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Inauguraldissertation

zur

Erlangung des Doktorgrades

der Humanwissenschaftlichen Fakultät

der Universität zu Köln

nach der Prüfungsordnung vom 10.05.2010

vorgelegt von

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aus

Bergisch Gladbach

Tag der Abgabe: 01.01.1970

Acknowledgment

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Contents

Summary

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Introduction

Insomnia disorder is related to dissatisfaction with duration or quality of sleep. It can be a source of distress and impairment by decreasing productivity on work or school and lowering energy to engage in social activities (Association, 2013). Prolonged effects of insomnia are associated with higher risk of harm on mental health (Johnson et al., 2006; Taylor et al., 2005) and cognitive functioning (Fortier-Brochu et al., 2012). Cognitive arousal is crucial to several behavioral models of insomnia as maintainer of the disorder (Espie et al., 2006; Harvey, 2002; Lundh, 2005; Morin et al., 1993; Ong et al., 2012; Perlis et al., 1997).

Dysfunctional beliefs and attitudes about sleep

Harvey's model (Harvey, 2002) is frequently mentioned as theoretical background in investigations about cognitive process in insomnia. It posits that the excess of negatively toned activity about sleep triggers arousal and distress, channeling attention and monitoring to sleep threats. This may create distorted perceptions of sleep and overestimation of the real deficits during the day. To cope, the individual may engage in safety behaviors that paradoxically increase worry and preclude sleep self correction. In Harvey's model, dysfunctional beliefs about sleep exacerbates negatively toned cognitive activity. Such beliefs are also the backbone of the Microanalytic model (Morin, 1993), one of the most cited models for insomnia in the literature (Marques et al., 2015).

Current evidence favors that beliefs and attitudes about sleep mediates insomnia perpetuation (Akram et al., 2020; Chow et al., 2018; Harvey et al., 2017; Lancee et al., 2019), although not all studies have found this association (Norell-Clarke et al., 2021). Morin (1993) suggests that insomnia maintenance feeds from a cyclic process of arousal, dysfunctional cognitions, maladaptive habits and consequences. Arousal refers to excessive activity in emotional, cognitive or physiologic domains, which can create core beliefs that guide information processing (Marques et al., 2015). This may give rise to unrealistic expectations and rigidly held beliefs about requirements for sleep, as well as increased worry about the causes and consequences of sleep disturbances. Subsequent unhealthy sleep practices may include daytime napping, excessive time in bed or indiscriminate use of sleep medication. Consequences, real or perceived, are linked to diminished performance during

the day.

Constructs and Their Relations. Individuals that show stronger insomnia symptoms typically demonstrate firm endorsement of dysfunctional beliefs about sleep (Carney & Edinger, 2006; Crönlein et al., 2014; Eidelman et al., 2016). Challenging those beliefs is in the core of Cognitive Behavioral Therapy for insomnia (CBT-I) (Belanger et al., 2006). A recent meta-analysis observed clinically significant improvements in beliefs and attitudes about sleep favoring CBT-I over controls – although, as the authors warn, those results should be interpreted with care given the low quality of evidence (Edinger J. D. et al., 2021). Insomnia severity was identified as risk factor for anxiety (Neckelmann et al., 2007) and depression (Blanken et al., 2020; Li et al., 2016), but some studies claim this relationship the other way around (Chen et al., 2017; Jansson-Fröjmark & Lindblom, 2008). A relationship between anxiety and depression with dysfunctional beliefs about sleep is also expected: Beck's classic cognitive mechanism for the cause and maintenance of depression gives a central role to inaccurate beliefs and maladaptive information processing (Beck, 1979). Anxiety can be elicited from displeasing memories created through exposure to adverse experiences (Brewin, 1996). Thus, unrealistic attributions and expectations about sleep (or lack of sleep) may elicit anxiety-provoking thoughts. Associação entre Depressão e DBAS (Sadler et al., 2013).

