SciMedCentral | Journal of Sleep Medicine & Disorders

Research Article

Effects of Deep Propioceptive Stimulation on the Efficiency of Sleep in People with Intellectual Disability and the Necessity of Extensive-Generalized Support

Àlex Gimeno-Ruiz[1]*, Ramon Novell-Alsina[1], Marta Vilà-Alsina M[1], David Torrents-Rodas[1], Laura Vergés-Planagumà[1], Susanna Esteba-Castillo[1], Cristina Pascual-Vissa[2], Margarita Costa-Burch[2], Núria Garcia-Delgado[2], and Dolors Batista-Vilà[2]

[1]*Specialized Mental Health Service for People with Intellectual Disabilies (SESMDI), Spain*

[2]*Els Roures Consorci Sant Gregori, Catalonia, Spain*

***Corresponding author**

Àlex Gimeno-Ruiz, Specialized Mental Health Service for People with Intellectual Disabilities (SESM-DI), Martí i Julià Hospital Park. Tillers Building C / Dr. Castany S / N, 17.190 Salt (Girona), Spain, Fax: 972182566 ; Tel: 972182517; Email: alex.gimeno@ias.cat

Submitted: 11 December 2020

Accepted: 20 December 2020

Published: 26 December 2020

ISSN: 2379-0822

Keywords
- Weighted blanket
- Proprioception
- Sleep efficiency
- Intellectual disability
- Extensive-generalized support

Abstract

Study carried out on people with intellectual disability (ID). The objective was to evaluate the efficacy of deep proprioceptive stimulation through the application of weight blankets on the efficiency of sleep in people with intellectual disabilities and the need for extensive-generalized support (study 1). A second objective was to evaluate if deep proprioceptive stimulation allows reducing the use of sedative medication (study 2). The study was applied in a sample of 64 people with ID (22 women 34%) with an average age of 41.05 years. Study 1 was divided into a pre-phase, in which the baseline of the subjects' sleep parameters was recorded during a week, and a post-phase, also of a week duration, in which the weight blankets were used and the same sleep parameters were still recorded. Once study 1 was completed, 14 participants from the original sample, who took sedative medication, were selected, and their medication dose was reduced. There were no differences in environmental conditions between control and experimental conditions. The quality of the sleep was recorded during the study with actimetry sensors placed in the ankle of each person studied. The results showed that an improvement in sleep efficiency, and a reduction in the number and minutes of awakenings was achieved when the use of the deep weight blanket. The latency time (time it takes you to fall asleep) was shortened when a deep-weight blanket was used even with the withdrawal of some sedative medication.

ABBREVIATIONS

ID: Intellectual Disability, ADHD: Hyperactivity Disorder and Attention Deficit; PSG: Polisomnography; ICSD: International Classification of Sleep Disorders

INTRODUCTION

Sleep is a physiological stage which involves the periodic abolition of consciousness and the reduction of responses to environmental stimuli. Its functions are endocrine regulation and memory consolidation [1]. Sleep needs are as diverse as each person who is studied and depend on multiple factors, such as age, customs, culture, etc. We normally consider that a person has a healthy sleep when they sleep enough to not feel fatigued or sleepy during the day and are able to function properly. Sleep deprivation has a negative effect on well-being and quality of life. In adults with Intellectual disability (ID), sleep disorders are associated with deterioration in diurnal functioning performance and an increase in challenging behaviors during the day [2], which have a negative impact in their quality of life [3].

People with ID have a prevalence of sleep disorders which varies from 13% to 86% in the population (including adults and children). If we focus specifically on data obtained from adults, the prevalence varies from 8.5% to 34.1% [4]. In people with autism, the sleep disorder frequency observed falls in a range from 44% to 83% of the population [5]. These ranges, which are especially large, will depend on variables such as the age of the subjects, the measures and the definitions of sleep disorders used in the different studies [6]. They also tend to depend on factors such as inherent abnormalities in the regulation of sleep and circadian rhythm, sensory deficits, and pharmacological treatments used to treat associated symptoms [7].

