Rasch Analysis of Lebanese Nurses’ Responses to the Copenhagen Burnout Inventory Alternative to the Maslach Burnout Inventory

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Abstract

Introduction: Lebanon struggled with political and economic crises before it was affected by the COVID-19 pandemic. Executive nurses and hospital administrations need reliable open-source measures to monitor burnout and prioritize nurses for intervention as Lebanon struggles with the multiple crises compounded by rising numbers of COVID-19 cases and deaths.

Objectives: The study aimed to determine whether the Copenhagen Burnout Inventory scales are suitable for settings experiencing multiple crises. Its objectives were to investigate the CBI scales’ measurement properties, identify burnout levels in a sample of nurses experiencing compound stressors, assess whether the scales’ three-dimensional burnout model is plausible, and establish norms for using the scales in work settings subject to compound external stressors.

Methods: The study is a psychometric analysis of the anonymous survey data of 142 registered nurses working in acute hospitals in Lebanon. We fitted the data to unidimensional and multidimensional Rasch rating scale models. Item fit, person separation and reliability, targeting, differential item functioning, and scale norms were estimated.

Results: Nurses in the sample had a high level of burnout. The Copenhagen Burnout Inventory scales have excellent reliability. The personal burnout and work-related scales were highly correlated and moderately correlated with the client-related burnout scale. Possible differential functioning in the work-related burnout scale requires further investigation.

Conclusion: More extensive and diverse studies in workplaces subjected to compound stressors are required to confirm the study results. Meanwhile, executive nurses and hospital administrations can use the norms reported to prioritize nurses for burnout prevention and intervention programs. In Lebanon, our reported CBI scale values can be used as baseline standards for studies tracking how the COVID-19 pandemic is impacting the nursing workforce.

Keywords

burnout, crises, COVID-19, fatigue, measurement, nurses, nursing workforce, psychometrics, Rasch analysis, reliability.

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Introduction

Lebanon is a country of 6.77 million people in Western Asia on the Eastern coast of the Mediterranean Sea (World Population Review, n.d.). The popular uprising of October 2019 provides the context for this study. People joined street demonstrations across the country to express their anger against corruption and rising living costs (Chulov, 2019). The COVID-19 pandemic added complexity to the economic crisis caused by the political crisis. According to United Nations’ agencies and other data sources, there had been 146,520 COVID-19 cases and 1200 deaths in Lebanon by June 2020 (Worldometer, 2020).
Burnout

Burnout is an occupational phenomenon, not a medical condition or disease. The International Classification of Diseases (ICD-11) (World Health Organization, 2019). ICD-11 describes burnout as a reason other than illness for which people contact and use health services. The ICD-11 describes burnout as a syndrome with three dimensions: energy depletion or exhaustion, mental distancing or cynicism and negativism towards the work role, and reduced self-efficacy. The ICD-11 highlights burnout’s cognitive aspects, but the syndrome is not in the latest edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) (American Psychiatric Association, 2013). Burnout among nurses is a global problem (Woo et al., 2020) and has been a topic for research since the inception of burnout research (Leiter & Maslach, 2016).

The research community has recently investigated the relationship between burnout and nurse satisfaction (Van der Heijden et al., 2019). (Labrague et al., 2020), nurses’ intention to leave (Minamizono et al., 2019, and burnout as a risk factor for depression and anxiety (Mousavi et al., 2017). The long-term physical consequences of burnout have received some attention (Salvagioni et al., 2017). Nurse executives, nurse leaders, and human resource specialists have long been concerned about the nurse turnover and replacement costs caused by burnout (Nursing Solutions, 2020). Consequently, reducing burnout among nurses is a global imperative. Lebanon needs burnout research and intervention studies because the sustainability of the nursing workforce is under threat.

The Rasch Measurement Model. The Danish mathematician Georg Rasch (1960) introduced the Rasch measurement model to the psychometric community. Ben Wright refined the model and disseminated it widely. David Andrich (1978) and Wright and Masters (1982) extended the model to estimate ordered category data. Geoff Masters (1982) introduced the partial credit model as an extension of the Andrich rating scale model. Investigators use the partial credit model when the items in a rating scale have different rating categories.

