



HAL
open science

Characterization of children with Specific learning disorders and sleep complaints

Julien Lioret, Marine Thieux, Nicolas Beck, Daniel Gerard, Patricia Franco, Aurore Guyon

► **To cite this version:**

Julien Lioret, Marine Thieux, Nicolas Beck, Daniel Gerard, Patricia Franco, et al.. Characterization of children with Specific learning disorders and sleep complaints. 27th Congress of the European Sleep Research Society, Sep 2024, Séville, Spain. hal-04930132

HAL Id: hal-04930132

<https://hal.science/hal-04930132v1>

Submitted on 5 Feb 2025

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Characterization of children with Specific learning disorders and sleep complaints

Julien Lioret^{1,2,3}, Marine Thieux^{1,2}, Nicolas Beck⁴, Daniel Gerard^{2,3}, Patricia Franco^{1,2}, Aurore Guyon^{1,2}

¹ Lyon Neuroscience Research Center (CRNL), INSERM U1028, CNRS UMR-5292, Lyon, France ; ² Pediatric Sleep Unit, National Reference Center for Narcolepsy, Hospital Woman-Mother-Children, Hospices Civils de Lyon, Lyon, France ; ³ Clinical Research Unit, Medipôle Hôpital Mutualiste (MHM), Villeurbanne, France ; ⁴ INSERM, Dijon, France

INTRODUCTION

Specific learning disorders (SLD) is reported in 8 to 10% of the general pediatric population. This condition is often associated with Attention Deficit Hyperactivity Disorder (ADHD) (33 to 70%) [1]. These neurodevelopmental disorders are commonly associated with sleep difficulties [2, 3]. Previous studies, based on questionnaires, showed that SLD is associated with more frequent sleep troubles, especially in children with SLD and ADHD [4, 5].

OBJECTIVES

The aims of this study were :

- 1) to evaluate clinical characteristics and sleep complaints of children with SLD, ADHD or both addressed to the pediatric sleep labs.
- 2) to evaluate sleep characteristics of polysomnographic recordings in children with SLD, ADHD or both.
- 3) to evaluate the impact of stimulant medications on sleep complaints and sleep quality

METHODS

One hundred and seventeen patients (5-18 y.o.), with SLD, ADHD or both, having completed a sleep assessment between 2015 and 2024 in *Lyon and **Dijon. **Exclusion criteria** : Opposition to clinical data use.

Clinical interview :

- Medical History
- Sleep complaints

Polysomnography :

- Sleep architecture
- Sleep fragmentation
- Respiratory abnormalities

Questionnaires:

- Epworth Sleep Scale Adapted (AESS)



Statistical Analyses:

- Kruskal Wallis' comparisons and paired comparisons (Wilcoxon or Khi²).

*Sleep Unit, National Reference Center for Narcolepsy, Hospital Woman-Mother-Child, Hospices Civils de Lyon ; **Ambulatory Drapeau Unit, Dijon

RESULTS

1. Patient characteristics

	SLD N = 62	SLD-ADHD N = 44	ADHD N = 11	P
Age (*)	11.21 (5.6 – 18.1)	11.25 (6.9 – 18.3)	10.5 (5.75 – 12.9)	NS
Girl (%)	38.7	47.7	36.4	NS
Overweight or obesity (%)	33.9	34.1	45.5	NS
Stimulant medications (%)	8.1	43.2	18.2	< 0.001
Melatonin Use (%)	3.2	9.1	9.1	NS

2. Medical history

	SLD	SLD-ADHD	ADHD	P
Preterm (%)	1.6	9.1	18.2	0.06
Allergy (%)	19.4	4.5	18.2	0.08
Asthma (%)	24.2	11.4	27.3	NS
SDB (%)	16.1	11.4	45.5	0.02
Adeno Tonsillectomy (%)	12.9	22.7	27.3	NS
Anxiety/Depression (%)	22.6	31.8	45.5	NS
Mood disorders (%)	1.6	11.4	27.3	0.01
OCD, ODD (%)	3.2	11.4	0.0	0.14
Multi-SLD (%)	38.7	65.9	0.027	0.027
HIP (%)	6.5	2.3	27.3	0.01
Autistic Spectrum (%)	1.6	9.1	0.0	0.13
Epilepsy (%)	6.5	4.5	0.0	NS

SDB: (OSA = OAH \geq 1.5 ; UARS = respiratory arousal index > 1/h and OAH $<$ 1.5/h) ; OCD : Obsessive-Compulsive Disorder ; ODD : Oppositional defiant disorder ; HIP : High Intellectual Potentialities

Children SLD with ADHD had higher % of stimulant medications than ADHD and SLD ($p < 0.001$).