The most common sleep complaints reported by DI individuals are difficulties in consolidating or maintaining sleep, and the existence of long periods of awakens during the night [8], problems which are part of the sleep disorders called dyssomnias [9]. People with ID have in communicating details about their experience during sleep, and this complicates early detection and subsequent treatment. Usually, treatment is considered and started when sleep deficiencies negatively affect the subject behavior and cognitive function [10].

Sleep disorders can be a symptom of mental illness and in people with ID this is also the case. However, it has been observed that a large percentage of these disorders, especially in people with more severe disabilities, are usually the result of any physical condition which causes pain or discomfort, the lack of adequacy of the physical characteristics of the room (temperature, overcrowding, light, etc.) [11], or worst, the lack of resources to attend the specific needs of each individual.

The management of sleep disorders is made particularly difficult by the scarcity of safe, effective, and affordable pharmacological treatments [12]. In addition, these treatments often amplify the disability, eroding the quality of life. Benzodiazepines are the most common treatment for insomnia, but excessive prolongation of their use can produce tolerance, dependence, and/or abuse; In the cognitive field, few studies have been published which report a deterioration related to the long-term intake of benzodiazepines [13], being the most frequent impairments reported in such studies the deterioration of visuospatial capacity, processing speed and verbal learning [14]. All of these consequences and secondary effects have led to the search for other classes of medications for insomnia, including antidepressants, anticonvulsants, hormones, and antipsychotics.

The prescription of psychotropics to people with ID is common. Studies in the United Kingdom report a prevalence of between 20% and 50% in hospitals and residential centers, and of 10% in people living in the home. A large percentage of these psychotropics are prescribed for the management of behavioural disorders and sleep disorders [15].

According to Reynolds [16], studies of sleep disorders provide strong evidence in favour of the use of behavioural strategies, based on learning insomnia management, and ecological strategies (rather than on the use of hypnotics), such as maintaining a regular sleep-wake schedule and regulating the ecological environment of the room.

One of the techniques which have the best response in the management of sleep disorders is proprioceptive stimulation. Proprioception is the sense which informs the organism of the position of the muscles, is defined as the ability to feel the relative position of contiguous body parts and intervenes in the relationship of the person with space. In particular, it helps to regulate the direction of movement and allows reactions in automatic responses, such as control of balance, coordination of both sides of the body, maintenance of the level of alertness of the central nervous system and influence on the emotional development and behaviour. The design of the proprioceptive stimulation blanket (or weight blanket) is based on the sensory integration theory of A. Jean Ayres [17] and his work with children with learning disabilities. His theory refers to a neurological process which organises the sensations which come from the body and the environment and makes it possible to use the body effectively in the ecological environment. Temple Grandin's research [18], with her hug machine for autistic children, supported the hypothesis that deep pressure has a calming effect for people with autism, especially those with high levels of excitement or anxiety.

There have been very few studies on the efficiency of proprioceptive stimulation. The most relevant is the one developed at the Danish University of Syddansk [19], where the use of proprioceptive blankets in young people with ADHD and sleep disorders for 14 days reduced the latency time and improved attention during daytime activities by 10%.

Another study which stands out is the one carried out by the University of Gothenburg (Sweden) to measure the positive effects of weight blankets on people who suffer from insomnia [20]. They made a series of records of physiological and behavioural responses which were improved during the use of weighted blankets, reaching the conclusion that their use can help reduce insomnia through the increase of tactile and proprioceptive sensory stimulation. Proposing the treatment as an innovative strategy, not a pharmacological one, to improve the quality of sleep.

Also noteworthy are those studies carried out by the American Occupational Therapist on increasing attention with the use of weight vests in children with autism spectrum disorder [21].

In sleep studies conducted with people with ID the choice of the evaluation method is of vital importance. Even though polysomnography (PSG) is the objective tool par excellence for assessing the quality of sleep, this type of exploration is carried out in sleep laboratories, and its complexity hinders its application in people with intellectual disabilities [24].

In a study by Van de Wouw, Evenhuis, & Echteld [4] whose objective was to compare the use of PSG method and actigraphy, the results showed that the differences in mean values were smaller than might be expected. Actigraphy provided a relatively reliable estimate of sleep parameters in adults with ID without being especially invasive and could be better in a natural sleep situation.