Rasch analysis estimates the probability of a respondent endorsing a scale item in each rating scale category. The estimates are in logits (additive log-odds units distributed at equal intervals on an underlying continuous latent variable). The expected probability of endorsing one of the two categories in a dichotomous rating scale is 0.5. The category endorsed depends on the respondent’s location on the latent variable. Similarly, the respondent’s trait measure (location on the latent variable) governs the probability of endorsing an item in each of the ordered categories in a polytomous rating scale. Data for polytomous rating scales are fitted to the following mathematical model: loge (Pnij/Pn(i-1)) - Bn - Di - Fj.

Loge is the natural logarithm of the probability Pnij of respondent n with trait level Bn endorsing category j in response to a scale item of difficulty Di, as opposed to the probability Pn(i-1) of endorsing the item in the next lowest category (j-1). The parameter Fj is the latent variable’s location corresponding to where there is an equal probability of endorsement in either of two adjacent categories. Dichotomous items have only one Rasch–Andrich threshold. Polytomous items have k-1 Rasch–Andrich thresholds where k is the number of rating scale categories.

The Rasch measurement model is the model of choice when investigating the psychometric characteristics of rating scales. It examines the spread of item and respondent locations on the same latent variable, calibrates measurement error to improve precision, indicates the probability of item fit, and requires that the data fit the model. Conjoint additivity is unique to Rasch measurement and enables using the same linear latent variable to locate respondents and items’ estimates.

Rasch fit statistics indicate how closely respondents and their responses match the Rasch measurement model’s predictions. Mean square values (MNSQs) estimate inlier-pattern sensitive (infit) and outlier-sensitive (outfit) statistics item fit. Infit and outfit values for an item that perfectly matches the Rasch measurement model have an MNSQ of 1. Items with MNSQ values > 1 overfit the model and maybe too predictable for successful measurement. Outfit and infit MNSQs in the range of 0.70–1.3 are acceptable for most purposes (Linacre, 2020b).

Rasch Fit Statistics

Inlier-pattern sensitive (infit) and outlier sensitive fit (outfit) statistics are estimated as mean squared (MNSQ) values. Infit and outfit values for an item that perfectly matches the Rasch measurement model have an MNSQ of 1. Items with MNSQ values > 1 overfit the model and lack precision. MNSQ values < 1 indicate overly predictable responses. MNSQ values in the range of 0.7 – 1.3 are acceptable for exploratory analyses (Linacre, 2002).

The Study

Objectives

To investigate the measurement characteristics of the Copenhagen Burnout Inventory scales, assess their conceptual plausibility, and determine baseline norms for measuring burnout among nurses experiencing
compound stresses at the start of the current political, economic, and COVID-19 crises in Lebanon.

**Design**

The study is a psychometric analysis of electronic survey data collected in October – December 2019 from a convenience sample of 142 registered nurses working in Lebanon’s acute hospitals.

**Methods**

Consecutive unidimensional Rasch rating scale analysis of the Copenhagen Burnout Inventory scales and multidimensional Rasch rating scale analyses to assess the plausibility of the three-dimensional model of burnout.

**Instrument.** The CBI was developed as three separate scales to measure burnout (Kristensen et al., 2005). The validity and reliability of the CBI scales have been confirmed in studies of human service workers, nurses, school, teachers, physicians, and other occupational groups in Denmark, Japan, New Zealand, Mongolia, and the United States, and other countries (T. Kristensen, personal communication, April 15, 2020). Cronbach alpha scale reliabilities in the range 0.84 - 0.91 for personal burnout, 0.84 - 0.90 for work-related burnout, and 0.84 - 0.92 for client related burnout have been reported recently (Montgomery et al., 2021; Papaefstathiou et al., 2019; Thrush et al., 2020).