ADHD children exhibited more history of respiratory disorders ($p = 0.02$), mood disorders ($p = 0.01$) and HIP ($p = 0.01$) than SLD and SLD/ADHD. SLD/ADHD children had a higher % of Multi-SLD than SLD children ($p = 0.027$).

The proportion of anxiety-depressive disorders in our group is significant, between 22 and 45%.

3. Sleep complaints

	SLD N = 62	SLD-ADHD N = 44	ADHD N = 11	P
Insomnia Complaints (%)	16.1	31.8	36.4	0.1
Sleepiness Complaints (%)	40.3	34.1	63.6	NS
Epworth (*)	9.0 (0 - 22)	7.5 (0 - 21)	7.5 (4 - 19)	NS
Epworth > 10 (%)	41.9	34.1	18.2	NS

4. Polysomnographic characteristics

	SLD	SLD-ADHD	ADHD	P
OAHI (*)	1,4 (0 – 64.1)	1.2 (0 – 38.4)	0.5 (0 – 4.6)	0.19
Mild OSA (%)	40.3	31.8	18.2	NS
Moderate OSA (%)	4.8	4.6	0.0	NS
Severe OSA (%)	4.84	2.27	0,0	NS
PLMS Index (*)	0.6 (0 – 36.3)	1.9 (0 - 42)	1.7 (0 - 6.4)	0.08
PLMS > 5/h (%)	27.4	34.1	18.2	0.08
Arousal Index (*)	17.5 (2.7 – 58.4)	13.9 (0.1 – 78.8)	9.4 (4.5 – 23.6)	0.04 (b, c)
Arousal Index > 15/h (%)	61.3	47.7	18.2	0.02
Respiratory Arousal Index (*)	2.6 (0 – 14.1)	2.3 (0 – 29.5)	1.3 (0.1 – 16.5)	NS
Respiratory Arousal Index (%)	32.3	43.2	45.5	NS

* median, min, max
Significance on paired comparisons Wilcoxon test : a = SLD - SLD/ADHD ; b = SLD - ADHD ; c = SLD/ADHD - ADHD
Mild OSA = OAH $>$ 1.5/h ; Moderate OSA = OAH $>$ 5/h ; Severe OSA = OAH $>$ 10/h ; PLMS = Periodic Leg Movement during Sleep \geq 5/h ; total arousal index > 15/h ; Respiratory Arousal index > 1/h without OSA.

