Cross-cultural adaptation and psychometric studies of the Dysfunctional Beliefs and Attitudes about Sleep scale and the Sleep Problem Acceptance Questionnaire

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Cross-cultural adaptation and psychometric studies of the DBAS-16 and SPAQ

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Summary

Insomnia disorder is characterized by frequent complaints about the quality and quantity of sleep. Prolonged exposure may cause physical and psychological damage. Negatively toned activity about sleep is a known reinforcer of insomnia. Because of that, treatments focusing on cognitive components of insomnia, such as Cognitive Behavior Therapy and Acceptance and Commitment Therapy, are popular alternatives or complements to drug therapy with known efficacy. Some specific tools to assess sleep-related cognitions are the Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS-16) – measuring the strength of agreement to maladaptive beliefs about sleep–, and the Sleep Problem Acceptance Questionnaire (SPAQ), created to assess acceptance levels of sleep problems. Although these scales have been subject to psychometric scrutiny, it is necessary to test for validity evidence with a Brazilian-Portuguese-speaking sample to achieve valid, reliable, and reproducible results with such a population using these tools. Therefore, the present study proposes a cross-cultural adaptation and study of the psychometric properties and validity evidences of the DBAS-16 and the SPAQ. The target sample is between 18 and 59 years old, with participants with and without insomnia complaints. The steps of the cross-cultural adaptation process were: forward translation, synthesis, back-translation, review and, pre-testing. We collected data from 1397 individuals with a mean age of 38.4 years, of which 1130 were female and 1062 reported insomnia symptoms. The analysis plan includes: Non-parametric item response theory, Confirmatory Factor Analyses, Multiple-group CFA, Reliability estimates of internal consistency and temporal stability, test of convergent validity with related constructs, and exploratory analysis using the Network psychometric approach.

Keywords: sleep-related cognitions, validity, insomnia, assessment.

Introduction

Insomnia is a disorder related to dissatisfaction with the duration or quality of sleep. It can be a source of distress and impairment by decreasing productivity and lowering energy to engage in social activities (American Psychiatric Association, 2013). Prolonged exposure is associated with a higher risk of adverse outcomes on mental health (Johnson et al., 2006; Taylor et al., 2005) and cognitive functioning (Fortier-Brochu et al., 2012).

Cognitive and behavioral models of insomnia emphasize the role of sleep-related cognitions as maintainers of insomnia. Cognitive arousal is crucial to several behavioral models of insomnia as a maintainer of the disorder (Espie et al., 2006; Harvey, 2002; Lundh, 2005; Morin et al., 1993; Ong et al., 2012; Perlis et al., 1997). Cognitive-behavioral treatments target modifying habits, routines, and ineffective beliefs about sleep, which correlates with objective and subjective improvements in sleep (Harvey et al., 2014; Montserrat Sánchez-Ortuño & Edinger, 2010). Despite its known effectiveness in insomnia treatment, some patients gain little from the cognitive-behavioral approaches (Dalrymple et al., 2010). An alternative treatment for insomnia is Acceptance and Commitment Therapy (ACT), which also focuses on cognitions (their role rather than contents or topographies) but promotes acceptance of feelings and thoughts related to symptoms rather than control (Hayes et al., 2011).

Be it either approach, these non-pharmacological treatments for insomnia are an effective and reliable alternative or complement to drug therapy (Hertenstein et al., 2014; Thakral et al., 2020). Because of that, it is also essential that valid and reliable assessment tools are available to examine the severity of symptoms or the results of an intervention, either in clinical or research settings. Two tools for assessing sleep-related cognitions are the Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS) and the Sleep Problem Acceptance Questionnaire (SPAQ). Although used widely worldwide, no study has assessed its psychometric properties with a Brazilian sample to date. Given that those measures were developed in a distinct cultural setting, it is necessary to obtain evidence for the applicability of these instruments within a specific context of a Brazilian-Portuguese-speaking population prior to usage in high-stakes settings.

Dysfunctional beliefs and attitudes about sleep

A. G. Harvey's model (2002) is frequently mentioned as theoretical background in investigations of cognitive processes 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 actual 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 exacerbate negatively toned cognitive activity. Such beliefs are also the backbone of the Microanalytic model (Morin, 1993), one of the most popular models for insomnia (Marques et al., 2015).

Current evidence favors that beliefs and attitudes about sleep mediate 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). The Microanalytic model (1993) suggests that insomnia maintenance feeds from a cyclic process of arousal, dysfunctional cognitions, maladaptive habits, and consequences. Arousal refers to excessive emotional, cognitive, or physiologic activity, which can create core beliefs that guide information processing (Marques et al., 2015). Consequences may include unrealistic expectations, rigid beliefs about sleep requirements, and 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. Real or perceived consequences are linked to diminished performance during the day.

Constructs and Their Relations. Individuals with higher insomnia symptoms are typically strong endorsers of dysfunctional beliefs about sleep (Carney & Edinger, 2006; Crönlein et al., 2014; Eidelman et al., 2016). Challenging those beliefs is at 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 (D. et al., 2021). Insomnia severity was identified as a risk factor for anxiety (Neckelmann et al., 2007) and depression (Blanken et al., 2020; Li et al., 2016). Nevertheless, some suggest these relationships are 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). Displeasing memories created through exposure to adverse experiences can elicit anxiety (Brewin, 1996). Thus, unrealistic attributions and expectations about sleep (or lack of sleep) may prompt anxiety-provoking thoughts. There is also evidence that dysfunctional beliefs about sleep are an indirect pathway between insomnia and depression (Sadler et al., 2013), consistent with Beck's (1979) formulation that individuals with negative cognitive styles are vulnerable to depression.

Measurement. Morin et al. (1993) developed the Dysfunctional Beliefs and Attitudes About Sleep Scale (DBAS) to assess sleep-disruptive cognitions. The DBAS is broadly employed in experimental studies assessing sleep-related cognitions, especially the 16-item version (Thakral et al., 2020). This instrument 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 with a 11-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 fifth second-order general factor. 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). Many researchers have translated and validated the DBAS-16 across various cultures (Boysan et al., 2010; Dhyani et al., 2013; Lang et al., 2017). These studies successfully replicated the original factor structure and presented good validity evidence.

Acceptance of sleeping problems

Shifting from the sole focus on the cognitive processes, “third generation” behavior therapies include metacognition as a target for intervention (i.e., changing how one relates to their thoughts rather than changing their contents) (Hayes, Follette, et al., 2004). Early models of insomnia including the metacognitive content refer to the interpretation of one’s sleep patterns or consequences of poor sleep as sleep interpreting processes (Lundh & Broman, 2000). These models also integrate arousal events as critical components to the causal chain that leads to insomnia. Lundh (2005) presented the idea that insomnia originates from the inability to disengage from information processing. He further argues that cognitive deactivation is essential for sleep occurrence, and efforts of metacognitive control prevent spontaneous relaxation. Insomnia is then maintained by the mutual contribution of sleep interfering and interpreting processes. Acceptance of the naturally occurring sleep processes through adopting an adaptive stance may help reduce arousal preventing the perpetuation of this cycle (Ong et al., 2012).

Constructs and Their Relations. The relationship between acceptance and constructs like insomnia, anxiety, and depression is similar to that expected in the cognitive behavioral model. As some theoretical models propose, insomnia is linked to a stringent attachment to sleep needs and expectations, which feeds worry, thought suppression, and rumination (Lundh, 2005; Ong et al., 2012). Although there is scarce investigation of the effects of acceptance-based therapies on primary insomnia, there is promising evidence that ACT is effective in reducing the severity of insomnia and improving sleep quality in such patients (Paulos-Guarnieri et al., 2022; Rash et al., 2019; Salari et al., 2020). Review studies also summarize compelling evidence that lower levels of psychological flexibility – from which acceptance is a process – are linked to symptoms of depression and anxiety (Bai et al., 2020; Bluett et al., 2014; Ruiz, 2010; Twohig & Levin, 2017). Additional evidence suggests that psychological inflexibility correlates with higher levels of sleep difficulty even after controlling for the effect of depressive symptoms (Kato, 2016).

Measurement. The Sleep Problem Acceptance Questionnaire (SPAQ) (Bothelius et al., 2015) is the only measure of acceptance of sleep difficulties with validated scores. This instrument is an adaptation of the Chronic Pain Acceptance Questionnaire. SPAQ is gradually gaining popularity as an assessment tool in ACT-based interventions for insomnia in addition to or replacement of more general measures of acceptance (Paulos-Guarnieri et al., 2022). Ultimately, SPAQ aims to examine the role of acceptance concerning sleep quality. Its items were purposely developed to resemble similar acceptance questionnaires used in other behavioral medicine contexts. Four items compose each factor; respondents rate them on a 7-point scale, where 0 means "Disagree," and six indicates "Completely agree". SPAQ presents a two-factor structure: *Activity Engagement* and *Willingness* – which correlates negatively (r = -0.26) (Bothelius et al., 2015). *Activity Engagement* relates to persistence with normal activities despite perceived dissatisfaction with sleep, whereas *Willingness* captures the ability to give up fighting sleep problems and controlling sleep.

