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# The reliability and factorial validity of the Swedish version of the Recovery Experience Questionnaire

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## Abstract

Recent research has indicated that recovery from work stress and effort might be crucial for health and well-being. Thus, a valid measurement of recovery becomes important. The main purpose of the present study was to empirically evaluate and seeking support for the hypothesized four-factor model of the Swedish version of Recovery Experience Questionnaire (REQ). The total sample ( $N = 680$ ) was randomly split into two subsamples. The first subsample was used for finding the best-fitting model using an exploratory factor analysis and the second subsample was used to test the a priori model using confirmatory factor analysis. The results support the proposed four-factor structure of the scale for both males and females. Additionally, apart from high reliability estimates, this instrument proved to have good convergent and discriminant validity for all four factors. Implications for the use of the REQ in conjunction with recovery-focused interventions were discussed, as were limitations such as low response rate.

Keywords: job stress recovery, psychophysiological deactivation, questionnaire, assesment, factor analysis, recovery experiences

Work stress is common among employees in the European member states with the highest levels reported in Greece, Slovenia, and Sweden (Milczarek, Schneider, & González, 2009). Numerous of studies have demonstrated that work stressors, such as high job demands in combination with low job control (Karasek, 1979) and imbalance between effort and reward (Siegrist, 1996) predict illness. For example, a meta-analysis, conducted by Li, Zhang, Loerbroks, Angerer, and Siegrist (2015) showed that work stress is associated with a significant increased relative risk of recurrent cardiac events. Another health problem is burnout/exhaustion, a syndrome regarded as a consequence of continuous and prolonged exposure to stressors, particularly work-related (Melamed, Shirom, Toker, Berliner, & Shapira, 2006). The syndrome has shown to be as prevalent as 16–20% in Sweden (Glise, Hadzibajramovic, Jonsdottir, & Ahlborg, 2010; Lindblom, Linton, Fedeli, & Bryngelsson, 2006), and associated with long-term sick leave (Bryngelson, Åsberg, Nygren, Jensen, & Mittendorfer-Rutz, 2013) and all-cause mortality among employees (Ahola, Väänänen, Koskinen, Kouvonen, & Shirom, 2010).

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Long-term stress reactions have been attributed to external stressors and associated with subsequent disease (e.g. Brunner, 2017; Esler, 2017) but also deficiencies in deactivation and recovery after exposure seems to be important factors when explaining prolonged effects (e.g. Brosschot, Gerin, & Thayer, 2006; McEwen, 1998; Zijlstra & Sonnentag, 2006). Recovery occurs in the absence of demands and can be conceptualized as a process of psychophysiological deactivation after effort expenditure strain or stress (Geurts & Sonnentag, 2006), allowing the arousal level to return to baseline, depleted resources to be restored, reducing fatigue, and allowing existing or future demands to be dealt with more efficiently (Zijlstra & Sonnentag, 2006).

Sonnentag and Geurts (2009) differentiate between *recovery processes* and *recovery outcomes*. Recovery as a process refers partly to activities and partly to experiences that will reduce strain. Recovery activities and recovery experiences are interdependent. For instance, low-effort activities are associated with experiences of relaxation (ten Brummelhuis & Bakker, 2012). Recovery outcome is described as the psychological and physiological result following a period of recovery processes.

Recovery from stress, work, and effort has been studied to a relatively low degree until lately, and during the last 15 years large progress has been made (Sonnentag, Venz, & Casper, 2017). Sonnentag and Fritz (2007) constructed the Recovery Experience Questionnaire (REQ) in an effort to assess experienced recovery from job stress as a universal process instead of specific types of activities that have been the focus in earlier research. These authors generated items that should tap into four dimensions: *Psychological detachment* goes beyond being physically away from the work situation. When individuals do not detach psychologically after work the identical functional systems that were activated during work will continue to be activated after work and complete recovery will not occur (Meijman & Mulder, 1998). *Mastery* experiences emerge from successful dealing with challenging situations, learning new things (e.g. learning a new hobby) and increase in internal resources, such as competencies, skills, self-efficacy, and positive mood (Sonnentag & Fritz, 2007). *Control* refers to experiences of deciding what to do during leisure time, how to do it, and when to do it. (Sonnentag & Fritz, 2007). Control during leisure time is also expected to enhance recovery by increasing feelings of competence and self-efficacy. Finally, *relaxation*, describes the experiences of low activation in the organism (Sonnentag et al., 2017; Stone, Kennedy-Moore, & Neale, 1995). Relaxation can stop the prolongation of harmful physiological stress responses and enable recovery processes to occur (Brosschot, Pieper, & Thayer, 2005; Geurts & Sonnentag, 2006; Lisspers, Almén, & Sundin, 2014).