The personal burnout scale (six items) is suitable for use with people outside the workforce. It measures “the degree of physical and psychological fatigue and exhaustion experienced by the person” (Kristensen et al., 2005, p. 197). The work-related burnout scale (seven items) measures “the degree of physical and psychological fatigue and exhaustion that is perceived by the person as related to [their] work” (Kristensen et al., 2005, p. 197). It measures burnout among employees irrespective of whether they work in a human service capacity. The client-related burnout scale (six items) for those who do “people work,” including nurses. It measures “the degree of physical and psychological fatigue and exhaustion perceived by the person as related to [their] work with clients” (Kristensen et al., 2005, p. 197). Investigators can amend the items by substituting descriptors such as customer, patient, student, resident, and inmate for “client” to fit the workgroup.

The response options for the personal burnout scale are: Always (100), Often (75), Sometimes (50), Seldom (25), Never/almost never (0). The work-related burnout scale and the client-related burnout scale use the same numerical values but with different category descriptors for some items. The descriptors: To a very high degree (100), To a high degree (75), Somewhat (50), To a low degree (25). To a very low degree (0) are used for items 4-6 in the work-related burnout scale and items 1-4 in the client-related burnout scale. A person’s burnout score on each scale is their total score divided by the number of scale items. A score of 50 is the criterion for identifying groups with high burnout.

**Sample.** The Order of Nurses sent invitations for the survey to 500 randomly selected registered nurses working in acute hospitals in Lebanon. The online survey received 258 responses. The number of blank responses was 158. An additional 10 surveys were excluded because the respondents gave the same response to all the items or responded to less than 50% of the items. A total of 142 surveys were analyzed (response rate 28.4%).

Table 1 shows the demographic characteristics of the 142 respondents.

**Data Collection.** The survey was open from October to December 2019. The survey had three sections: 12 demographic questions, 39 questions about risk factors for burnout, and 19 CBI items. We will report the other study results separately. The first COVID-19 infection in Lebanon was recorded on February 21, 2020 (“First Case of Coronavirus”, 2020).

**Ethical Considerations.** A university institutional review board approved the study. Participation was voluntary and anonymous. The Order deleted the email addresses of participants immediately after the survey closed. We analyzed the data on password-protected computers to maintain confidentiality. University policy requires the deletion of the data within three years.

**Data Analysis.** We used the Rasch rating scale model in WINSTEPS Version 4.5.3 (Linacre, 2020a) to conduct consecutive analyses of the three CBI subscales’ measurement performance. We reviewed item and person measures and examined dimensionality to identify possible non-Rasch dimensions. Using the criterion .30, we reviewed standardized residuals for item dependence. When examining item fit, we looked for Infit and outfit MNSQ values outside the range of 0.7 – 1.3. We inspected respondent separation indices and item reliability coefficients to assess scale precision. We looked for respondent separation indices >2.0 and item reliability coefficients of .80 (Linacre, 2020a). We examined pairwise differences between groups to identify differential item functioning (DIF).

**Results**

The CBI scales fitted the Rasch rating scale model and mean sample burnout scores were high for this sample of
respondents. The following results confirm that the CBI scales are reliable and useful measures of burnout.

**Global Statistics**

Our analyses of the CBI scales confirmed that all three had an acceptable independent fit to the Rasch rating scale model. Personal Burnout Scale (six items), log likelihood X² (1389, N = 142) = 1384.44), p = .53, root mean square standard error (RMSE) = .5830. Work-Related Burnout Scale (seven items), log likelihood X² (1643, N = 142) = 1637.37), p = .53, RMSE = .5921. Client-Related Burnout Scale (six items), log likelihood X² (1395, N = 142) = 1384.44), p = .57, RMSE = .5745.

**Respondent Measures**

Personal Burnout Scale mean raw scores (n = 142) were in the range 49.65 for item 6 (feeling tired) to 69.19 for item 1 (susceptibility to illness). The sample mean raw score was 58.87. When measured on the Rasch dimension rescaled to 0-100 with extreme score respondents excluded, the mean latent measure for personal burnout was 55.83.

