fit statistics among the models

df degree of freedom, *SRMR* standardized root mean square residual, *RMSEA* root mean square error of approximation, *NFI* normed fit index, *CFI* comparative fit index, *TLI* Tucker–Lewis index

Table 2 Factor loadings, standard errors and internal consistency (standardized Cornbachs' α) for the five-factor solution of the WHQ

Item	Job design α = .65 Ω = .73	Work strain α = .58 Ω = .66	Work support α = .73 Ω = .86	Somatic condition/pain α = .75 Ω = .84	Anxiety/worries α = .79 Ω = .87
WHQ_W1	0.56/1.00				
WHQ_W2	0.61/1.09 (.06)				
WHQ_W3	0.65/1.14 (.06)				
WHQ_W4	0.59/1.05 (.06)				
WHQ_W5		0.65/1.00			
WHQ_W6		0.47/.72 (.05)			
WHQ_W7		0.65/1.00 (.06)			
WHQ_W8		0.29/.44 (.05)			
WHQ_W9		0.42/.64 (.05)			
WHQ_W10			0.73/.82 (.03)		
WHQ_W11			0.89/1.00		
WHQ_W12			0.61/.69 (.03)		
WHQ_H1					0.59/.70 (.03)
WHQ_H2					0.60/.72 (.03)
WHQ_H3				0.79/.94 (.04)	
WHQ_H4				0.61/.94 (.04)	
WHQ_H5				0.66/1.00	
WHQ_H6				0.40/.02 (.002)	
WHQ_H7				0.59/.03 (.002)	
WHQ_H8					0.81/.96 (.02)
WHQ_H9					0.74/.85 (.02)
WHQ_H10					0.72/.85 (.02)
WHQ_H11					0.84/1.00

N = 1963, Standardised values followed by unstandardised values with standard errors in parentheses

of variance due to measurement error [39]. The AVE for each factor were as follows: *Job Design* AVE = 0.37, *Work Support* AVE = 0.56, *Job Strain* AVE = 0.26, *Somatic Condition/Pain* AVE = 0.39, and *Anxiety/Worries* AVE = 0.52. Given the suggested minimum level of 0.5, three subscales did not exceed this threshold. To assess discriminant validity, we compared the AVE with the respective square-rooted interconstruct correlations [39]. This comparative analysis yielded that the subscale *Somatic Condition/Pain* showed discriminatory ability slightly below the suggested threshold and shared variance with items of the subscale *Anxiety/Worries* ($r = 0.67$).

Item Analysis and Reliability of the Five-Factor Solution

We observed the item discrimination (*rjt*), internal consistency, and composite reliability of the items of the five subscales. The ability of the WHQ subscales to discriminate between participants with high versus low scores was

