The effectiveness of weighted blankets on sleep problems for children with Autism Spectrum Disorder

Mullins, K.

The Allied Health Scholar (2024), Vol 5 (1)

Background

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterised by impairments in social communication, sensory anomalies, and restricted behaviours or interests (Lord et al., 2020). Sleep problems are commonly reported by parents of children with ASD, with prevalence of sleep disorders in children with ASD estimated to be from 44–83% (Richdale, 1999). Sleep is essential to child development and health, and sleep problems in children can lead to compromised neurobehavioral functioning and learning, difficulty with mood and emotional regulation, daytime fatigue and reduced alertness (Sadeh, 2007).

There is growing interest toward the use of complementary and non-pharmacological interventions for ASD, with up to 74% of children with ASD using at least one form of complementary therapy (Hyman et al., 2020). Sensory-integration based interventions, including deep-pressure stimulation and weighted blankets, are an increasingly popular example of such interventions. It is theorised that these interventions provide deep pressure and consistent sensory input which reduces the body's physiological arousal and stress levels (Mullen et al., 2008). Weighted blankets and deep pressure interventions are becoming increasingly popular to improve sensory regulation and improve sleep in the ASD population. However, there is currently little evidence to support the use of weighted items, and to date there are no systematic reviews investigating the impact of weighted blankets on sleep for children with ASD. This systematic review aims to identify the effectiveness of weighted blankets on sleep problems for children with ASD (PICO in *Table 1*).

Table 1: PICO

	Definition	**Inclusion**	**Exclusion**
Population	Children aged under 18 with Autism Spectrum Disorder	Children under the age of 18, children, kids, Autism Spectrum Disorder	Adults over the age of 18, not diagnosed with Autism Spectrum Disorder
Intervention	Weighted blanket	Weighted blanket, weighted items	Other interventions
Comparison	Nil comparator		
Outcome	Sleep behaviours		Behaviours or symptoms not related to sleep.
Studies		Quantitative. All countries, study types, years.	Non-human, not published in English. Qualitative studies.

Method

Three health focused databases (Medline, Emcare, and Embase) were searched to identify literature appropriate for the review. These databases were chosen because of their likelihood to retrieve articles relevant to the research question. To locate relevant studies, MeSH headings and keywords were used with necessary truncation and Boolean operators, as outlined in *Table 2* (see entire Medline search in Appendix A). Inclusion and exclusion criteria are defined in *Table 1*. No limits were applied to ensure search results were not restricted.

Table 2: MeSH headings and keywords used in search strategy

Element	**Concept**	**MeSH Headings**	**Keywords**
Population	Children	Child/ Adolescent/ Minor	Child* Adolescent* Under 18 P?ediatric
	ASD	Autism/ Autism spectrum disorder/	Autis* ASD Asperger*
Intervention	Weighted blanket		Weighted blanket*

Results of search

All studies identified through database searching were imported into Covidence for screening. There were initially 31 studies, 14 were removed as duplicates, and the remaining 17 were screened and assessed for eligibility using the inclusion and exclusion criteria. Three full text articles met the inclusion criteria and were selected for the review (PRISMA diagram – *Appendix B*). The 3 selected studies were the highest available evidence for the research. One randomised controlled trial was available, and the other studies were lower on the hierarchy of evidence, being pre-post designs, which is a level 4 on the NHMRC hierarchy of evidence (National Health and Medical Research Council, 2009).

The McMaster critical review tool for quantitative studies was used to assess the methodological quality of the included studies (Law et al., 1997). This tool was selected as it is easily accessible and was appropriate for all included studies.

Results

The results from the included studies were analysed independently (Table 3) and the data was extracted before being synthesised together to understand the findings. All three studies similar outcome areas but utilised different measures. Gee et al. (2016) utilised daily online surveys

completed by caregivers to measure the participants sleep behaviours, and Gee et al. (2020) utilised these surveys as well as data from the Sense Sleep App. Gringras et al. (2014) utilised a variety of measures including actigraphy, and parent-completed surveys and questionnaires.