OBJECTIVE

The first objective of this study was to evaluate the efficacy of deep proprioceptive stimulation, through the application of weighted blankets, on the efficiency of sleep in people with ID requiring extensive-generalized support (Study 1). A second objective was to evaluate if deep proprioceptive stimulation allows reducing the use of sedative medication (Study 2).

METHOD

Participants

For study 1, a sample of 64 people was selected (22 women, 34.4%, and 42 men, 65.6%) with a diagnosis of moderate / severe ID in their certificate, and an average age of 41.05 years (SD = 12.48). The people studied are the residents of the Residence "Els Roures" in the Sant Gregori Consortium (Girona, Spain). For study 2, 14 people from the study sample 1 were selected (5 women, 35.7%, and 9 men, 64.3%). This grouphad been prescribed with some sedative medication to combat a sleep

SciMedCentral

disorder (specifically, intrinsic type disomnias, Ref ICSD). The mean age of this group was 42.43 years (SD = 13.72).

MATERIALS AND METHODS

The deep proprioceptive stimulation was carried out using Protac® weighted blankets, adult size (140 x 200cm) with 50 plastic balls and 7 kg of weight.

The sleep parameters of this study were recorded using the technique of actigraphy, based on the principle that during sleep the movements of the individual diminish until they are practically at rest. Actigraphs of the Actigraph® brand WActiSleep-BT were used for this study.

The actigraph is a sensor, with the appearance of a clock (equipped with an accelerometer), which allows the recording of daily motor activity and periods of inactivity. The duration of the recording is variable, and usually ranges from one day to several weeks [25].

An actigraph was placed on the ankle of each participant to record their motor activity. The information collected by the actigraphs was stored in the same sensor, and then transferred into dump a database for the processing, analysis, report and graphic representation of the original information recorded The information which the actigraph gives us is analysed and complemented with the information provided by the patient through a sleep journaliinfo which must be filled in during the days on which the sensor is worn [26].

The rest-activity patterns thus recorded allow us to estimate sleep-wake cycles, providing data on sleep hygiene, such as total waking time, total sleeping time, number of awakenings, or sleep latency [27].

In addition to the sleep parameters, some control variables were collected by means of a sleep register, including the temperature and ambient noise of the room, and the participants' bedtime and wake-up times.

Study 1 was divided into a pre-phase, in which the baseline of the sleep parameters was recorded during a week, and a post-phase, also of a week's duration, in which the weighted blankets were used and the same parameters were recorded without interruption. After carrying out study 1, 14 participants who took sedative medication were selected from the subjects of study 1 and their medication dose was reduced (Table 1). The sleep parameters were recorded for one more week, to determine whether the possible improvements obtained using the blankets were maintained despite reducing the dose of medication (study 2).

Analysis

The sleep parameters analysed were the number of hours for which the participant was sleeping, the sleep latency minutes, the number of awakenings, the waking minutes after falling asleep for the first time, the average number of minutes in which he/she was awake every time he/she woke up, and the sleep efficiency. The latter is expressed as a percentage and was calculated with the following formula: (hours sleeping/hours lying down) * 100.

Table 1: Sedative medications taken by participants in study 2 and reduction of their doses.

Medication Name	Drug Reduction (mg)	Reduction percentage
Lorazepam	1mg	100%
Clorazepate dipotassium	5mg	6.25%
Olanzapine	5 mg	42.85 %
Olanzapine	2.5 mg	50 %
Olanzapine	5 mg	100%
Melatonine	3.8mg	100 %
Trazodone	100mg	100 %
Clotiapine	20mg	25%
Clonazepam	1mg	33%
Diazepam	2.5mg	100%
Risperidone	0.5 mg	20%
Clonazepam	0.5mg	100%
Clorazepate dipotassium	10 mg	50%
Lormetazepam	2 mg	100 %

