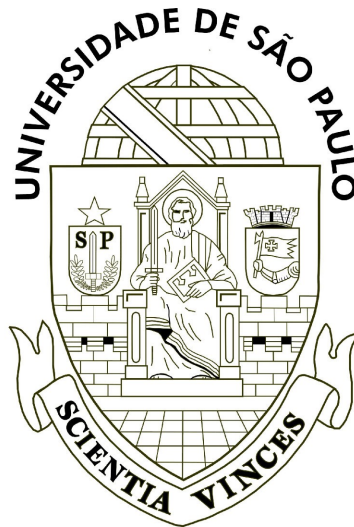


This page and the next page should be removed

An example document using RMarkdown and papaja to write
your dissertation



Inauguraldissertation
zur
Erlangung des Doktorgrades
der Humanwissenschaftlichen Fakultät
der Universität zu Köln
nach der Prüfungsordnung vom 10.05.2010
vorgelegt von
Tobias Heycke
aus
Bergisch Gladbach
Tag der Abgabe: 01.01.1970

Acknowledgment

Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet. Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet. Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor danke frederik invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet.

Contents

Summary	7
Introduction	8
Dysfunctional beliefs and attitudes about sleep	8
Constructs and Their Relations	9
Measurement	9
Sleep Problem Acceptance Questionnaire (SPAQ)	10
Constructs and Their Relations	10
Measurement	10
Objectives	10
Method	11
Participants and Study Design	11
Item translation	11
Additional measures	12
Analytical Plan	12
Partial results	13
Cross-cultural adaptation	13
References	14
Appendix	A
: Sets of IADS sounds used in Experiment 1: Valence Positive, Neutral, Negative	20
Appendix	B
: Priors for the Bayesian logistic mixed effects regression models of two- alternative forced choice responses	21
Appendix	C
: Mean CS visibility (Experiment 2 and Experiment 3)	22

Summary

Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet. Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet. Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet.

Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel illum dolore eu feugiat nulla facilisis at vero eros et accumsan et iusto odio dignissim qui blandit praesent luptatum zzril delenit augue dui dolore te feugait nulla facilisi. Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat.

Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel illum dolore eu feugiat nulla facilisis at vero eros et accumsan et iusto odio dignissim qui blandit praesent luptatum zzril delenit augue dui dolore te feugait nulla facilisi.

Nam liber tempor cum soluta nobis eleifend option congue nihil imperdiet doming id quod mazim placerat facer possim assum. Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat.

Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel illum dolore eu feugiat nulla facilisis.

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.

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 version 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 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 committee of ethics of the Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo - HCFMUSP (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. 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. 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.

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). 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.

Analytical Plan

Partial results

Cross-cultural adaptation

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>
- Association, A. P. (Ed.). (2013). *Diagnostic and statistical manual of mental disorders: DSM-5* (5th ed). American Psychiatric Association.
- 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](https://doi.org/10.1016/s1389-9457(00)00065-4)
- 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), zsz288. <https://doi.org/gghm2s>
- 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>
- 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.
- 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>
- 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>
- 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>
- 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>
- Edinger J. D., Arnedt J. Todd, Bertisch Suzanne M., Carney Colleen E., Harrington John J., Lichstein Kenneth L., Sateia Michael J., Troxel Wendy M., Zhou Eric S., Kazmi Uzma, Heald Jonathan L., & Martin Jennifer L. (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>
- Eidelman, P., Talbot, L., Ivers, H., Bélanger, 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>
- 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.smr.2006.03.002>
- 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.smr.2011.03.008>
- Harris, P. A., Taylor, R., Minor, B. L., Elliott, V., Fernandez, M., O’Neal, L., McLeod, L., Delacqua, G., Delacqua, F., Kirby, J., others. (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., 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>
- 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>
- 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>
- 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>
- 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>
- 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/>
- 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>
- 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.smr.2019.101230>
- Zigmond, A. S., & Snaith, R. P. (1983). The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica*, 67(6), 361–370.

