

Examination of the Factor Structure of the Recovery-Stress-Questionnaire

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Introduction

Much attention has focused on the diagnosis of overtraining. Kellmann and Kallus (2001) enabled a paradigm shift by publishing the Recovery-Stress Questionnaire Sport (RESTQ-Sport). The RESTQ-Sport measures the frequency of activities, experienced (mood) states, and appraised events regarding current stress and recovery, focusing not only on stress but also on recovery. The RESTQ-Sport was modularly developed. The basic RESTQ module (Kallus, 1995) was originally constructed for application in the work setting. In an attempt to make the instrument applicable to athletes, Kellmann and Kallus (2001) added seven sport-specific scales to the basic module that assess additional

aspects of stress and recovery in the sport area (see Fig. 1). To illustrate the construct validity of the RESTQ-Sport, Kellmann and Kallus (2000, 2001) performed a principal component analysis with a varimax rotation. In regard to the modular construction of the RESTQ-Sport the factor analysis was performed independently for the general and the sport-specific components and only on the scale level. No evidence concerning the first order, respectively the item level, is reported. The aim of our study was to assess the psychometric properties of the RESTQ-Sport scales with a sample of competitive athletes using the more sophisticated CFA.

Method

Sample: 453 competitive athletes from 51 different sport disciplines. 355 males and 98 females. Age: $M = 20.7$

Instrument: The 76-item German version of the RESTQ-Sport developed by Kellmann and Kallus (2000) was employed.

Data Analyses: A sequential model of testing was adopted in two phases. In phase 1 we assessed the basic factor structure of the RESTQ-Sport independently for submodels for the

general as well as for the sport-specific components of the questionnaire on item level. In phase 2 we conducted second order CFA's on the scale level in an attempt to validate the separation in the general and a sport-specific components. This procedure was used independently for the general and sport-specific components and, the combined general and the sport-specific components.

Results

Model 1 (Fig. 2): On Item level the analyses produced an unacceptable fit ($GFI = .71$) for the general part of the REST-Q. One fifth of the items in the general component revealed very low factor loadings on their respective scales. The fragmentation in stress and recovery factors was confirmed by a high negative estimated correlation between these two factors.

Model 2 (Fig. 3): The analyses on item level for the sport specific part of the REST-Q also revealed an unacceptable fit ($GFI = .84$). Three items of the Burnout-Scales produced low factor loadings on the respective scales. The fragmentation in stress and recovery factors was confirmed once again.

Model 3: An acceptable fit of the general part on scale level was produced by the addition of seven extra paths (see Table 1) listed below.

- Social Stress \rightarrow Emotional Stress
- Physical Complaints \rightarrow Fatigue
- Physical Complaints \rightarrow Physical Recovery
- Physical Recovery \rightarrow Physical Complaints
- Fatigue \rightarrow Sleep Quality
- Fatigue \rightarrow Lack of Energy
- Success \rightarrow Conflicts / Pressure

Hence, the concept of stress and recovery was approved.

Model 4: An acceptable fit of the sport specific part on scale level was produced by the addition of three extra paths (see Table 1) listed below.

- Disturbed Breaks \rightarrow Burnout / Personal accomplishment
- Disturbed Breaks \rightarrow Fitness / Being in shape
- Fitness / Injury \rightarrow Fitness / Being in shape

Thus enabling the concept of recovery and stress to be confirmed.

Model 5 (Fig. 4): An acceptable fit of the model (combining general and sport specific components) was only produced through the addition of 14 extra paths. In addition to the paths from model 3 and model 4 the following four paths between scales from the general and scales from the sport specific components:

- Fatigue \rightarrow Fitness / Being in Shape
- Disturbed Break \rightarrow Fatigue
- Physical Recovery \rightarrow Fitness / Being in Shape
- Physical Complaints \rightarrow Fitness / Injury

This suggests that the concepts physical complaints, physical recovery and fatigue show a stronger relationship to the sport specific component of the REST-Q than to the general component.

