

Serial Diverse Imagining Task: A New Remedy for Excessive Cognitive Pre-sleep Arousal

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I. Introduction

Pre-sleep arousal such as a racing mind, worries, and rumination are common bedtime complaints among poor sleepers and often seem uncontrollable. Carney and Waters (2006) developed **Structured Problem-Solving** (also called **Constructive Worry**) to replace bedtime worrying by setting aside 15 minutes earlier in the day to worry constructively (i.e., listing aspects of the worrisome topic and steps toward their solutions). Structured Problem-solving reduces pre-sleep arousal and sleep onset latency (Carney & Waters, 2006; Digdon & Koble, 2011); however, it has two potential limitations: 1) it focuses only on worrying and not on all types of sleep-disruptive thoughts; and 2) it needs to be done well before bedtime so there might be problems with forgetting and time conflicts.

Beaudoin created the **Serial Diverse Imagining Task** (SDI) that can be used for any type of sleep-disruptive thoughts. Like traditional (monotonous) imagery training (Morin & Azrin, 1987), SDI is a mental imagery technique done while in bed ready to sleep, with the aim of distracting subjects from concerns and arousing mental activity. However, it is based on a theory of sleep onset and insomnia that proposes that imagery-rich mind wandering is *somnolent* (Beaudoin, 2013). Also, it is meant to be a more active, engaging technique (and predicted to be more *counter-insomnolent*) in that the participant imagines a diverse series of images, switching frequently between images. This changing imagery is expected to divert attention away from other thoughts that are sleep-disruptive (insomnolent mentation).

Research Goal: To evaluate the Serial Diverse Imagining task in comparison to Structured Problem-Solving and the combination of both interventions.

II. New Cognitive Shuffle Insomnia Treatment: Serial Diverse Imagining

Participants: 154 university students (137 female) who complained of excessive cognitive pre-sleep arousal. Mean age was 20.24 (SD = 3.78).

Design: Students were randomly assigned to intervention groups (SDI or Structured Problem Solving) and completed measures at baseline and multiple times up to 1 month after receiving the interventions.

While the SDI technique can be done without software, in this study, an app for iPhone® and iPad® ("the App") provided participants with an audio recording of random concrete words or phrases (items) presented one at a time with an 8-second gap between items. During this gap, the person makes a mental image of the item until the next word prompts the next image, and so on. The App can be played with or without earbuds/headphones. After the adjustable timer expires, the APP stops playing content. The default value of the time is 20 minutes. The App sends anonymized time-stamped user interaction data to a server.

Materials and Procedure:

Baseline measures include:

- Pre-Sleep Arousal Scale (Nicassio, Mendowitz, Fussell, & Petras, 1985)
- Sleep Quality Scale (Yi, Shin, & Shin, 2006)
- Glasgow Sleep Effort Scale (Broomfield & Espie, 2005)
- Sleep Hygiene Index (Mastin, Bryson, & Corwyn, 2006) (included as a control to check whether other sleep-impacting factors changed during the study)

Participants were given instructions for their interventions and were asked to do them for one week, and to complete a daily electronic sleep diary (diary data not reported here due to space).

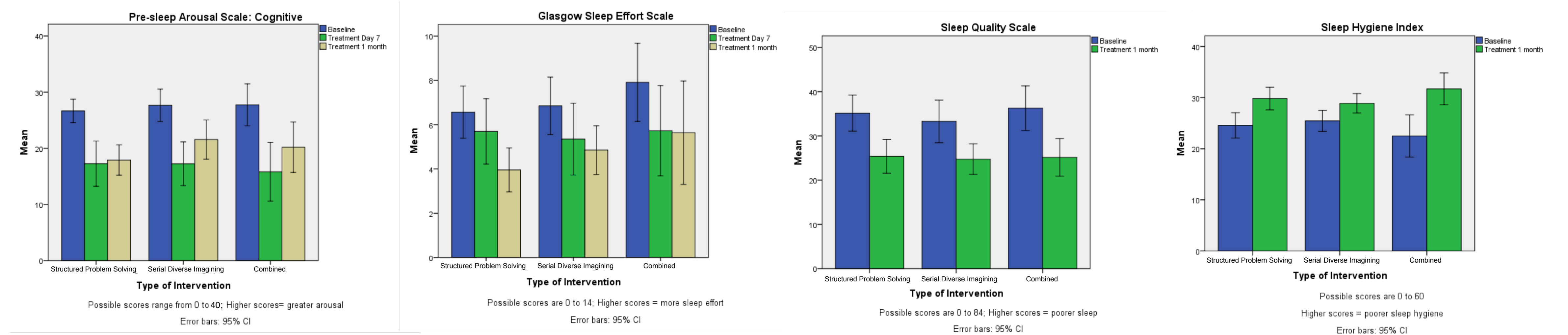
At the end of **1 week of intervention**, they re-did

- Pre-Sleep Arousal Scale
- Glasgow Sleep Effort Scale

They continued using the interventions as needed for 3 more weeks.