For each of the parameters, two means were calculated, one from the data collected during the seven nights of the pre-phase and the other from the data collected during the seven nights of the post-phase. Similarly, a pre and a post average were obtained for the control variables. Given that a considerable number of participants showed a relatively high sleep efficiency (≥ 90%) as early as the pre phase, the sample was divided into two groups: pre sleep efficiency < 90% (n = 27) and pre sleep efficiency ≥ 90% (n = 37). Thus, mixed ANOVAs were carried out with the variable intrasubject phase (pre, post) and the variable inter-subject group (pre efficiency <90%, pre efficiency ≥ 90%). Both the control variables and those of the sleep parameters showed non-normal distributions (determined by visual inspection and the Shapiro-Wilk test). Even so, the ANOVAs were used to analyse the Phase × Group interaction. Differences in pre and post measurements within each group were then analysed by nonparametric Wilcoxon tests. The level of statistical significance

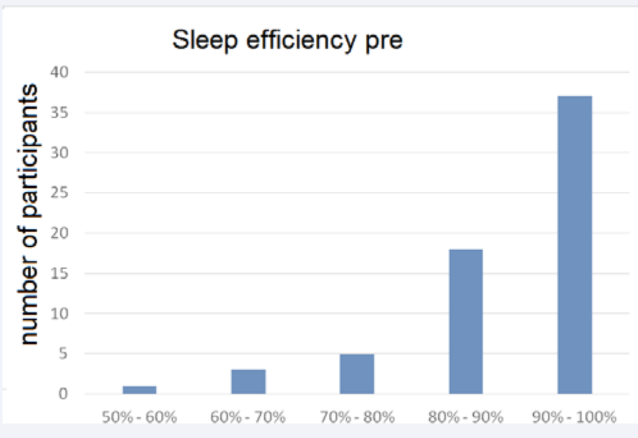

Figure 1 Study 1. Frequency distribution of sleep efficiency in the pre phase (n= 64).

used was p ≤ 0.05. The η2 is presented as a measure of the size of the effect.

Trial 1

Figure 1 shows that a considerable number of individuals (n = 37) already had a high sleep efficiency in the pre phase (≥ 90%). For this reason, two groups were created based on this variable (pre sleep efficiency < 90% and pre sleep efficiency ≥ 90%). The control variables presented similar means in the pre and post phases and in the two groups (absence of significance of the main phase and group effects, and of the Phase x Group interactions, all Fs < 3.96, ps > 0.05, Table 2).

Figure 2 shows the graphs of the means of the sleep parameters as a function of the pre sleep efficiency group and phase. The significance of some Phase x Group interactions (Table 3), and the subsequent comparisons of the pre and post means within each group, showed that in the pre sleep efficiency

<90% group, the number of sleeping hours (z = -2.64, p < 0.01) and sleep efficiency (z = -3.41, p < 0.001) increased, and the number of minutes awake after falling sleep the first time (z = -3.17, p < 0.01) as well as the average of minutes awake during each awakening (z = -3.41, p < 0.01) decreased. In addition, despite the absence of significance of the Phase x Group interaction, the pre sleep efficiency < 90% group also showed a decrease in sleep latency (z = -2.26, p = 0.02) and in the number of awakenings (z = -1.99, p = 0.05). In the pre sleep efficiency ≥ 90% group the parameter values remained high, and therefore no difference was made between the pre and post phases (all zs > - 0.96, ps > 0.34).

Trial 2

Table 4 shows the means of the control variables before and after reducing the sedative medication. Despite the similarity of the values, the Wilcoxon tests indicated a statistically significant delay in the time when the participants went to bed (z = -2.36, p <0.05) and rose (z = -2.61). , p <, 01). For that reason, the number of hours in which the participants remained bedded at night was calculated and it was found that this did not differ between phases (z = -1.73, p>, 05). There were also no differences between temperature and ambient noise (zs> -1,96, ps>, 05).

Table 5 shows the means of sleep parameters before and after reducing the medication to the participants. Interestingly, an increase in the hours in which they were sleeping was observed (z = -2.48, p <0.05) and a decrease in sleep latency (z = -2.54, p <0.05) after reducing the dose. The values of the rest of the parameters remained similar (all zs> -1.47, ps>, 05).