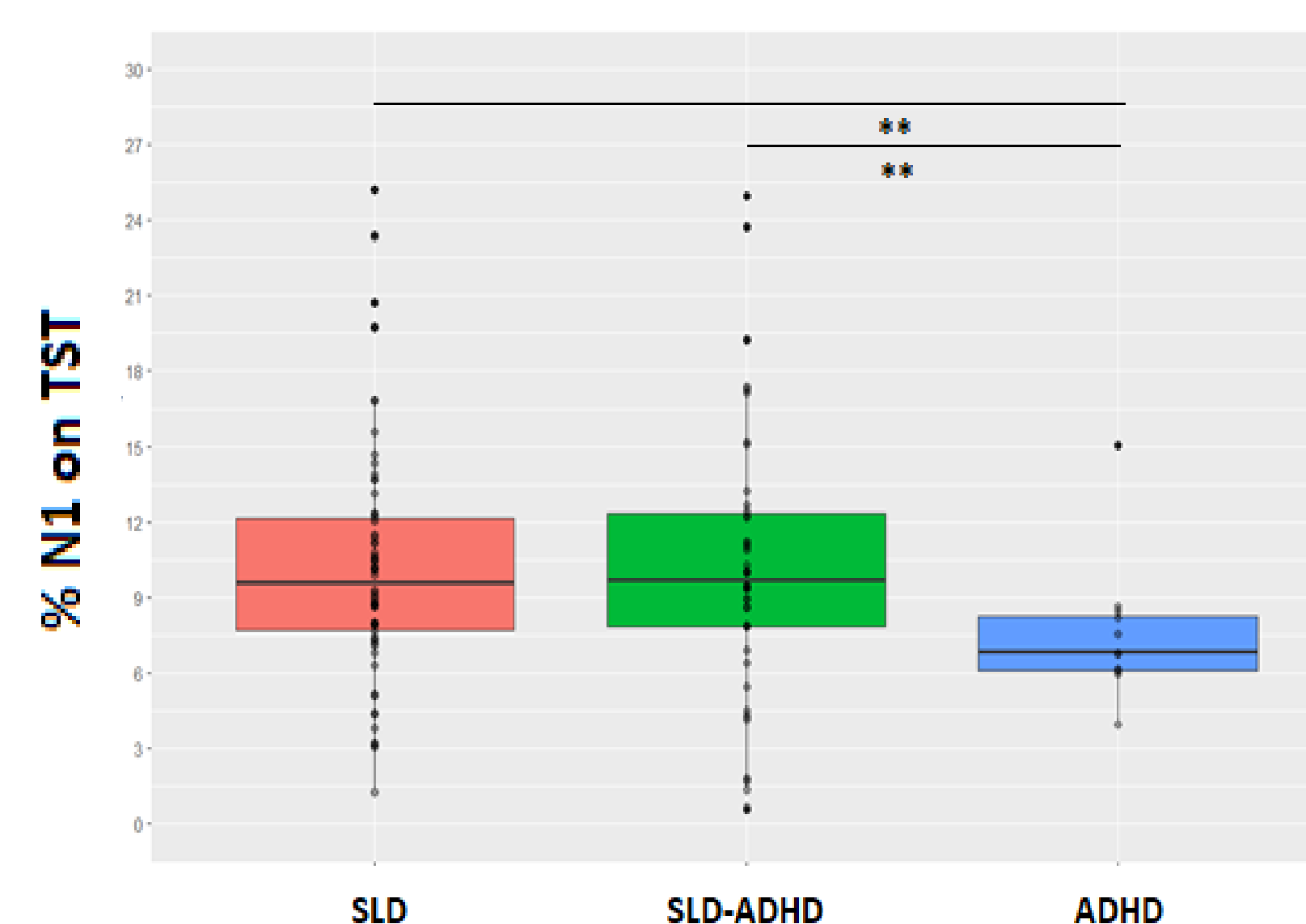


Figure 1: Percentage of stage N1 in children with SLD (red), ADHD (green), SLD or ADHD (blue) ** = $p < 0.04$

Children SLD with or without ADHD had higher Arousal Index than ADHD alone ($p = 0.04$).

Moreover, these children had higher % of N1 Sleep than ADHD ($p = 0.04$; Fig 1).

Stimulants seemed to increase the Arousal Index ($p = 0.061$) and N1 Sleep duration ($p = 0.062$).

5. Impact of stimulant medications

Children with stimulants had lower score at AESS than children without stimulant ($p = 0.04$; Fig 2).