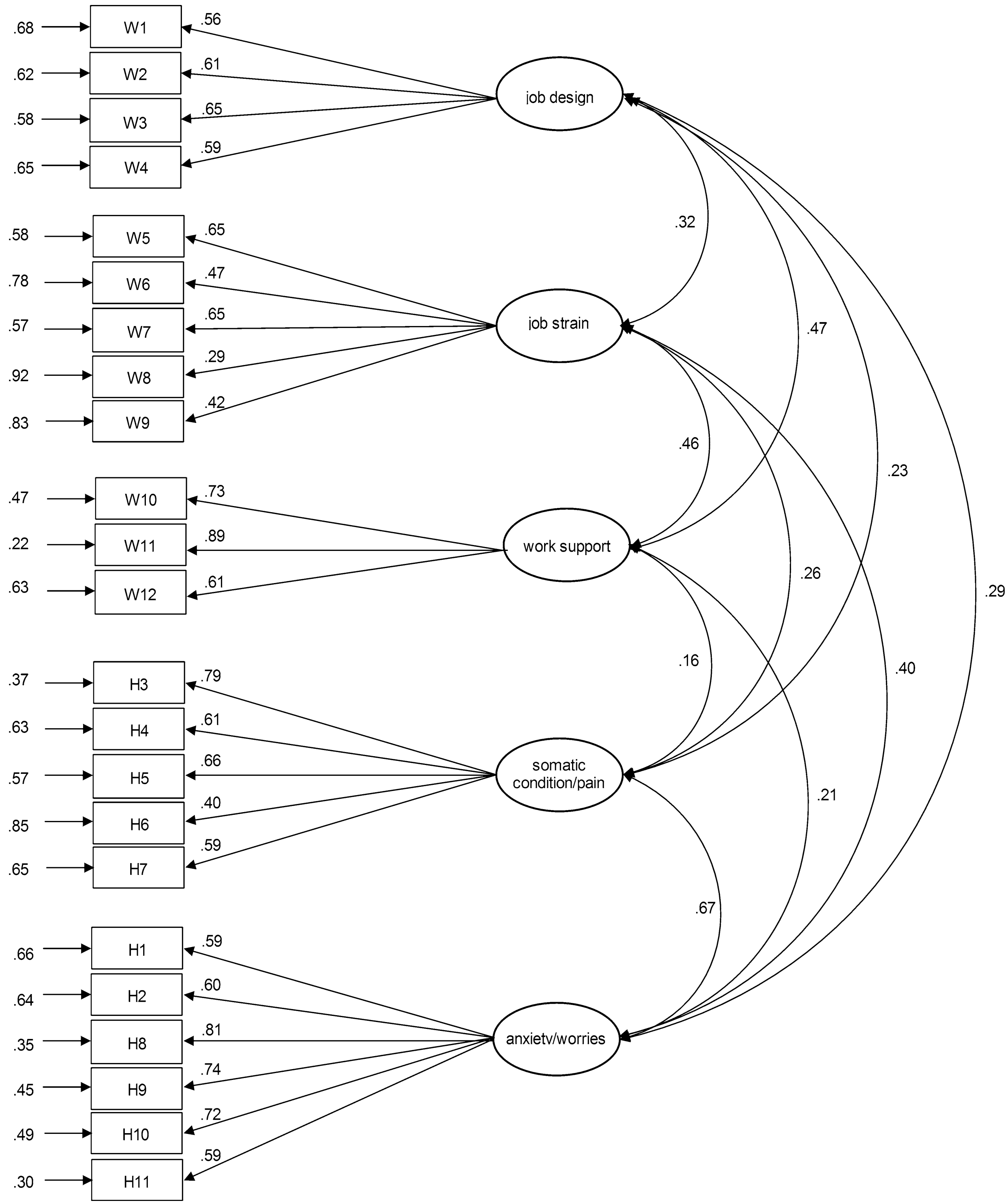

Fig. 1 *Rectangles* represent observed variables and *circles* represent latent constructs. The *two-headed arrows* represent correlations among the constructs. The paths from the latent constructs to the observed variables represent the standardized loading of each variable onto its respective construct

satisfactory, as item discrimination coefficients ranged from $rjt = 0.30$ to $rjt = 0.75$, except for item W8 ($rjt = 0.24$) and item H6 ($rjt = 0.27$). In Table 2 internal consistency is given by Cronbachs' α and composite reliability by total ω. The coefficients ranged between $\alpha = 0.58$ (*Job Strain*) and $\alpha = 0.79$ (*Anxiety/Worries*) and $\omega = 0.66$ and $\omega = 0.87$. With exception of coefficients of the subscale *Job Strain*, reliability can be interpreted as acceptable.

Predictive Validity

We examined the predictive validity of the questionnaire and performed four separate multiple linear hierarchical regression analyses (HMLR) for the four different outcome variables.

Days of Working Disability

A HMLR was performed to predict days of working disability. In the first step all control variables (gender, age, and accident type) were entered simultaneously into the model. Age and type of accident were significantly correlated with days of working disability. This first step did explain a significant variation of days of working disability [$\Delta R^2 = 0.014$, $F(3, 1959) = 10.3$, $p < 0.001$]. In the second step all predictors were entered simultaneously, resulting in a significant increase in ΔR^2 [$F(5, 1954) = 60.76$, $p < 0.001$]. Five coefficients demonstrated a significant relationship with days of working disability (Table 3): gender [$\beta = -0.09$, $t(1954) = -4.26$, $p < 0.001$], age [$\beta = 0.08$, $t(1954) = 3.63$, $p < 0.001$], *Job Design* [$\beta = 0.05$, $t(1954) = 2.17$, $p < 0.05$], *Somatic Condition/Pain* [$\beta = 0.18$, $t(1954) = 7.32$, $p < 0.001$], and *Anxiety/Worries* [$\beta = 0.25$, $t(1954) = 10.04$, $p < 0.001$]. The direction of the significant coefficients indicated that more days of working disability were related to higher age, male gender, and higher scores on the respectively WHQ subscales. The full model $\Delta R^2 = 0.144$ was significantly greater than zero [$F(8, 1954) = 42.40$, $p < 0.001$] and corresponded to a medium effect $f^2 = 0.17$ [45].

Well-Being: Negative Feelings

Next, we performed a HMLR to predict negative feelings of the participants 18 months after their accident. First, we entered all control variables (gender, age, and accident type) into the model. Age was significantly correlated with negative feelings as shown in Table 4 . No other significant association of these control variables with the outcome variable was found. This first step did not explain a significant variation of negative feelings [$\Delta R^2 = 0.01$, $F(3, 188) = 2.68$, $p < 0.20$]. In the second step all subscales were entered simultaneously resulting in a significant increase in ΔR^2 [$F(5, 183) = 18.19$, $p < 0.001$]. *Anxiety/Worries* was the only significant predictor of negative feelings [$\beta = 0.56$, $t(183) = 8.73$, $p < 0.001$]. The direction of this association indicated that a higher score on this subscale resulted in more negative feeling as measured by the BWQ. This final model explained 32 % of the variance in the data [$F(8, 183) = 12.2$, $p < 0.001$], which corresponds to a strong effect $f^2 = 0.47$ [45].

Well-Being: Life Satisfaction

Then, we performed a hierarchical MLR for the prediction of life satisfaction 18 months after the accident. In the first

Table 3 Hierarchical multiple linear regression analyses with days of work incapacity as dependent variable

	b	*SE B*	β	*b boot*	*t*	ΔR^2	*Total* ΔR^2
Step 1						0.02	0.02
Gender: Male	−7.13	6.70	−0.02	−6.90	−1.01		
Age	0.82	0.23	0.91	0.81	4.01***		
Injury type: recreational	22.55	6.18	0.08	22.41	3.52***		
Step 2						0.12	0.14
Gender: male	−27.60	6.48	−0.09	−27.76	−4.26***		
Age	0.78	0.22	0.08	0.78	3.63***		
Injury type: recreational	9.40	5.82	0.03	9.44	1.62		
WHQ_Job design	2.08	0.96	0.05	2.09	2.17*		
WHQ_Work support	−0.84	1.12	−0.02	−0.84	−0.97		
WHQ_Job strain	−0.80	0.83	−0.02	−0.82	−0.75		
WHQ_Somatic condition/pain	0.33	0.04	0.18	0.33	7.32***		
WHQ_Anxiety/worries	9.30	0.93	0.25	9.25	10.04***		

$N = 1963$, *B boot* = unstandardized regression weight bootstrapped with 5000 bootstrap-samples non-parametric at random

* $p < 0.05$; *** $p < 0.001$

Table 4 Hierarchical multiple linear regression analyses with well-being (subscale mean negative feelings) as dependent variable