Due to the difference in outcome measures and the wide-ranging age demographic from 4-16 years old, the synthesis of results was based on overall data trends rather than precise comparison. All included studies found no significant changes or improvements in sleep behaviours with the weighted blanket intervention. However, Gringras et al. (2014) found a statistically significant, but clinically small, improvement in sleep when using the control group.

One study found that the weighted blanket was effective for improving the morning mood of one participant and reducing the number of night wakings of the other participant, as reported by the daily caregiver survey (Gee et al., 2016). Another study found that objective data from the Sense Sleep App found the weighted blanket to be ineffective for all outcomes, however using the caregiver surveys found that morning mood improved for one participant, and number of night wakings decreased for another participant (Gee et al., 2020).

The study conducted by Gringras et al (2014) also found that children preferred the weighted blanket over the control blanket, and that parents reported their children displayed calmer behaviours when using the weighted blanket.

Discussion

The aim of this systematic review was to determine the effectiveness of weighted blankets on sleep problems for children with ASD. Three studies were used within the review, all of which found no evidence that weighted blankets improve sleep problems for children with ASD.

Children with ASD have impairments in social communication, sensory anomalies, and behavioural challenges (Lord et al., 2020). ASD is also highly correlated with sleep disorders and sleep problems, leading to further challenges with developmental functioning, emotional regulation, and daytime behaviours. These difficulties can significantly impact a child's ability to engage in meaningful activities, education, and can also impact their development. Current treatment options for children with ASD include developmental, behavioural, and psychosocial therapies such as applied behavioural analysis (ABA) and cognitive behavioural therapy (CBT)(Lord et al., 2020), and pharmacological medications may also be used to treat ASD symptoms or co-morbidities.

Table 3: Description and results from studies

Author details	Research Design, Study Objective	Participants	Intervention Procedure	Outcome Measures	Results and Findings
Gee, Peterson, Buck & Lloyd, 2016	Multiple baseline design across participants To explore the efficacy of weighted blankets with children with an autism spectrum disorder and sleep disturbances.	2 male children aged 4-5 with ASD, sleep disturbances, and sensory over-reactivity.	Participants were provided with a weighted blanket following the 9-day baseline data collection phase. Treatment lasted 14 days, followed by a 7-day withdrawal phase. Caregivers were provided oral and written instruction on the use and precautions of the blanket. The weight of the blanket was approximately 10% of the child's body weight.	Daily online survey completed by caregivers. Sleep behaviours: Time to fall asleep. Hours of sleep. Number of wakings Morning mood.	Visual analyses of the data points (increased or decreased variability) and the trend lines (slope and level) was conducted. Overall, no significant change was detected for any of the outcomes.
Gringras et al., 2014	Randomised Controlled Trial 'To assess the effectiveness of a weighted-blanket intervention in treating severe sleep problems in children with	73 children aged from 5 years to 16 years and 10 months, with a diagnosis of autism spectrum disorder, and their parents reported they had a sleep problem for at least the previous 5 months.	Participants underwent a baseline adaptation and monitoring period of 7-21 days. Participants were either allocated to the treatment first or control first group. The weighted blanket chosen adhered to the guidance on sensory interventions as proposed by Ayres, and was either 2.25kg (small) or 4.5kg (large).	Sleep behaviours were measured by Actigraphy, Parent-completed diary, and Questionnaires – Composite Sleep Disturbance Index (CSDI), the Aberrant Behaviour Checklist (ABC), Sensory Behaviour Questionnaire (SBQ). Outcome areas included:	No significant results for TST, SOL, sleep efficiency, or measures of wake after sleep onset. Significant difference (P=.010) found improvement in sleep using control blanket. The study found that children preferred the weighted blanket over the control blanket, and that parents reported that their child was calmer with the weighted blanket.