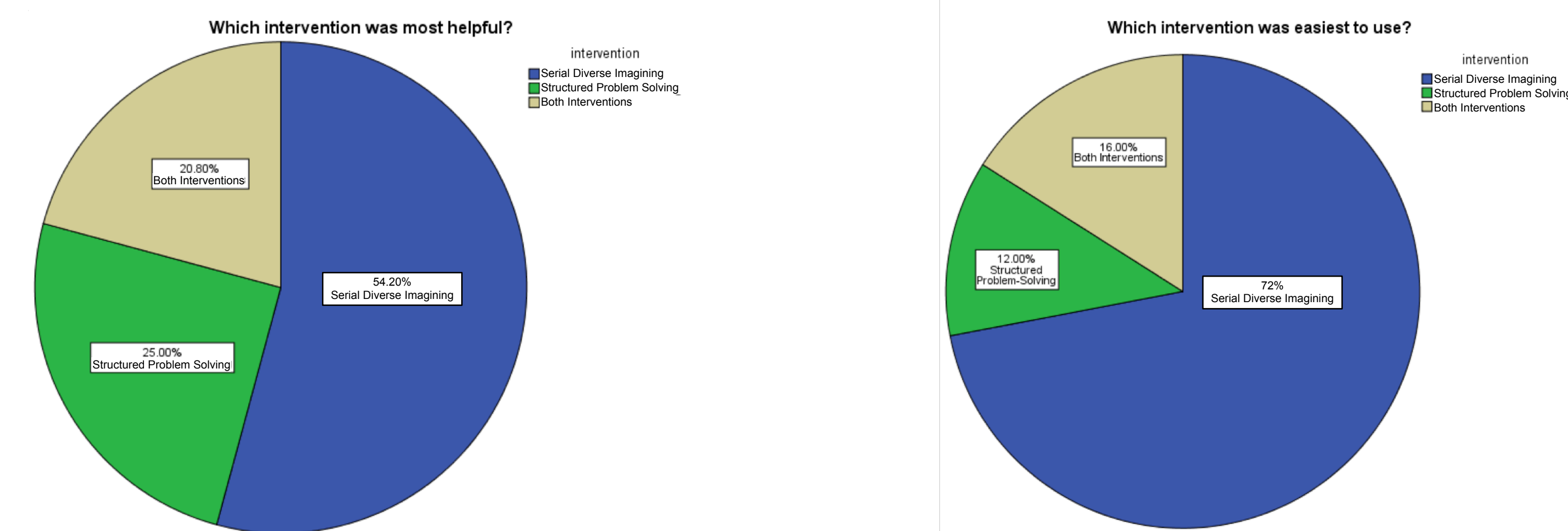
After about **1 month since starting the intervention**, they re-did **all baseline measures** and were asked to evaluate the interventions. Those who received both interventions compared the effectiveness and ease of use of the interventions.

III. Results



Repeated measures ANOVAs indicated improvements from baseline to post-treatment on all measures ($p < .001$, Partial $\eta^2 = .43$ to $.71$) except the Sleep Hygiene Index, which worsened ($p < .001$, Partial $\eta^2 = .23$). The latter finding is not unexpected because baseline was at the start of the academic term when academic pressure is less intense. The fact that sleep and arousal improved despite poorer sleep hygiene is notable.

There were no significant effects of type of intervention or interaction effects; however, these findings are not interpretable because observed power was low ($< 50\%$).



IV. Conclusion

This study identified a new intervention — Serial Diverse Imagining Task — which reduced pre-sleep arousal and sleep effort and improved sleep quality compared to baseline. On these outcomes, Serial Diverse Imagining was as effective as Structured-Problem-Solving. Moreover, participants who received both interventions were more likely to rate Serial Diverse Imagining as more helpful and easier to use than Structured Problem-Solving.

Select References

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- Morin, C. M., & Azrin, N. H. (1988). Behavioral and cognitive treatments of geriatric insomnia. *Journal of Consulting and Clinical Psychology*, 56(5), 748–753.

Disclosure. Luc P. Beaudoin is a director and shareholder of CogSci Apps Corp. and owner of CogZest which develop and market cognitive science-based products.

Further references and information can be obtained online from <http://www.sfu.ca/~lpb/insomnia/sdi-constructive-worry>
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