The cross-cultural adaptation process

Psychologists must conduct psychometric studies of their assessment tools to prove that the scale items are good approximations of the intended construct (McNeish, 2022). Before using an existing psychological instrument in a distinct context of how it was originally developed, it is vital to assess the construct's existence and similarity since it may manifest itself differently (Flake et al., 2017; Herdman et al., 1998). A model proposed by Herdman et al. (1998) devises five types of equivalence to be assessed, namely: (1) Conceptual equivalence; (2) Item equivalence; (3) Semantic equivalence; (4) Operational equivalence; and (5) Measurement equivalence. There are many suggestions for the required steps of a cross-cultural adaptation process (Reichenheim & Moraes, 2007). Nevertheless, much of the published research in cross-cultural adaptation follows Beaton's (2000) guidelines (Arafat et al., 2016).

1. Items translation. 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 (Borsa et al., 2012; Epstein et al., 2015; Geisinger, 1994; Reichenheim & Moraes, 2007). They should work independently; preferably, one translator is aware of the concepts underlying the questionnaire, while the second should have no expertise in its context and be blind or unfamiliar with it (Beaton et al., 2000). The mixed configuration of the translation team is justified because the informed translators can find appropriate correspondences to highly domain-specific words or expressions. In contrast, naive translators are prone to choose terms closer to those used routinely by the target population.

2. Synthesis of the translations. Once the initial translations are completed, a committee should consider the original instrument and the translated versions and reach an agreement for a single version. Most cross-cultural adaptation guidelines suggest at least three committee members: the two initial translators and a third unbiased judge (Koller et al., 2012). There are also suggestions that this committee can be composed of judges experts on the concepts underlying the questionnaire (Epstein et al., 2015; Guillemin et al., 1993). Regardless, judges and authors should work together to assess the equivalence between the original version and the translations regarding semantics, idiomatic equivalence, experiential equivalence, and conceptual equivalence (Borsa et al., 2012).

3. Back-translation. In the back-translation phase, the synthesized version should be translated back to the source language in at least two new versions, produced by translators fluent in the source language and with a strong target language domain (Gjersing et al., 2010; Guillemin et al., 1993). Beaton et al.'s (2000) guideline suggests that the back-translation should precede the synthesis of the initial translations. However, Borsa et al. (2012) favor delaying this procedure to the last stage of the cross-cultural adaptation process, given that the translation must be thoroughly evaluated before the appreciation by the original authors. There are, therefore, different views of when one should execute this phase – or even if it is necessary, given the lack of evidence of its contribution to improving the instrument adaptation (Epstein et al., 2015; Geisinger, 1994; van Widenfelt et al., 2005). Be that as it may, the back-translation process is a way for the original authors to assess the equivalence of meaning between the original and translated items and identifying inconsistencies or conceptual errors (Beaton et al., 2000; Borsa et al., 2012).

4. Expert committee. As hinted in previous sections, there are different views on the formation of the expert committee or when it should be called to action. Authors such as Beaton et al. (2000) suggest that the group should be composed of methodologists, health professionals, language professionals, and translators (forward and back translators) who are so far involved in the process. They also encourage carefully recording of each decision made by the committee. What underlies this phase is the assessment of aspects not yet considered, such as instrument structure, layout, instructions, and adequacy of expressions in the items (Borsa et al., 2012).

5. Pilot study. After completing adjustments, the instrument is ready for a pre-test with a small sample representative of the target population. For many authors, the pilot study is succeeded only by the final semantic adjustments suggested by the pre-testing sample (Beaton et al., 2000; Dortas Junior et al., 2016; Gjersing et al., 2010; Reichenheim & Moraes, 2007; Wild et al., 2005). The pre-testing may unveil unanticipated issues the test subjects might encounter and any divergences regarding the comprehension of item meaning and expressions as well as the test instructions (Borsa et al., 2012; Epstein et al., 2015; van Widenfelt et al., 2005). In short, the purpose of the pre-test is to assess whether the examinees can comprehend the concept of the questions consistently and as intended by the researchers (Collins, 2003). The pre-testing can be executed with a focus group – where researchers collect the participants' impressions about the writing and content of the instrument –or through individual cognitive interviews, which allow a deeper understanding of the issues raised by the participants (Epstein et al., 2015). Recommendations following the exact sample size for the pilot study also vary. For instance, Beaton et al. (2000) suggest probing 30 to 40 subjects. Other authors suggest more modest numbers, like 6 to 10 (Epstein et al., 2015) or 5 to 8 subjects (Wild et al., 2005). More relevant than an exact sample size for the pilot study is that participants are a representative sample that should reflect the diversity of cultural backgrounds in the target population (Borsa et al., 2012).

Objectives

The current project, therefore, aims at (a) developing a Brazilian-Portuguese translation of the Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS-16) and the 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 (CFAs), 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 an RMSEA of 0.059 in a CFA for DBAS-16. Taking this value as a prior guess for the populational RMSEA value, we calculated the sample sizes required 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 α of 0.05. Results show that 216 subjects are necessary to reject the test for not-close fit, and 920 participants are required to reject the test of close fit. 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 publication (Bothelius et al., 2015).

The Ethics Committee of the General Hospital of the University of São Paulo, School of Medicine (HC-FMUSP), São Paulo, Brazil (CAAE: 46284821.1.0000.0068) approved this study. Inclusion criteria were age between 18 and 59 years and reported having no difficulties in reading or writing in Portuguese.

Participants were recruited mainly from online advertisements, especially on HC-FMUSP's social media platforms (Instagram and Facebook). The data collection took place between May 2021 and July 2022, with brief breaks in between. Because the measures evaluated in this study refer to sleep difficulties, we sought to include participants with and without insomnia complaints. The first group was people registered for an experimental behavioral treatment for insomnia, which this study is a branch. To recruit participants without insomnia complaints, we asked for volunteer participation of people believing not to have sleeping problems.

Bad sleepers were classified according to the presence of insomnia complaints: (i) difficulty initiating and/or maintaining sleep, defined as a sleep onset latency and/or wake after sleep onset greater than or equal to 30 minutes, with a corresponding sleep time of less than or equal to six hours per night; (ii) presence of insomnia for more than three nights per week and more than three months; (iii) sleep disturbance (or associated daytime fatigue) causing significant distress or impairment in social, occupational, or other areas of functioning. This definition represents a combination of criteria from the International Classification of Sleep Disorders and the Diagnostic and Statistical Manual of Mental Disorders, along with quantitative cutoffs typically used in insomnia research (American Academy of Sleep Medicine, 2014; American Psychiatric Association, 2013; Edinger et al., 2004). In addition to these criteria, participants' total score on the Insomnia Severity Index should not exceed 7 points (Bastien et al., 2001).

Participants were informed about the main objective of the research and signed the informed consent. They were informed that their answers would be kept confidential and that all procedures guaranteeing the privacy of their results would be adopted. Then, they were 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. We mainly based our methods on Beaton's (2000) recommendations with the addition of more up-to-date insights from Borsa et al. (2012). The following procedures were applied both to DBAS-16 as well as to SPAQ. Only the expert committee and the first translation team had a different configuration for each instrument. Figure 1 summarizes the steps taken in the process.

In the first stage, the items of the original versions were translated from English (source language) to Portuguese (target language) by three independent translators. Two were familiar with the instrument constructs and the other, English teachers unaware of the instrument concepts and with no clinical or medical background. An expert committee of health professionals in insomnia synthesized the three versions. A form adapted from Koller et al. (2012) was given to each committee member to register the rationale for the decisions (see Appendix C). Then, two independent translators, native speakers of 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 both first authors of the original questionnaires. Together with the expert committee, we debated over suggestions raised by the original authors and made changes accordingly to the translated version.

In 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 the overall mean age was 43 years (range: 19–57 years). To obtain feedback from diverse regional contexts (Borsa et al., 2012), we recruited participants from the five Brazilian regions and with varying educational levels. We could interview nine participants from the Southwest region, three from the South, two from the Northeast, and one from Middle-west. We conducted individual cognitive interviews with each participant.

