RE-VALIDATION OF THE RECOVERY FROM ILLNESS SCALE BY RASCH AND CONFIRMATORY FACTOR ANALYSIS

Mohammad Imran Khan* and Abhay Kumar Srivastava**

ABSTRACT

The recovery from illness scale is designed to measure the illness recovery among people suffering from medically manageable non-terminal psychosomatic illness as a unidimensional construct. The scale consists of nine items. The aim of this study was to re-validate the unidimensional structure of the scale through confirmatory factory analysis (CFA) and to compare the factor structure with Rasch analysis. 140 participants suffering from various chronic and non-chronic (non-terminal) illnesses responded on the scale. CFA was carried out to confirm the unidimensional structure of the scale. Initially, uncorrelated and correlated residual term models (based on modification indices) were tested. Out of nine items one item found loading almost nil (β=0) and hence it was removed. Model was re-tested after removing the item. Correlated residual term model found better fitting with the data. Internal consistency (Cronbach’s alpha) of the scale was calculated to further ensure the unidimensionality in the data. Once ensuring the unidimensional structure of the scale by using CFA, Rasch analysis was carried out. Results of Rasch analysis revealed two misfitted items based on item fit (infit and outfit) statistics. After deletion of the misfitted items, Rasch data-model fit was achieved. Unidimensionality was confirmed with the principal component analysis of Rasch residuals. Unidimensionality and model fit of Rasch fitted model was compared with the unidimensional model obtained through CFA. Model fit values and item loading of both the model found almost similar. Although, Rasch model resulted in improved psychometric properties of the scale as evident through item and person separation indices.

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INTRODUCTION

The ultimate goal of any health care practice is to improve the subjective well-being and quality of life. In this context, assessment of treatment effectiveness can be considered as an important factor in determining the quality of life (Guyatt, Feeny, & Patrick, 1993). General discussion related with the subjective well-being as conceptualized by Diener (1984) has emphasized on the importance of global and domain specific life satisfaction (Diener, Suh, Lucas, & Smith, 1999). In the context of clinical assessment of health related quality of life (HRQOL) has been much emphasized as domain satisfaction and several mechanisms related with elevated level of HRQOL has been linked through the pathways of treatment adherence, self-efficacy and many other psychological factors (Kamalski, Hoekstra, van Zanten, Grolman, & Rovers, 2010; Guyatt, Feeny, & Patrick, 1993).

Since last couple of decades, HRQOL has been considered as a significant treatment outcome measure as an indicator of treatment effectiveness (Kamalski, Hoekstra, van Zanten, Grolman, & Rovers, 2010). However, with the paradigm shift in the medical science approaches to illness treatment, general life expectancy has been increased. Hence, in addition to the HRQOL, subjective feeling of faster recovery may also be an important predictor of treatment effectiveness. There may be several reasons for considering subjective evaluation of recovery from illness. For example, with the technological advancement of treatment modalities, course and duration of treatment has decreased for many illnesses, many diseases that have earlier been considered as incurable are now very well medically manageable and curable.

Therefore, with the appropriate application of treatment methods, faster recovery from illness is expected. Consequently, quantum of the subjective recovery from illness is necessary to be assessed for ensuring the optimal treatment effectiveness. Further, due to advancement in the treatment technologies many diseases like diabetes or coronary heart disease are well medically manageable resulting in significant increase in number of chronically ill patients. Reduction of physical symptoms, pain and discomfort are very important indicators of treatment outcome measures related with subjective well-being or health related quality of life. Therefore, objective measure of recovery from illness related symptoms may be considered as an important variable in determining the medicinal dose, treatment modality and overall health care practice.

The concept of recovery has recently gained the health care related attention during the last decades (Shepherd, Boardman, & Slade, 2008). Recovery has been defined as the process of managing illness, moving out from the devastating
effects of illness and ability to manage a meaningful life (Anthony, 1993; Meddings & Perkins, 2002). The concept of the assessment of recovery from the symptoms can be considered to fall on a continuum ranging from very subjective to more objectives (Hopper, 2004; Warner, 1994; WHO, 1979). Objective measures of recovery from illness mainly focus on symptomatic and functional aspects (Davidson, 2003; Ridgway, 2001).