	B	*SE B*	β	*t*	ΔR^2	*Total* ΔR^2
Step 1					0.01	0.01
Gender: male	0.14	0.14	0.07	0.95		
Age	−0.01	0.01	−0.13	−1.85		
Injury type: recreational	0.01	0.15	0.00	0.06		
Step 2					0.31	0.32
Gender: male	0.04	0.12	0.02	0.36		
Age	0.00	0.01	−0.04	−0.72		
Injury type: recreational	−0.08	0.13	−0.04	−0.65		
WHQ_Job design	0.01	0.02	0.04	0.63		
WHQ_Work support	−0.02	0.02	−0.06	−0.95		
WHQ_Job strain	0.00	0.02	0.02	0.24		
WHQ_Somatic condition/pain	0.00	0.00	0.05	0.76		
WHQ_Anxiety/worries	0.15	0.02	0.56	8.73***		

$n = 192$

* $p < 0.05$; *** $p < 0.001$

step all control variables (gender, age, and accident type) were entered simultaneously into the model. None of the potential cofounders was significantly related to life satisfaction and the first step failed to explain a variation of life satisfaction [$\Delta R^2 = 0.00$, $F(3, 188) = 0.66$, $p = 0.58$] (Table 5). In the second step we entered simultaneously all WHQ subscales, resulting in a significant increase in ΔR^2 [$F(5, 183) = 12.02$, $p < 0.001$]. In this final model only the WHQ subscale *Anxiety/Worries* significantly predicted life satisfaction [$\beta = -0.49$, $t(183) = -7.21$, $p < 0.001$]. The direction of this association indicated that higher scores on this subscale resulted in lesser life satisfaction as measured by the BWQ. The full model R^2 was significantly greater than zero [$F(8, 183) = 7.83$, $p < 0.001$]. This total adjusted explained variance of life satisfaction of 22 % by the final model corresponded to a medium effect size $f^2 = 0.28$ [45].

Job Satisfaction

Finally, we performed a hierarchical MLR for the prediction of job satisfaction 18 months after the accident. First we entered all control variables (gender, age, and accident type) into the model and no significant association of these control variables with the outcome variable was found, nor did this first model explain a variation of job satisfaction [$R^2 = 0.00$, $F(3, 188) = 0.591$, $p = 0.62$]. In the second step we entered simultaneously all WHQ subscales, resulting in a significant increase in ΔR^2 [$F(5, 183) = 7.31$, $p < 0.001$]. Three coefficients in the final model of the

Table 5 Hierarchical multiple linear regression analyses with well-being (subscale life satisfaction) as dependent variable

	B	*SE B*	β	*t*	ΔR^2	*Total* ΔR^2
Step 1					0.00	0.00
Gender: Male	0.00	0.03	0.01	0.14		
Age	0.00	0.00	0.07	0.92		
Injury type: recreational	0.03	0.03	0.07	0.95		
Step 2					0.22	0.22
Gender: male	0.01	0.03	0.04	0.53		
Age	0.00	0.00	−0.02	−0.25		
Injury type: recreational	0.05	0.03	0.11	1.70		
WHQ_Job design	0.00	0.00	−0.11	−1.55		
WHQ_Work support	0.00	0.01	0.00	0.05		
WHQ_Job strain	0.00	0.00	0.00	0.07		
WHQ_Somatic condition/pain	0.00	0.00	0.09	1.37		
WHQ_Anxiety/worries	−0.03	0.00	−0.49	−7.21***		

$n = 192$

*** $p < 0.001$

hierarchical MLR analysis demonstrated a significant relationship with job satisfaction (Table 6): *Work Support* [$\beta = -0.27$, $t(183) = -3.62$, $p < 0.001$], *Job Strain* [$\beta = -0.17$, $t(183) = -2.36$, $p < 0.05$], and *Anxiety/ Worries* [$\beta = -0.21$, $t(183) = -2.90$, $p < 0.01$]. The direction of the significant coefficients indicated that a higher score on the WHQ subscales predicted a diminished job satisfaction 18 months after the accident. The full model ΔR^2 was significantly greater than zero [$F(8, 183) = 4.83$, $p < 0.001$]. The total adjusted explained variance of job satisfaction of 13.8 % corresponded to a medium effect $f^2 = 0.16$ [45].

Discriminatory Ability of the Subscales of WHQ

To evaluate the discriminatory ability of the WHQ subscales, we performed unpaired *t* test to compare the RTW and the non-RTW-group. The results are given in Table 7. The two groups scored significantly different on four out of five subscales. Only the WHQ subscale *Work Support* did not differ significantly [$M_{diff} = 0.40$, $t(179) = 1.74$, $p = 0.08$]. The strongest effect (Cohen's $d = 0.55$), was reached by *Anxiety/Worries*, which could be interpreted as moderate [45].

Discussion

This study presents the WHQ as screening tool for minor to moderate injured workers at risk for a complicated rehabilitation. We defined a complicated recovery process as more days of working disability, decreased life satisfaction, increased negative feelings, and lesser job satisfaction.

Our findings support the internal validity of the WHQ in a sample of persons who made an insurance claim. Factorial analyses revealed a five-factor structure: (1) *Job Design*, (2) *Job Strain*, (3) *Work Support*, (4) *Somatic Condition/Pain*, and (5) *Anxiety/Worries*. Although our final five-factor model missed to reach satisfactory overall model fit by means of χ^2 and χ^2/df, all other fit measures could be interpreted as good to excellent [37]. Intercorrelations between the subscales were weak to moderate (between $r = 0.12$ and $r = 0.47$) and the factors correlated weak to moderate ($\psi = 0.16$ to $\psi = 0.67$). We interpreted the partial low but significant correlations as an indication of discriminant validity of the subscales. However, according to the Fornell–Lacker criterion [38] only *Work Support* had sufficient discriminant validity. In the case of convergent validity, the subscales *Work Support* and *Anxiety/Worries* exceeded the proposed threshold of 0.5 of the AVE [39]. The alpha coefficients indicated a satisfactory internal consistency of the subscales and were equal or superior to 0.65, except for *Job Strain*. In sum, these results would suggest accurate psychometric properties.