Additional 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). Respondents are classified as follows: absence of insomnia (0–7), mild insomnia (8–14), moderate insomnia (15–21), and severe insomnia (22–28). We used the Brazilian-Portuguese version (Castro, 2011).
2. *The Hospital Anxiety and Depression Scale (HADS)* (Zigmond & Snaith, 1983) assesses psychological distress in non-psychiatric patients. It contains a two-factor structure with seven items assessing Anxiety plus seven other items measuring Depression. All items refer exclusively to the emotional state and do not reflect somatic symptoms. The total score for each subscale is 0–21. Scores of 0–8 indicate the absence of anxiety/depression, and scores of 9 and above indicate the presence of anxiety/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, Strosahl, et al., 2004) is a measure of psychological flexibility composed of seven items rated on a scale from 1 (never true) to 7 (always true). It is scored by adding up scores for each question. Higher scoring indicate high psychological *inflexibility*. The Brazilian-Portuguese version used in this study was produced by Barbosa and Murta (2015).

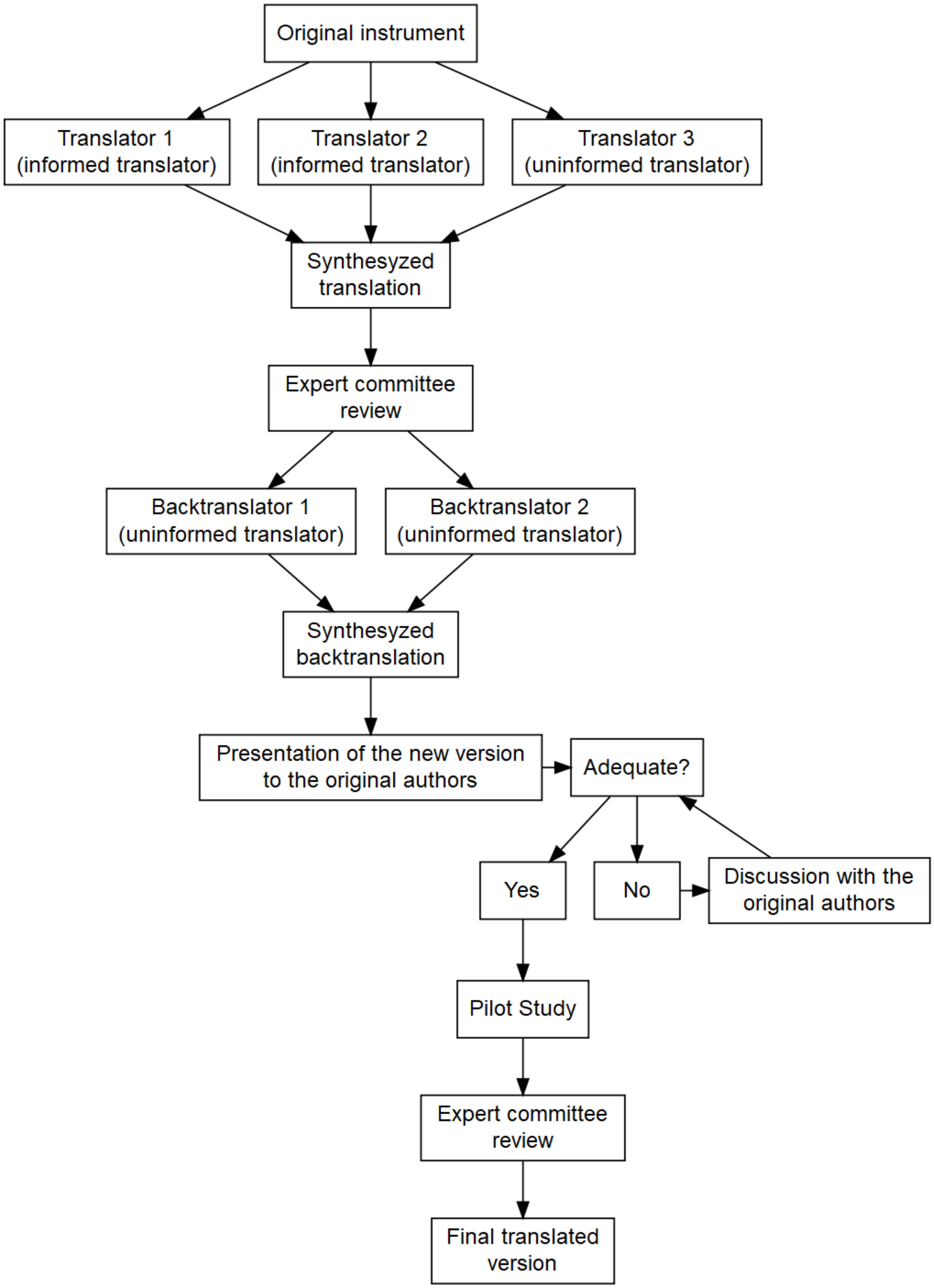

Figure 1. Stages of cross-cultural adaptation. Adapted from "Cross-Cultural Adaptation and Validation of Psychological Instruments: Some Considerations", by J. C. Borsa, B. F. Damásio and D. R. Bandeira, 2012, Paidéia, 22(53), 423-432; "Guidelines for the Process of Cross-Cultural Adaptation of Self-Report Measures", by D. E. Beaton, C. Bombardier, F. Guillemin, and M. B. Ferraz, 2000, SPINE, 25(24), 3186-3191.

Analytical Plan

Descriptive statistics. This phase examines of response frequency and item statistics to assess item variation, distribution, and data entry. Items with insufficient variation might be inadequate for differentiating respondents and may need to be excluded or merged into fewer categories (Dima, 2018). We will also diagnose inter-item correlations, scan for multivariate outliers (via Mahalanobis distance) to identify any anomalous response patterns, and verify if the items follow a multivariate normal distribution.

Non-parametric item response theory (NIRT). Next, we examine item response patterns using Mokken Scaling Analysis (MSA), a non-parametric Item Response Theory (NIRT) technique. NIRT models provide a more flexible alternative to models from the parametric item response theory (PIRT) family by employing less restrictive assumptions about the data. However pertaining to both models, assumptions such as Local independence, Monotonicity, and Unidimensionality can be weakened in such ways in NIRT that an ordinal measurement is possible (Junker & Sijtsma, 2001). The MSA approach requires that the item response function (IRF) meet only ordering requirements, exempting the need to match a particular shape (Wind, 2017). MSA allows ordering people on latent variable θ by their test scores; investigating unidimensionality by identifying subscales and deviating items using the AISP algorithm; estimation of the item step response functions (ISRFs; i.e., the probability of obtaining at least score x_j given a latent variable θ, $P(X_j \geq x_j|\theta)$) and assessment of the non-monotonicities (i.e., probability of endorsing a 'correct' response option not increasing with increasing levels of the latent dimension); and differential item functioning (i.e., if the same item have different response probabilities for people having the same θ level but who are members of two different groups) (Sijtsma & van der Ark, 2017). To run the analyses, we will use the `mokken` package available in R (Van der Ark, 2007, 2012).

Structural Validity Evidence. To assess the factorial structure of both measures, we will conduct Confirmatory Factor Analyses (CFAs) taking as a priori guess the aspects of the original models (i.e, the number of factors present in the data, which indicators are related to which factors, presence of higher-order or bi-factor structure etc.). Given that our data was collected using Likert scales with more than six ordered categories, we have opted to follow recent suggestions to use the Maximum Likelihood with Robust standard errors

(MLR) estimator (Rhemtulla et al., 2012). To evaluate model fit, we will use the following fit statistics: chi-squared (χ^2); Tucker-Lewis Index (TLI); Comparative Fit Index (CFI); Relative Noncentrality Index (RNI); Root Mean Square Error of Approximation (RMSEA); and Standardized Root Mean Squared Residual (SRMR).

CFA studies have traditionally relied on fixed cutoff values such as SRMR $\leq$ .08, RMSEA $\leq$ .06, and CFI, TLI, and RNI $\geq$ .96 to assess model misspecification (Hu & Bentler, 1999). Although used broadly, adopting such criteria does not come without its problems, as with many other one-size-fits-all solutions used in applied psychological research (McNeish & Wolf, 2021). Moreover, these cutoff values were established for continuous data analyzed using the normal-theory maximum likelihood (ML). Therefore, following Xia and Yang's (2019) recommendations, we will interpret these fit indices as diagnostic tools rather than a blind criterion for accepting or rejecting the hypothesized models.

We also plan to investigate measurement invariance across groups with and without insomnia symptoms (i.e., if the psychometric properties of the scales are equivalent across groups). To attain this goal we'll use the multiple-group CFA (MGCFA) approach. The MGCFA approach tests invariance by constraining measurement properties (i.e., factor structure, factor loadings, intercepts, and residual variances) across groups in increasingly restrictive models (Flake & Luong, 2021). In each stage we test differences in fit between the restricted model and the less-restricted model looking at exact fit in terms of χ^2 and degrees of freedom, CFI and, RMSEA (Wicherts & Dolan, 2010). We also look at the Akaike information criterion (AIC) and the Bayesian information criterion (BIC), where, for those two, lower values are an indication of better fit. We will use the R package `lavaan` (Rosseel, 2012) to conduct these tests.