It has been shown that high levels of the recovery experiences like those described above are associated with health and well-being (Sonnentag et al., 2017). The most consistent results have been found for relaxation and psychological detachment, the factors involving physiological deactivation and cognitive deactivation, respectively.

Using confirmative factor analyses (CFA), Sonnentag and Fritz (2007) contrasted the proposed four-factor structure against alternative models; one-factor, the best-fitting two-factor models and best-fitting three-factor models. The results showed that the items on the scale were better represented by four factors compared to a one common factor, a two-factor or three-factor structure.

Apart from the Sonnentag and Fritz study (2007) conducted in Germany, the REQ has to date been translated into several languages and validated in different countries: In Spain (Sanz-Vergel et al., 2010), Japan (Shimazu, Sonnentag, Kubota, & Kawakami, 2012), South Africa (Mostert & Els, 2015), South Korea (Park, Park, Kim, & Hur, 2011), Finland (Kinnunen, Feldt, Siltaloppi,

& Sonnentag, 2011), and in Holland (Bakker, Sanz-Vergel, Rodríguez-Muñoz, & Oerlemans, 2015). In competition with variety of contrasting models, all of the studies above found support for proposed four-factor structure.

Using CFA, the main purpose of the present study was to empirically evaluate the multidimensional model of the Swedish version of the REQ, seeking support for the hypothesized four-factor model. Instead of using a variety of competing models as in many previous validation studies, the alternative model was determined based on the outcome exploratory factor analysis (EFA). Compared to previous studies, this study looked more systematically at the discriminant and convergent validity, and examined a possible similarity in the factor structure across gender.

## Methods

### Participants and procedure

The participants in the present study consisted of 815 (483 women and 332 men) individuals in the working-age population (24–55 years) randomly selected from two medium-sized communities in Sweden. A battery consisting of several self-rating scales including the REQ was sent to 4,000 persons (response rate 20.4%) stratified according to the number of inhabitants of each age group in the city. The participant could choose between completing a paper version or a digitalized Internet version of the scales. Seventeen percent of the data were collected via the Internet. The respondents were informed about the research and informed consent was requested and obtained from all participants. Questions concerning confidentiality, anonymity, and the respondent's rights were emphasized. Only those with  $\geq 20$  h/week paid work were included in the analyses. In addition, only those with no missing data on the REQ were retained for the analyses ( $N = 680$ , mean age = 41.19,  $SD = 9.31$ ), which left 17.0% of the total sample for analyses.

Ethical permission was applied for and received from the regional committee in Umeå (dnr: 2011-317-31 Ö).

### Instrument

#### *Recovery experiences*

The REQ (Sonnentag & Fritz, 2007) consists of 16 items and 4 subscales that reflect the underlying dimensions of recovery experience: Psychological detachment (4 items), Relaxation (4 items), Control (4 items), and Mastery (4 items). The items (see Table 1) are scored on a five-point Likert scale ranging from 1 (do not agree at all) to 5 (fully agree).

Both back-translation and the use of a committee were applied in order to translate the questionnaire into Swedish language. A professional translator fluent in German, English, and Swedish was provided with both the German and the English version of the scale, and then translated the items to Swedish (providing several alternative formulations when suitable). Based on these suggestions, a committee consisting of three members of the research project group at the time (the first and the third author of this article, and a third person now deceased) determined a first preliminary version of a scale. This version was then sent to a colleague with English as native language but fluent in Swedish for back-translation to English. The back-translated version was then compared with the original English version. Based on interpretation of equivalence in the meaning of the items of the two versions, we revised two items (6 and 14) and a word in the instructional text to the questionnaire. In conclusion, even though some formulations were

Table 1. Factor loadings from the exploratory factor analysis with a Maximum Likelihood method and oblique rotation.