It is noteworthy that these factors are in line with the prominent biopsychosocial approaches on working disability [14, 25]. Only motivational factors, as suggested by the promising Readiness-to-Return-to-Work-Model [20], are underestimated by the WHQ. However, there is strong evidence that persons with work disability remain generally motivated to RTW [8]. Although we did not include motivational factors, we comprised social support at work in the questionnaire. As has previously been postulated, social support might be considered as an influential factor for a wide range of health- and work-related variables [22, 24, 46, 47].

Table 6 Hierarchical multiple linear regression analyses with job satisfaction as dependent variable

	B	*SE B*	β	*t*	ΔR^2	*Total* ΔR^2
Step 1					0.00	0.00
Gender: Male	0.23	0.26	0.07	0.88		
Age	0.01	0.01	0.07	0.96		
Injury type: recreational	0.14	0.28	0.04	0.49		
Step 2					0.14	0.14
Gender: Male	0.09	0.26	0.03	0.37		
Age	0.00	0.01	0.03	0.44		
Injury type: recreational	0.16	0.27	0.04	0.61		
WHQ_Job design	0.01	0.03	0.02	0.21		
WHQ_Work support	−0.08	0.05	−0.27	−3.62***		
WHQ_Job strain	−0.16	0.03	−0.17	−2.36*		
WHQ_Somatic condition/pain	0.00	0.00	0.03	0.47		
WHQ_Anxiety/worries	−0.10	0.04	−0.21	−2.90**		

$n = 192$

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 7 Comparison between workers returned to work and workers not returned to work on the different WHQ-subscales using two-sided *t* test (Welch)

	Non-RTW $n = 156$		RTW $n = 1807$		*t* (*df*)	Effect size (*d*)
	M	*SD*	*M*	*SD*		
WHQ_Job design	10.01	3.41	9.31	2.91	2.51 (175)**	0.22
WHQ_Job strain	12.98	3.37	12.23	3.44	2.65 (184)**	0.22
WHQ_Work support	6.95	2.70	6.55	2.52	1.74 (179)	0.15
WHQ_Somatic condition/pain	185.24	64.57	157.89	67.56	5.06 (186)***	0.41
WHQ_Anxiety/worries	5.64	3.50	3.76	3.32	6.48 (180)***	0.55

$N = 1963$

** $p < 0.01$; *** $p < 0.001$

Our analyses of the predictive ability of the WHQ revealed significant relationships between the WHQ subscales and days of working disability, job satisfaction, and RTW. These findings are of particular importance, given that evidence for the association between work-related factors with rehabilitation outcomes is rather scarce. In our study, *Work Support* and *Job Strain* were significantly associated with job satisfaction 18 months post-injury, whereas *Job Design* predicted days of full working disability. When comparing workers who returned to paid work with workers who did not, the non-RTW group scored significantly higher on all subscales of the WHQ, except from the subscale *Work Support* ($p = 0.08$). One possible explanation may lie in the small effect of this difference ($d = 0.15$). Indeed, a power analysis revealed a modest statistical power of 0.56, which means that about 750 additional persons would be necessary to detect this possible effect.

Moreover, previous findings on social support at works are mixed. It seems reasonable to assume that social support influences many health-related variables and could be seen as a protective factor for RTW [22, 24, 46, 47]. Nevertheless, studies indicated that social support could also have detrimental effects and could be a risk factor in its own right. For example, Elfering et al. [46] found that a combination of high support from the closest colleagues and low support from supervisor have a detrimental effect on experienced low back pain 4 years after baseline assessment. In line with this view, Krause et al. [24] reported that supervisory support increased RTW by 20 %, but found no effect of coworker social support. Therefore, when support at work is measured in general this may prevent the detection of significant effects. This could be the reason for the weak correlations of *Work Support* with other outcome measures in this study.

Yet, the predictive ability of the WHQ for well-being 18 months after the accident was less powerful. Only *Anxiety/Worries* showed a significant relationship with life satisfaction and negative feelings. However, both models explained a significant amount of variance ($R^2 = 0.22$ respectively $R^2 = 0.32$) with a medium to strong effect size. One possible explanation of the strong predictive ability *Anxiety/Worries* could be that this factor comprises trauma symptomatology (PTSD symptoms), anxiety, distress, and worrying. All of this variables have been repeatedly associated with different rehabilitation outcomes [9–13, 18].

Contrary to most previous research observations on predictors of RTW, we found that female gender was predictive for fewer days of working disability. Laisné et al. [9], for example, found that men are more likely to engage in the RTW process 2 months after the accident. However, 8 months after the accident this association did not remain significant. Further, Stover and colleagues [15] found that female gender was predictive for work-time lost longer than 6 months post-injury in a large sample of 81,077 claimants. However, this effect was not significant anymore for the prediction of long-time working disability over 6 years. In addition, Seland et al. [23] showed that injured women with ankle fractures were less likely to return to work when compared to men with the same injury. Yet, the effect was not significant in women with wrist fractures. Nonetheless, the reason for these inconsistent findings remains unclear and warrants further research.

Taken together, each of the different WHQ subscales predicted at least one of the different outcomes' variables examined in this study. Thus, the WHQ provides a comprehensive assessment, which not only takes work-related factors into account, but also psychosocial variables. Case managers deal with a large unselected group of injured persons and should therefore be able to detect who need special attention and additional care in a convenient and feasible way. The WHQ was constructed to address the large variability in the population of injured employees due to different injuries and accident types and reliably predict the persons at high risk for a complicated recovery process. Therefore, the questionnaire is applicable to a wide range of different injury types and its evaluation does not require a special training. Hence, the assessment through the WHQ could improve rehabilitation interventions and prevention policies in line with the biopsychosocial view on rehabilitation.

