

Differences in Sleep Related Learning in Children with ASD and Williams Syndrome

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Introduction

- Sleep plays an important role in brain development, and also contributes to learning and daytime functioning
- Current research suggests that restricted sleep in childhood leads to adverse effects such as impaired cognitive functioning
- Individuals with ASD commonly experience sleep problems; few studies have investigated sleep problems in WS but they are reported
- As sleep has been found to play an active role in children's memory consolidation, it was considered vital to assess the impact of sleep on children's functioning

The current study

The current study examined sleep related learning patterns in two developmental disorders, namely ASD and WS. Severe sleep problems have been reported in both populations, however manifest differently. Children with ASD are reported to suffer from frequent night wakings, whereas children with WS are reported to suffer from sleep onset delay. The main aim of this study is to:

- Examine sleep patterns of children with ASD and in children with WS in comparison to Typically Developing children
- Examine sleep related learning patterns of children with ASD, children with WS and Typically Developing children

Participants

12 children with ASD, 12 children with WS and 12 TD children partook in the study (age range; 6-18 years). Participants with ASD were assessed using ADOS and the Childhood Autism Rating Scale (CARS). Children with WS were recruited via the Williams Syndrome UK database.

References

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Methods

All participants were measured on the following:

- **Medical History Questionnaire:** detailing clinical diagnosis (where appropriate) and any other conditions or variable that may have an effect on sleep (e.g. technology use, diet and additional conditions such as asthma)
- **Animal Naming Task (AN):** a declarative memory, non-word explicit learning task. It is used to assess sleep-dependent memory consolidation in children. Children are trained in terms of learning the non-word names of farmyard animals (e.g. Coby the Dog, Jaala the Pig and Eagus the Sheep). After training, participants are tested three times over a 24 hour period



- **Child Sleep Habits Questionnaire (CSHQ):** a screening instrument for school-aged children based on clinical symptom presentations of common sleep disorders. A cut-off total CSHQ score of 41 identifies children with a clinical sleep problems
- **Sleep diary:** a parental record of the child's bed- and wake-time
- **Actigraphy watch:** a reliable measure of sleep as it records day- and night- time activity through motion (used on the non-dominant wrist)

Results I

Actigraphy:

- Noteworthy findings in sleep latency (the period between wakefulness and sleep) between TD groups and DD groups



Table 1. Mean scores (SD) of each group (TD, ASD and WS) drawn from actigraphy data

	Actual Sleep Time (H:M)	Sleep Latency (H:M)
TD (n=9)	07:45 (00:34)	00:24 (00:13)
ASD (n=9)	07:28 (01:19)	01:07 (01:02)
WS (n=7)	07:46 (01:22)	00:51 (00:49)

Results II

Between group comparisons were carried out for WS, ASD and TD groups.

Table 2. Mean scores (SD) of each Group (TD, ASD and WS) on CSHQ variables

CSHQ Scores	TD (n=12)	ASD (n=12)	WS (n=12)
CSHQ total	48.92 (9.59)	51.25 (10.42)	47.00 (7.75)
Bedtime resistance	9.50 (3.0)	8.83 (3.48)	7.00 (2.55)
Sleep onset delay	1.50 (.67)	1.83 (.83)	2.15 (.94)
Sleep duration	4.17 (1.34)	4.75 (1.82)	4.58 (1.78)
Sleep anxiety	7.00 (2.56)	5.92 (2.32)	5.17 (1.75)
Night Wakings	5.00 (1.21)	5.67 (1.37)	4.59 (1.98)
Parasomnias	9.08 (3.92)	10.33 (3.34)	9.15 (1.99)
Disordered Breathing	3.08 (.29)	3.67 (1.23)	3.59 (1.44)
Daytime sleepiness	13.00 (2.49)	13.00 (2.08)	13.08 (3.66)

Table 2 shows that:

- Children with WS display high levels of bedtime resistance and daytime sleepiness
- Children with ASD demonstrate high levels of parasomnias
- Children with ASD have a higher CSHQ total, indicating more frequent sleep problems in this population

Correlations:

- Positive association between CSHQ Total and Actual Sleep Time in TD participants
- Negative association between CSHQ Total and Actual Sleep Time in ASD and WS participants

Conclusions

- As predicted, children with WS display higher bedtime resistance and daytime sleepiness compared to TD and ASD participants
- Unlike TD and ASD participants, children with WS performed poorly on the animal naming task suggesting that learning and memory was not enhanced after sleep
- Parental report (CSHQ) does not appropriately correspond with actigraphy data, suggesting that parents may not be fully aware of sleep problems in their children

Future Directions:

- Taking salivary cortisol data to examine biological markers in relation to sleep and sleep related learning