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Priming affects poor sleepers but not normal sleepers on an Insomnia Ambiguity Task

JASON ELLIS[1], MARIA GARDANI[1] and HENRIETTE HOGH[2]

[1]University of Glasgow Sleep Centre, Sackler Institute of Psychobiological Research, Southern General Hospital, Glasgow and [2]Department of Psychology, University of Surrey, Guildford, Surrey, UK

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SUMMARY With increasing importance being placed on the role of cognitive biases as a maintaining factor in insomnia, the influence of order effects on interpretative responses should be examined and subsequently accounted for. The aim of the present study was to examine whether asking participants about their sleep experiences, prior to testing for a perceptual bias, affects responses on a sleep-related ambiguity task. One hundred and seventeen undergraduate students, blind to the aims of the experiment, were issued either the Dysfunctional Beliefs and Attitudes to Sleep scale (DBAS-10) and Insomnia Severity Index (ISI) before, or following, completion of an Insomnia Ambiguity Task (IAT). As expected, a multivariate analysis of variance showed that the order in which participants completed the task affected the responses on the IAT with those given the DBAS-10 and ISI first, showing greater insomnia-related interpretations than those given the IAT first. However, on closer examination, this effect was evident only for those who were defined as poor sleepers, and that normal sleepers were largely unaffected by the order in which the tests are given. The results are discussed in terms of design and management of sleep-related research protocols involving implicit cognitive tasks.

KEYWORDS attention, cognition, insomnia ambiguity, interpretative bias

INTRODUCTION

It is standard practice in sleep research that participants who respond to adverts are doing so based upon their self-defined sleep status. In an attempt to define participants in insomnia research, using samples of good and poor sleepers, it is commonplace to administer a diagnostic measure such as the Pittsburgh Sleep Quality Index (PSQI) (Buysse *et al.*, 1989) or the Insomnia Severity Index (ISI) (Morin, 1993), before any additional testing takes place. These measures have been shown to be reliable and valid indices of both sleep disturbance and insomnia, respectively, and these procedures make ethical and practical sense. However, there is the possibility that issuing these diagnostics or recruitment methods prior to further additional assessments may result in a response bias by increasing the participants' sensitivity to their current sleep status.

Where researchers should be mindful of this increased sensitivity, it is unlikely to impact too heavily on other distal measures of sleep and sleepiness, and as this sensitivity increases for poor sleepers, it would be reasonable to assume that this also increases for normal sleepers. However, one of the areas in which this increased sensitivity may need further consideration is while examining the relationship between sleep and proximal cognition. Recently, there has been increasing evidence demonstrating a relationship between sleep and cognitive biases, particularly in the areas of attention and perception (MacMahon *et al.*, 2006; Marchetti *et al.*, 2006; Spiegelhalder *et al.*, 2008; Taylor *et al.*, 2003; Woods *et al.*, 2009). Researchers have used a plethora of techniques to determine the existence, and extent, of these biases and the results from these studies are promising for both diagnostic

Correspondence: Jason Ellis, University of Glasgow Sleep Centre, Sackler Institute of Psychobiological Research, Southern General Hospital, Glasgow G51 4TF, UK. Tel.: +44-141-201-2457; fax: +44-141-232-7697; e-mail: j.ellis@clinmed.gla.ac.uk

and treatment purposes (Espie *et al*., 2006). Indeed, research in this area suggests that poor sleepers attend to sleep-related information quicker than non-sleep-related information (Espie *et al*., 2006), are more likely to interpret ambiguous stimuli as sleep-related as opposed to non-sleep related (Ree *et al*., 2006) and are more likely to engage in worrisome, sleep-related, preoccupations compared to their normal-sleeping counterparts (Ellis *et al*., 2007).

As sophistication in this area has grown, more and more researchers are beginning to incorporate tasks that attempt to index implicit attitudes, drawing heavily from paradigms used to examine implicit biases in depression and anxiety. One of the benefits of using an implicit task, such as the Emotional Stroop, the Induced Changed Blindness, the Posner or the Implicit Association Task (IAT), is that they have been successful in determining that interpretative, attentional and perceptual biases are not just the result of a self-reporting bias. However, with the possibility of a priming sensitivity being activated before an implicit-task takes place, the true value of the associated findings cannot be determined. Therefore, the aim of the present study was to examine whether a priming sensitivity to poor sleep exists, the extent of this priming sensitivity on scores on an insomnia interpretative task and, finally, whether this priming sensitivity equally affects both good and poor sleepers.