Measurement. To assess sleep-disruptive cognitions, Morin et al. (1993) developed the Dysfunctional Beliefs and Attitudes About Sleep Scale (DBAS). The DBAS started as a 30-item self-report instrument rated in a 100-mm visual analog scale of agreement/disagreement. Later, Morin and colleagues (2007) shortened it to a 16-item version, and replaced the response format for a 10-point scale ranging from 0 (strongly disagree) to 10 (strongly agree). The items of the brief version were selected from the original scale based on criteria of response distribution, range, item-total correlations and exploratory oblique factor analysis. A 4-factor structure was fitted to the 16 items in a confirmatory factor analysis, labeled (a) consequences of insomnia, (b) worry about sleep, (c) sleep expectations, (d) medication, and a 5th second-order general factor. The DBAS is broadly employed in experimental studies assessing sleep-related cognitions, especially the 16-item version (Thakral et al., 2020). Many researchers translated and validated the DBAS-16 across various cultures. These studies successfully replicated the original factor structure and

presented good validity evidences (Boysan et al., 2010; Dhyani et al., 2013; Lang et al., 2017). Moreover, the DBAS-16 outperformed the 30 and 10-item versions in reproducibility of factor structure, measures of internal consistency, concurrent validity and sensitivity to change (Chung Ka-Fai et al., 2016).

Sleep Problem Acceptance Questionnaire (SPAQ)

Constructs and Their Relations.

Measurement.

The cross-cultural adaptation process

Before using existing measures in a distinct cultural context of where it was originally developed it's important to assess the construct existence and similarity in this new context, since it may manifest differently (Flake et al., 2017; Herdman et al., 1998). A model proposed by Herdman et al. (1998) devise five types of equivalence to be assessed, namely, (1) conceptual equivalence; (2) Item equivalence; (3) Semantic equivalence; (4) Operational equivalence; and (5) Measurement equivalence.

A minimum of two translators, fluent in both source and target language and acquainted with both cultural backgrounds, should produce the initial translation of the instrument Epstein et al. (2015). They should work independently and it is preferred that one translator is aware of the concepts underlying the questionnaire while the second should be someone with no medical or clinical background and blind to the concepts in the questionnaire (Beaton et al., 2000).

Objectives

The present project therefore aims at (a) developing a Brazilian portuguese translation of the Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS-16) and Sleep Problem Acceptance Questionnaire (SPAQ), (b) examining its factorial structure, and (c) examining its construct validity.

Method

Participants and Study Design

To estimate an adequate sample size for the confirmatory factor analyses we used MacCallum et al.'s (1996) root-mean-square error of approximation (RMSEA) tests of close and not-close fit. All tests were conducted in R 4.1.3 (R Core Team, 2022) using `semTools` version 0.5.6 (Jorgensen et al., 2021). Morin (2007) reports RMSEA = 0.059 in a confirmatory factor analysis for DBAS-16. Taking this value as prior guess for the true RMSEA score, we calculated the sample sizes required to to reject the test for not-close fit of RMSEA > 0.08 and the test of close fit of RMSEA < 0.05 with a power of 0.80 and $\alpha = 0.05$. Results show that 216 subjects are necessary to reject the test for not-close fit, and the test of close fit would be rejected with 920 participants. Therefore, we aimed at a minimum sample size of 920 participants. SPAQ's fit index was not considered in this power analysis due to the large RMSEA (0.081) reported by the original authors (Bothelius et al., 2015).

This study was approved by the Ethics Committee of the General Hospital of the University of São Paulo, School of Medicine (HCFMUSP), São Paulo, Brazil (CAAE: 46284821.1.0000.0068). To be included, participants must age between 18 and 59 years and indicate no difficulties in reading or writing. Participants will be informed about the main objective of the research and sign the informed consent. Then, they are requested to respond to an online survey using REDCap electronic data capture tools (Harris et al., 2009, 2019), including the Brazilian-Portuguese versions of DBAS-16 and SPAQ and other auxiliary instruments.

Item translation. There is low agreement about the required steps of a cross-cultural adaptation process (Reichenheim & Moraes, 2007). Nevertheless, the guidelines proposed by Beaton et al. (2000) are followed by a large body of the research, with minor modifications (Arafat et al., 2016). Therefore, we mainly based our methods on Beaton's (2000) recommendations with the addition of more up to date insights from (**borsa2012?**). Fig X summarize the steps taken in the process.