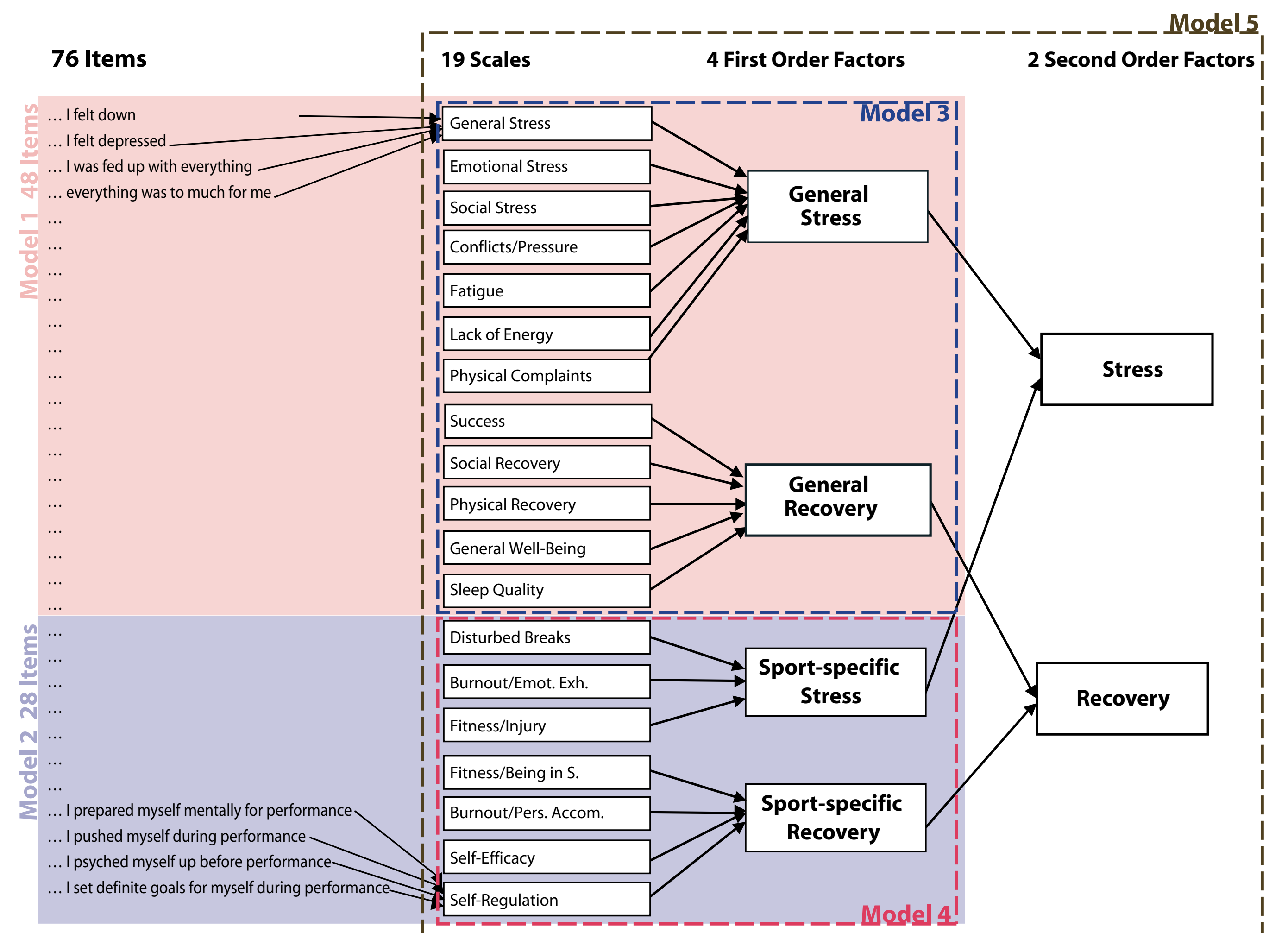


Abb. 1: A graphical representation of the RESTQ-Sport. Always 4 items are grouped together to one of the 19 scales. Each tested model is identified with different a different colour.