METHOD

Participants and procedure

Participants were a cohort of first-year, first-semester, undergraduate psychology students, undertaking a core research methods and statistics module. The aim of this module is to introduce differing research methodologies experientially over 24 weeks. Class contact involves a 3-h session in which the particular method is outlined and evaluated, using best-practice examples from the literature, and students are then given a practical exercise where they either collect data in class or design and conduct a study in groups before the next class. At this point in the semester students were unaware that the primary interest of the investigator was sleep research, as his role within that context was as the module coordinator for the Research Methods programme.

MATERIALS

Insomnia ambiguity task (Ree and Harvey, 2006)

The IAT comprises of 27 ambiguous sentences each followed by one insomnia-consistent and one insomnia-inconsistent interpretation. For example, ‘Simon noticed how long it had taken him to relax while lying in bed: quickly (insomnia-consistent), slowly (insomnia-inconsistent)’. Participants were asked to make a decision on the content of the ambiguous sentence. For the purpose of this study, if a participant chose an insomnia-consistent statement they were given a score of 1 and if they chose an insomnia-inconsistent statement they were given a score of 0. Scores ranged from 0 to 27 with higher scores indicating more insomnia-congruent endorsements.

Insomnia severity index (Morin, 1993)

The ISI is a seven-item self-report measure that provides a brief tool for the clinical evaluation of insomnia. According to the authors, scores on the ISI define insomnia as: 0–7 (no clinical insomnia), 8–14 (subthreshold insomnia), 15–21 (insomnia of moderate severity) and 22–28 (severe insomnia).

Dysfunctional beliefs and attitudes about sleep scale-10 (Espie *et al*., 2000)

The DBAS-10 is a shortened version of the original DBAS (Morin, 1993) that comprises 10 sleep-related dysfunctional statements, which the participant rates on a 100-mm visual analogue scale. In the present study, the DBAS-10 was used as the main priming tool, as it was always presented first in the primed condition.

Procedure

As the students entered the lecture room they were assigned randomly to sit at a desk on which was placed a questionnaire booklet with either the IAT first, followed by the DBAS-10 and ISI (unprimed condition), or the DBAS-10 and ISI first, followed by the IAT (priming condition). The titles from each measure had been removed. The instructions on the front sheet for both conditions were identical and informed the participant of their right to anonymity and confidentiality, and that they did not have to participate in the research and could withdraw from the study at any time. The participants were asked to follow the instructions on each booklet, not to turn to another page until the one they were working on was complete, and to work quickly but thoroughly through each of the tests. Additionally, they were asked not to confer with their classmates, and that silence was to be maintained until all the completed questionnaires were collected by the investigator. At the end of the session, participants were thanked for their time and debriefed fully as to the aims and objectives of the experiment.

RESULTS

Of the 123 students attending the lecture, 119 agreed to take part and returned completed questionnaires. Of the 118 participants (one participant was eliminated for completing the IAT incorrectly), 60 completed the unprimed condition [mean age 18.94, standard deviation (SD) 0.96] and 58 completed the primed condition (mean age 20.45, SD 5.48) (Table 1). There was no difference between groups in terms of sex ($\chi^2 = 1.93$, df = 1, $P = 0.23$); however, there was an age difference ($t = 2.05$, df = 116, $P < 0.05$), with seven of the eight mature students being assigned randomly to the primed condition. A (2 × 2) between-subjects analysis of covariance

Table 1 Demographics and Insomnia Ambiguity Task (IAT) scores by condition and sleep status

	Primed (n = 58)		*Unprimed (n = 60)*	
	Good sleepers (n = 30)	*Poor sleepers (n = 28)*	*Good sleepers (n = 29)*	*Poor sleepers (n = 31)*
Age	20.81 (SD 5.36)	20.02 (SD 5.58)	19.02 (SD 0.76)	18.87 (SD 1.13)
Gender	27 (90%) Female	24 (85.7%) Female	23 (79.3%) Female	24 (77.4%) Female
IAT scores	13.63 (SD 4.40)	17.54 (SD 4.54)	12.90 (SD 3.76)	14.52 (SD 3.48)

SD, standard deviation.

