MODELING BURNOUT SYNDROME'S LATENT TRAIT OF NURSES USING THE GRADED RESPONSE MODEL

Juliana Marambaia Maia[1], Cibele Russo[2], Jorge Bázan[2] and Emmanuel Lesaffre[3]

Introduction

The aim of the Item Response Theory (IRT) is to propose models for latent traits, which are non-observable characteristics of an individual. On the IRT methodology, there are models for items with polytomous responses, such as the Graded Response Model, a widely known model in the literature.

The motivation for this paper comes from a dataset belonging to the RN4CAST project related to the burnout syndrome. Maslach et al (1996) explain that burnout is a psychological syndrome that has a multidimensional configuration of emotional exhaustion, depersonalization, and personal accomplishment.

In this study, the Graded Response Model is used to explain the variability of the latent trait for the emotional exhaustion on 300 nurses from Belgium.

Goals

In this paper, our proposal is to use the Graded Response Model to model a burnout dimension, the emotional exhaustion, on nurses in Belgium. The main aim of this study is to estimate the items' parameters and the nurses' latent trait, under a Bayesian approach using the R's package R2OpenBUGS (Sturtz et al, 2005), and to plot the item's characteristic curves.

Material and Methods

The RN4CAST project (Sermeus et al, 2011) involved 12 countries in Europe, and a large number of hospitals, nursing units, nurses and patients. According to Maslach et al (1996) burnout is "a physical and emotional fatigue that leads to a loss of motivation for work, which can evolve until the appearance of feelings of inadequacy and failure". To calculate the burnout dimensions on nurses, the Maslach Burnout Inventory (MBI) was used, which is a

[1] University of São Paulo and Federal University of São Carlos (USP and UFSCar) - CAPES, juliana.marambaia@usp.br

[2] Institute of Mathematics and Computer Sciences - University of São Paulo (USP)

[3] L-BioStat, KU Leuven, Belgium

22-item questionnaire to be answer in a Likert scale of 7 points, where 9 of them represent the emotional exhaustion.

The graded response model was proposed by Samejima (1969). Let Y_{ij}be the response of the i-th nurse in the j-th item on the MBI. Each item j, $j = 1,\ldots 22$, has $m_j = 7$ categories (0 to 6) but was considered that $Y_{ij} = 1,\ldots,7$ (the category 0 is represented by $Y_{ij} = 1$, and so on) and $i = 1,\ldots,n$ is the number of nurses ($n = 300$). Then, $Y_{ij}|\theta_i,\xi_j \sim Categorical(P_{ij1},\ldots,P_{ij7})$, where θ_i is the latent trait, a burnout dimension of the i-th nurse and $\xi_j = (a_j, b^*_{j1},\ldots,b^*_{j(m-1)})^T$ is the parameter vector related to the j-th item, in which $b^*_{jk} = a_j b_{jk}, \forall k \in 1,2,\ldots,m_j - 1$. The parameter b_{jk} represents the difficulty of moving from the category $k-1$ to k of the item j.

According to da Silva et al (2017), in a graded response model, the probability of a nurse scoring a specific category is modeled from cumulative probabilities, $P_{ijk}{}^+$, which are the probability of the nurse i to select a specific category k or other lower category in item j. So, $P_{ijk}{}^+ = P(Y_{ij} \leq k|\theta_i,\xi_j) = L(\eta_{ijk})$, where $L(.)$ represent the link function and commonly uses the logistic cumulative distribution as the link function. Therefore, the probability that the nurse i selects a category k in an item j is obtained by subtracting the adjacent cumulative probabilities.

Results and Discussion

Analyses were obtained considering 300 nurses drawn randomly from the country Belgium, and 9 items that represent the emotional exhaustion in the burnout syndrome. The Table 1 shows the item's parameter estimates obtained by a Bayesian approach using the OpenBUGS software through R2OpenBUGS (Sturtz et al, 2005) package in R.

Table 1 – Item's parameter estimates of the graded response model.

Parameters	Item								
	1	2	3	4	5	6	7	8	9
a	2,6	2,8	2,6	0,7	3,0	2,4	1,4	1,3	2,2
b_1	-3,8	-4,4	-3,5	0,5	-1,5	-2,2	-3,0	-0,6	-1,4
b_2	-0,8	-2,2	-1,2	1,7	0,9	-0,0	-1,3	1,2	1,1
b_3	0,4	-0,9	0,2	2,6	2,0	0,9	-0,6	1,9	1,7
b_4	2,1	0,7	1,4	3,8	3,5	2,4	0,4	2,8	3,0
b_5	3,1	1,4	2,5	4,5	4,1	3,0	0,9	3,1	3,7
b_6	6,3	4,3	5,3	27,7	6,5	5,5	2,4	4,6	5,9

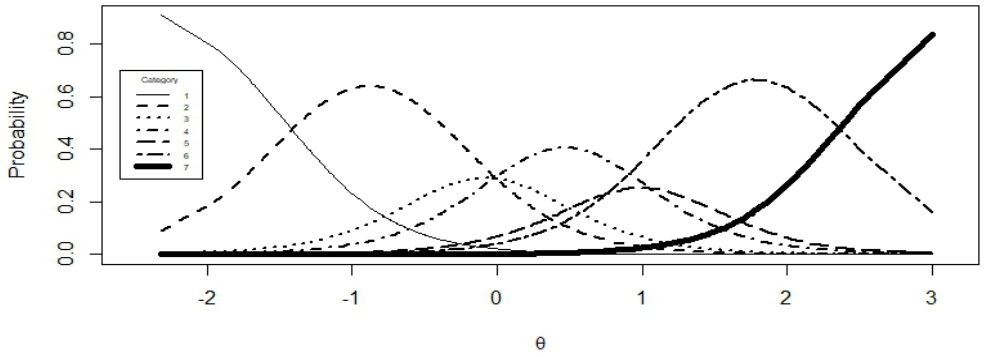

Figure 1 – Item's characteristic curves for item 1.

Table 1 shows that the emotional exhaustion of nurses is well discriminated by the parameter a in all items, except the item 4 ("Working with people all day is really a strain for me"). The items with the grater discrimination are the item 2 and 5 ("I feel used up at the end of the workday" and "I feel burned-out from my work", respectively). In the literature, parameters greater than 1 indicate acceptable discrimination. The greatest values of the parameter b are observed in the item 4. Figure 1 shows the item characteristic curves of each category for the item 1 ("I feel emotionally drained from my work").

Conclusion

In this paper, the Graded Response Model was used to modeled the emotional exhaustion, a burnout dimension, on nurses in Belgium using a Bayesian approach. Item's parameter estimates and item's characteristic curves are presented.

References

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