Reliability Estimators. In Classical Test Theory (CTT), the reliability of a test is the ratio of true score variance to test score variance (McDonald, 1999). The internal consistency of a scale is a test of reliability that measures the degree to which the set of items co-vary, relative to their sum score (Cronbach, 1951). To indicate it we'll estimate Cronbach's alpha (α), McDonald's omega total (ω_t), and omega hierarchical (ω_h). Although α is the most common measure of internal consistency reliability, ω_t (assumes an unidimensional scale) and ω_h (best for scales that may contain subfactors) are better alternatives because, contrary to α, it does not assume tau equivalence (i.e., loadings are not assumeded to be equal) (McNeish, 2018). The internal consistency indices will be calculated using the R package `MBESS` (Kelley, 2022). Common guidelines suggests internal consistency indices $\geq$ .70 as an acceptable threshold for reliability (Kline, 1986).

In addition to internal consistency, we will estimate the test-retest reliability to assess the consistency of test scores across time. This phase comprises a simple calculation of the Pearson product-moment correlation between baseline test scores and a second administration taken 14 days later. Higher correlation coefficients indicate high test-retest reliability.

Convergent validity evidence. Convergent validity refers to the expected relationship between test scores and other measures of the same or similar constructs (American Educational Research Association, American Psychological Association and National Council on Measurement in Education, 2014). Regarding the DBAS-16, we expect a positive correlation between its scores and the HADS subscales of depression and anxiety and with IGI scores. For SPAQ, the same relationships are expected with the addition of a negative correlation with AAQ-II scores.

Network psychometrics. Psychiatry and psychology have recently begun to shift from viewing psychopathology as originating from a root cause (e.g., latent variable models) to an approach that models it as a network of causal interactions among symptoms (Borsboom, 2008; Borsboom & Cramer, 2013; Bringmann et al., 2022). In line with these recent formulations, we will conduct exploratory analyses of the scales subject of this study following a psychometric network perspective. We will conduct this phase following the steps outlined by Christensen, Golino, et al. (2020) to test validity from the network perspective: a) Redundancy Analysis, b) Dimension Analysis, and c) Internal Structure Analysis. All these analyses will be performed using the `EGAnet` (H. Golino & Christensen, 2022) package for R.

Redundant items can cause unintended effects when estimating dimensionality in psychometric modeling. The shared substantive cause may obscure the interpretation of centrality measures in network models. For latent variable models, it has the potential to cause a violation of the principle of local independence, resulting in a poor fit (Christensen, Garrido, et al., 2020). To detect redundant items, we can use the *Unique Variable Analysis*

(UVA) (Christensen, Garrido, et al., 2020). This algorithm first computes the association structure of the observed data, then uses a threshold or significance test to determine redundancy between pairs of variables. The redundant variables can be removed, leaving only one non-redundant indicator, or aggregated as latent variables.

To estimate dimensionality, we take advantage of a popular technique in the psychometric network literature called *Exploratory Graph Analysis* (EGA) (H. F. Golino & Epskamp, 2017). This method estimates the number of dimensions in multivariate data using undirected network models. The EGA algorithm first estimates a Gaussian Graphical Model, using the graphical least absolute shrinkage and selection operator (GLASSO), then applies the Walktrap community detection algorithm to determine the number and content of communities in the network. These communities in network models are statistically equivalent to factors of latent variable models (H. F. Golino & Epskamp, 2017).

A network equivalent of factor loadings is a measure called *network loading* (Christensen & Golino, 2021a). These loadings represent the unique contribution of each node to the emergence of a dimension in a network. The authors of this method also argue that network and factor loadings are comparable when the data-generating model is a factor model.

Computing internal consistency measures from a network perspective is not possible because the necessary common covariance between items is removed in network models (Christensen, Golino, et al., 2020). To overcome this limitation, Christensen, Golino, et al. (2020) suggests examining "the extent to which items in a dimension are homogeneous and interrelated given the multidimensional structure of the questionnaire" (p. 8), which they refer to as *structural consistency.* Christensen and Golino (2021b) developed the *Bootstrap Exploratory Graph Analysis* (bootEGA) to estimate this measure. In rough terms, bootEGA generates a sampling distribution of EGA results using simulated data to inform how often dimensions are replicated across the bootstrap replicates (structural consistency) and how often each item is allocated in its respective empirical dimension across replications (item stability).

Partial results

Cross-cultural adaptation

The initial translation of SPAQ and DBAS-16 instructions, rating scale, and items were a mix of translations produced by the three (for each instrument) forward translators. To some items, a particular translation was taken with minor or no modifications. Others were a merge of two or more versions with additions where it was deemed necessary. The instruments' versions produced in each stage of the cross-cultural adaptation process and detailed documentation of criteria for decisions are available at osf.io/av45j.

Once the translation process was completed, a sample of 15 subjects from the target population evaluated each instrument. Overall, participants had a good comprehension of the test items and instructions, and only a single term of the DBAS-16 required alteration for a more natural reading in the target language. We also noted that participants without sleeping problems had trouble relating to some SPAQ items due to ambiguity induced by item wording. For instance, in the first question, some participants said they would disagree with the sentence because they do not have sleep problems despite agreeing that they are living a normal life. After debating these issues with the original authors, we added a sentence to the instrument instructions asking people to think about any difficulties with sleep they have, or have had, no matter how small they feel them to be, and then answer accordingly. The final version of both DBAS-16 and SPAQ are on Appendices A and B, respectively.

Sample description

After excluding individuals who did not meet the inclusion criteria and those who failed to complete at least the first questionnaire on the survey (DBAS-16), the final sample was comprised of 1397 individuals, of which 1130 were female and 1062 reported insomnia symptoms. The sample mean age was 38.41 years (SD = 9.79, Range: 18–59.80 years). 619 participants reported having a formal job, and 1085 had a university degree. A detailed description of the sample is found on Table 1.

Table 1
Sample description

	n = 1397
Sex Male (%)	267 (19.1)
Age [mean (SD)]	38.41 (9.79)
Race (%)	
Asian	48 (3.4)
Black	331 (23.7)
Other/Not informed	13 (0.9)
White	1005 (71.9)
Marital Status (%)	
Cohabiting	179 (12.8)
Divorced	129 (9.2)
Married	488 (34.9)
Single	588 (42.1)
Widowed	13 (0.9)
Educational Level (%)	
Primary School	17 (1.2)
Secondary School	295 (21.1)
University degree or higher	1085 (77.7)
Monthly income [mean (SD)]	9197.40 (7946.13)
Occupation (%)	
Informal work	46 (3.3)
Regular job	619 (44.3)
Retired	29 (2.1)
Self-employed	410 (29.3)
Student	172 (12.3)
Unemployed	121 (8.7)
Insomnia (%)	1062 (76.0)
Region (%)	
Central-West	54 (3.9)
Northeast	105 (7.6)
Northern	36 (2.6)
Southeast	1083 (77.9)
Southern	112 (8.1)

Next steps

Table 2

Timeline of the next steps

Period	Activities
Nov/22 – Jan/23	Execute all data analyses
Feb/23 – May/23	Write manuscripts
Jun/23	Submit thesis

References

Akram, U., Gardani, M., Riemann, D., Akram, A., Allen, S. F., Lazuras, L., & Johann, A. F. (2020). Dysfunctional sleep-related cognition and anxiety mediate the relationship between multidimensional perfectionism and insomnia symptoms. *Cognitive Processing*, *21*(1), 141–148. https://doi.org/10.1007/s10339-019-00937-8

American Academy of Sleep Medicine (Ed.). (2014). *International classification of sleep disorders* (3rd ed). American Academy of Sleep Medicine.

American Educational Research Association, American Psychological Association and National Council on Measurement in Education (Ed.). (2014). *Standards for Educational and Psychological Testing*. American Educational Research Association.

American Psychiatric Association (Ed.). (2013). *Diagnostic and statistical manual of mental disorders: DSM-5* (5th ed). American Psychiatric Association.

Arafat, S., Chowdhury, H., Qusar, M., & Hafez, M. (2016). Cross Cultural Adaptation and Psychometric Validation of Research Instruments: A Methodological Review. *Journal of Behavioral Health*, *5*(3), 129. https://doi.org/10.5455/jbh.20160615121755

Bai, Z., Luo, S., Zhang, L., Wu, S., & Chi, I. (2020). Acceptance and Commitment Therapy (ACT) to reduce depression: A systematic review and meta-analysis. *Journal of Affective Disorders*, *260*, 728–737. https://doi.org/10.1016/j.jad.2019.09.040

Barbosa, L. M., & Murta, S. G. (2015). Propriedades psicométricas iniciais do acceptance and action questionnaire-II-versão brasileira. *Psico-USF*, *20*, 75–85.