The procedures described were applied both to Dysfunctional Beliefs and Attitudes about Sleep (DBAS-16) as well as to the SPAQ. However, the expert committee and the

first translation team had a different configuration for each instrument.

In the first stage the items of the original versions were translated from English (source language) to Portuguese (target language) by three independent translators in each case, of which two were familiar with the instrument constructs and the other unaware of its concepts and with no clinical or medical background. The three versions were synthesized by an expert committee of health professionals. The rationale for the decisions was registered in an adaptation of the form proposed by Koller et al. (2012), given to the members of the committee. Then, two independent translators fluent in the source language back translated the synthesized version to English. We reconciled the back translations into a single version and submitted it to appreciation by the first author of the original questionnaire. Together with the expert committee we debated over suggestions raised by the original authors and made changes accordingly to the translated version.

As the final step, we conducted a pilot study with 15 participants from the target population to probe the pre-final version. There were 12 female participants and overall mean age was 43 years (range: 19–57 years). As to avoid restricting the feedback to specific regional contexts (Borsa et al., 2012), we aimed to diversify our sample with participants from every region of the country and with varying educational level. We were able to interview nine participants from the Southwest region, three from South, two from Northeast and one from Middle-west. We conducted individual cognitive interviews with each participant. Overall participants had a good comprehension of the test items and instructions and only a single term was replaced in DBAS-16 (see change history on the electronic supplementary materials).

Aditional measures

1. *Insomnia Severity Index (ISI)* (Bastien et al., 2001; Morin et al., 2011) is a 7-item questionnaire to assess insomnia severity and its impact on the patient's life. Raters use a 5-point scale ranging from 0 (no problem) to 4 (very severe problem). We used the Brazilian-portuguese version (Castro, 2011).
2. *The Hospital Anxiety and Depression Scale (HADS)* (Zigmond & Snaith, 1983) is a

scale used to assess psychological distress in non-psychiatric patients. It is formed by a two-factor structure with 7 items assessing Anxiety plus 7 items measuring Depression. A Brazilian-portuguese version produced by Botega et al. (1995) was used.

3. *Acceptance and Action Questionnaire-II (AAQ-II)* (Bond et al., 2011; Hayes et al., 2004) is a measure of psychological flexibility composed by seven items rated in a scale from 1 (never true) to 7 (always true). it is scored by adding up scores for each question. Higher scoring indicate less flexibility. The Brazilian-portuguese version used in this study was produced by Barbosa and Murta (2015).

Analytical Plan

Descriptive statistics. This phase comprise examination of response frequency and item statistics in order to assess item variation and data entry quality. Items with insufficient variation might be bad for differentiating respondents. We'll also estimate inter-item correlations and scan for multivariate outliers to identify if there are any anomalous response patterns.

Partial results

Cross-cultural adaptation

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Appendix A

Sets of IADS sounds used in Experiment 1: Valence Positive, Neutral, Negative

Table A1
Sound-Nr. (Bradley & Lang, 2007)

Positive	Neutral	Negative
110	109	278
172	171	279
725	206	285
809	221	296
810	270	501
811	365	624
815	367	625
816	368	711
817	375	712
820	722	719

Appendix B

Priors for the Bayesian logistic mixed effects regression models of two-alternative forced choice responses