Our study has several strengths. First, days of working disability during the study period were assessed in terms of time off work based on administrative data provided by the accident insurance. It seems plausible to assume that this data provides a more accurate estimation of days of working disability than the common assessment by means of self-report. Moreover, the available data allowed us to address the commonly known problem of recurrence in injury populations. Therefore, we were able to compute the exact days of sick leave of each worker and each injury within the study period. Second, we analyzed a large sample which enabled us to use confirmatory factorial analyses to detect the internal factor structure and perform bootstrapping to deal with the observed multivariate non-normality and multivariate outliers [40]. Third, we were able to reinvestigate a subsample of injured workers 18 months after the accident to analyze well-being and job satisfaction. This long-term follow-up period can be seen as an important time span in the natural history of recovery [23]. Fourth, the application of very few exclusion criteria may have strengthened the study's external validity and generalizability of our results. At the same time this approach may have limited the study's internal validity, which may be one explanation for the moderate explained variance in our regression models.

However, our results should be generalized cautiously as our study has some limitations that must be addressed. First, variability in participants' time since injury raises important questions about completeness of outcome data. For example, some people with more recent injuries who had not returned to work at the time when the outcome measurement was taken would have returned to work later [19]. Moreover, persons who had filed their claim recently and had therefore only a few days of working disability may have shown a complicated recovery process later, which could not be captured. Moreover, we have no access to the exact date of the accident and the application of the WHQ. The case managers were requested to apply the WHQ within the first 3 months after the accident; however, we were not able to control their adherence. This missing information may limit the definitive conclusions that can be drawn from this study, especially in terms of the predictive validity of the WHQ.

Second, our sample was recruited within a Swiss insurance setting. In Switzerland all inhabitants receive compensation in the case of work disability. There is a mandatory accident insurance that covers injuries due to work-related or recreational accidents. Thus, it is unlikely that different compensation systems related to different types of accident biased our results. Nevertheless, the generous compensation system may limit the generalizability of our findings to other countries with less generous compensation [21].

Third, data concerning family status, profession, current income, and exact type of injury were not accessible from the dataset extracted from the insurance record and therefore not available for our analyses. It seems plausible to assume that these variables may be associated with RTW, well-being, or job satisfaction. Nevertheless, it seems unlikely that the inclusion of these variables would have yielded completely different results. It might, however, be a reason for the only moderate explained variance in some of our regression models. In addition, this missing information clearly affects the comparability of our results with other studies.

Fourth, we stated that the identification of vulnerable accident victims should occur directly after the accident. In this study, however, the screening was administered within the first 3 months after the accident. Thus, injured workers who returned to work sooner were not captured. Our main goal was, however, to provide a reliable screening tool to identify injured workers at risk for a complicated rehabilitation. We defined more days of working disability as one core feature of a complicated recovery process and 3 months of work disability could be seen as a generally accepted cut-off point for the transition to the chronic stage [48]. Nevertheless, this specific inclusion criterion may affect the generalization of our findings. However, we assume that the WHQ could be easily adopted in other contexts than solely an insurance environment. Further research should evaluate the WHQ in multiple contexts, which allow its earlier application, for example, in an emergency setting.

Fifth, some subscales of the WHQ did not show sufficient discriminant and convergent validity and some items showed large error variances, which warrant additional research. Further investigations should therefore evaluate the correlations of the WHQ with questionnaires measuring health- and work-related factors after accidents and try to replicate the postulated five-factor structure in a sample with a specific injury. For public purposes, we translated the WHQ items to English; its validation, however, is pending. We were convinced of the advantages of the use of the WHQ: the time to administer is short (to complete the WHQ about 5 min are needed), no special training is needed, and, given the observed responder rate, the face validity of the questionnaire could be seen as high. Also the WHQ could be transferred to other settings than the insurance context. However, further research on its predictive validity, for example in terms of an ROC analysis, to set accurate cut-off points is warranted.

Limitations notwithstanding, our present findings indicate that the WHQ is a valid and reliable screening tool to identify injured workers at risk for a complicated rehabilitation. Despite the fact that the accidents in our sample were minor to moderate, our findings could be interpreted as an emphasis on the paramount role of psychosocial variables in the recovery process of injured workers. From a theoretical viewpoint, our results reaffirm the importance of assessing psychopathology, cognitive, social, and work-related factors in injured employees and confirm the biopsychosocial nature of work disability and RTW.

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Compliance with Ethical Standards

Conflict of interest Sandra Abegglen, Ulrike Hoffmann-Richter, Volker Schade, Hans Jörg Znoj declares that he has no conflict of interest.

Ethical Approval 'All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000.' Ethical approval was obtained from the Ethics Commission University of Berne under reference No. 2011-04-172.

Appendix: WHQ Items

No.	English version	German version	Rating scale	Origin scale
WHQ_Work				
W1	Can you independently plan and organize your work?	Können Sie Ihre Arbeit selbständig planen und einteilen?	Likert scale (1–5)	KFZA
W2	Can you learn something new in your job?	Können Sie bei Ihrer Arbeit Neues dazu lernen?	Likert scale (1–5)	KFZA
W3	In my job, I can see from the result whether my work was good or not	Bei meiner Arbeit sehe ich selber am Ergebnis, ob meine Arbeit gut war oder nicht	Likert scale (1–5)	KFZA
W4	In my work I can carry out a working task, from A to Z	Bei meiner Arbeit kann ich eine Sache oder ein Produkt von A bis Z herstellen resp. Ausführen	Likert scale (1–5)	SALSA
W5	My job is not ideal, but it could be even worse	Meine Arbeit ist zwar nicht gerade ideal, aber schliesslich könnte Sie noch schlimmer sein	Likert scale (1–7)	AZK
W6	I have too much work	Ich habe zu viel Arbeit	Likert scale (1–5)	KFZA
W7	Needed information or working tools (e.g., computer) are often not available	Oft stehen mir die benötigten Informationen, Arbeitsmittel (z.B. Computer) nicht zur Verfügung	Likert scale (1–5)	KFZA
W8	I am often interrupted in my work (e.g., telephone calls)	Ich werde bei meiner Arbeit immer wieder unterbrochen (z.B. durch Telefon)	Likert scale (1–5)	KFZA
W9	The working conditions at my workplace are unfavorable. There are disturbances, such as noise, temperature, dust	An meinem Arbeitsplatz gibt es ungünstige Umgebungsbeding ungen wie Lärm, Klima, Staub	Likert scale (1–5)	KFZA
W10	In case of any difficulties, I can rely on my colleagues	Ich kann mich auf meine Arbeitskollegen/-kolleginnen verlassen, wenn es bei der Arbeit schwierig wird	Likert scale (1–5)	KFZA
W11	In case of any difficulties, I can rely on my boss/supervisor	Ich kann mich auf meine/n direkte/n Vorgesetzte/n verlassen, wenn es bei der Arbeit schwierig wird	Likert scale (1–5)	KFZA
W12	I always get feedback about the quality of my work from my colleagues or my supervisor	Ich bekomme von Vorgesetzten sowie Arbeitskollegen/-innen immer Rückmeldung über die Qualität meiner Arbeit	Likert scale (1–5)	KFZA