Mean raw scores for the Work-Related Burnout Scale (n = 142) ranged from 52.46 for item 5 (feeling tired) to 69.19 for item 1 (susceptibility to illness). The sample mean raw score was 59.28, slightly higher than that for the Personal Burnout Scale. When the latent measures were rescaled 0-100 after excluding extreme scores, the mean latent measure was 47.13.

Client-Related Burnout Scale mean raw scores (n = 142) ranged from 45.45 for item 6 (how long can continue to work with clients) to 69.19 for item 1 (hard to work with clients). The sample mean raw score was 46.71. With extreme scores excluded and the Rasch measures rescaled 0-100, the mean latent measure was 47.21.

The mean Rasch measure for the 130 non-extreme respondents to the Work-Related Burnout Scale was 47.73, slightly higher than the item mean of 47.17. The small difference in the means indicates that, like the Personal Burnout items, the Work-Related items targeted the center of the respondent distribution. None of the mean item estimates matched respondents with mean Rasch measures below 39, between 45 and 51, or above 55.

Rasch measure means for the 130 non-extreme respondents to the Client-Related Burnout Scale was 47.21, slightly higher than the mean of 46.17 for the items. The small difference in the means indicates that the items targeted the center of the respondent distribution. None of the mean item estimates matched respondents with mean Rasch measures below 39, between 44 and 51, or above 55.

The mean Personal Burnout Scale Rasch measure for the 130 non-extreme respondents was 47.21, higher than the 46.71 for the items. The small difference indicates that the items targeted the center of the respondent distribution. None of the mean item estimates matched respondents with mean Rasch measures below 39, between 44 and 51, or above 55.

All three CBI scales had a ceiling effect of 7.7% and a small floor effect of 0.7%.

**Rasch measure means for the 130 non-extreme respondents to the Client-Related Burnout Scale was 47.21, slightly higher than the mean of 46.17 for the items. The small difference in the means indicates that the items targeted the center of the respondent distribution. None of the mean item estimates matched respondents with mean Rasch measures below 39, between 44 and 51, or above 55.**

**Misfitting Respondents**

The number of respondents who misfitted the Work-Related Burnout Scale (MNSQ values > 2 was 12 (8.4%). The number of respondents who misfitted the Personal Burnout Scale and the Client-Related Burnout...
Scale was 14 (9.8%). We included the data of the misfitting respondents in our analyses to ensure the data represented the sample.

**Item Fit**

Table 2 shows the item measures, means and MNSQ values for the CBI scales.

**Response Ordering and Item Dependence**

There was no rating category disordering or evidence of item dependence.

**Dimensionality**

The Rasch measures for the three CBI scales explained similar proportions of variance: The measures for the Personal Burnout Scale and the Client-Related explained 65.0% of the variance data. The proportion of explained variance for the Work-Related Burnout Scale was slightly lower at 64.1%. The eigenvalues for the first contrasts in the unexplained variance for the three scales were < 2, indicating that none of the scales had a non-Rasch dimension with a strength of at least two items.

**Differential Item Functioning**

We identified possible bias in two items in the Personal Burnout Scale. Compared with other respondents with the same mean Rasch measure, it was more difficult for nurses aged < 40 years to endorse item 3 (emotional exhaustion), contrast = 1.46 logits, SE = 1.09, Mantel $X^2 = 4.00$, p. = .045. Conversely, compared with males at the same locations on the latent personal burnout dimension, it was easier for females to endorse item 4 (cannot take it anymore), contrast = -.75 logits, SE = 0.34, Mantel chi-square = 8.93, p. = .002. No bias was associated with marital status or nursing qualification. There was no evidence that items in the Work-Related Scale or the Client-Related Burnout Scale are biased for age, gender, marital status, or nursing qualification.