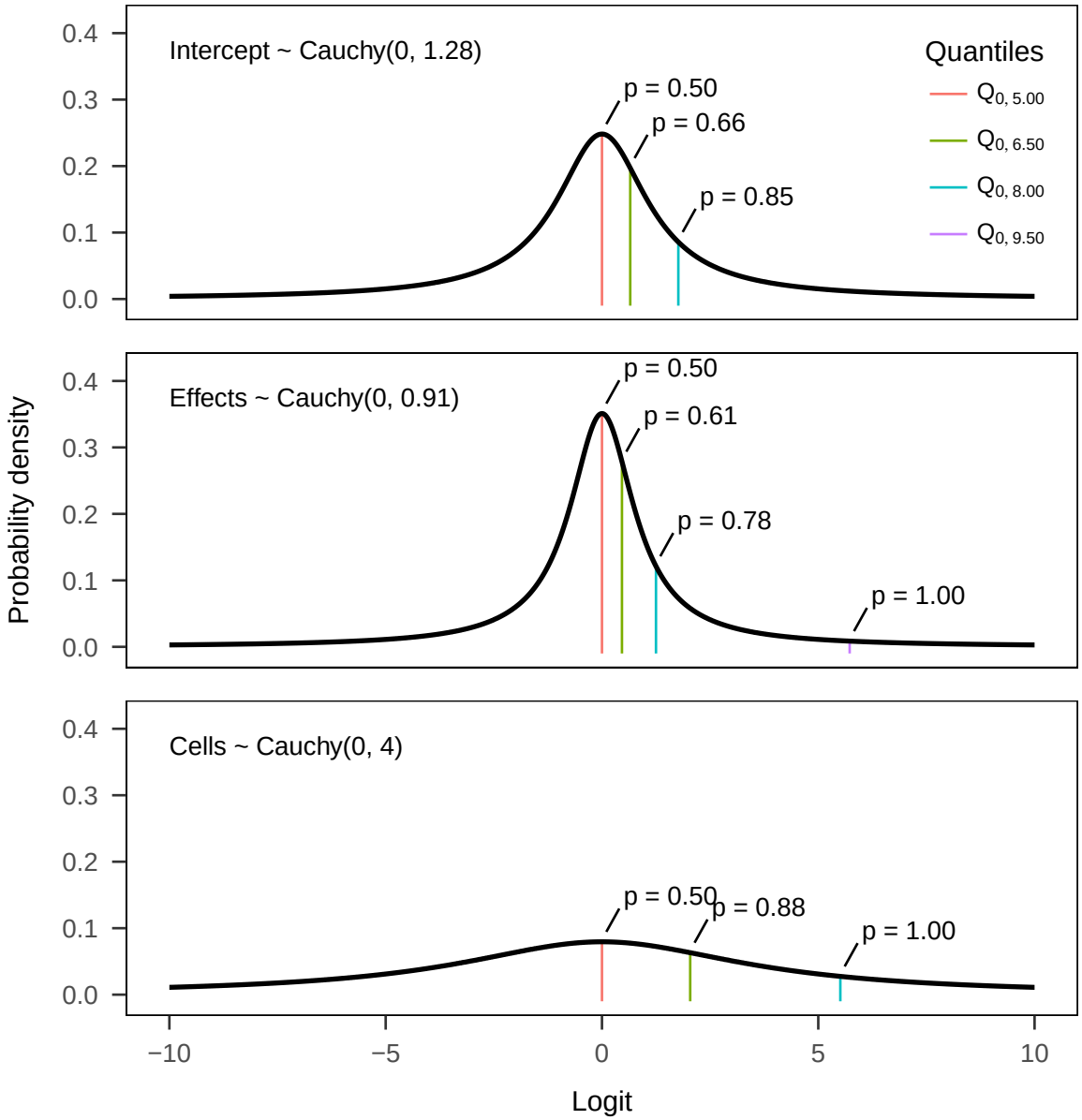

Figure B1. Priors for the Bayesian logistic mixed effects regression models of two-alternative forced choice responses. Colored lines represent distribution quantiles; annoted probabilities represent the resulting probability of choosing a positively paired CS starting from chance level (p = 0.5).

Appendix C

Mean CS visibility (Experiment 2 and Experiment 3)

Mean Visibility scores of each CS in Experiment 2 (chance level = .250, $N = 37$) and pilot of Experiment 3 (chance level = .125, $N = 7$) and the presentation time for each stimulus as used in Experiment 3.

Table C1
Mean CS visibility

CS	Visibility Study 2	Visibility Pilot	Set
03.png	.512	.400	1000 ms
08.png	.540	.329	1000 ms
14.png	.900	.657	1000 ms
22.png	.475	.400	1000 ms
04.png	.438	.200	20 ms
20.png	.400	.271	20 ms
50.png	.356	.129	20 ms
51.png	.423	.243	20 ms