	autism spectrum disorder (ASD).'		During the treatment phases, each blanket was used for 12-16 days. After the first treatment phase, the researchers removed the initial blanket, and provided the next blanket.	Sleep – Sleep onset latency (SOL) Total sleep time (TST) Sensory Profiles Daytime behaviours Perceptions of blanket use	
Gee, Lloyd, Sutton, & McOmber, 2020	Multiple baseline design across participants 'To explore the efficacy of weighted blanket applications and sleep quality in children with autism spectrum disorder and behavioural manifestations of sensory processing deficits'	2 children with ASD and sensory processing deficits 1 male; 1 female Aged 4	Participants were provided with a weighted blanket following the 9-day baseline data collection phase. Treatment lasted 14 days, followed by a 7-day withdrawal phase. Caregivers were provided oral and written instruction on the use and precautions of the blanket. The blankets weighed from 3-7 pounds to accommodate the varying weights of participants.	Daily online survey completed by caregivers. Sleep behaviours: Time to fall asleep. Hours of sleep. Number of wakings Morning mood. 'Sense Sleep app' data, collecting measures: Overall sleep quality Total hours of sleep Number of hours of deep sleep	The percentage of non-overlapping data (PND) statistic was calculated to assess treatment effectiveness. Daily caregiver survey Time to fall asleep: ineffective Sleep duration: ineffective Number of wakings: Ineffective (John), Effective (Katie) Morning mood: Effective (John), Ineffective (Katie) Sense Sleep App Sleep score: ineffective Sleep duration: ineffective Deep sleep duration: Ineffective

All included studies found that weighted blankets had no impact on sleep problems for children with ASD. However, evidence to support weighted blanket use is stronger in the adult population, with one study finding that weighted blankets improved sleep in adults with chronic insomnia (Ackerley et al., 2015). These results are likely due to differences in outcome measures, and use of subjective tools such as questionnaires, as well as participants from a non-ASD population. It is important to note that despite there being no strong supportive evidence for weighted blankets to improve sleep, participants generally felt positive about their use. Gringras et al. (2014) found that more children "really liked" using the weighted blanket compared to the control blanket, and the participants' parents reported that their children were more calm and had improved sleep when using the weighted blanket.

Gringras et al. (2014) was a high quality and generalisable study. The randomised controlled trial design, along with a range of outcome measures, and large sample size, make the results more valid and reliable. The sample size consisted of 80% males, which is representative of the ASD population being more prevalent among males. The intervention was also similar among all three studies. Gee et al. (2016; 2020) both used the same intervention approach with a baseline for 9 days, intervention for 14 days, and withdrawal phase for 7 days. Participants in the study by Gringras et al. (2014) also underwent a baseline monitoring period, then underwent either control or intervention for 12-16 days, then switching blankets to the other treatment group.

There were a number of limitations within the studies which reduce the validity, generalisability, and reliability of the results. Gee et al. (2016) only utilised subjective measures in the form of daily caregiver surveys, which the other two studies utilised objective measurements. However, the reliability and validity of the Sense Sleep App could not be confirmed by researchers due to the proprietary nature of the device (Gee et al., 2020). Convenience sampling was used in the studies by Gee et al. (2016; 2020) and both of these only had a small sample size of 2 participants. Another limitation is that the weight of the weighted blankets is inconsistent between studies, with Gee et al. (2016; 2020) calculating the blankets to be approximately 10% of the participants' body weight, while Gringras et al. (2014) used either a small (2.25kg) or large (4.5kg) blanket sold by the manufacturer.

Further research into weighted blankets is necessary to find the effect of this intervention on sleep, and other symptoms of ASD.

Clinical bottom line

The evidence appraised in this review suggests that there is no strong evidence to support the use of weighted blankets as an intervention to improve sleep problems for children with autism spectrum disorder. However, they may potentially have other benefits such as children liking to use weighted blankets and parents perceptions of weighted blankets being positive for improving children's sleep and mood. Based on these findings, Occupational Therapists should prescribe weighted blankets with caution and recognise the limitations in this area of research and utilise weighted blankets alongside other interventions for improving sleep problems for children with ASD.

Disclaimer: This report was prepared by a graduate-entry student as part of assignment purposes.

