The relationship between sleep and social cognition

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Introduction

Sleep problems are amongst the most prevalently reported difficulties with well-being and link to our physical and mental health. A growing body of evidence suggests sleep problems are also meaningfully linked with difficulties in the social domain[1]. This includes evidence that:

- Sleep difficulties are amongst the most prevalent difficulties reported by autistic children and adults[2]
- Sleepiness predicts motivation for social engagement[3]
- Sleep deprivation impairs a range of social abilities including: perspective taking[4], emotional intelligence[5], moral judgement[6], sarcasm detection[7], emotion-recognition[8], negotiation[9] and empathy[10]

Several unanswered questions remain about how sleep, social understanding and social functioning, particularly relating to:

CONSISTENCY ACROSS SUBDOMAINS

Here we ask:

1. Which aspects of individual differences in social functioning relate to poor sleep?
2. What range of socio-emotional abilities are/ are not impacted by sleep deprivation?

MECHANISMS

Here we ask:

1. How does anxiety mediate the relationship between social functioning and poor sleep?
2. Does sleep change social decision-making, as well as performance?
3. How long does the impact of sleep deprivation on social motivation last?

Individual Differences

Over 2 studies, we examined the relationship between self-reported sleep problems, social functioning and anxiety.

Method. Undergraduate students (Study 1, N = 194; Study 2, N = 225) completed a series of online questionnaires, including Pittsburgh Sleep Quality Index (PSQI[11]), Social Responsiveness Scales (SRS[12]) and Generalised Anxiety Disorder Screener (GAD-7[13]).

Planned analysis looked at correlation amongst measures, regression for subscales of Social Functioning (SRS-2) predicting Sleep Problems (PSQI) and mediation of the relationship between Social Functioning and Sleep Problems by Anxiety.

Results.

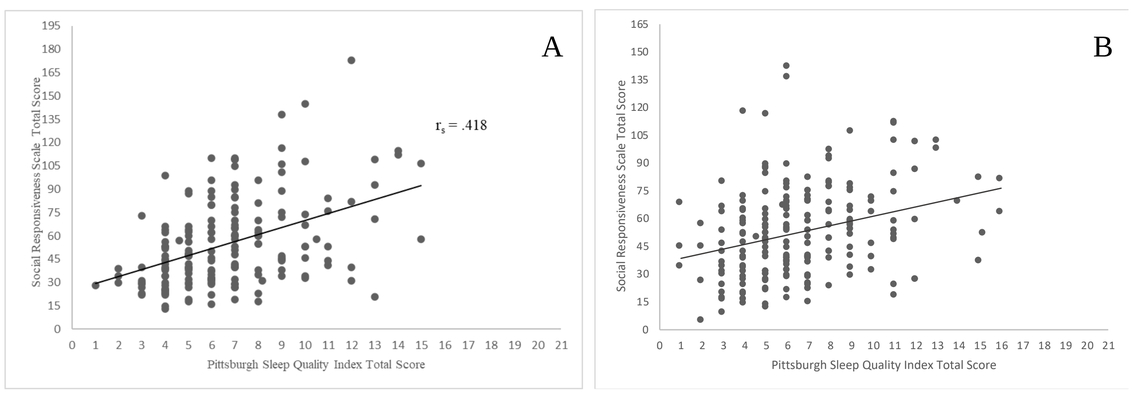

Figure 1. Strong correlation between Social Functioning difficulties and Sleep Problems from Study 1 (A) and Study (2). ~60% of participants reach thresholds for possible Sleep Problems

	Variable	1	2	3	4	5	6
1.	PSQI total	--					
1.	Social awareness	.211**	--				
1.	Social cognition	.331**	.398**	--			
1.	Social communication	.399**	.517**	.673**	--		
1.	Social motivation	.345**	.287**	.574**	.797**	--	
1.	Restricted Interests and Repetitive Behaviours	.418**	.444**	.671**	.751**	.659**	--

Table 1. All subscales of Social Functioning correlate with poor sleep; regression model includes all subscales (study 1)

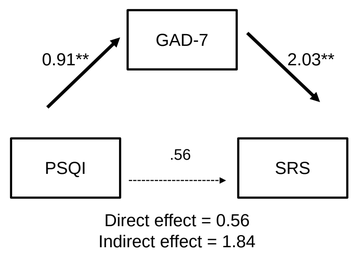

Figure 2. Relationship between Sleep and Social Functioning fully mediated by Anxiety.