No.	English version	German version	Rating scale	Origin scale
WHQ_Health				
H1	Did you feel helpless during or after the accident?	Fühlten Sie sich während des Unfalls oder kurz danach hilflos?	0, 1	PTBS
H2	Do pictures about it (the accident) pop up into your mind?	Haben Sie plötzlich auftretende Bilder (vom Unfall) im Kopf?	0, 1	PTBS
H3	How would you describe your actual general health condition?	Wie würden Sie ihren gegenwärtigen Gesundheits-zustand beschreiben?	VAS (0–100)	IRES
H4	How often did you suffer from pain recently?	Wie häufig haben Sie in der letzten Zeit unter Schmerzen gelitten?	VAS (0–100)	IRES
H5	How much do you feel that this pain affects your daily life?	Wie stark fühlen Sie sich durch diese Schmerzen im täglichen Leben beeinträchtigt?	VAS (0–100)	IRES
H6	I think that I am not able to work normally within 3 months	Ich glaube, dass ich mindestens 3 Monate nicht normal arbeiten gehen kann	Likert scale (0–6)	FABQ
H7	(In the past week) I felt as if I am slowed down	(In der letzten Woche) fühlte ich mich in meinen Aktivitäten gebremst	Likert scale (0–3)	HADS
H8	(In the past week), worrying thoughts go through my mind	(In der letzten Woche) gingen mir beunruhigende Gedanken durch den Kopf	Likert scale (0–3)	HADS
H9	Have you recently been worrying about earning less in the future because of the accident?	Machen Sie sich in der letzten Zeit Sorgen darüber, dass Sie in Zukunft wegen des Unfalls weniger verdienen?	Likert scale (0–3)	SPE
H10	How much were you bothered or distressed over the past 7 days by feeling lonely?	Wie sehr litten Sie in den letzten 7 Tagen unter Einsamkeitsgefühlen?	Likert scale (0–4)	SCL-90
H11	How much were you bothered or distressed over the past 7 days by feeling fearful?	Wie sehr litten Sie in den letzten 7 Tagen unter Furchtsamkeit?	Likert scale (0–4)	SCL-90

VAS visual analog scale, *KFZA* Kurzfragebogen zur Arbeitsanalyse [49], *AKZ* Arbeitszufriedenheitsskala [50], *SALSA* Subjektive Arbeitsanalyse [51], *PTSB* Screening Posttraumatische Belastungsstörung [52], *IRES* Indikatoren des Reha-Status [53], *FABQ* Fear Avoidance Belief Questionnaire [54], *HADS* Hospital Anxiety Depression Scale [55], *SPE* Skala zur Messung der subjektiven Prognose der Erwerbstätigkeit [56] *SCL-90* Symptom Checklist 90 [57]

References

1. World Health Organization. Injuries and violence: the facts 2014. Geneva: WHO; 2014.
2. Centers of Disease Control and Prevention Appendix II. Definitions and methods [Internet]. 2007 [cited 2016 May 21]. http://www.cdc.gov/nchs/data/injury/Definitions_of_injury_terms.pdf.
3. Adams PF, Martinez ME, Vickerie JL, Kirzinger WK. Summary health statistics for the U.S. population: National Health Interview Survey, 2012. Vital Health Stat. 2013;10(259):1–95.
4. Hashemi L, Webster BS, Clancy EA, Courtney TK. Length of disability and cost of work-related musculoskeletal disorders of the upper extremity. J Occup Environ Med. 1998;40(3):261–9. doi:10.1097/00043764-199803000-00008.
5. Siegenthaler F. Ich glaube, dass ich mindestens drei Monate nicht normal arbeiten gehen kann [I think that I am not able to work normally within 3 months]. Suva Med. 2010;22–39.
6. Harper S. Economic and social implications of aging societies. Science. 2014;346(6209):587–91. doi:10.1126/science.1254405.
7. Waddell G, Burton AK. Is work good for your health and well-being?. London: Stationery Office; 2006.
8. Saunders SL, Nedelec B. What work means to people with work disability: a scoping review. J Occup Rehabil. 2014;24(1):100–10. doi:10.1007/s10926-013-9436-y.
9. Laisné F, Lecomte C, Corbière M. Biopsychosocial determinants of work outcomes of workers with occupational injuries receiving compensation: a prospective study. Work. 2013;44(2):117–32. doi:10.3233/WOR-2012-1378.
10. Lange C, Burgmer M, Braunheim M, Heuft G. Prospective analysis of factors associated with work reentry in patients with accident-related injuries. J Occup Rehabil. 2007;17(1):1–10. doi:10.1007/s10926-006-9039-y.
11. Lin KH, Guo NW, Shiao SC, Liao SC, Hu PY, Hsu JH, et al. The impact of psychological symptoms on return to work in workers after occupational injury. J Occup Rehabil. 2013;23(1):55–62. doi:10.1007/s10926-012-9381-1.
12. Mason S, Wardrope J, Turpin G, Rowlands A. Outcomes after injury: a comparison of workplace and non workplace injury. J Trauma Acute Care Surg. 2002;53(1):98–103. doi:10.1097/00005373-200207000-00019.
13. Schultz IZ, Crook J, Berkowitz J, Milner R, Meloche GR. Predicting return to work after low back injury using the