	No. Items ("During time after work ...") (In Swedish, "På fritiden efter arbetet ...")	Factor 1: CO & RE	Factor 2 PD	Factor 3: MA
9	I determine for myself how I will spend my time (CO) (bestämmer jag själv hur jag ska tillbringa min tid)	.913	.105	.015
4	I decide my own schedule (CO) (planerar jag själv hur resten av dagen ska se ut)	.858	-.027	-.085
1	I feel like I can decide for myself what to do (CO) (känns det som om jag själv kan bestämma vad jag ska göra)	.824	.100	.007
13	I take care of things the way that I want them done (CO) (tar jag itu med saker på det sätt jag själv vill)	.760	-.026	.032
6	I kick back and relax (RE) (tar jag det lugnt och slappnar jag av)	.694	-.108	-.016
12	I use the time to relax (RE) (använder jag tiden till att slappna av)	.661	-.061	.004
11	I do relaxing things (RE) (gör jag saker som får mig att varva ner)	.552	-.092	.164
14	I take time for leisure (RE) (tar jag mig tid till avkopplande fritidsaktiviteter)	.463	-.078	.294
5	I don't think about work at all (PD) (tänker jag inte alls på jobbet)	-.027	-.916	-.040
3	I forget about work (PD) (glömmer jag bort jobbet)	-.055	-.866	.016
10	I distance myself from my work (PD) (kan jag distansera mig från jobbet)	.044	-.837	-.045
16	I get a break from the demands of work (PD) (får jag en paus från kraven på jobbet)	.055	-.525	.072
15	I do something to broaden my horizons (MA) (gör jag något som gör att jag vidgar mina vyer)	-.001	-0.141	.847
7	I seek out intellectual challenges (MA) (söker jag intellektuella utmaningar)	-.079	-0.040	.706
2	I learn new things (MA) (lärt jag mig nya saker)	.070	0.123	.656
8	I do things that challenge me (MA) (gör jag saker som stimulerar mig)	.204	0.035	.618

Notes: PD = psychological detachment, RE = relaxation, MA = mastery, CO = control.

difficult to make culturally adequate (e.g. "I kick back and relax"), we did not encounter any obvious translation problems.

Cronbach  $\alpha$ 's for the different types of recovery experiences were: Psychological detachment .88; Relaxation .86; Mastery .84; Control .89; and for the entire instrument .92.

### Analytic approach

A cross-validation approach was used, and the overall sample was ( $N = 680$ ) randomly split into two subsamples. The first subsample was used for finding the best-fitting model using EFA ( $N = 340$ ). In evaluating factorial validity, in the EFA all of the 16 items were entered using the Maximum Likelihood method using with oblique rotation. Factors with eigenvalues of greater than one were extracted.

Using a CFA, we then tested if the REQ structure could be represented by four correlated first-order factors. In addition, dependent on the outcome of the EFA, an alternative factor structure was compared with the proposed four-factor structure of the scale. Apart from above, a number of a priori assumptions further guided the analyses: (1) Each item would be associated with only the factor it was designed to measure and other coefficients would be fixed to zero; (2) all factors would be allowed to covary, allowing for an oblique factor model; (3) modifications should be kept at a minimum and be based on statistical as well as theoretical concerns, and should exclude the addition of factorially complex items; and (4) correlated error terms would be restricted within the latent constructs.

There are numerous measures for evaluating the overall fit of the models with somewhat different theoretical frameworks and that addresses different components of fit (e.g. Hu & Bentler, 1995), and it is generally recommended that multiple measures should be used. Apart from reporting relative chi square statistics ( $\chi^2/df$ ) as a measure of fit, three conventional indices of goodness of fit was calculated; the root mean square error of approximation (RMSEA), the standardized root mean square residual (SRMR), and the comparative fit index (CFI). With respect to the RMSEA, values below .06 are considered a good-fitting model, values below .08 indicates an adequate fit. SRMR values around .08 or lower indicates a good fit to the data. For the CFI, values above .90 suggest an acceptable fit and values above .95 a close fit. See Hu and Bentler (1999) for suggested cut-off criteria for fit indices.