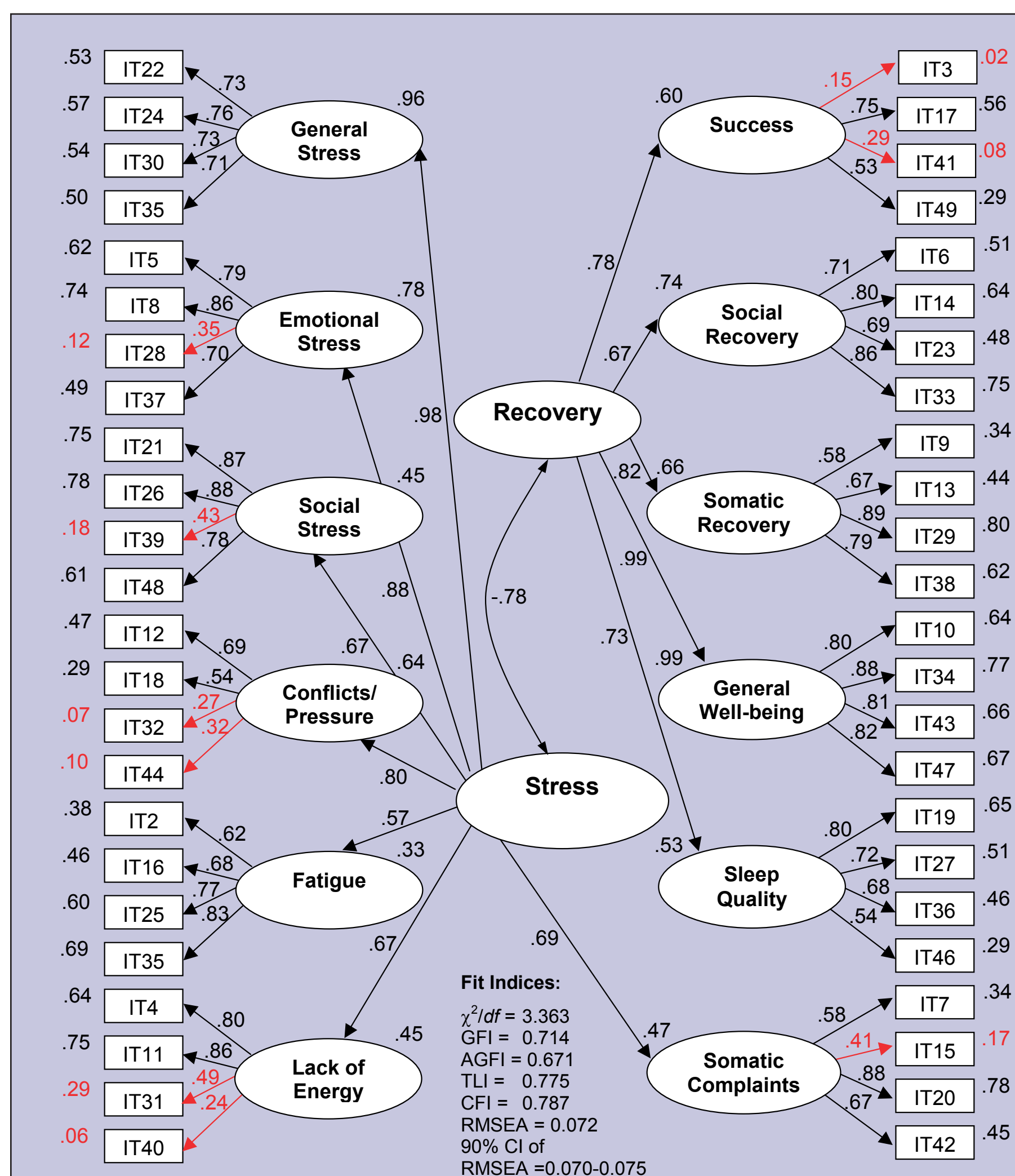


Figure 2 (Model 1): Confirmatory factor analysis of the general part of the RESTQ-Sport on item level. All parameters are standardized.