There has been some relatively widely used measures of illness recovery measures in the field of psychiatric mental health practices, for example, Illness management and recovery scale (IMR) (Mueser & Gingerich, 2005) and recovery markers questionnaire (RMQ) (Ridgway & Press, 2004). However, no psychometric tool is available to measure illness recovery, especially for the psychosomatic illnesses and more specifically in Indian population except recovery from illness scale (Srivastava, 2008).

However, as the concept of psychometric assessment of illness recovery has been given significant consideration in the assessment of treatment effectiveness. Still the effectiveness of the construct has not been much established. Therefore, the present study was undertaken to evaluate the psychometric properties of the recovery from illness scale through classical test theory (CTT) approach of confirmatory factor analysis (CFA) and item response theory under Rasch rating scale model. CTT is based on the approach of estimating average error in the test score in a given sample and set of test items (Fan, 1998; Anastasi & Urbina, 2002).

Unlike CTT which is based on the observed score theory, IRT belongs to the family of psychometric approach which is based on the true score theories (Fan, 1998; Embretson & Reise, 2000). As a theoretical assumption, IRT adopts an explicit model for the probability of each possible alternative response, based on the function of the latent trait and certain item parameters. The fundamental feature of IRT is that performance on an item is related to the estimated amount of respondent’s latent trait (Anastasi & Urbina, 2002). There are different families of IRT models like binary IRT models, such as one parameter logistic model (1-PL) assessing difficulty parameter, two parameter logistic model (2-PL), assessing difficulty and discrimination parameters and three parameter logistic model (3-PL), assessing difficulty, discrimination and guessing parameters.

Apart from these binary IRT model there are also partial credit, graded response and rating scale models. Rasch family of IRT model is special case of 1-PL IRT model that assumes discrimination parameter to unit (Rasch, 1960/1980; Bond & Fox, 2001). Rasch measurement model is based on the sufficient statistic and generally makes use of conditional maximum likelihood for parameter estimation. Describing in detail about the estimation procedure and differences in Rasch and non-Rasch approach is outside the scope of the paper (for further details refer to Rasch (1960/1980), Fox and Jones (1998), Wright and Stone (1979), Bond and Fox (2001)).
Rasch is the simplest but most stringent IRT model in its parameter specification for data-model fit assessment (Bond & Fox, 2001; Rasch, 1960/1980). The basic strength of the Rasch analysis is the sample or population independent estimation of item parameter (Wright & Stone, Best Test Design, 1979). It provides the estimate of goodness of fit between the item difficulty and person ability on the same invariant (logit) scale (Wright, 1992). Assumptions of Rasch models include unidimensionality, local independence and parameter invariance (Bond & Fox, 2001; Rasch, 1960/1980). These properties of Rasch measurement are its unique features that make it applicable for construct validation as well as for objective measurement in any field of psychometric evaluation.

Recently there has been an increasing trend for using Rasch measurement model in the health research (Fox & Jones, 1998; Ramp, Khan, Misajon, & Pallant, 2009). The implication of Rasch approach in health psychological research has been motivated by several potential advantage of Rasch model. For example, reducing the number of items in the scale without any loss in the psychometric properties, ability to identify items not-fitting with the data, ensuring parameter invariance and sample independent estimation of item parameters (Hambleton, Swaminathan, & Rogers, 1991; Hambleton & Swaminathan, 1985).

METHODS

Participants

Patients suffering from various chronic and non-chronic illnesses participated in the study. Data was collected on 140 respondents of both the gender. Patients in the chronic illness group were having health problems mainly related with asthma, hypertension, diabetes, and coronary heart disease. Patients under non-chronic illness group were having very common health problems like common cold, irregular bowel syndrome or allergy etc. Patients suffering from any kind of terminal illness such as cancer, AIDS/ HIV, or degenerative neurological problems like dementia etc. were excluded from the study. Further, participants suffering from any type of physical abnormalities like blindness, skelto-muscular abnormalities such as polio and amputation of limb etc. were also excluded from the study. Age range of the patients was 25 to 65 years (mean age 48.50 years).

Instrument

Recovery from Illness Scale: Recovery from illness scale was developed to measure the illness recovery among people suffering from non-chronic and chronic (medically manageable) psychosomatic illness. This scales consisted of nine likert type items to be rated on four point scale viz. totally agree, somewhat agree, somewhat disagree and totally disagree. For positively worded items responses were coded as 3 for totally agree to 0 for totally disagree. Reverse scoring was done for negatively worded items. These items were framed to tap
the subjective experience in the improvement of physical illness, like “I experience quick recovery (in the symptoms)” (Srivastava, 2008).