Next, composite reliability (CR) was used as measure of internal consistency of the factors, where values greater than .70 is indicative of good reliability. Discriminant validity is achieved when average variance extracted (AVE) is greater than maximum shared squared variance (MSV) or average shared squared variance (ASV). For convergent validity, AVE should be equal or greater than .50 and lower than CR. Put differently, variance explained by the construct should be greater than measurement error and greater than cross-loadings. See, for example, Hair, Black, Babin, and Anderson (2010) for suggested thresholds for these analyses.

For the analyses, IBM SPSS 20 and SPSS AMOS 22 (Arbuckle, 2013) for Windows were used.

## Results

Table 1 shows the results of EFA. Three factors with eigenvalues of greater than one were extracted. Factor 1 consisted of eight items regarding control and relaxation; Factor 2 consisted of four items regarding psychological detachment; and Factor 3 consisted of four items regarding mastery.

For confirmatory factor analyses, the goodness-of-fit indices for the models as well as the  $\chi^2$  difference tests of improvements are presented in Table 2. The three-factor structure model based on the EFA suggested an inadequate fit of the model. When testing the proposed four-factor structure of the scale, this model significantly improved the fit. The relative chi square statistics suggested an acceptable fit of the model, but apart from the RMSEA, the other standard indices

Table 2. Estimates of confirmatory factor analyses: model-fit indices for a three-factor and four-factor models.

Model	$\chi^2$ (df)	$\chi^2/df$	CFI	SRMR	RMSEA	$\Delta\chi^2$ , df ( <i>p</i> )
Three-factor	595.15 (101)	5.89	.88	.08	.11	
Four-factor <sup>a</sup>	459.02 (98)	4.68	.92	.08	.10	136.3 (<.0001)
Four-factor, final <sup>b</sup>	286.47(84)	3.41	.95	.07	.08	173.14 (<.0001)

Notes: CFI = Comparative Fit Index, SRMR = Standardized Root Mean square Residual, RMSEA = Root Mean Square Error of approximation.

<sup>a</sup>The proposed 4-factor structure with 16 items.

<sup>b</sup>The proposed 4-factor structure with 15 items (minus Item 14).

suggested an adequate fit of the model. The modification indices suggested that permitting "I take time for leisure" (from the factor Relaxation) to load on both Relaxation and Mastery factor would improve model fit, but adding a path would complicate interpretation of the two factors and this item was therefore removed. With this modification, the model was significantly improved, with all fit indices reaching acceptable ranges.

For the final model, Table 3 shows that CR indices indicate a good reliability for all factors (all above .70). In addition, indices of convergent validity indicated no validity concerns; all four factors AVE were less than CR and greater than .50. More importantly, indices of discriminant validity indicate good validity for all four factors (all AVE markedly higher than MSV and ASV).

Next, a multi-group model was performed in which fit for both genders was examined simultaneously. In this model, the factor structure was specified identically across groups, and all parameters were freely estimated across genders. This is a method of formally establishing configural invariance (i.e. equivalence in factor structure across the genders). The fit indices of this configural model showed that this model had adequate fit for the data ( $\chi^2/df = 2.19$ , RMSEA = .06, SRMR = .08, and CFI = .94), suggesting that the final four-factor structure is similar across genders, with the same items characterizing each factor.

Finally, as described above, a multi-group model was performed in which fit for the two age cohorts (age group 24–39 vs. age group 40–55) was examined simultaneously. The fit indices of this configural model showed that this model had adequate fit for the data ( $\chi^2/df = 2.13$ , RMSEA = .06, SRMR = .09, and CFI = .94), suggesting that the final four-factor structure is similar across the age cohorts.

## Discussion

In this study, we looked systematically at the validity of the REQ. The analyses permitted tentative answers concerning the generalizability, psychometric properties, and practical utility of the

Table 3. Indicators of internal consistency and validity (and factor correlations) for the final model.