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### Table 2. Copenhagen Burnout Inventory Item Measures and Fit Statistics by Scale.

| Items by Scale                  | Measures 0–100 | Logit scale | SE | Infit MNSQ | Outfit MNSQ | Point-measure correlation | Estimated discrimination |
|--------------------------------|----------------|-------------|----|------------|-------------|---------------------------|--------------------------|
| **Personal Burnout Scale**     |                |             |    |            |             |                           |                          |
| How often feel tired?          | 45.55          | -1.6        | .15| 1.14       | 1.16        | .75                       | .85                      |
| How often physically exhausted?| 45.92          | -.79        | .15| .95        | .92         | .80                       | 1.04                     |
| How often emotionally exhausted?| 46.37         | -.34        | .14| .98        | 1.04        | .81                       | 1.00                     |
| Think “I can’t take it anymore”?| 47.32         | .60         | .14| .91        | .92         | .85                       | 1.08                     |
| How often do you feel worn out?| 47.35          | .63         | .14| .77        | .75         | .87                       | 1.27                     |
| Feel weak and susceptible to illness?| 47.77   | 1.06        | .14| 1.15       | 1.15        | .82                       | .81                      |
| **Mean**                       | 46.71          |             |    |            |             |                           |                          |
| **Work-Related Burnout Scale** |                |             |    |            |             |                           |                          |
| Worn out at end of working day?| 46.10          | -1.07       | .15| 1.19       | 1.20        | .74                       | .80                      |
| Morning exhaustion at thought of another day at work?| 46.45 | -.72 | .15 | .94 | .93 | .79 | 1.04 |
| Every working hour is tiring for you?| 46.89 | -.28 | .14 | .99 | 1.06 | .81 | .98 |
| Enough energy for family and friends (reverse keyed)?| 47.80 | .63 | .14 | .91 | .92 | .85 | 1.09 |
| Work emotionally exhausting?| 47.83          | .66         | .14| .75        | .72         | .87                       | 1.30                     |
| Does your work frustrate you?| 48.24          | 1.07        | .14| 1.15       | 1.13        | .82                       | .82                      |
| Feel burned out because of your work?| 46.89 | -28 | .14 | 1.00 | 1.00 | .82 | 1.03 |
| **Mean**                       | 47.17          |             |    |            |             |                           |                          |
| **Client-Related Burnout Scale** |                |             |    |            |             |                           |                          |
| Hard to work with clients?| 45.55          | -1.16       | .15| 1.14       | 1.16        | .75                       | .85                      |
| Drains energy to work with clients?| 45.92 | -.79 | .15 | .95 | .92 | .80 | 1.04 |
| Frustrating to work with clients?| 46.37 | -.34 | .14 | .98 | 1.04 | .81 | 1.00 |
| Give more than you get back from work with clients?| 47.32 | .60 | .14 | .91 | .92 | .85 | 1.08 |
| Tired working with clients?| 47.35          | 1.06        | .14| .77        | .75         | .87                       | 1.27                     |
| Wonder how long you can continue working with clients?| 47.77 | -.79 | .14 | 1.15 | 1.15 | .82 | .81 |
| **Mean**                       | 46.71          |             |    |            |             |                           |                          |

*Note. Respondents, n = 142.*
qualification. These results require confirmation in future studies because identifying differential functioning is complex and likely to be unreliable with sample sizes of less than 100 in both the reference and comparison group (Scott et al., 2009).

Separation and Reliability

We report person separation and reliability statistics in Table 3. The scales had excellent internal consistency (the Cronbach α coefficient was .91 for the Personal Burnout and Client-Related Burnout scales and .93 for the Work-Related Burnout scale.

Norm Values. Table 4 presents raw scores and normed Rasch measures for the three CBI scales.

Discussion

To the best of our knowledge, ours is the first Rasch analysis of the CBI scales. In this section, we explain how our results relate to the study’s objectives. We address Kristensen et al. (2005) comments about using the CBI scales as we proceed.

Objective – CBI Measurement Characteristics

For a scale to be sufficiently productive of measurement, it must meet the strict requirements. It must be unidimensional, have content validity, show sufficient variability, measure the latent trait with an acceptable signal to noise ratio, explain a sufficient proportion of variance in the raw data, and have a plausible theoretical rationale. The global statistics we reported in the results section, the proportion of variance explained by the measures, and our comments on dimensionality indicate that the three CBI scales measure burnout independently.