Bastien, C. H., Vallières, A., & Morin, C. M. (2001). Validation of the Insomnia Severity Index as an outcome measure for insomnia research. *Sleep Medicine*, *2*(4), 297–307. https://doi.org/10.1016/s1389-9457(00)00065-4

Beaton, D. E., Bombardier, C., Guillemin, F., & Ferraz, M. B. (2000). Guidelines for the Process of Cross-Cultural Adaptation of Self-Report Measures: *Spine*, *25*(24), 3186–3191. https://doi.org/10.1097/00007632-200012150-00014

Beck, A. T. (1979). *Cognitive therapy of depression*. Guilford press.

Belanger, L., Savard, J., & Morin, C. M. (2006). Clinical management of insomnia using cognitive therapy. *Behavioral Sleep Medicine*, *4*(3), 179–198. https://doi.org/10.1207/s15402010bsm0403_4

Blanken, T. F., Borsboom, D., Penninx, B. W., & Van Someren, E. J. (2020). Network outcome analysis identifies difficulty initiating sleep as a primary target for prevention of depression: A 6-year prospective study. *Sleep*, *43*(5), 1–6. https://doi.org/gghm2s

Bluett, E. J., Homan, K. J., Morrison, K. L., Levin, M. E., & Twohig, M. P. (2014). Acceptance and commitment therapy for anxiety and OCD spectrum disorders: An empirical review. *Journal of Anxiety Disorders*, *28*(6), 612–624. https://doi.org/10.1016/j.janxdis.2014.06.008

Bond, F. W., Hayes, S. C., Baer, R. A., Carpenter, K. M., Guenole, N., Orcutt, H. K., Waltz, T., & Zettle, R. D. (2011). Preliminary psychometric properties of the acceptance and action questionnaire–II: A revised measure of psychological inflexibility and experiential avoidance. *Behavior Therapy*, *42*(4), 676–688.

Borsa, J. C., Damásio, B. F., & Bandeira, D. R. (2012). Adaptação e validação de instrumentos psicológicos entre culturas: algumas considerações. *Paidéia (Ribeirão Preto)*, *22*(53), 423–432. https://doi.org/10.1590/S0103-863X2012000300014

Borsboom, D. (2008). Psychometric perspectives on diagnostic systems. *Journal of Clinical Psychology*, *64*(9), 1089–1108. https://doi.org/10.1002/jclp.20503

Borsboom, D., & Cramer, A. O. J. (2013). Network Analysis: An Integrative Approach to the Structure of Psychopathology. *Annual Review of Clinical Psychology*, *9*(1), 91–121. https://doi.org/10.1146/annurev-clinpsy-050212-185608

Botega, N. J., Bio, M. R., Zomignani, M. A., Garcia Jr, C., & Pereira, W. A. (1995). Transtornos do humor em enfermaria de clínica médica e validação de escala de medida (HAD) de ansiedade e depressão. *Revista de Saude Publica*, *29*, 359–363.

Bothelius, K., Jernelöv, S., Fredrikson, M., McCracken, L. M., & Kaldo, V. (2015). Measuring Acceptance of Sleep Difficulties: The Development of the Sleep Problem Acceptance Questionnaire. *Sleep*, *38*(11), 1815–1822. https://doi.org/10.5665/

sleep.5170

Boysan, M., Merey, Z., Kalafat, T., & Kağan, M. (2010). Validation of a brief version of the dysfunctional beliefs and attitudes about sleep scale in Turkish sample. *Procedia - Social and Behavioral Sciences*, *5*, 314–317. https://doi.org/10.1016/j.sbspro.2010.07.095

Brewin, C. R. (1996). Theoretical foundations of cognitive-behavior therapy for anxiety and depression. *Annual Review of Psychology*, *47*(1), 33–57.

Bringmann, L. F., Albers, C., Bockting, C., Borsboom, D., Ceulemans, E., Cramer, A., Epskamp, S., Eronen, M. I., Hamaker, E., Kuppens, P., Lutz, W., McNally, R. J., Molenaar, P., Tio, P., Voelkle, M. C., & Wichers, M. (2022). Psychopathological networks: Theory, methods and practice. *Behaviour Research and Therapy*, *149*, 104011. https://doi.org/10.1016/j.brat.2021.104011

Carney, C. E., & Edinger, J. D. (2006). Identifying Critical Beliefs About Sleep in Primary Insomnia. *Sleep*, *29*(3), 342–350. https://doi.org/10.1093/sleep/29.3.342

Castro, L. S. (2011). *Adaptação e validação do Índice de Gravidade de Insônia (IGI)* [PhD thesis]. Universidade Federal de São Paulo.

Chen, P.-J., Huang, C. L.-C., Weng, S.-F., Wu, M.-P., Ho, C.-H., Wang, J.-J., Tsai, W.-C., & Hsu, Y.-W. (2017). Relapse insomnia increases greater risk of anxiety and depression: Evidence from a population-based 4-year cohort study. *Sleep Medicine*, *38*, 122–129. https://doi.org/10.1016/j.sleep.2017.07.016

Chow, P. I., Ingersoll, K. S., Thorndike, F. P., Lord, H. R., Gonder-Frederick, L., Morin, C. M., & Ritterband, L. M. (2018). Cognitive mechanisms of sleep outcomes in a randomized clinical trial of internet-based cognitive behavioral therapy for insomnia. *Sleep Medicine*, *47*, 77–85. https://doi.org/10.1016/j.sleep.2017.11.1140

Christensen, A. P., Garrido, L. E., & Golino, H. (2020). *Unique variable analysis: A network psychometrics method to detect local dependence* [Preprint]. PsyArXiv. https://doi.org/10.31234/osf.io/4kra2

Christensen, A. P., & Golino, H. (2021a). On the equivalency of factor and network loadings. *Behavior Research Methods*, *53*(4), 1563–1580. https://doi.org/10.

3758/s13428-020-01500-6

Christensen, A. P., & Golino, H. (2021b). Estimating the Stability of Psychological Dimensions via Bootstrap Exploratory Graph Analysis: A Monte Carlo Simulation and Tutorial. *Psych*, *3*(3), 479–500. https://doi.org/10.3390/psych3030032

Christensen, A. P., Golino, H., & Silvia, P. J. (2020). A psychometric network perspective on the validity and validation of personality trait questionnaires. *European Journal of Personality*, *34*(6), 1095–1108. https://doi.org/10.1002/per.2265

Chung Ka-Fai, Ho Fiona Yan-Yee, & Yeung Wing-Fai. (2016). Psychometric Comparison of the Full and Abbreviated Versions of the Dysfunctional Beliefs and Attitudes about Sleep Scale. *Journal of Clinical Sleep Medicine*, *12*(06), 821–828. https://doi.org/10.5664/jcsm.5878

Collins, D. (2003). Pretesting survey instruments: An overview of cognitive methods. *Quality of Life Research*, *12*(3), 229–238. https://doi.org/10.1023/A:1023254226592

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, *16*(3), 297–334. https://doi.org/10.1007/BF02310555

Crönlein, T., Wagner, S., Langguth, B., Geisler, P., Eichhammer, P., & Wetter, T. C. (2014). Are dysfunctional attitudes and beliefs about sleep unique to primary insomnia? *Sleep Medicine*, *15*(12), 1463–1467. https://doi.org/gn3m9k

D., E. J., Todd, A. J., M., B. S., E., C. C., J., H. J., L., L. K., J., S. M., M., T. W., S., Z. E., Uzma, K., L., H. J., & L., M. J. (2021). Behavioral and psychological treatments for chronic insomnia disorder in adults: An American Academy of Sleep Medicine systematic review, meta-analysis, and GRADE assessment. *Journal of Clinical Sleep Medicine*, *17*(2), 263–298. https://doi.org/10.5664/jcsm.8988

Dalrymple, K. L., Fiorentino, L., Politi, M. C., & Posner, D. (2010). Incorporating Principles from Acceptance and Commitment Therapy into Cognitive-Behavioral Therapy for Insomnia: A Case Example. *Journal of Contemporary Psychotherapy*, *40*(4), 209–217. https://doi.org/10.1007/s10879-010-9145-1

Dhyani, M., Rajput, R., & Gupta, R. (2013). Hindi translation and validation of dysfunctional beliefs and attitudes about sleep (DBAS - 16). *Industrial Psychiatry Journal*, *22*(1), 80–85. https://doi.org/10.4103/0972-6748.123639

Dima, A. L. (2018). Scale validation in applied health research: Tutorial for a 6-step R-based psychometrics protocol. *Health Psychology and Behavioral Medicine*, *6*(1), 136–161. https://doi.org/10.1080/21642850.2018.1472602

Dortas Junior, S. D., Lupi, O., Dias, G. A. C., Guimarães, M. B. S., & Valle, S. O. R. (2016). Cross-cultural adaptation and validation of health questionnaires. *Brazilian Journal of Allergy and Immunology (BJAI)*, *4*(1). https://doi.org/10.5935/2318-5015.20160003

Edinger, J. D., Bonnet, M. H., Bootzin, R. R., Doghramji, K., Dorsey, C. M., Espie, C. A., Jamieson, A. O., McCall, W. V., Morin, C. M., & Stepanski, E. J. (2004). Derivation of research diagnostic criteria for insomnia: Report of an american academy of sleep medicine work group. *Sleep*, *27*(8), 1567–1596.