psychosocial risk for occupational disability instrument: a validation study. J Occup Rehabil. 2005;15(3):365–76. doi:10.1007/s10926-005-5943-92005.
14. Schultz IZ, Stowell AW, Feuerstein M, Gatchel RJ. Models of return to work for musculoskeletal disorders. J Occup Rehabil. 2007;17(2):327–52. doi:10.1007/s10926-007-9071-6.
15. Stover B, Wickizer TM, Zimmerman F, Fulton-Kehoe D, Franklin G. Prognostic factors of long-term disability in a workers' compensation system. J Occup Environ Med. 2007;49(1):31–40. doi:10.1097/01.jom.0000250491.37986.b6.
16. Hepp U, Moergeli H, Buchi S, Bruchhaus-Steinert H, Sensky T, Schnyder U. The long-term prediction of return to work following serious accidental injuries: a follow up study. BMC Psychiatry. 2011;11(1):53. doi:10.1186/1471-244X-11-53.
17. Meerding WJ, Looman CW, Essink-Bot ML, Toet H, Mulder S, van Beeck EF. Distribution and determinants of health and work status in a comprehensive population of injury patients. J Trauma Acute Care Surg. 2004;56(1):150–61. doi:10.1097/01.TA.0000062969.65847.8B.
18. Tecic T, Lefering R, Althaus A, Rangger C, Neugebauer E. Pain and quality of life 1 year after admission to the emergency department: Factors associated with pain. Eur J Trauma Emerg Surg. 2013;39(4):353–61. doi:10.1007/s00068-013-0271-9.
19. Fadyl J, McPherson K. Return to work after injury: a review of evidence regarding expectations and injury perceptions, and their influence on outcome. J Occup Rehabil. 2008;18(4):362–74. doi:10.1007/s10926-008-9153-0.
20. Franche RL, Krause N. Readiness for return to work following injury or illness: conceptualizing the interpersonal impact of health care, workplace, and insurance factors. J Occup Rehabil. 2002;12(4):233–56. doi:10.1023/A:1020270407044.
21. Hepp U, Schnyder U, Hepp-Beg S, Friedrich-Perez J, Stulz N, Moergeli H. Return to work following unintentional injury: a prospective follow-up study. BMJ Open. 2013;3(12):e003635. doi:10.1136/bmjopen-2013-003635.
22. Pjanic I, Messerli-Bürgy N, Bachmann MS, Siegenthaler F, Hoffmann-Richter U, Znoj HJ. Predictors of depressed mood 12 months after injury. Contribution of self-efficacy and social support. Disabil Rehabil. 2014;36(15):1258–63. doi:10.3109/09638288.2013.837971.
23. Seland K, Cherry N, Beach J. A study of factors influencing return to work after wrist or ankle fractures. Am J Ind Med. 2006;49(3):197–203. doi:10.1002/ajim.20258.
24. Krause N, Dasinger LK, Deegan LJ, Rudolph L, Brand RJ. Psychosocial job factors and return-to-work after compensated low back injury: a disability phase-specific analysis. Am J Ind Med. 2001;40(4):374–92. doi:10.1002/ajim.1112.
25. Feuerstein M. A multidisciplinary approach to the prevention, evaluation, and management of work disability. J Occup Rehabil. 1991;1(1):5–12. doi:10.1007/BF01073276.
26. Brouwer S, Franche RL, Hogg-Johnson S, Lee H, Krause N, Shaw WS. Return-to-work self-efficacy: development and validation of a scale in claimants with musculoskeletal disorders. J Occup Rehabil. 2011;21(2):244–58. doi:10.1007/s10926-010-9262-4.
27. Siegenthaler F. Psychische Gesundheit und Rückkehr zur Arbeit von Verletzten nach leichten und moderaten Unfallereignissen—Prädiktoren für die Früherkennung komplizierter Heilungsverläufe [Mental health and return to work of minor to moderate injured persons—predictors for early identification of complicated recovery trajectories] [unpublished doctoral thesis]. [Bern (CH)]: University of Berne; 2011 [cited 2016 May 21]. http://www.zb.unibe.ch/download/eldiss/11siegenthaler_f.pdf.
28. Znoj HJ. ISRCTN05534684, Improving the diagnostic procedure for injured patients—Optimization for the questionnaire "Fragebogen Arbeit und Befinden" (OptiFAB) [Internet]. 2011 [cited 2016 May 21]. Available from ISRCTN: http://dx.doi.org/10.1186/ISRCTN05534684.
29. Grob A, Lüthi R, Kaiser FG, Flammer A, Mackinnon A, Wearing AJ. Berner Fragebogen zum Wohlbefinden Jugendlicher (BFW) [The Bern Subjective Well-Being Questionnaire on Adolescents (BFW)]. Diagnostica. 1991;37(1):66–75.
30. Bruggemann A. Zur empirischen Untersuchung verschiedener Formen von Arbeitszufriedenheit [Empirical investigation of different different kinds of job satisfaction]. Z Arbeitswiss. 1976;30:71–4.
31. Fox J, Weisberg S. An R companion to applied regression. Washington: Sage; 2010.
32. Rosseel Y. Lavaan: an R package for structural equation modeling. J Stat Softw. 2012;48(2):1–36. doi:10.18637/jss.v048.i02.
33. Revelle W. Psych: procedures for personality and psychological research [Internet]. 2015 [cited 2016 May 21]. Available from Northwestern University, Illinois. http://CRAN.R-project.org/package=psychVersion=1.5.4.
34. Su YS, Yajima M, Gelman AE, Hill J. Multiple imputation with diagnostics (mi) in R: Opening windows into the black box. J Stat Softw. 2011;45(2):1–31. doi:10.18637/jss.v045.i02.
35. R Core Team. R: A language and environment for statistical computing. Open source: R Foundation for Statistical Computing [Internet]. Vienna; 2015 [cited 2016 May 21]. http://www.R-project.org/.
36. Flora DB, Curran PJ. An empirical evaluation of alternative methods of estimation for confirmatory factor analysis with ordinal data. Psychol Methods. 2004;9(4):466–91. doi:10.1037/1082-989X.9.4.466.
37. Schermelleh-Engel K, Moosbrugger H, Müller H. Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. Methods Psychol Res Online. 2003;8(2):23–74.
38. Dunn TJ, Baguley T, Brunsden V. From alpha to omega: a practical solution to the pervasive problem of internal consistency estimation. Br J Psychol. 2014;105(3):399–412. doi:10.1111/bjop.12046.
39. Fornell C, Larcker DF. Evaluating structural equation models with unobservable variables and measurement error. J Market Res. 1981;18(1):39–50. doi:10.2307/3151312.
40. Efron B, Tibshirani RJ. An introduction to the bootstrap. New York: Chapman Hall; 1994.
41. Little RJA. A test of missing completely at random for multivariate data with missing values. J Am Statist Assoc. 1988;83(404):1198–202. doi:10.1080/01621459.1988.10478722.
42. Horn JL. A rationale and test for the number of factors in factor analysis. Psychometrika. 1965;30:179–85.
43. Revelle W, Rocklin T. Very simple structure: An alternative procedure for estimating the optimal number of interpretable factors. Multivar Behav Res. 1979;14(4):403–14. doi:10.1207/s15327906mbr1404_2.
44. O'Connor BP. SPSS and SAS programs for determining the number of components using parallel analysis and Velicer's MAP test. Behav Res Methods Instr. 2000;32(3):396–402. doi:10.3758/BF03200807.
45. Cohen J. Statistical power for the social sciences. Hillsdale: Laurence Erlbaum; 1988.
46. Elfering A, Semmer NK, Schade V, Grund S, Boos N. Supportive colleague, unsupportive supervisor: the role of provider-specific constellations of social support at work in the development of low back pain. J Occup Health Psychol. 2002;7(2):130–40. doi:10.1037/1076-8998.7.2.130.
47. Uchino BN, Cacioppo JT, Kiecolt-Glaser JK. The relationship between social support and physiological processes: a review with emphasis on underlying mechanisms and implications for