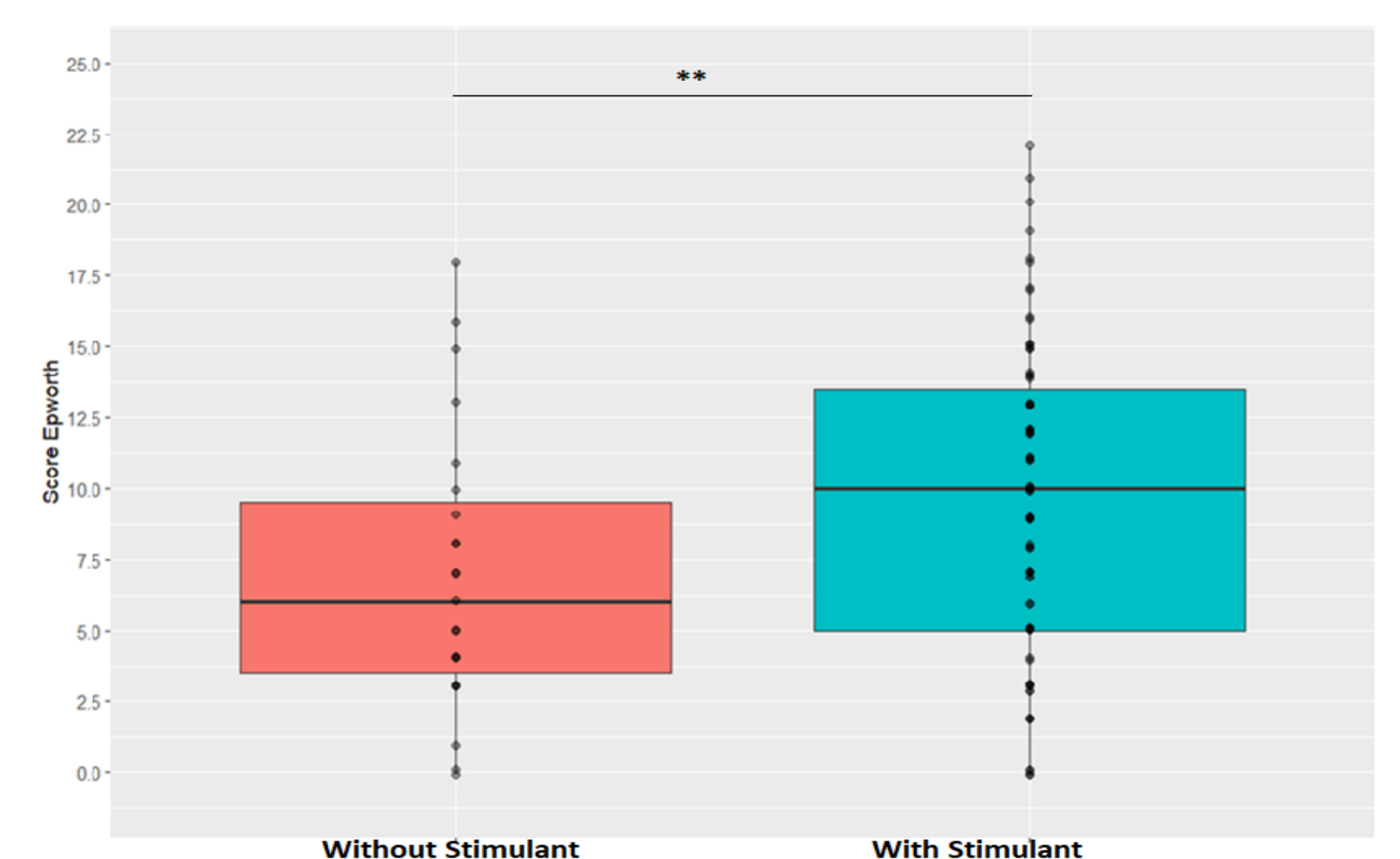


Figure 2: Score AESS in children with stimulant (red) or without stimulant (blue) ** = $p < 0.04$

6. Sleep Architecture

	SLD	ADHD	SLD-ADHD	P
N1 % (*, **)	9.6 (1.4 - 25.2)	6.9 (4.1 - 15.1)	9.7 (0.6 - 25)	0,05
N2 % (*, **)	44 (34.6 - 59.2)	47.2 (36.9 - 55.8)	46.5 (14.4 - 76.1)	0,7
N3 % (*, **)	25.1 (8.2 - 36.6)	23.5 (15.5 - 32.1)	23.4 (0.6 - 52.1)	0,6
REM % (*, **)	20.9 (12.2 - 26.8)	23.7 (15.7 - 25.1)	21.2 (4 - 33.6)	0,5
WASO % (*)	52 (17.5 - 269.5)	40 (9 - 110.5)	61.3 (0.5 - 205.5)	0,5
Efficiency % (*)	90.4 (56.8 - 98)	86.5 (68.8 - 95)	87.9 (68.8 - 99.9)	0,8
Sleep Latency (*)	21.3 (1.9 - 101)	15.9 (6 - 49.7)	18.6 (0.3 - 78.8)	0,9
Rem Latency (*)	130.5 (9 - 370.5)	153.5 (60 - 237.5)	129.3 (23.3 - 319.5)	0,4

* median, min, max
** % of Total Sleep Time

CONCLUSIONS

This study showed that 30 to 40% of children with SLD with or without ADHD had complaints of sleepiness. These children showed a high % of mild OSA and PLM. They had also a significant proportion of sleep fragmentation probably of multifactorial origins (respiratory disorders, stimulant therapy or anxiety-depressive feelings). Further study with more patients is underway.

REFERENCES

- [1] Mayes S et al. JPedPsy. 2008
- [2] Margagi L et al. BMC Neurology. 2013
- [3] Cortès S et al. J. AM. ACAD. CHILD ADOLESC. PSYCHIATRY. 2009
- [4] Carotenuto M et al. Acta Paediatrica. 2016
- [5] Saccani M.S et al. Int. J. Environ. Res. Public Health. 2022