Eidelman, P., Talbot, L., Ivers, H., BÃÂlanger, L., Morin, C. M., & Harvey, A. G. (2016). Change in Dysfunctional Beliefs About Sleep in Behavior Therapy, Cognitive Therapy, and Cognitive-Behavioral Therapy for Insomnia. *Behavior Therapy*, *47*(1), 102–115. https://doi.org/10.1016/j.beth.2015.10.002

Epstein, J., Santo, R. M., & Guillemin, F. (2015). A review of guidelines for cross-cultural adaptation of questionnaires could not bring out a consensus. *Journal of Clinical Epidemiology*, *68*(4), 435–441. https://doi.org/10.1016/j.jclinepi.2014.11.021

Espie, C. A., Broomfield, N. M., MacMahon, K. M. A., Macphee, L. M., & Taylor, L. M. (2006). The attention-intention-effort pathway in the development of psychophysiologic insomnia: A theoretical review. *Sleep Medicine Reviews*, *10*(4), 215–245. https://doi.org/10.1016/j.smrv.2006.03.002

Flake, J. K., & Luong, R. (2021). *Measurement Invariance Testing Using Confirmatory Factor Analysis and Alignment Optimization: A Tutorial for Transparent Analysis Planning and Reporting*. https://doi.org/10.31234/osf.io/qr32u

Flake, J. K., Pek, J., & Hehman, E. (2017). Construct Validation in Social and Personality Research: Current Practice and Recommendations. *Social Psychological and*

Personality Science, *8*(4), 370–378. https://doi.org/10.1177/1948550617693063

Fortier-Brochu, E., Beaulieu-Bonneau, S., Ivers, H., & Morin, C. M. (2012). Insomnia and daytime cognitive performance: A meta-analysis. *Sleep Medicine Reviews*, *16*(1), 83–94. https://doi.org/10.1016/j.smrv.2011.03.008

Geisinger, K. F. (1994). Cross-cultural normative assessment: Translation and adaptation issues influencing the normative interpretation of assessment instruments. *Psychological Assessment*, *6*(4), 304–312. https://doi.org/10.1037/1040-3590.6.4.304

Gjersing, L., Caplehorn, J. R., & Clausen, T. (2010). Cross-cultural adaptation of research instruments: Language, setting, time and statistical considerations. *BMC Medical Research Methodology*, *10*(1), 13. https://doi.org/10.1186/1471-2288-10-13

Golino, H. F., & Epskamp, S. (2017). Exploratory graph analysis: A new approach for estimating the number of dimensions in psychological research. *PLOS ONE*, *12*(6), e0174035. https://doi.org/gbjzzb

Golino, H., & Christensen, A. P. (2022). *EGAnet: Exploratory graph analysis – a framework for estimating the number of dimensions in multivariate data using network psychometrics*. https://CRAN.R-project.org/package=EGAnet

Guillemin, F., Bombardier, C., & Beaton, D. (1993). Cross-cultural adaptation of health-related quality of life measures: Literature review and proposed guidelines. *Journal of Clinical Epidemiology*, *46*(12), 1417–1432. https://doi.org/10.1016/0895-4356(93)90142-N

Harris, P. A., Taylor, R., Minor, B. L., Elliott, V., Fernandez, M., O'Neal, L., McLeod, L., Delacqua, G., Delacqua, F., Kirby, J., et al. (2019). The REDCap consortium: Building an international community of software platform partners. *Journal of Biomedical Informatics*, *95*, 103208.

Harris, P. A., Taylor, R., Thielke, R., Payne, J., Gonzalez, N., & Conde, J. G. (2009). Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *Journal of Biomedical Informatics*, *42*(2), 377–381.

Harvey, A. G. (2002). A cognitive model of insomnia. *Behaviour Research and Therapy*, *40*(8), 869–893. https://doi.org/fwxq35

Harvey, A. G., Bélanger, L., Talbot, L., Eidelman, P., Beaulieu-Bonneau, S., Fortier-Brochu, É., Ivers, H., Lamy, M., Hein, K., Soehner, A. M., Mérette, C., & Morin, C. M. (2014). Comparative efficacy of behavior therapy, cognitive therapy, and cognitive behavior therapy for chronic insomnia: A randomized controlled trial. *Journal of Consulting and Clinical Psychology*, *82*(4), 670–683. https://doi.org/10.1037/a0036606

Harvey, A. G., Dong, L., Bélanger, L., & Morin, C. M. (2017). Mediators and treatment matching in behavior therapy, cognitive therapy and cognitive behavior therapy for chronic insomnia. *Journal of Consulting and Clinical Psychology*, *85*(10), 975–987. https://doi.org/10.1037/ccp0000244

Hayes, S. C., Follette, V. M., & Linehan, M. (2004). *Mindfulness and acceptance: Expanding the cognitive-behavioral tradition*. Guilford Press.

Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (2011). *Acceptance and commitment therapy: The process and practice of mindful change*. Guilford press.

Hayes, S. C., Strosahl, K., Wilson, K. G., Bissett, R. T., Pistorello, J., Toarmino, D., Polusny, M. A., Dykstra, T. A., Batten, S. V., Bergan, J., et al. (2004). Measuring experiential avoidance: A preliminary test of a working model. *The Psychological Record*, *54*(4), 553–578.

Herdman, M., Fox-Rushby, J., & Badia, X. (1998). A model of equivalence in the cultural adaptation of HRQoL instruments. *Quality of Life Research*, *7*, 323–335.

Hertenstein, E., Thiel, N., Lüking, M., Külz, A. K., Schramm, E., Baglioni, C., Spiegelhalder, K., Riemann, D., & Nissen, C. (2014). Quality of Life Improvements after Acceptance and Commitment Therapy in Nonresponders to Cognitive Behavioral Therapy for Primary Insomnia. *Psychotherapy and Psychosomatics*, *83*(6), 371–373. https://doi.org/10.1159/000365173

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1–55. https://doi.org/10.1080/

10705519909540118

Jansson-Fröjmark, M., & Lindblom, K. (2008). A bidirectional relationship between anxiety and depression, and insomnia? A prospective study in the general population. *Journal of Psychosomatic Research*, *64*(4), 443–449. https://doi.org/10.1016/j.jpsychores.2007.10.016

Johnson, E. O., Roth, T., & Breslau, N. (2006). The association of insomnia with anxiety disorders and depression: Exploration of the direction of risk. *Journal of Psychiatric Research*, *40*(8), 700–708. https://doi.org/d5k6f6

Jorgensen, T. D., Pornprasertmanit, S., Schoemann, A. M., & Rosseel, Y. (2021). *semTools: Useful tools for structural equation modeling*. https://CRAN.R-project.org/package=semTools

Junker, B. W., & Sijtsma, K. (2001). Nonparametric Item Response Theory in Action: An Overview of the Special Issue. *Applied Psychological Measurement*, *25*(3), 211–220. https://doi.org/10.1177/01466210122032028

Kato, T. (2016). Impact of psychological inflexibility on depressive symptoms and sleep difficulty in a Japanese sample. *SpringerPlus*, *5*(1), 712. https://doi.org/gmdm5s

Kelley, K. (2022). *MBESS: The MBESS r package*. https://CRAN.R-project.org/package=MBESS

Kline, P. (1986). *A handbook of test construction: Introduction to psychometric design.* Methuen.