DISCUSSION

The results of this research indicate that deep proprioceptive stimulation (using weighted blankets) improves the efficiency of sleep in people with ID and with need for extensive-generalised support. In study 1, participants with efficiency lower than 90% in the pre-blanket use phase showed an improvement in all the sleep parameters studied: they increased the number of sleeping hours and the sleep efficiency, and decreased the dream latency, the number of awakenings, the minutes in which the participants were awake during the night, and the average duration of each awakening. No changes were observed among the participants who already had a high efficiency (> 90%) before sleeping with the weight blankets, probably due to a ceiling effect. In addition, study 2 showed that this improvement was maintained after reducing the dose of medication in the subgroup of participants with sleep disorders, who took sedative drugs. The number of hours of sleep even increased, and sleep latency decreased even more.

The results of our research are in line with most of the previous studies conducted with proprioceptive materials, which have shown that their use improves attention and sleep, and reduces disruptive behaviours in populations which have a need for support in their daily activities as a common characteristic. For example, Olson et al. [21], reported that 92.2% of the therapists of the American Occupational Therapist recommended the use of weighted vests in children with autism spectrum disorder, and 70% reported an improvement in attention in the tasks which they carried out with the vest on. On the other hand, there are very few specific studies on the efficiency of the proprioceptive blanket. The most relevant is the one developed by Hvolby and Bilenberg [19] on the application of proprioceptive blankets in children and adolescents with ADHD and sleep disorders. The deep proprioceptive stimulation blanket was applied to 21 young people to assess whether it improved their sleep pattern. Nineteen of the participants received one or more drugs for ADHD (including methylphenidate, atomoxetine, and dextroamphetamine), while three of them took melatonin to improve sleep. During the study there were no changes in the pharmacological regimen. They placed the actigraphs and compared sleep with and without a blanket for 28 days. (7 initials without blanket, 14 with blanket and 7 finals without blanket). The results showed improvement in latency records, number of awakenings and total sleep time.

On the other hand, Hvolby and Bilenberg applied surveys to teachers and parents, presenting improvement in daytime behaviour, especially in concentration and the reduction of hyperactivity.

Table 2: Study 1. Averages and standard deviations of the control variables as a function of group and phase.

	Pre sleep efficiency < 90% (n = 27)		Pre sleep efficiency ≥ 90% (*n* = 37)	
	Pre	Post	Pre	Post
Temperature (ºC)	24,15 (1,56)	24,22 (1,55)	24,00 (1,66)	24,92 (5,48)
Environmental noise (dB)	32,93 (4,72)	32,99 (5,28)	32,63 (3,90)	34,43 (11,50)
Bedtime	21:00 (00:39)	21:04 (00:44)	21:01 (00:39)	21:04 (00:40)
Time to wake up	08:34 (00:38)	08:29 (00:44)	08:29 (00:30)	08:26 (00:32)

