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“Life” beyond classical test theory: Some considerations on using complementary psychometric approaches in sleep medicine

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It is common the using of self-report measures in sleep medicine field. In fact, this is a topic that will remain pertinent in the next years [1]. The construction, development, and adaptation of these measures require specialized knowledge and competences that are quite familiar to psychologists. Psychometrics is a scientific field which relates statistics and mathematics with psychology [2]. In other words, it concerns to the measure of psychological constructs. Similarly to other areas, there are domains of sleep medicine, as it is the case of insomnia, where self-report scales are an important subjective tool in assessment and therapy, serving in several cases as a diagnostic complementary exam [3].

It is worth noting that, despite a large volume of published and validated measures, there has been a growing tendency in reducing the scales' dimension, even in short scales, specifically in health-related applied settings. Particularly in the sleep medicine context, the sophistication of instruments is emergent. For example, the Insomnia Severity Scale (ISI) is one of the most widely used questionnaires in sleep medicine that comprises only 7 items to assess insomnia's severity [5]. Nonetheless, there is already literature attempting to reduce even more this brief scale in terms of its items [6]. In current days, it is demanded that the researchers and clinicians do not overload the patients or participants with an excessive number of scales in their research protocols. Thus, our concern is: how can we assess what we want – in a reliable and valid way – with as few items as possible? In the majority of cases, what has been published in the literature so far is based upon the Classical Test Theory (CTT). Due to this fact, the overall concern with reducing scales' extension is almost exclusively based in the classical concepts related to this approach. Therefore, the using of principle component analyses, exploratory and confirmatory factor analyses, Cronbach's alphas to measure internal consistency and, in some cases, the ROC curve analyses to suggest potential

cut-off points are the mainstream practice in the field. This is also the current scenario in psychological assessment even in other domains beyond sleep medicine [7]. Of course, there is no problem with this practice. However, in sleep medicine field, perhaps it is time to use other contemporary and alternative/complementary approaches as well. In this sense, we observe in the literature that the using of Item Response Theory (IRT) is scarce and Network Analysis (NA) even more, albeit this latter is a relatively new approach in psychometrics [8,9].

Thus, what we propose here is the possibility to evaluate the most frequent and well-known scales with the lens of CTT, IRT and NA whenever it is possible. Do the conclusions converge? If not, why not? The IRT comprises a set of mathematically techniques that allows to uncover the items which give more information (and in what parts of) regarding latent trait [10]. So, if we have a scale with 7 items, perhaps we observe that only three items give us relevant information about the latent trait. The NA, for example, is an alternative to the latent variable approach; it posits that symptoms of a hypothetic disorder are not explained by a latent construct or variable that is not directly observed, but instead, it assumes that the symptoms are systems of mutually reinforcing symptoms and explores the potential of these symptom-symptom interactions [11].

Contrary to what happened in the past, nowadays, the scarcity of software is not a limitation. Currently, we have free software such as *R* encompassing several packages to perform sophisticated analysis comprising IRT or NA [12]. It is worth mentioning that the learning curve of this software is demanding. However, several tutorials may aid the researchers in their analyses. Even so, there are other free software options such as JASP, which is based in *R* programming that enables the NA, for example, in a

friendly way. One interesting possibility to conduct IRT in a user-friendly manner, albeit a paid one, is the IRTPRO software.

In this line, at the present moment, our research team is studying some assessment tools such as the Glasgow Sleep Effort Scale (GSES) [13] using these different psychometric approaches.

In sum, we would like to call attention of sleep researchers and sleep experts to the fact that it is essential to test the measures we currently use in our clinical and research practice against the tools that psychometrics give us. We believe that this task constitutes a major aim of sleep psychology.

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