**Procedure**

Participants of the study were approached either with the recommendation and consent of the concerned physician in out-patient door section of the hospitals or in the private clinics of the medical practitioners. Diagnosis was confirmed with the physician before administering the tool to ensure the inclusion/exclusion criteria. All the participants were currently not having any severe physical discomfort and were able to give their response on the scale. Participants were briefed about the purpose of the study. After taking their verbal consent scale was administered.

It was ensured that participants have given their response on all the items. Incomplete data sets were excluded from the analysis.

**Statistical Analysis**

**Confirmatory Factor Analysis and Scale Reliability:** Purpose of carrying the confirmatory factor analysis was twofold. First to ensure the unidimensionality of the construct, as one of the basic assumption of the Rasch analysis and second, ensuring the latent structure of the construct by investigating the data model fit and item loadings on the construct. Model fit indices of significance of chi-square<.05, chi-square/df (between 5 to 2), Goodness of fit index (GFI)>.95, incrimental fit index (IFI) >.95, Tucker-Lewis Index (TLI)>.90, Comparative Fit Index (CFI) >.95 and root mean square error approximation (RMSEA)<.05 were used to judge model fit (Tanaka, 1993). Item loading was judged through standardized loading coefficients and significance level <.05. Inter item consistency (cronbach’s alpha) was computed to ensure the scale reliability.

**Rasch Analysis**

Rasch rating scale analysis was carried out by using “Bond & Fox Steps”, a customized version of Winsteps (Bond & Fox, 2007).

**Rasch Fit Statistics**

Rasch fit statistics ensures the item fit with the Rasch model. There are two commonly used fit statistics which are the mean square (MNSQ) infit and outfit statistics. The mean square fit statistics has the chi-square distribution and has the expected value of one. The value of the infit and outfit can ranged from 0 to positive infinity. Infit and outfit mean squares are the squared values of the residuals of difference between the values observed and the value predicted by the model. MNSQ greater than one demonstrates over variation between the model and the observed values. For example, MNSQ of 1.4 indicate 40% over variation of noise than predicted by the Rasch model. Similarly, MNSQ value less than one demonstrate under variation. For example, MNSQ of .6 indicates
40% under variation or overlap in item score than predicted by the Rasch model (Bond & Fox, 2001).

The outfit MNSQ statistics is the average standardized unweighted residual variance across item and person, indicating that the estimate is more affected by unexpected responses. The infit MNSQ is the weighted residuals according to their individual variance to minimize the effect of unexpected response at distant from the measure. It is more influenced by the unexpected response closure to item or person measure (Bond & Fox, 2001). The t-value of infit and outfit MNSQ can be obtained by converting it to normalized t-statistics by using Wilson-Hilferty transformation. The t-statistics has expected value of 0 and standard deviation of unit. Value between –2 to +2 indicates acceptable item fit.

The infit and outfit statistics are the measures of internal validity of the response pattern (Linacre & Wright, 1994). It is the widely used statistic in applying Rasch analysis for the psychometric evaluation of the assessment tools. The ideal value is one to indicate best data-model fit. Wright, Linacre, Gustafson, and Martin-Lof (1994) have suggested the value of MNSQ falling in between 0.6 to 1.4 indicates good Rasch model fit. Whereas, Wolfe and Chiu (1999) suggest the value between 0.8 to 1.4. Taking a more stringent criterion, Mok, Cheong, Moore, and Kennedy (2006) suggested it between 0.7 to 1.3. Following the Mok et al. suggestion, MNSQ value between 0.7 to 1.3 has been used to judge the item data fit. Apart from the MNSQ, standardized fit value was also used. Standardized MNSQ value (t-value) has the normal distribution. Value between –2 to 2 indicates acceptable model-data fit (Bond & Fox, 2001). Bond Fox step produce z-value equivalent to t-value.