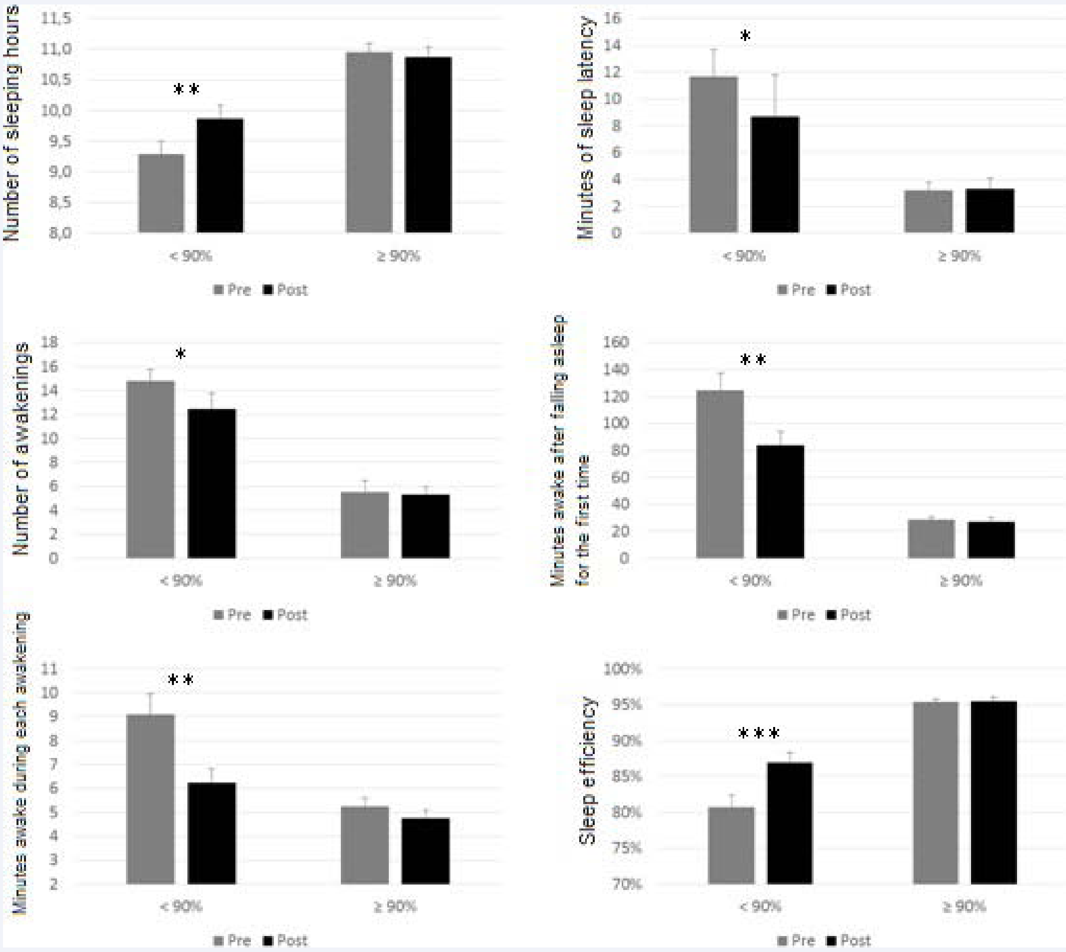

Figure 2 Study 1. Averages of sleep parameters as a function of sleep efficiency group pre (<90% and ≥ 90%) and phase (pre and post, n = 64). * *p* < ,05; ** *p* < ,01, *p* < ,001 (determined by the Wilcoxon test).

Table 3. Study 1. Results of the mixed ANOVAs carried out on sleep parameters (n = 64).

		df	*F*	*η2*	*p*
Number of sleeping hours					
Phase		1	7,34	,10	< ,01
Group		1	30,04	,33	< ,001
Phase x Group		1	12,49	,17	< ,001
Minutes of sleep latency					
Phase		1	1,85	,03	ns
Group		1	10,45	,14	< ,01
Phase x Group		1	2,10	,03	ns
Number of awakenings					
Phase		1	5,10	,08	,03
Group		1	56,56	,48	< ,001
Phase x Group		1	3,70	,06	ns
Minutes awake after falling asleep for the first time					
Phase		1	18,22	,23	< ,001
Group		1	72,65	,54	< ,001
Phase x Group		1	15,56	,20	< ,001
Minutes awake during each awakening					

Phase	1	13,84	,18	< ,001
Group	1	17,86	,22	< ,001
Phase x Group	1	6,93	,10	,01
Sleep efficiency				
Phase	1	20,34	,25	< ,001
Group	1	84,61	,58	< ,001
Phase x Group	1	18,67	,23	< ,001
df: degrees of freedom; ns: not significant.				

Table 4. Study 2. Averages and standard deviations of the control variables as a function of phase (n = 14).

	Usual medication	Reduced medication
Temperature (ºC)	24,02 (1,62)	23,18 (1,43)
Environmental noise (dB)	32,24 (3,63)	35,75 (7,29)
Bedtime	21:01 (00:42)	21:08 (00:26)
Time to wake up	08:21 (00:32)	08:43 (00:18)
Hours in which remained bedded at night	12,21 (0,80)	12,00 (0,68)

Table 5. Study 2. Means and standard deviations of the variables of sleep parameters as a function of phase (n = 14).