References

Ackerley, R., Badre, G., & Olausson, H. (2015). Positive Effects of a Weighted Blanket on Insomnia. Journal of Sleep Medicine & Disorders, 2(3), 1–.

Gee, B. M., Lloyd, K., Sutton, J., & McOmber, T. (2020). Weighted Blankets and Sleep Quality in Children with Autism Spectrum Disorders: A Single-Subject Design. Children (Basel), 8(1), 10–. https://doi.org/10.3390/children8010010

Gee, B. M., Peterson, T. G., Buck, A., & Lloyd, K. (2016). Improving sleep quality using weighted blankets among young children with an autism spectrum disorder. International Journal of Therapy and Rehabilitation, 23(4), 173–181. https://doi.org/10.12968/ijtr.2016.23.4.173

Gringras, P., Green, D., Wright, B., Rush, C., Sparrowhawk, M., Pratt, K., Allgar, V., Hooke, N., Moore, D., Zaiwalla, Z., Wiggs, L. (2014). Weighted blankets and sleep in autistic children – A randomized controlled trial. Pediatrics, 134: 298-306. https://doi.org/10.1542/peds.2013-4285

Hyman, S. L., Levy, S. E., & Myers, S. M. (2020). Identification, Evaluation, and Management of Children With Autism Spectrum Disorder. Pediatrics (Evanston), 145(1), 1–. https://doi.org/10.1542/PEDS.2019-3447

Law M., Stewart D., Pollock N., Letts L., Bosch J., Westmorland M. (1997). Critical Review Form - Quantitative Studies. McMaster University.

Lord, C., Brugha, T. S., Charman, T., Cusack, J., Dumas, G., Frazier, T., Jones, E. J. H., Jones, R. M., Pickles, A., State, M. W., Taylor, J. L., & Veenstra-VanderWeele, J. (2020). Autism spectrum disorder. Nature Reviews. Disease Primers, 6(1), 5–5. https://doi.org/10.1038/s41572-019-0138-4

Mullen, B., Champagne, T., Krishnamurty, S., Dickson, D., & Gao, R. X. (2008). Exploring the Safety and Therapeutic Effects of Deep Pressure Stimulation Using a Weighted Blanket. Occupational Therapy in Mental Health, 24(1), 65–89. https://doi.org/10.1300/J004v24n01_05

Richdale, A. L. (1999). Sleep problems in autism: prevalence, cause, and intervention. Developmental Medicine and Child Neurology, 41(1), 60–66. https://doi.org/10.1017/S0012162299000122

Sadeh, A. (2007). Consequences of sleep loss or sleep disruption in children. Sleep Medicine Clinics. 2, 513–520. https://doi.org/10.1016/j.jsmc.2007.05.012

National Health Medical Research Council (2009). NHMRC Additional Levels of Evidence and Grades for Recommendations for Developers of Guidelines. Australian Government. https://www.mja.com.au/sites/default/files/NHMRC.levels.of.evidence.2008-09.pdf

Appendices

Appendix A: Search strategy for Medline

Medline: Ovid MEDLINE® All 1946 to September 29 2023

Search History (9) — View Saved

# ▲	Searches	Results	Type	Actions	Annotations
1	Child/	1925682	Advanced	Display Results More	
2	Adolescent/	2222770	Advanced	Display Results More	
3	(child* or adolescent* or under 18 or p?ediatric).mp. [mp=title, book title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms, population supplementary concept word, anatomy supplementary concept word]	4035479	Advanced	Display Results More	
4	1 or 2 or 3	4035479	Advanced	Display Results More	
5	Autism Spectrum Disorder/	20086	Advanced	Display Results More	
6	(autis* or ASD or asperger*).mp. [mp=title, book title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms, population supplementary concept word, anatomy supplementary concept word]	80821	Advanced	Display Results More	
7	5 or 6	80821	Advanced	Display Results More	
8	weighted blanket*.mp.	46	Advanced	Display Results More	
9	4 and 7 and 8	8	Advanced	Display Results More	

Save Remove Combine with: AND OR — Contract

Appendix B: PRISMA flow chart