Dimensionality

Unidimensionality assumption is related with the concept that only single underlying construct is responsible in the variation of the examinees’ responses. Violation of this assumption can result in severe biases in item and person parameter estimations. Bond & Fox Steps (Winsteps) makes use of Principal Component Analysis (PCA) of Rasch residuals. In PCA of Rasch residuals, first of all item trait level is estimated and then the residual is analyzed for its meaningful structure. If data is closure to the Rasch measurement model, then residual factor loading will be smaller (Linacre, 2010). To ensure unidimensionality in the construct a cutoff value of 60% of the variance explained by the measurement and an eigenvalue of 3 or less and total percentage variance of 5 or less should be explained by first contrast of unexplained variance (Linacre, 2010).

Reliability

The Rasch measurement model provides two types of item and person reliability indices, i.e. separation index and reliability index. Separation index indicates the number of level into which item and person can be separated. The person reliability indicates that the sample would perform in same way on
another parallel set of items measuring the same latent trait (Wright & Masters, 1982). Person separation \((G_p) > 1.0\) indicates that the measurement is spread over a continuum with sufficient breadth in position. It is equivalent to cronbach’s alpha. Item separation \((G_i) >1.0\) indicates a broader spread in the latent trait measured by the items (Linacre, 2010).

**RESULTS**

Confirmatory factor with all the 9 items in the scale (Fig. 1a) resulted in unacceptable model fit as indicated by model fit indices, except of IFI (>.95) and CFI (> .95). Further to check the unidimensionality, model was re-tested with some of the correlated residual terms as indicated by the modification indices (Fig 1b). Correlated residual terms model resulted into good model fit. Item loadings obtained through both the correlated and uncorrelated residual term model were almost similar and significantly loaded \((p<.01)\) except for Item 4. Item 4 showed almost nil loading in both the models and hence considered as misfit item. Results are summarized in table 1.

![Figure 1a. Uncorrelated Residual Term Unidimensional Model of Recovery from Illness Scale with all the Nine Items.](image)

**TABLE 1**

Model Fit Summary as Tested Before and After Fitting with CFA and Rasch Analyzed Model.

<table>
<thead>
<tr>
<th>Model Fit Indices</th>
<th>With all the 9 items</th>
<th>After Removing Misfitted Item</th>
<th>After Fitting With the Rasch Rating Scale Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Un-correlated Residual Term</td>
<td>Correlated Residual Term</td>
<td>Un-correlated Residual Term</td>
<td>Correlated Residual Term</td>
</tr>
</tbody>
</table>

Contd. table 1...
Contd. Table 1...

<table>
<thead>
<tr>
<th></th>
<th>Chi-Sq</th>
<th>Chi-Sq/df</th>
<th>GFI</th>
<th>IFI</th>
<th>TLI</th>
<th>CF1</th>
<th>RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>84.790*</td>
<td>3.14</td>
<td>0.895</td>
<td>0.959</td>
<td>0.945</td>
<td>0.959</td>
<td>0.959</td>
<td>0.122</td>
</tr>
<tr>
<td>27.032</td>
<td>1.287</td>
<td>0.961</td>
<td>0.996</td>
<td>0.993</td>
<td>0.996</td>
<td>0.996</td>
<td>0.045</td>
</tr>
<tr>
<td>74.247*</td>
<td>3.712</td>
<td>0.893</td>
<td>0.962</td>
<td>0.946</td>
<td>0.962</td>
<td>0.962</td>
<td>0.137</td>
</tr>
<tr>
<td>20.732</td>
<td>1.382</td>
<td>0.967</td>
<td>0.996</td>
<td>0.992</td>
<td>0.996</td>
<td>0.996</td>
<td>0.052</td>
</tr>
<tr>
<td>23.563*</td>
<td>2.618</td>
<td>.952</td>
<td>.985</td>
<td>.974</td>
<td>.985</td>
<td>.985</td>
<td>.106</td>
</tr>
<tr>
<td>9.087</td>
<td>1.298</td>
<td>.980</td>
<td>.998</td>
<td>.995</td>
<td>.998</td>
<td>.998</td>
<td>.046*</td>
</tr>
</tbody>
</table>

Figure 1b. Correlated Residual Term Unidimensional Model of Recovery from Illness Scale with all the Nine Items.

Table 2

Scale Reliability Before and After Removing the Misfitted Items in CFA and Rasch Analysis.