	Usual medication	Reduced medication
Number of sleeping hours	10,35 (1,12)	10,81 (0,90)
Minutes of sleep latency	3,52 (3,31)	1,43 (1,74)
Number of awakenings	7,56 (7,09)	7,94 (6,93)
Minutes awake after falling asleep for the first time	48,77 (50,72)	44,73 (44,67)
Minutes awake during each awakening	5,26 (3,51)	4,86 (2,34)
Sleep efficiency	91,7% (0,09%)	93,3 (0,06%)

However, the difficulty of finding the ideal tools to measure improvement in people with support needs means that there are few studies with proprioceptive material and that sometimes their results are contradictory. As in the study carried out in the United Kingdom in three participating centres (The Evelina Children's Hospital, Oxford Brookes University and Lime Trees Child and Family Unit) in which their authors observed the effects of weight-bearing blankets on the sleep of children with autism. Although the perception of children, families and caregivers was of an improvement in sleep and their daytime behaviours, the scales chosen, and/or the data collection material did not objectively reflect this improvement [28]. On the other hand, in the study carried out in Gothenburg (Sweden) with people (without disabilities) who suffered from insomnia, it was observed that when the participants used the weight blanket, they had a quieter night's sleep, with a decrease in sleep movements. Subjectively, they believed that the use of the blanket gave them a more comfortable shape, better quality, and safer sleep [20].

CONCLUSION

This research shows that deep proprioceptive stimulation is an effective ecological solution to treat sleep disorders in people with ID and with need for extensive-generalized support. Its use even allows the reduction of hypnotic drugs, thus reducing the side effects that these can produce. These findings are important because sleep disorders cause alterations in the diurnal behavior of people with ID, which in many cases end up becoming behavioral disorders and lead to an overmedication pattern. Studies on the efficacy of general proprioceptive materials are needed to assess if their effects are also beneficial in other aspects of the daily life of people with ID.

REFERENCES

1. Camino León R. Seminario "Alteraciones del sueño en los trastornos del Neurodesarrollo". Dr. de Neuropediatría. H. U. Reina Sofía. Córdoba. 2012.

2. Sajith SG, Clarke D. Melatonin sleep disorders associated with intellectual disability: a clinical review. Journal of Intellectual Disability Research. 2007; 51: 2-13.

3. Vila MT, Soto BB, Prefasi MB, Ferrer CC, Olmos MP, Campos IL. Trastornos del sueño en niños y adolescentes con incapacidad psíquica: Análisis comparativo entre alumnos escolarizados en centros ordinarios y centros de educación especial de la Comunidad Valenciana. In Anales de Pediatría. 2008; 69: 335-341.

4. Ellen van de Wouw, Heleen M Evenhuis, Michael A Echteld. Comparison of two types of actiwatch with polysomnography in older adults with intellectual disability: A pilot study. J Intellect Dev Disabil. 2013; 38: 265-273.

5. Richdale AL. Sleep problems in autism: prevalence, cause and intervention. Dev Med Child Neurol. 1999; 41: 60-66.

6. Dijik E van, Hilgenkamp TIM, Evenhuis HM, Echteld MA. Exploring the use of actigraphy to investigate sleep problems in older people with intellectual disability. Journal of Intellectual Dissability Research. 2012; 56: 204-211.

7. Berkman J. Sleep in children with developmental disabilities. Medicine and Health. 2006; 89: 94-96.

8. Gállego Pérez-Larraya J., Toledo JB., Urrestarazu E, Iriarte J. Clasificación de los trastornos del sueño. In Anales del Sistema Sanitario de Navarra. 2007; 30: 19-36.

9. American Academy of Sleep Medicine. International classification of sleep disorders, revised: Diagnostic and coding manual. Chicago, Illinois: American Academy of Sleep Medicine. 2001.

10. E van de Wouw, H M Evenhuis, M A Echteld. Prevalence, associated factors and treatment of sleep problems in adults with intellectual disability: A systematic review. Res Dev Disabil. 2012; 33: 1310-1332.