(ANCOVA), with IAT score as the dependent variable and age as a covariate, showed a main effect for the priming condition [$F_{(1,113)} = 6.02$, $P < 0.02$] and a main effect for sleep status (good sleepers = <8 on the ISI versus poor sleepers = ≥8 on the ISI) [$F_{(1,113)} = 13.47$, $P < 0.001$]. However, there was no interaction effect [$F_{(1,113)} = 2.30$, $P = 0.13$].

When split by sleep status, there was no difference by sex ($\chi^2 = 0.24$, df = 1, $P = 0.62$) or by age ($t = -0.71$, df = 116, $P = 0.48$). Independent t-tests on priming differences, by sleep status, showed this priming effect was evident for poor sleepers ($t = 2.88$, df = 57, $P < 0.006$) but not for normal sleepers ($t = 0.69$, df = 57, $P = 0.49$) (Fig. 1).

DISCUSSION

The findings suggest that priming does have an overall effect on scores on the Insomnia Ambiguity Task. Moreover, in line with Ree *et al.* (2006) findings, poor sleepers (defined in their study as having an ISI score of >8) were also more likely to interpret ambiguous items as insomnia-consistent than insomnia-inconsistent. Interestingly, there was no interaction between sleep status and priming condition. However, when comparing those with a sleep problem to those without, it would appear that this lack of interaction occurs because there is a priming bias within both good and poor sleepers, albeit this is more pronounced in the poor sleeper group. As such, investigators should be mindful of these findings when they are designing studies examining cognitive biases, as the order in which measures are given may well inflate superficially the differences observed between insomniacs and normal sleepers. Moreover,

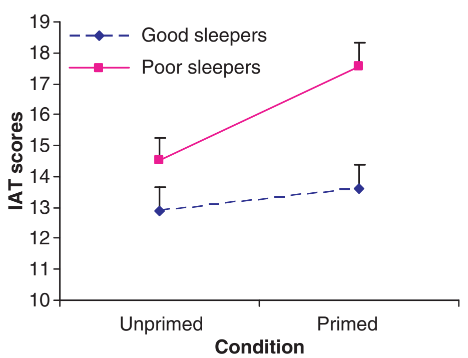

Figure 1. Differences on Insomnia Ambiguity Task (IAT) scores between sleeper groups by condition.

researchers should be wary when comparing the results of studies that have used a measure of sleep disturbance or insomnia (e.g. PSQI or ISI) before an attentional or perceptual processing task with studies that have conducted this in the opposite order.

Interestingly, the results also add further support for the use of the IAT to examine interpretive biases in insomnia. Although the priming resulted in overall increased scores on the IAT (approximately two points), there was a significant difference between the normal sleepers and the poor sleepers.

One of the limitations that requires consideration in this study is the nature of the sample. As the sample comprised students, it is likely that the erratic sleep/wake schedules associated with this group, and reflected in the high numbers of participants defined with a sleep problem, may have influenced the results. Where it was felt prudent to use this group for this initial investigation, because the testing conditions could be standardized, the data could be collected expeditiously and the benefits outweighed the costs significantly, applying these results to samples of clinically defined insomniacs would be unwise. However, as the ISI is a reliable and sensitive index of insomnia, these findings provide the first indication that these priming effects will also be applicable to a broader range of poor sleeper groups.

Adding to the limitations is the fact that the researchers did not account for the time of study. Sleepiness at the time of the investigation could interfere with the responses in that an individual with sleep difficulties may be more prone to make biased interpretations at particular times of the day (early morning or postlunch dip) when they feel more tired. Ree and Harvey (2006), using the IAT, show that study participants who were sleepy at the time of the experiment responded in an insomnia-consistent manner when presented with ambiguous material. However, as this study was conducted mid-morning (10:00 hours), this effect is likely to be minimal, but should be examined more carefully with a measure of sleepiness. Another limitation is the potential that completing the DBAS-10 first may have influenced the results on the ISI. This point should be considered in both the context of this study and in future research of this nature.

Future research may want to examine the extent of the priming bias on other cognitive tasks. In this vein, it would be interesting, and helpful, to create an index of the effect of this bias on all the available implicit measures so that researchers can use this as a guideline when reporting the results from their studies.

DISCLOSURE

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