<table>
<thead>
<tr>
<th>Item No</th>
<th>With all the 9 items</th>
<th>After Removing Misfitted Item</th>
<th>After Fitting With the Rasch Rating Scale Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.917</td>
<td>0.961</td>
<td>.951</td>
</tr>
<tr>
<td>2</td>
<td>0.919</td>
<td>0.962</td>
<td>.951</td>
</tr>
<tr>
<td>3</td>
<td>0.918</td>
<td>0.962</td>
<td>.952</td>
</tr>
<tr>
<td>4</td>
<td>0.966</td>
<td>Removed</td>
<td>Removed</td>
</tr>
<tr>
<td>5</td>
<td>0.918</td>
<td>0.961</td>
<td>.951</td>
</tr>
<tr>
<td>6</td>
<td>0.916</td>
<td>0.960</td>
<td>.950</td>
</tr>
</tbody>
</table>
However, since there is no theoretical assumption for the relationship in the residual terms related with the construct, cronbach’s alpha and scale reliability, if item deleted, was computed. Further, scale reliability found to increase much higher after deleting Item 4 (alpha = .97), as compared to any other item. Results indicated that Item 4 is not fitting into the unidimensional conceptualization of Recovery form Illness Scale. Results of scale reliability are summarized in table 2. Internal consistency (cronbach’s alpha) of scale with all the nine items was .93. After eliminating the item 4 from the scale uncorrelated residual term model (Fig 2a) was tested and found not fitted as indicated by chi-square value (p>.05), GFI <.9, and RMSEA >1. However, values of IFI, TLI and CFI were greater than .95. Therefore, the specified model was considered as unfitted. Further, based on the modification indices correlated residual term model was tested (Fig 1d). Good model fit was obtained as indicated by chi-square value (p>.05), chi-square/df<1.5, values of GFI, IFI, TLI, CFI greater than .95 and RMSEA =.05 (Fig 2b).

![Figure 2a. Uncorrelated Residual Term Unidimensional Model of Recovery from Illness Scale after Removing Item 4.](Journal of Indian Health Psychology)
Although, in both the models (Fig. 2a and Fig 2b), item loadings of all items were significantly loaded (p<.05) and were almost similar. Item loadings in both the models were higher than .85 except for Item 9, which was again within acceptable range (> .7).

After ensuring the unidimensionality through conventional CFA method (by removing Item 4), Rasch rating scale analysis was carried out by retaining eight items in the scale. Item fit analyses indicated two misfitted items (Item 7 and Item 8) as evident through the infit and outfit MNSQ values > 1.3 or < .7 and z-
values > ±2. Results of Rasch item fit statistics are summarized in table 3. Although, the PCA of Rasch residual analysis indicated towards the unidimensional nature of the data as indicated through eigenvalue of the total variance explained by the measure is greater than 60% and the eigenvalue of the unexplained variance in the first contrast is less than 3. Total percentage of unexplained variance in the first contrast was also less than 5. Results of PCA of Rasch residuals are summarized in table 4.

The most misfitted items, i.e. item number 7 and 8 were excluded from the scale. Scale was again re-analyzed with the remaining 6 items. All the remaining items, after excluding items 7 and 8, found within acceptable range of fit values (MNSQ ranged from .7 to 1.3 and z value between -2 to 2) (table 3).

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Rasch Analysis with all 8 Items in the scale</th>
<th>Rasch analysis after removing misfitted Items in the scale</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Infit MNSQ</td>
<td>Infit Z-Value</td>
</tr>
<tr>
<td>1</td>
<td>0.77</td>
<td>−2.05</td>
</tr>
<tr>
<td>2</td>
<td>0.84</td>
<td>−1.23</td>
</tr>
<tr>
<td>3</td>
<td>1.02</td>
<td>0.22</td>
</tr>
<tr>
<td>4</td>
<td>Item Removed (based on CFA)</td>
<td>Item Removed (based on CFA)</td>
</tr>
<tr>
<td>5</td>
<td>0.76</td>
<td>−1.80</td>
</tr>
</tbody>
</table>

Contd. table 3...
Total variance explained by the scale after removing the misfitted items (item numbers 4, 7 and 8) was 80.00 percent (>60%). The percentage of unexplained variance in the first contrast was 5 and the eigenvalue of unexplained variance in the first contrast was 1.6 (<3). Thus, the data confirms the unidimensional Rasch model (table 4).

TABLE 4
Standardized Residual Variance (In Eigenvalue Units)
of PCA of Rasch Residuals.