The MNSQ values in Table 1 confirm that the 19 CBI items had a good signal to noise ratio because they are all within the widely accepted range of 0.7 to 1.3. However, the MNSQ values have a narrow range, which indicates that the items function too uniformly. The values below 1 indicate that the responses to almost 50% of the items were too predictable. Consequently, the Rasch measures slightly over-explained the variance in the data. The Personal Burnout and Client-Related Burnout scales explained 0.5% more variance than predicted by the Rasch model (65% > 64.5%). The excess variance explained by the Work-Related Burnout measures was 0.4% (64.1% > 63.7%).

Participants were able to use the CBI rating scale (100, 75, 50, 25, and 0) to differentiate between the descriptive rating scales. Accordingly, none of the rating scale categories was disordered. However, the structurally missing values in the CBI’s rating scale (1-24, 26-49, 51-75, and 76-100) requires investigators to recode the data before fitting it to the Rasch model. We recoded the data using the values 1-4 to obtain accurate Rasch measures and estimates.

Objective – Levels of Burnout

We investigated whether the CBI scales can identify low, moderate, high, and extremely high burnout levels in nurses experiencing compound stressors. Kristensen et al. (2005) regard burnout as a variable state without a zero point and recommend a scale score of 50 as the threshold for high burnout on all three scales. However, we believe that it is important to differentiate burnout levels in nurses working in conditions of compound stressors.

In our study, the three CBI scales separated the sample into 4.3, 4.45, and 4.3 statistically different burnout levels centered on their mean values. After examining the standard errors of the raw scores and adjusting for ease of interpretation, we recommend the following cut-points for all three CBI scales: low burnout ≤ 35, moderate burnout 36-49, high burnout 50-69, and high burnout ≥ 70.
extremely high burnout \( \geq 70 \). The proportions of respondents in each category in our sample (n = 142) were: low burnout 15%, moderate burnout 18%, high burnout 47%, extreme burnout 20%.

**Objective - Theoretical Plausibility of the Three-Dimensional Burnout Model**

Conquest V.4 software (Adams et al., 2015) was used to examine the theoretical plausibility of the Kristensen et al. (2005) three-dimensional model of burnout. We began by examining the correlations between the three CBI scales using the multidimensional Rasch rating scale model. The scores were strongly correlated \( (r = 0.93) \). We combined the Personal Burnout Scale and the Work-Related Burnout Scale into one scale. The combined scale correlated \( r = 0.64 \) with the Client-Related Burnout Scale. The difference in the deviance statistics for the three-dimensional model and two-dimensional model was statistically significant (\( \Delta X^2 = 29.66, df = 3, p < .01 \)). The Akaike Information Criterion (AIC) weight for the three-dimensional model was lower than that for the two-dimensional model (6432.09793 < 6511.76382). We concluded that the three-dimensional model is more plausible than the two-dimensional model because it was a better fit for the data. However, the superiority of the three-dimensional model requires confirmation in studies with larger and more diverse samples.

**Objective – CBI Norm Values for Nurse Burnout in Compound Stressor Settings**

Kristensen et al. (2005) encourage investigators to report norm values for the CBI scales. We report the norm values estimated from our sample in Table 4.