11. Novell Alsina R, Rueda Quitllet P, Salvador Carulla L, Forgas Farre E. Salud mental y alteraciones de la conducta en las personas con discapacidad intelectual: Guía práctica para técnicos y cuidadores. 2015.

12. Jeste D, Reynolds C. Sleep disorders: An Overview. Pshychiatric News. 2012; 47: 20.

13. Mauro Manconi, Raffaele Ferri, Silvia Miano, Michelangelo Maestri, Valentina Bottasini, Marco Zucconi, et al. Sleep architecture in insomniacs with severe benzodiazepine abuse. Clin Neurophysiol. 2017; 128: 875-881.

14. Melinda J Barker, Kenneth M Greenwood, Martin Jackson, Simon F Crowe. Cognitive effects of long-term benzodiazepine use: a meta-analysis. CNS Drugs. 2004; 18: 37-48.

15. Smith C, Felce D, Ahmed Z, Fraser WI, Kerr M, Kiernan C, et al. Sedation effects on responsiveness: evaluating the reduction of antipsychotic medication in people with intellectual disability using a conditional probability approach. J Intellect Disabil Res. 2002; 46: 464-471.

16. Reynolds CF. Sleep Disorders: An Overview. Psychiatric News. 2012; 47: 4-9.

17. Ayres AJ. Sensory integration and learning disorders. Western Psychological Services. 1972.

18. Grandin T. Calming effects of deep touch pressure in patients with autistic disorder, college students, and animals. J Child Adolesc Psychopharmacol. 1992; 2: 63-72.

19. Allan Hvolby, Niels Bilenberg. Use of Ball Blanket in attention- deficit/hyperactivity disorder sleeping problems. Nord J Psychiatry. 2011; 65: 89-94.

20. Ackerley R, Badre G, Olausson H. Positive Effects of a Weighted Blanket on Insomnia. J Sleep Med Disord. 2015; 2: 1022.

21. Olson LJ, Moulton HJ. Use of weighted vests in pediatric occupational therapy practice. Phys Occup Ther Pediatr. 2004; 24: 45-60.

22. Quintero-Hernández K, Giner P, Torres N, Chilet R, Ruiz L, Moliner J, et al. Sleep disturbances in schizophrenia. Sleep assessment in the schizophrenic patient by means of actigraphy. 2012.

23. Palma JA. Diagnostic protocol for sleep disorders. 2015; 11: 4409-4413.

24. Morin CM. The nature of insomnia and the need to refine our diagnostic criteria. Psychosom Med. 2000; 4: 483-485.

25. Torres N, Giner P, Chilet R, Mazzillo A, Rodrigo A, Ruiz L. "Insomnia y actigrafía." 2011; 12º Congreso Virtual de Psiquiatría. Interpsiquis 2011. Servicio de Neurofisiología Clínica. Hospital Universitario Dr. Peset, Valencia.

26. Oviedo-Montés, T., Giner P, Torres N, Mazzillo-Ricaurte A, Estudio retrospectivo de la actigrafía en una unidad de sueño. Revista de Neurologia. 2015; 60: 278-282.

27. García de Gurtubay I. "Estudios diagnósticos en patología del sueño." Anales del Sistema Sanitario de Navarra. 2007; 30. Gobierno de Navarra. Departamento de Salud.

28. Paul Gringras, Dido Green, Barry Wright, Carla Rush, Masako Sparrowhawk, Karen Pratt, et el. Weighted Blankets and sleep in autistic children – A randomized Controlled. Pediatrics. 2014; 134: 298-306.

Cite this article

Gimeno-Ruiz À, Novell-Alsina R, Marta Vilà-Alsina M, Torrents-Rodas D, Vergés-Planagumà L, et al. (2020) Effects of Deep Propioceptive Stimulation on the Efficiency of Sleep in People with Intellectual Disability and the Necessity of Extensive-Generalized Support. J Sleep Med Disord 6(4): 1116.

https://www.jscimedcentral.com/SleepMedicine/sleepmedicine-6-1116.pdf