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>With all 8 Items in the scale</th>
<th>After removing the misfitted items in the scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Variance</td>
<td>41.0 (83.70%)</td>
<td>23.4 (80.00%)</td>
</tr>
<tr>
<td>Explained by the Measures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unexplained Variance</td>
<td>8.0 (16.30%)</td>
<td>6.0 (20.00%)</td>
</tr>
<tr>
<td>Unexplained variance in 1st contrast</td>
<td>1.9 (3.90%)</td>
<td>1.6 (5.00%)</td>
</tr>
</tbody>
</table>

Psychometric properties of the resultant scale after Rasch analysis were re-investigated to compare it with the original conceptualization of the scale. Unacceptable fit was found for un-correlated residual term model as indicated though only chi-square value (p<.05) and RMSEA>.1. Apart from these indices, values of GFI, IFI, TLI and CFI were all higher than .95. Thus, model may be considered as marginally fit with the data. However, as compared to other uncorrelated residual term model, the Rasch fitted model was found to demonstrate relatively higher fit with the data. Moreover, based on modification indices, correlated residual term model was tested and found well fitted with the data (table 1).

Alpha, if item deleted, found similar for all the items and ranged between .95 to .96. Internal item consistency in the scale (cronbach’s alpha) was .96 which is almost similar to the non-Rasch fitted scale but was much higher than the original 9-item scale (table 2). Rasch fitted scale resulted into improved
psychometric properties as indicated through item and person separation index and reliability. Person separation index and reliability of both the (8-item scale and Rasch fitted) scale were similar, whereas, the item reliability was found to improve in the Rasch fitted scale (table 2).

DISCUSSION

Recovery from illness scale was constructed to measure the subjective experience in the improvement of illness symptoms as a unidimensional construct in patients suffering from non-chronic and chronic psychosomatic illnesses. This scale consisted of nine items. The present study aimed to further re-investigate the validity of the scale through unidimensional Rasch analysis and comparing the results with the factor structure obtained through the conventional method of confirmatory factory analysis (CFA) in classical test theory.

Initial specification of the model found not fitted. Based on modification indices, correlated residual term model was again re-tested and found fitted. Out of nine items, item number four found to have almost nil loading on the factor. After removing the item, model was again tested. Although, model fit was not obtained for uncorrelated residual term model and hence, correlated residual term model was analyzed and found to show good model fit. Further, since a correlated residual term model may be accepted, provided there should not be a systematic relationship in the residual or error terms of observed variable, i.e. items. Therefore, alpha value of the resultant scale after deleting each item was calculated to ensure no significant change in the alpha value after deleting each item. Results indicated almost unchanged alpha value with very minute variations (<.007) in the resultant scale with eight items. Overall alpha value of scale (.966) indicates very good scale reliability.

After determining the unidimensionality in the scale and removing the misfit item, scale with the remaining eight items was subjected to Rasch analysis. Rasch data-model fit was investigated through item fit statistics (MNSQ and z-value) and principal component analysis (PCA) of Rasch residuals to investigate the single latent trait explaining the variance in the observed responses. Item fit statistic revealed two of the items (item 7 and 8) were not fit with the Rasch model. PCA of Rasch residual, indicated sufficient unidimensionality in the data set. Although, based on the item fit statistic, the misfit items were removed from the scale. Scale was again analyzed further to ensure the data-model fit. Rasch analysis with the resultant scale of 6 items (after removing items 4, 8 and 9) found to be fitted with the Rasch model. All items found well fitted, as indicated through infit and outfit MNSQ and z-values. PCA of Rasch residual also showed sufficient unidimensionality in the data.

Rasch fitted model was again re-analyzed through CFA to compare the model fit and item loadings with the non-Rasch fitted model. Results revealed relatively better fit in the model (uncorrelated residual terms) as compare to non-
Rasch fitted model, as indicated by chi-square/df, GFI, IFI, TLI, CFI and RMSEA value was also very close to marginally accepted fit value. Even though, possibility was further explored by testing correlated residual term model obtained through Rasch analysis. Model fit of the correlated residual term model found to improve, as indicated through all the model fit indices taken into the consideration. Very slight variations (.008 to .01) in the scale reliability (alpha value) of Rasch fitted and non-Rasch fitted model was found. Thus, the Rasch analysis found to detect more misfitted item as compare to conventional CFA method.