| Score | Measure | SE | Nval | Pctl | Score | Measure | SE | Nval | Pctl | Score | Measure | SE | Nval | Pctl |
|-------|---------|----|------|------|-------|---------|----|------|------|-------|---------|----|------|------|
| 0     | –6.21E  | 1.85| 235  | 1    | 0     | –6.21E  | 1.84| 226  | 1    | 0     | –6.21E  | 1.85| 235  | 1    |
| 4     | –4.95   | 1.05| 282  | 1    | 4     | –4.96   | 1.03| 273  | 1    | 4     | –4.95   | 1.05| 282  | 1    |
| 8     | –4.15   | 0.78| 311  | 1    | 7     | –4.2    | 0.76| 302  | 1    | 8     | –4.15   | 0.78| 311  | 1    |
| 12    | –3.63   | 0.68| 331  | 1    | 11    | –3.71   | 0.65| 321  | 1    | 12    | –3.63   | 0.68| 331  | 1    |
| 17    | –3.2    | 0.63| 346  | 2    | 14    | –3.32   | 0.59| 336  | 2    | 17    | –3.2    | 0.63| 346  | 2    |
| 21    | –2.83   | 0.6  | 360  | 5    | 18    | –2.99   | 0.56| 348  | 3    | 21    | –2.83   | 0.6 | 360  | 5    |
| 21    | –2.48   | 0.58| 373  | 7    | 21    | –2.69   | 0.54| 360  | 4    | 21    | –2.48   | 0.58| 373  | 7    |
| 29    | –2.14   | 0.58| 385  | 10   | 25    | –2.4    | 0.53| 371  | 6    | 29    | –2.14   | 0.58| 385  | 10   |
| 33    | –1.81   | 0.58| 398  | 13   | 29    | –2.12   | 0.53| 381  | 9    | 33    | –1.81   | 0.58| 398  | 13   |
| 37    | –1.48   | 0.58| 410  | 16   | 32    | –1.85   | 0.53| 392  | 11   | 37    | –1.48   | 0.58| 410  | 16   |
| 42    | –1.13   | 0.6  | 423  | 20   | 36    | –1.56   | 0.54| 402  | 14   | 42    | –1.13   | 0.6 | 423  | 20   |
| 46    | –0.76   | 0.62| 437  | 24   | 39    | –1.27   | 0.55| 414  | 18   | 46    | –0.76   | 0.62| 437  | 24   |
| 50    | –0.36   | 0.64| 451  | 33   | 43    | –0.96   | 0.56| 425  | 20   | 50    | –0.36   | 0.64| 451  | 33   |
| 54    | 0.07    | 0.66| 467  | 43   | 46    | –0.64   | 0.58| 438  | 24   | 54    | 0.07    | 0.66| 467  | 43   |
| 58    | 0.52    | 0.68| 484  | 51   | 50    | –0.29   | 0.6 | 451  | 32   | 58    | 0.52    | 0.68| 484  | 51   |
| 58    | 0.99    | 0.69| 501  | 58   | 54    | 0.07    | 0.61| 465  | 42   | 58    | 0.99    | 0.69| 501  | 58   |
| 67    | 1.47    | 0.69| 519  | 65   | 57    | 0.45    | 0.62| 479  | 49   | 67    | 1.47    | 0.69| 519  | 65   |
| 71    | 1.95    | 0.7  | 537  | 71   | 61    | 0.84    | 0.62| 494  | 55   | 71    | 1.95    | 0.7 | 537  | 71   |
| 75    | 2.45    | 0.71| 555  | 76   | 64    | 1.22    | 0.62| 508  | 60   | 75    | 2.45    | 0.71| 555  | 76   |
| 79    | 2.96    | 0.72| 574  | 81   | 68    | 1.6     | 0.62| 523  | 64   | 79    | 2.96    | 0.72| 574  | 81   |
| 83    | 3.5     | 0.75| 594  | 83   | 71    | 1.99    | 0.62| 537  | 70   | 83    | 3.5     | 0.75| 594  | 83   |
| 87    | 4.08    | 0.79| 616  | 87   | 75    | 2.37    | 0.62| 552  | 76   | 87    | 4.08    | 0.79| 616  | 87   |
| 92    | 4.77    | 0.88| 641  | 90   | 79    | 2.77    | 0.63| 567  | 80   | 92    | 4.77    | 0.88| 641  | 90   |
| 96    | 5.72    | 1.12| 676  | 91   | 82    | 3.18    | 0.65| 583  | 83   | 96    | 5.72    | 1.12| 676  | 91   |
| 100   | 7.09E   | 1.85| 727  | 96   | 86    | 3.62    | 0.68| 599  | 85   | 100   | 7.09E   | 1.89| 727  | 96   |

Note. Score = raw re-scaled score averaged across scale items; Measure = measure corresponding to Score; SE = standard error of re-scaled measures. Nval (Normed Values) = linearly re-scaled measures to achieve sample person mean of 500 and population mean of 100; Pctl (Percentile) = cumulative frequency percent for the next lowest score plus half the frequency for the current score halffrounded and constrained in the range 1-99 to avoid zero frequencies; E = estimated.
norm values in Table 4 will facilitate comparisons of burnout in different populations experiencing compound stressors. The Rasch measures and item difficulty estimates will be consistent with but not identical to our reported values because maximum likelihood estimates cannot establish parameters free of sample bias.