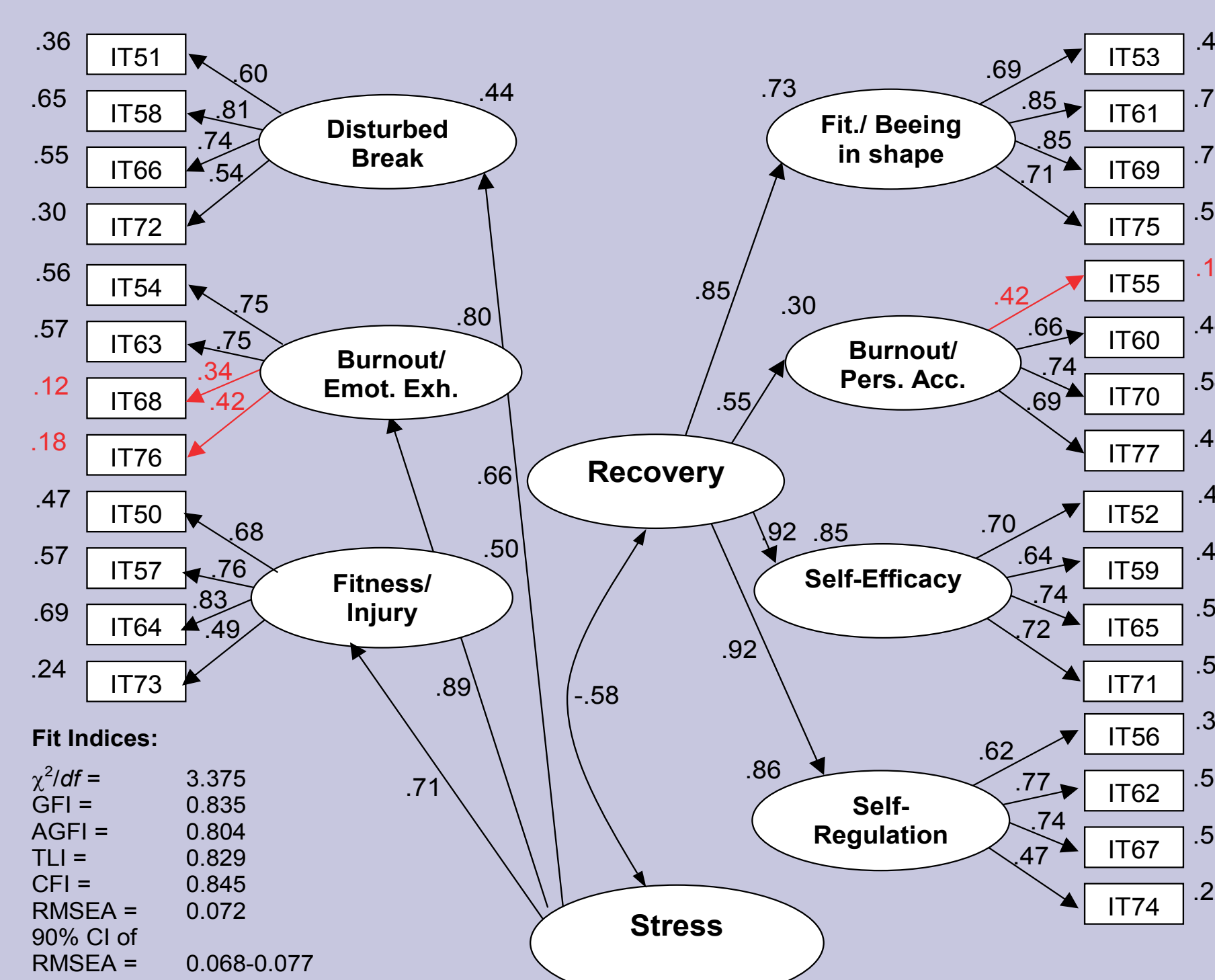


Figure 3 (Model 2): Confirmatory factor analysis of the sport specific part of the RESTQ-Sport on item level. All parameters are standardized.

Table 1 Summary of Fit Indices of the RESTQ-Sport.

	χ^2/df	GFI	TLI	RMSEA	90% CI of RMSEA	AIC
Model 1: General Part Item Level (0)	3.36	.71	.78	.072	.070-.075	3805
Model 2: Sport-specific Part Item Level (0)	3.38	.84	.83	.072	.068-.077	1282
Model 3a: General Part Scale Level (0)	11.81	.79	.76	.155	.144-.166	3083
Model 3b: General Part Scale Level (7)	3.60	.95	.94	.076	.063-.088	229
Model 4a: Sport-specific Part Scale Level (0)	11.28	.91	.78	.151	.129-.173	1029
Model 4b: Sport-specific Part Scale Level (3)	2.18	.99	.98	.051	.021-.080	58
Model 5a: 2 nd order Factor Model (0)	10.55	.68	.68	.145	.139-.152	5284
Model 5b: 2 nd order Factor Model (14)	3.64	.90	.91	.076	.069-.084	599

Note: Values enclosed in parentheses indicate the number of additional constraints needed in the model. GFI = Goodness of Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; AIC = Akaike Information Criterion.