Generally, the concept of recovery form illness has been primarily investigated in the field of psychiatric mental health. Most of the recovery related scales are multi-dimensional. For example, Recovery Assessment Scale consisted of 24 items and divided into five sub-scales (Giffort, Schmook, Woody, Vollendorf, & Gervain, 1995). Crisis Hostel Healing Scale developed by Dumont (2000) contains 40 items measuring 10 related domains. Personal Vision of Recovery Questionnaire (PVRQ) developed by Ensfield (1998) as a multi-dimension measure of recovery assesses belief about own recovery including social support, personal challenges, professional assistance, action and help-seeking.

Similarly, Mental Health Recovery Measures (Young, Ensing, & Bullock, 1999), and Recovery attitude Questionnaire (Steffen, Borkin, Krzton, Wishnick, & Wilder, 1999) etc. are multidimensional measures. Recovery is a complex and insightful concept in understanding the response to a particular disease and its interaction with the treatment. Recovery can be explained in two ways. First, entirely based on the bio-medical model emphasizing on the reduction or complete absence of symptoms at physiological level.

Second, at the level of individual’s attitude and motivation and his subjective appraisal in a positive and adaptive manner to recover from illness and discomfort. Recovery is widely explored in the realm of mental illnesses and has been established as multi-dimensional construct. But, almost it is an unexplored concept in the context of physical health problems. Further, the tools available to measure recovery from mental illness cannot be applied for measuring recovery from physical illness, as the nature, symptoms, etiology and process of psychological adaptation to these two class of illnesses are very different.

In physical health care services, quick, reliable and interpretable assessment of treatment effectiveness is required. Particularly, in case of chronic and severe illnesses, course and direction of treatment depends on the primary diagnosis and patients’ response to the medication. However, apart from the physiological conditions and bio-medical treatments, patients’ psychological state also determines the treatment effectiveness and therefore, needs to be taken into consideration while deciding about the treatment. In this context, subjective evaluation of recovery from the illness can be an important indicator for taking an early
decision about the treatment methods and medication. Recovery from illness scale was constructed as a unidimensional measure to evaluate the subjective experience of improvement in physical health symptoms.

Another issue related with the meaningfulness in the assessment or recovery or in general to any psychometric measurement is to have a measurement tool based on interval scale. Interval scale has its inherited properties to provide meaningful measures (Wright & Linacre, 1989). Traditional analysis methods based on CTT are based on true score theory which makes use of only ordering without any proportional meaning. This issue is best dealt by Rasch approach of measurement construction. Rasch measurement transform the ordinal data into logit scale. Logit scale has constant linear interval meaning and can be used for meaningful and objective interpretation of the ordered category responses (Linacre, 2010). Findings of this study also indicated improvement in the psychometric properties after Rasch analysis, as two of the misfitted items could not be detected through CFA. By applying CFA to test the priori factor structure does not necessarily ensure expected explanation of the model with the data in hand. If this is the case, generally model is re-specified. A model specified of one sample or population does not necessarily hold the same structure for another sample. This leads to the issue of measurement invariance and fitting the model with the data (Linacre, 2003). However, on the contrary, Rasch model is a stringent model and data is required to fit with the assumptions of the model (Yen & Bond, 2011; Bond & Fox, 2007). Therefore, to establish construct validity as a unidimensional measure, Rasch measurement can be an appropriate way to test the proposed model. Since, Rasch item and person parameters are estimated separately and they are independent of each other, measurement invariance can be achieved and it is one of the essential assumptions of the Rasch measurement construction.

In conclusion, the present study aimed to investigate the psychometric properties of the recovery from illness scale in the mixed population suffering from various psychosomatic illnesses as a global and disease independent measure of treatment outcome. To investigate the factor structure and construct validity, CFA and Rasch analysis was applied. Rasch analysis indicated the unidimensionality in the data set, which was cross confirmed by CFA. Although, Rasch analysis (item fit MNSQ) resulted in relatively more precise assessment of item fit in the scale and was able to detect misfitted items which was not evident through CFA.

Further studies can be carried out by including patients suffering from certain specific disease and after controlling the disease specific factors IRT analysis can be carried out to confirm the factor structure of the scale.
REFERENCES


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