Koller, M., Kantzer, V., Mear, I., Zarzar, K., Martin, M., Greimel, E., Bottomley, A., Arnott, M., Kuliś, D., & The ISOQOL TCA-SIG. (2012). The process of reconciliation: Evaluation of guidelines for translating quality-of-life questionnaires. *Expert Review of Pharmacoeconomics & Outcomes Research*, *12*(2), 189–197. https://doi.org/10.1586/erp.11.102

Lancee, J., Effting, M., van der Zweerde, T., van Daal, L., van Straten, A., & Kamphuis, J. H. (2019). Cognitive processes mediate the effects of insomnia treatment: Evidence from a randomized wait-list controlled trial. *Sleep Medicine*, *54*, 86–93. https://doi.org/10.1016/j.sleep.2018.09.029

Lang, C., Brand, S., Holsboer-Trachsler, E., Pühse, U., Colledge, F., & Gerber, M. (2017). Validation of the German version of the short form of the dysfunctional beliefs and attitudes about sleep scale (DBAS-16). *Neurological Sciences*, *38*(6), 1047–1058. https://doi.org/10.1007/s10072-017-2921-x

Li, L., Wu, C., Gan, Y., Qu, X., & Lu, Z. (2016). Insomnia and the risk of depression: A meta-analysis of prospective cohort studies. *BMC Psychiatry*, *16*, 375. https://doi.org/f9bsxr

Lundh, L.-G. (2005). The Role of Acceptance and Mindfulness in the Treatment of Insomnia. *Journal of Cognitive Psychotherapy*, *19*(1), 29–39. https://doi.org/10.1891/jcop.19.1.29.66331

Lundh, L.-G., & Broman, J.-E. (2000). Insomnia as an interaction between sleep-interfering and sleep-interpreting processes. *Journal of Psychosomatic Research*, *49*(5), 299–310. https://doi.org/10.1016/S0022-3999(00)00150-1

MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods*, *1*(2), 130–149. https://doi.org/10.1037/1082-989X.1.2.130

Marques, D. R., Allen Gomes, A., Clemente, V., Santos, J. M., & Castelo-Branco, M. (2015). Hyperarousal and failure to inhibit wakefulness in primary insomnia: "“Birds of a feather"? *Sleep and Biological Rhythms*, *13*(3), 219–228. https://doi.org/10.1111/sbr.12115

McDonald, R. P. (1999). *Test theory: A unified treatment.* Lawrence Erlbaum Associates Publishers.

McNeish, D. (2018). Thanks coefficient alpha, we'll take it from here. *Psychological Methods*, *23*(3), 412–433. https://doi.org/10.1037/met0000144

McNeish, D. (2022). Limitations of the Sum-and-Alpha Approach to Measurement in Behavioral Research. *Policy Insights from the Behavioral and Brain Sciences*, *9*(2), 196–203. https://doi.org/10.1177/23727322221117144

McNeish, D., & Wolf, M. G. (2021). Dynamic fit index cutoffs for confirmatory factor analysis models. *Psychological Methods*, No Pagination Specified–No Pagination Specified. https://doi.org/gm79hm

Montserrat Sánchez-Ortuño, M., & Edinger, J. D. (2010). A penny for your thoughts: Patterns of sleep-related beliefs, insomnia symptoms and treatment outcome. *Behaviour Research and Therapy*, *48*(2), 125–133. https://doi.org/10.1016/j.brat.2009.10.003

Morin, C. M. (1993). *Insomnia: Psychological assessment and management.* Guilford press.

Morin, C. M., Belleville, G., Bélanger, L., & Ivers, H. (2011). The Insomnia Severity Index: Psychometric Indicators to Detect Insomnia Cases and Evaluate Treatment Response. *Sleep*, *34*(5), 601–608.

Morin, C. M., Stone, J., Trinkle, D., Mercer, J., & Remsberg, S. (1993). Dysfunctional beliefs and attitudes about sleep among older adults with and without insomnia complaints. *Psychology and Aging*, *8*(3), 463–467. https://doi.org/frwwvp

Morin, C. M., Vallières, A., & Ivers, H. (2007). Dysfunctional Beliefs and Attitudes about Sleep (DBAS): Validation of a Brief Version (DBAS-16). *Sleep*, *30*(11), 1547–1554. https://doi.org/10.1093/sleep/30.11.1547

Neckelmann, D., Mykletun, A., & Dahl, A. A. (2007). Chronic insomnia as a risk factor for developing anxiety and depression. *Sleep*, *30*(7), 873–880. https://doi.org/gf26g2

Norell-Clarke, A., Hagström, M., & Jansson-Fröjmark, M. (2021). Sleep-Related Cognitive Processes and the Incidence of Insomnia Over Time: Does Anxiety and Depression Impact the Relationship? *Frontiers in Psychology*, *12*. https://doi.org/gk8x3v

Ong, J. C., Ulmer, C. S., & Manber, R. (2012). Improving sleep with mindfulness and acceptance: A metacognitive model of insomnia. *Behaviour Research and Therapy*, *50*(11), 651–660. https://doi.org/f4fczt

Paulos-Guarnieri, L., Linares, I. M. P., & El Rafihi-Ferreira, R. (2022). Evidence and characteristics of Acceptance and Commitment Therapy (ACT)-based interventions for insomnia: A systematic review of randomized and non-randomized trials. *Journal of Contextual Behavioral Science*, *23*, 1–14. https://doi.org/10.1016/j.jcbs.2021.11.001

Perlis, M. L., Giles, D. E., Mendelson, W. B., Bootzin, R. R., & Wyatt, J. K. (1997). Psychophysiological insomnia: The behavioural model and a neurocognitive perspective. *Journal of Sleep Research*, *6*(3), 179–188. https://doi.org/fcrnvj

R Core Team. (2022). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. https://www.R-project.org/

Rash, J. A., Kavanagh, V. A. J., & Garland, S. N. (2019). A Meta-Analysis of Mindfulness-Based Therapies for Insomnia and Sleep Disturbance: Moving Towards Processes of Change. *Sleep Medicine Clinics*, *14*(2), 209–233. https://doi.org/10.1016/j.jsmc.2019.01.004

Reichenheim, M. E., & Moraes, C. L. (2007). Operacionalização de adaptação transcultural de instrumentos de aferição usados em epidemiologia. *Revista de Saúde Pública*, *41*(4), 665–673. https://doi.org/10.1590/S0034-89102006005000035

Rhemtulla, M., Brosseau-Liard, P. É., & Savalei, V. (2012). When can categorical variables be treated as continuous? A comparison of robust continuous and categorical SEM estimation methods under suboptimal conditions. *Psychological Methods*, *17*(3), 354–373. https://doi.org/10.1037/a0029315

Rosseel, Y. (2012). lavaan: An R package for structural equation modeling. *Journal of Statistical Software*, *48*(2), 1–36. https://doi.org/10.18637/jss.v048.i02

Ruiz, F. J. (2010). A review of Acceptance and Commitment Therapy (ACT) empirical evidence: Correlational, experimental psychopathology, component and outcome studies. *International Journal of Psychology & Psychological Therapy*, *10*, 125–162.

Sadler, P., McLaren, S., & Jenkins, M. (2013). A psychological pathway from insomnia to depression among older adults. *International Psychogeriatrics*, *25*(8), 1375–1383. https://doi.org/10.1017/S1041610213000616

Salari, N., Khazaie, H., Hosseinian-Far, A., Khaledi-Paveh, B., Ghasemi, H., Mohammadi, M., & Shohaimi, S. (2020). The effect of acceptance and commitment therapy on insomnia and sleep quality: A systematic review. *BMC Neurology*, *20*(1), 300. https://doi.org/10.1186/s12883-020-01883-1

Sijtsma, K., & van der Ark, L. A. (2017). A tutorial on how to do a Mokken scale analysis on your test and questionnaire data. *British Journal of Mathematical and Statistical Psychology*, *70*(1), 137–158. https://doi.org/10.1111/bmsp.12078

Taylor, D. J., Lichstein, K. L., Durrence, H. H., Reidel, B. W., & Bush, A. J. (2005). Epidemiology of Insomnia, Depression, and Anxiety. *Sleep*, *28*(11), 1457–1464. https://doi.org/gg5k3t

Thakral, M., Von Korff, M., McCurry, S. M., Morin, C. M., & Vitiello, M. V. (2020). Changes in dysfunctional beliefs about sleep after cognitive behavioral therapy for insomnia: A systematic literature review and meta-analysis. *Sleep Medicine Reviews*, *49*, 101230. https://doi.org/10.1016/j.smrv.2019.101230

Twohig, M. P., & Levin, M. E. (2017). Acceptance and Commitment Therapy as a Treatment for Anxiety and Depression: A Review. *Psychiatric Clinics*, *40*(4), 751–770. https://doi.org/10.1016/j.psc.2017.08.009

Van der Ark, L. A. (2007). Mokken scale analysis in R. *Journal of Statistical Software*, *20*(11), 1–19. https://www.jstatsoft.org/article/view/v020i11

Van der Ark, L. A. (2012). New developments in mokken scale analysis in R. *Journal of Statistical Software*, *48*(5), 1–27. https://www.jstatsoft.org/article/view/v048i05

van Widenfelt, B. M., Treffers, P. D. A., de Beurs, E., Siebelink, B. M., & Koudijs, E. (2005). Translation and Cross-Cultural Adaptation of Assessment Instruments Used in Psychological Research With Children and Families. *Clinical Child and Family Psychology Review*, *8*(2), 135–147. https://doi.org/10.1007/s10567-005-4752-1

Wicherts, J. M., & Dolan, C. V. (2010). Measurement Invariance in Confirmatory Factor Analysis: An Illustration Using IQ Test Performance of Minorities. *Educational Measurement: Issues and Practice*, *29*(3), 39–47. https://doi.org/10.1111/j.1745-3992.2010.00182.x

Wild, D., Grove, A., Martin, M., Eremenco, S., McElroy, S., Verjee-Lorenz, A., & Erikson, P. (2005). Principles of Good Practice for the Translation and Cultural Adaptation Process for Patient-Reported Outcomes (PRO) Measures: Report of the ISPOR Task Force for Translation and Cultural Adaptation. *Value in Health*, *8*(2), 94–104. https://doi.org/10.1111/j.1524-4733.2005.04054.x

Wind, S. A. (2017). An Instructional Module on Mokken Scale Analysis. *Educational Measurement: Issues and Practice*, *36*(2), 50–66. https://doi.org/10.1111/emip.12153

Xia, Y., & Yang, Y. (2019). RMSEA, CFI, and TLI in structural equation modeling with ordered categorical data: The story they tell depends on the estimation methods. *Behavior Research Methods*, *51*(1), 409–428. https://doi.org/10.3758/s13428-018-1055-2

Zigmond, A. S., & Snaith, R. P. (1983). The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica*, *67*(6), 361–370.