Sleep Deprivation

Undergraduate students completed a battery of measures of social understanding and engagement under two conditions – when rested and following overnight sleep deprivation.

Method.

25 participants completed sleep diaries for three days prior to completing each of two testing sessions one week apart. Under one condition, they attempted to remain awake all night – responding to hourly emails from the research team. In the other, they followed their regular sleeping pattern. They completed a battery of measures (below) at 9AM the following morning.

Reading the Mind in the Eyes Task[14]

Traditional measure of recognition of "complex" emotions through looking at picture stimuli of eyes.

Previous findings are inconsistent on how sleep deprivation affects emotion recognition.

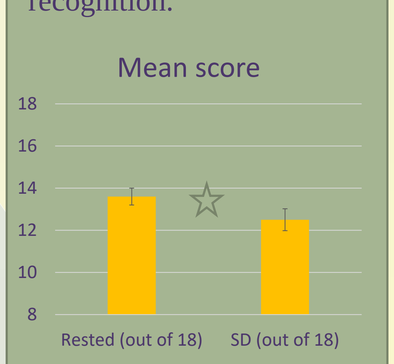

Figure 3. Participants perform worse at the RMET when sleep deprived.

Sleep deprivation worsens emotion recognition performance, but more work needed on understanding why.

Social Motivation[3]

Participants rate their desire to engage in a range of activities at a particular time point.

Previous findings have shown people are more socially motivated when rested and this correlates inversely with sleepiness.

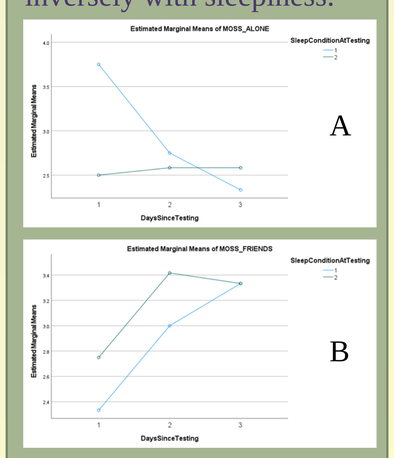

Figure 4. Participants want to be alone more (A) and with friends less (B) when sleep deprived. At day 2, some evidence that Social Motivation remains reduced (though desire to be alone lessens). Evidence for correlation with sleepiness.

Moral Reasoning[15]

Participants judge whether characters are "better" or "worse" in a series of social scenarios (see poster 20 for more details).

Effects of Consistency evidence of consulting a broader range of information in judgements about morality.

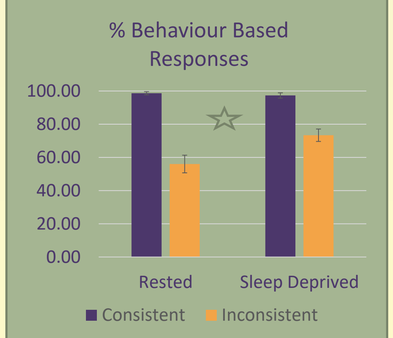

Figure 5. Participants show bigger effect of Consistency when Rested than Sleep Deprived.

People use a narrower range of sources of information to judge morality if sleep deprived

Conclusions

Poor sleep is linked to poorer social cognition and poorer social functioning. This is evidenced by individual differences in self reports ->

Those who report more sleep difficulties report more social difficulties

And the impact of experimental sleep deprivation->

Inducing sleep deprivation changes performance on measures of social understanding

More work is needed to fully understand breadth, depth and mechanism for difference. From our studies we propose:

- **Self reports on ALL aspects of social understanding predict poor sleep.**
- **The link between poor sleep and social difficulties is explained by shared variance with ANXIETY.**
- **The affect of sleep deprivation on social motivation may last more than one day.**
- **When sleep deprived, we may use a narrower range of information to make moral judgements.**

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