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

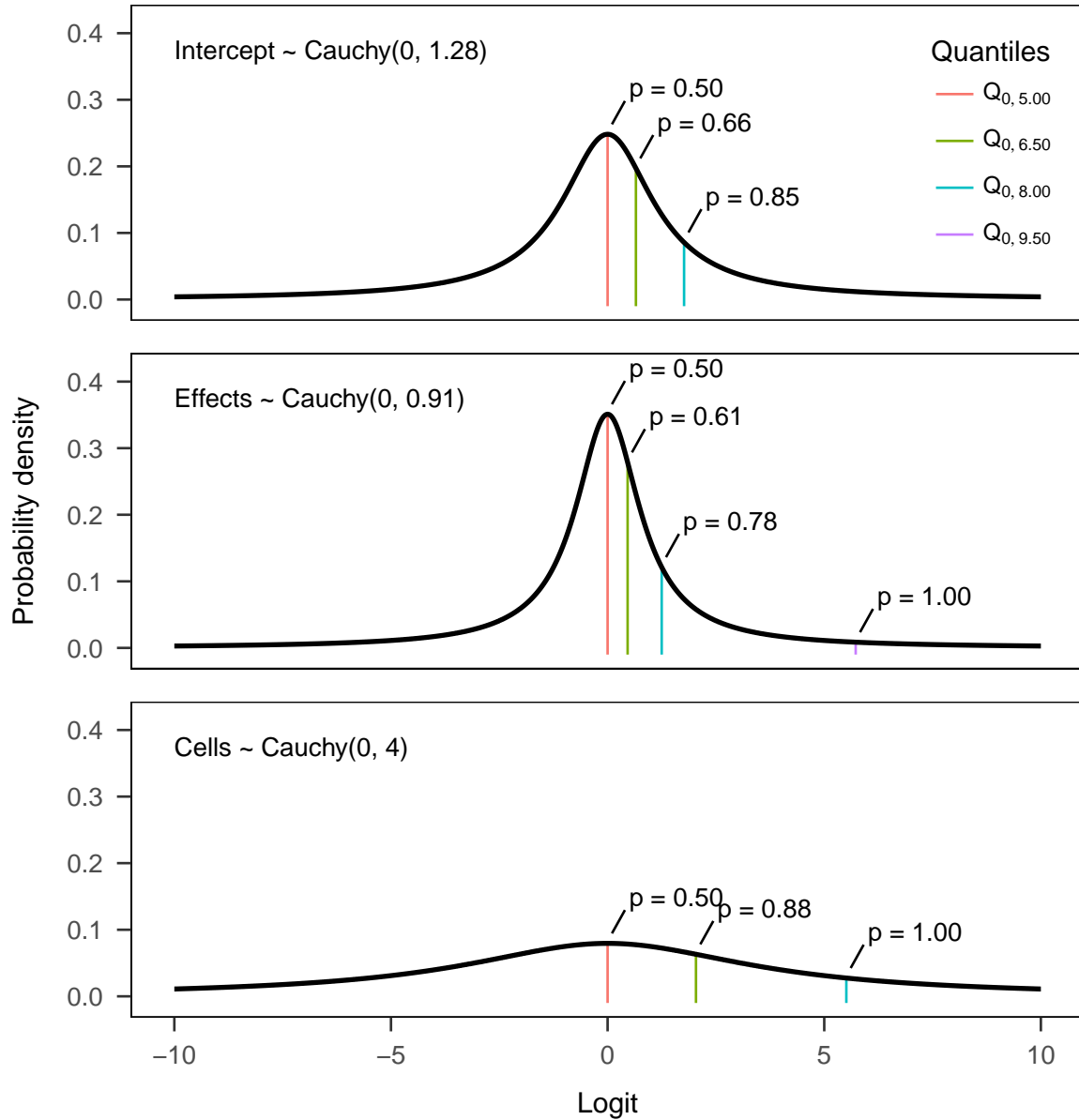


Figure B1. Priors for the Bayesian logistic mixed effects regression models of two-alternative forced choice responses. Colored lines represent distribution quantiles; annotated probabilities represent the resulting probability of choosing a positively paired CS starting from chance level ($p = 0.5$).

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