health. Psychol Bull. 1996;119(3):488–531. doi:10.1037/0033-2909.119.3.488.

48. Frank JW, Kerr MS, Brooker AS, DeMaio SE, Maetzel A, Shannon HS, et al. Disability resulting from occupational low back pain. Part I: what do we know about primary prevention? A review of the scientific evidence on prevention before disability begins. Spine. 1996;21(24):2908–17. doi:10.1097/00007632-199612150-00024.
49. Prümper J, Hartmannsgruber K, Frese M. KFZA. Kurz-Fragebogen zur Arbeitsanalyse [KFZA. A short questionnaire for job analysis]. Z Arb Organ. 1995;39(3):125–31.
50. Baillod J, Semmer N. Fluktuation und Berufsverläufe bei Computerfachleuten [Turnover and career paths of computer specialists]. Z Arb Organ. 1994;8(4):152–63.
51. Rimann M, Udris I. Fragebogen Salutogenetische Subjektive Arbeitsanalyse (SALSA) [Subjective analysis of work—The questionaire SALSA]. In: Dunckel H, editor. Handbuch psychologischer Arbeitsanalyseverfahren [Handbook of psychological methods of work analysis]. Zürich: vdf Hochschulverlag ETH; 1999. p. 239–63.
52. Stieglitz RD, Nyberg E, Albert M, Frommberger U, Berger M. Entwicklung eines Screeninginstrumentes zur Identifizierung von Risikopatienten für die Entwicklung einer Posttraumatischen Belastungsstörung (PTBS) nach einem Verkehrsunfall [Development of a screening instrument to identify patients at risk of developing a posttraumatic stress disorder (PTSD) after an accident]. Z Kl Psych Psychoth. 2002;31(1):22–30. doi:10.1026/0084-5345.31.1.22.
53. Gerdes N, Jäckel WH. Der IRES-Fragebogen für Klinik und Forschung [IRES-24 patient questionnaire]. Rehabilitation. 1995;34(2):XIII–XXIII.
54. Waddell G, Newton M, Henderson I, Somerville D, Main CJ. A fear-avoidance beliefs questionnaire (FABQ) and the role of fear-avoidance beliefs in chronic low back pain and disability. Pain. 1993;52(2):157–68. doi:10.1016/0304-3959(93)90127-B.
55. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. Acta Psychiat Scand. 1983;67(6):361–70. doi:10.1111/j.1600-0447.1983.tb09716.x.
56. Mittag O, Raspe H. Eine kurze Skala zur Messung der subjektiven Prognose der Erwerbstätigkeit: Ergebnisse einer Untersuchung an 4279 Mitgliedern der gesetzlichen Arbeiterrentenversicherung zu Reliabilität (Guttman-Skalierung) und Validität der Skala [A Brief Scale for Measuring Subjective Prognosis of Gainful Employment: Findings of a Study of 4279 Statutory Pension Insurees Concerning Reliability (Guttman Scaling) and Validity of the Scale]. Die Rehabil. 2003;42(3):169–74. doi:10.1055/s-2003-40095.
57. Derogatis LR, Lipman RS. SCL-90. Administration, scoring and procedures manual-I for the R (revised) version and other instruments of the psychopathology rating scales series. Chicago: Johns Hopkins University; 1977.