Type of REQ estimates	CR	AVE	MSV	ASV	1	2	3	4
Mastery	.835	.560	.384	.292	–			
Detachment	.901	.697	.245	.197	.408	–		
Relaxation	.870	.691	.612	.393	.569	.495	–	
Control	.889	.667	.612	.391	.620	.422	.782	–

Notes: CR = Composite Reliability; AVE = Average Variance Extracted; MSV = Maximum Shared squared variance; ASV = Average Shared squared Variance.

REQ. Our results provided support for the internal consistency of the REQ. The CR indices indicated good reliability for all four factors, and Cronbach's alphas were adequate and comparable to those found in previous studies (e.g. Kinnunen et al., 2011; Shimazu et al., 2012).

The EFA extracted three factors with eigenvalues of greater than one. The first extracted factor with most explained variance consisted of eight items regarding control and relaxation (with mastery and psychological detachment loading on separate factors), a factor structure that is consistent with best-fitting three-factor model in previous studies (Kinnunen et al., 2011; Mostert & Els, 2015; Sonnentag & Fritz, 2007).

When testing the three-factor structure model that was based on the EFA, the model did not fit the data sufficiently well. When the 16 items from the REQ were included in a CFA, the feasibility of a four-factor solution was examined. Even though the goodness-of-fit indices for the model were acceptable, the modification indices suggested that by letting one item loading on two factors, the fit of the four-model would improve appreciably. However, it was not considered appropriate to allow one item to cross load on separate factors as it would complicate interpretation, and this item was therefore removed. With this modification of the model, the fit was significantly improved. In addition, the convergent validity was good for all four factors and the shared variance between the factors was sufficiently low to suggest independence between the factors in the model (i.e. good discriminant validity).

Evidence of strong validities are important since validated instruments measuring various aspects of recovery are lacking, and that research shows that stress recovery are associated with well-being (Sonnentag et al., 2017) and important or perhaps even crucial for maintaining good health (McEwen, 1998).

Results from the multi-group model indicated that the four-factor solution applies for both males and females, and for the two different age cohorts. This is important since women has been found to report higher prevalence of high distress days and a lower prevalence of distress-free days (Almeida & Kessler, 1998), recover suboptimally after work (Frankenhaeuser et al., 1989; Lundberg & Frankenhaeuser, 1999), and report higher levels of burnout (Norlund et al., 2010).

Several limitations need to be addressed. First, although we followed established recommendations when translating the REQ, the techniques used have their shortcomings (Maneesriwongul & Dixon, 2004). For example, a committee does not control for shared misconceptions, and a back-translated version of a scale could be equivalent to the original version despite not necessarily being translated adequately. However, as stated above, we followed established recommendations using independent translator and back-translator as well as a committee handling difficult or cumbersome translation issues. Second, the response rate was low, which of course could reduce the generalizability of the findings. However, our main concern was not trying to generalize but to psychometrically test the REQ scale. One reason though for the low response rate could be that the relatively large battery of self-rating scales were perceived as too demanding for some individuals. Thus, there is a risk that people with few opportunities to recover from work are less likely to complete the scales. Third, 17% of the data were collected via the Internet. Even though earlier analyses on other instruments suggest that Internet surveys will generate comparable data to paper surveys (e.g. Im et al., 2005; Pettit, 2002), future research should examine the psychometric properties of the two formats of the REQ separately. Fourth, the present study analyzed data from a community sample. It is important to recognize that the REQ itself may demonstrate different psychometric properties depending on the population

(e.g. gender identity, socioeconomic status, language, health status, and profession), and future research needs to gather information about the REQ among specific populations. In addition, there are several other important issues to address. For example, we need to establish valid cut-off scores for problematic low levels of recovery experiences in order to identify people who are in need of improved recovery experiences.

Notwithstanding, we found support for the proposed four-factor structure in the Swedish version of the REQ. This is an important finding because it may help us select measurement tools for the examination of job stress recovery experiences. For example, following an intervention, Lisspers et al. (2014) found that changed levels of “recovery behaviour” were associated with changed levels of burnout in a subclinical sample. Thus, recovery-focused interventions might be a suitable approach in both treatment and prevention of burnout and valid measures of recovery experiences could add understanding to recovery processes.

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