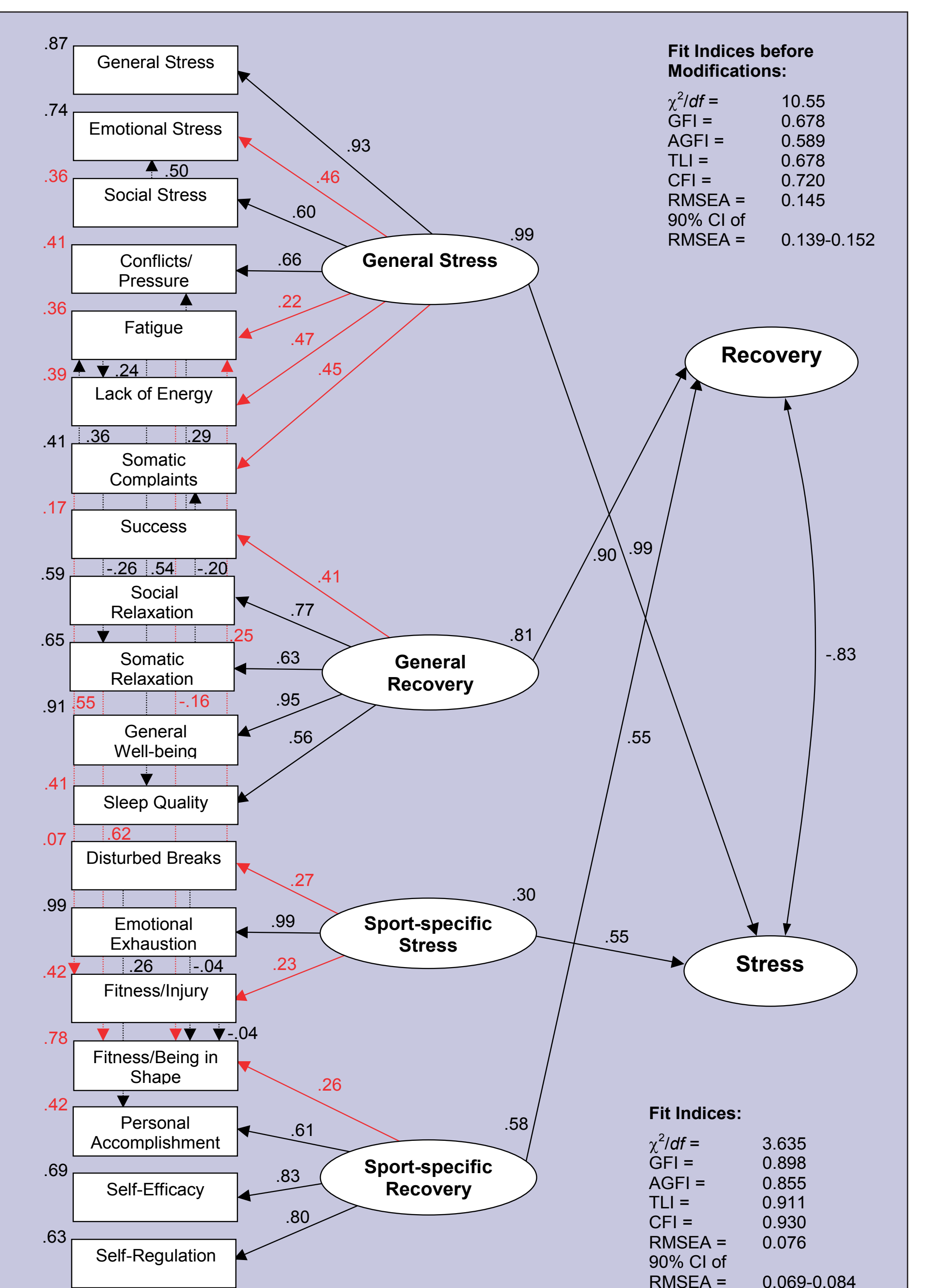


Figure 4 (Model 5): Confirmatory factor analysis of the RESTQ-Sport on scale level. All parameters are standardized.

Discussion

The empirical evidence of our data demonstrated a discrepancy in the structural integrity of the RESTQ-Sport. Several of the squared multiple correlations had a value lower than .30, indicating that the factor is not explained by the item. Large modification indices indicated that the model fit would improve if items were allowed to cross load on a non-intended factor, which indicated a factorial ambiguity in various items. We suggest that certain items of the RESTQ-Sport should be omitted and others regrouped to different scales. However, strong evidence was found for the two broader conceptual components of stress and recovery under which the scales of the RESTQ-Sport are subordinated. Continuing research is needed to further develop the benefits of the REST-Q in detecting athletes high at risk from overtraining.

Reference

- Kallus, K.W. (1995). Der Erholungs-Belastungs-Fragebogen. Frankfurt: Swets & Zeitlinger.
- Kellmann, M., & Kallus, K.W. (2000). Erholungs-Belastungsfragebogen für Sportler. EBF-Sport Manual. Frankfurt a. M.: Swets & Zeitlinger.
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