**Future Studies**

The CBI scales measure the strength with which people attribute burnout to domains in their lives. Therefore, as we continue developing our research program, we will focus on whether nurses can attribute their fatigue and exhaustion to sources other than those related to their personal and working lives. By answering this question, we hope to contribute insights that will inform the conceptualization of burnout and interventions to help nurses cope with the challenges confronting them during the COVID-19 pandemic in countries like Lebanon that are on the brink of political and financial collapse.

**Current Situation**

The situation in Lebanon has deteriorated since the study data were collected. Nurses continue to struggle against the financial pressures that compound the impact of the COVID-19 pandemic. The Lebanese lira continues to fall in value as the political deadlock frustrates the formation of a technocratic government to work with the International Monetary Fund to rescue the country (“Lebanese Pound Falls”, 2021, March 23. To date there have been 444,865 confirmed COVID-19 cases in Lebanon and 5,850 deaths. There are 89,792 active cases, and 990 COVID patients in intensive care units (Worldometer, 2021). The public hospital system is stretched to capacity and the private hospital sector continues to struggle with financial pressures. The Ministry of Public Health has launched a national vaccination campaign. Almost 250,000 Pfizer vaccinations have arrived in the country. A total of 104,961 people has received a first dose and almost 60,000 a second dose (Lebanese Ministry of Public Health, 2021).

Despite Lebanon’s deepening economic crisis and the poor prospects for forming a new government, nursing directors and health care executives can support the nursing workforce by extending the best practices adopted by the leading hospitals in the country to all nurses. Leading hospitals have established help lines for staff, patients, and other people in distress to call. Nurse leaders are meeting with nurses to listen to their concerns and offer practical assistance when possible. Nurses are encouraging their colleagues to access the free or low-cost psychological services provided by NGOs. Nurses are forming self-help groups, sharing information about credible and free online stress management resources, and supporting their colleagues, families, and friends on social media. More strategic approaches are needed to support the sustainability of the nursing workforce. Nurse executives can lobby the Ministry of Public Health to require hospitals to monitor burnout in the workforce to maintain accreditation. A follow up study is investigating burnout and resilience in a national survey of nurses. Data analysis and manuscript preparation are in progress, and an intervention study is planned.

**Limitations**

We attribute the lack of sufficient variance in our study to the sample’s small sample size and homogeneity. The proportions of variance explained by the Rasch measures could reflect a tendency for the respondents to respond to a general perception of burnout rather than the CBI scale item content. In future studies, we can reduce global perceptions by randomly distributing CBI items in a larger set of items. Our findings require confirmation in a larger study that oversamples respondents with likely high and low burnout levels. We can determine whether a higher-order dimension explains the strong correlations between the CBI scales with a larger, more heterogeneous sample. We could not estimate test-retest reliability because our respondents were anonymous and could not be re-surveyed.

**Conclusion**

Our findings show that the CBI scales have sufficient sensitivity to distinguish between nurses with low, moderate, high, and very-high burnout in conditions of compound stressors. The scales have acceptable reliability for research and management surveys of the nursing workforce. The scales’ targeting can be improved by recruiting larger samples of nurses and adding additional items to the scales. Meanwhile, the cut-off points we have suggested will assist executive nurses and nurse leaders in identifying practice settings in which nurses are at risk for higher burnout levels. More extensive studies with more diverse samples are needed to examine possible differential functioning in the Work-Related Burnout scale. More multidimensional Rasch rating scale analyses are required to examine the construct validity of the CBI scales. Investigators in crisis torn countries can compare their results with our norm values and examine whether the suggested cut-points are valid. Our reported CBI scale values can be used as baseline measures for monitoring burnout in Lebanon’s nursing workforce.
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