Appendix A

Crenças e Atitudes Disfuncionais sobre o Sono (CADS-16)

Uma série de afirmações refletindo as crenças e atitudes das pessoas em relação ao sono estão listadas abaixo. Por favor, indique o quanto você concorda ou discorda de cada afirmação. Não há respostas certas ou erradas. Para cada afirmação, circule o número que corresponde à sua crença pessoal. Por favor, responda todos as afirmações, mesmo que não se apliquem diretamente à sua situação.

Discordo Fortemente										Concordo Fortemente
0	1	2	3	4	5	6	7	8	9	10

1. Preciso de 8 horas de sono para me sentir revigorado(a) e funcionar bem durante o dia.

0	1	2	3	4	5	6	7	8	9	10

2. Quando não durmo o suficiente à noite, preciso recuperar o sono no dia seguinte com um cochilo ou dormindo mais na próxima noite.

0	1	2	3	4	5	6	7	8	9	10

3. Estou preocupado(a) que a insônia crônica possa trazer consequências graves em minha saúde física.

0	1	2	3	4	5	6	7	8	9	10

4. Estou preocupado(a) que eu talvez perca o controle sobre minha habilidade de dormir.

0	1	2	3	4	5	6	7	8	9	10

5. Sei que uma noite de sono ruim vai interferir nas minhas atividades cotidianas no dia seguinte.

0	1	2	3	4	5	6	7	8	9	10

6. Para estar alerta e funcionar bem durante o dia, eu acredito que seria melhor tomar um remédio para dormir do que ter uma noite de sono ruim.

0	1	2	3	4	5	6	7	8	9	10

7. Quando me sinto irritado(a), deprimido(a), ou ansioso(a) durante o dia, provavelmente foi porque não dormi bem na noite anterior.

0	1	2	3	4	5	6	7	8	9	10

8. Quando durmo mal uma noite, sei que irá atrapalhar meu sono pelo resto da semana.

0	1	2	3	4	5	6	7	8	9	10

9. Sem uma noite de sono adequada, eu mal consigo funcionar no dia seguinte.

0	1	2	3	4	5	6	7	8	9	10

10. Não consigo prever se vou ter uma noite de sono boa ou ruim.

0	1	2	3	4	5	6	7	8	9	10

11. Tenho pouco controle sobre as consequências negativas de um sono ruim.

0	1	2	3	4	5	6	7	8	9	10

12. Quando me sinto cansado(a), sem energia, ou não funciono bem durante o dia, geralmente é porque não dormi bem na noite anterior.

0	1	2	3	4	5	6	7	8	9	10

13. Acredito que a insônia seja essencialmente o resultado de um desequilíbrio do meu organismo.

0	1	2	3	4	5	6	7	8	9	10

14. Sinto que a insônia está arruinando minha capacidade de aproveitar a vida e me impede de fazer o que eu quero.

0	1	2	3	4	5	6	7	8	9	10

15. Medicação é provavelmente a única solução para a minha falta de sono.

0	1	2	3	4	5	6	7	8	9	10

16. Evito ou cancelo compromissos (sociais, familiares) após uma noite de sono ruim.

0	1	2	3	4	5	6	7	8	9	10

Appendix B

Questionário de Aceitação dos Problemas no Sono (QAPS)

Abaixo você irá encontrar uma lista de afirmações. Por favor, avalie o quanto você concorda com cada frase escolhendo uma alternativa. Responda da melhor forma que puder mesmo que você não tenha (mais) problemas de sono, ou que eles sejam pouco frequentes. Poucas pessoas tem um sono perfeito todas as noites. Deste modo, pense em qualquer dificuldade com sono que tenha, ou já tenha tido, por menor que seja, e responda de acordo.

0	1	2	3	4	5	6
Discordo	Concordo muito pouco	Concordo levemente	Concordo parcialmente	Concordo moderadamente	Concordo quase completamente	Concordo completamente

1.	Embora as coisas tenham mudado, estou vivendo uma vida normal apesar dos meus problemas de sono.	0	1	2	3	4	5	6
2.	Eu levo uma vida plena apesar de ter problemas de sono.	0	1	2	3	4	5	6
3.	Minha vida está indo bem apesar dos meus problemas de sono	0	1	2	3	4	5	6
4.	Apesar dos problemas de sono, agora estou seguindo um certo curso na minha vida.	0	1	2	3	4	5	6
5.	Manter meus problemas de sono sob controle é minha maior prioridade.	0	1	2	3	4	5	6
6.	Eu preciso me concentrar em me livrar dos meus problemas de sono.	0	1	2	3	4	5	6
7.	É importante eu continuar lutando contra meus problemas de sono.	0	1	2	3	4	5	6
8.	Meus pensamentos e sentimentos sobre meus problemas de sono devem mudar antes de eu dar passos importantes na minha vida.	0	1	2	3	4	5	6

Appendix C

Reconciliation: decisions and documentation form

Adapted from: Koller, M., Kantzer, V., Mear, I., Zarzar, K., Martin, M., Greimel, E., ... & ISOQOL TCA-SIG. (2012). The process of reconciliation: evaluation of guidelines for translating quality-of-life questionnaires. *Expert review of pharmacoeconomics & outcomes research, 12*(2), 189-197.

Parte I: Decisões

Opções de decisões para a tradução reconciliada

1. Tradução A como está
2. Tradução B como está
3. Tradução C como está
4. A com pequenas modificações
5. B com pequenas modificações
6. C com pequenas modificações
7. Mesclar A, B e C como elas são, com A adaptado de B e C
8. Mesclar A, B e C como elas são, com B adaptado de A e B
9. Mesclar A, B e C como elas são, com C adaptado de A e B
10. Mesclar A e B como elas são, com B adaptado de A
11. Mesclar A e B como elas são, com A adaptado de B
12. Mesclar A e C como elas são, com C adaptado de A
13. Mesclar A e C como elas são, com A adaptado de C
14. Mesclar B e C como elas são, com B adaptado de C
15. Mesclar B e C como elas são, com C adaptado de B
16. Mesclar A e B com modificações/adições, com A adaptado de B
17. Mesclar A e B com modificações/adições, com B adaptado de A
18. Preparar uma tradução completamente nova C

Critérios de decisão para escolher qualquer uma das opções acima

1. Fonte e compreensibilidade

1.1. Reflete melhor as definições conceituais e o significado do texto de origem

1.2. Reflete melhor a ênfase do texto de origem (i.e., qual é o ponto principal do texto de origem)

1.3. É compreensível para um leigo sem conhecimentos médicos

1.4. É compreensível para uma população de diversos níveis educacionais

1.5. É o mais próximo possível do texto de origem

1.6. É lido com mais naturalidade no idioma de destino

2. Cultural

2.1. É culturalmente apropriado no âmbito de tópicos sensíveis

2.2. É culturalmente apropriado no âmbito das diferenças culturais da vida

3. Gramatical

3.1. A sintaxe está correta

3.2. As formas e tempos verbais estão corretos

3.3. Gênero e número estão adaptados e corretos

3.4. Outros elementos estão corretos (especialmente artigos e preposições)

4. Terminologia

4.1. Inclui todas as palavras-chave

4.2. É semanticamente preciso

4.3. O vocabulário/terminologia é consistente em toda a tradução

Parte II: Documentação do processo de reconciliação

Tradução A:

Tradução B:

Tradução C:

Tradução reconciliada:

Opção de decisão: escolher uma das opções 1 a 18

Critérios de decisão: escolher dentre os critérios 1.1 a 4.3