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**RELATIONSHIP BETWEEN BULLYING BEHAVIOURS AND
SLEEP QUALITY IN SCHOOL-AGED CHILDREN**

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Abstract

Do children who practice bullying have more sleep disturbances than those who do not practice bullying? The research questions for this study were 1) Are there are differences in sleep quality between aggressors and non-aggressors and between victims and non-victims? 2) Do aggressors have higher SDI than non-aggressors? 3) What are the sleep characteristics in aggressors, non-aggressors, victims and non-victims? The purpose of the study was to analyse whether school-aged children who practice bullying have worse sleep quality than those who do not practice it and to identify the characteristics of dysfunctional sleep for aggressors? The research method was a cross-sectional study focusing on quantitative methodology. We analysed and compared the results of two questionnaires: bullying, aggressiveness among children with n= 1109, answered by the children and the Children's Sleep Habits Questionnaire (CSHQ), with n= 883, answered by the parents. A convenience sample of 8 state and private schools in Portugal was worked upon. The SDI of aggressors is not significantly different from the SDI of non-aggressors. In the 33 CSHQ items, in seven the aggressors manifest significant differences: they go to bed at the same time less often, "fight" going to bed, sleep poorly, wet the bed more often, have a more agitated sleep, wake up with nightmares and are grumpier. There are no differences between the two groups, as both have high SDI. In the aggressors, the SDI is accentuated in relation to non-aggressors with regard to the following: more difficulty in going to bed at the same time, fight more at bedtime, sleep less, wet the bed, have more agitated sleep, wake up with nightmares more and wake up grumpy.

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Keywords: Children, bullying, Sleep Disturbance Index (SDI).



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1. Introduction

We live in a society that is deprived of sleep, both among adults and among children and where aggressive behaviours in school contexts are quite expressive. A possible explanation for aggressive behaviour may be disturbed sleep characteristics.

Although sleep is a fundamental behavioural condition for the physiological maintenance of the body, sleep restriction is increasingly common in industrialized societies due to the extension of work throughout the 24 hours of the day. Recent studies indicate that the sleep duration of children has decreased in the last few decades about 30 to 60 minutes, and it is important to understand the characteristics and restrictive factors for children's sleep, bringing in parental support behaviours to this understanding (Pyper, Harrington, & Manson, 2017).

Sleep changes during the life cycle. The characteristics of a new-born's sleep are not the same as a school-aged child or an adolescent or adult. In a person without sleep disturbances, non-REM sleep and REM sleep cyclically alternate through the night. Each can occur every 70 to 110 minutes, in a process of 4 to 6 cycles per night. The way in which each sleep phase is distributed during the night may change with age, circadian rhythm, temperature, drug intake, or disease (Hirshkowitz, Whiton, Steven, Alessi, Oliviero, DonCarlos, Hazen, Herman, Eliot & Katz, 2015).

Adequate sleep duration for healthy individuals who do not suffer from any sleep disturbance varies greatly at the level of the developmental cycle; for new-borns, the adequate sleep duration is between 14 and 17 hours, for small children it is between 12 and 15 hours, for preschool age children it is between 10 and 13 hours and for school age children it is between 9 and 11 hours. For adolescents, the adequate sleep duration ranges from 8 to 10 hours and is considered appropriate. For adults and young adults, it is between 7 and 9 hours and for older adults it is 7 to 8 hours (Hirshkowitz, et al., 2015). Thus, sufficient sleep duration requirements vary throughout the life span and from person to person (Hirshkowitz et al., 2015). Individuals who normally sleep out of the normal pattern may exhibit signs or symptoms of health problems and this may compromise their well-being (Hirshkowitz et al., 2015). Other authors consider that school- aged children (6 to 12 years old) should sleep 10 to 12 hours per night, but studies show that they sleep on average 9.5 hours and that one third develops sleep problems (Mindell, Meltzerb, Carskadonc, & Chervind, 2009).

Sleep problems during childhood and adolescence are frequent and sometimes they are not transient. Some studies report that sleep problems do not disappear or diminish at all with advancing age, and can become chronic. It is very worrying that many parents still underestimate their children's sleep problems and the seriousness of their consequences (Cheung, Bedford, Urabain, Karmiloff-Smith, & Smith, 2017).

Some authors point out that the primordial and simplest function of sleep is to allow the recovery of energy expenditure during the waking period, favouring the conservation and restoration of energy and cerebral energy metabolism. However, other functions have been attributed, particularly during REM sleep, such as maintaining the body's overall balance in binocular vision, the biochemical processes of the brain that regulate the entire wake-sleep cycle, organization and structuring of memory skills, and body temperature regulation. The functions of sleep are associated with the general balance of the body, so

when there are sleep disturbances a wide range of changes may arise in terms of cognitive, social, physical, or occupational functioning. In short, sleep disturbances can be strongly detrimental to the quality of life of individuals (Mindell, & Leec, 2015).

Given the importance of sleep in child development and its interference with behaviour, we are interested in understanding the extent to which sleep hygiene and/or sleep disturbances may potentiate aggressive behaviour in school-aged children. Aggressive behaviours are common among children, and are a major problem in schools (Gomes, 2013). Bullying is characterized by physical or verbal violence behaviours in which one of the actors assumes power over the other. The victim is the object of aggression and plays this role repeatedly. This aggression can be performed by a single individual or by a group (Olweus, 1997). Bullying behaviours are repeated over time and occur mostly in the school space, and include: insults, jokes, mocking, derogatory nicknames, scolding, exclusion, beating up, threatening, stealing, sexually touching, and intimidating. The victim may suffer in silence or share what happened, however, being a victim of bullying is always a highly traumatic and suffering situation (Gomes, 2013).

Bullying children are at high risk of developing behavioural problems, have a higher psychiatric risk, delinquency, substance abuse, antisocial behaviour, violence, and criminal activity, while children who are victims of bullying are more likely to develop poor self-image, depression and low quality of life (O'Brien, Lucas, Guire, Felt, Chervin, Hoban, & Ruzicka, 2011),

We are interested in understanding the possible relationships between sleep problems and aggressive behaviour or bullying. Knowing that there is a negative effect caused by sleep deficit in the cortical pre-frontal functioning, this can contribute to loss of control in terms of emotions, including loss of the regulation of aggressive impulses. There may also be a relationship between sleep problems and aggressive behaviours according to individual variation in terms of certain neurobiological systems. These variations may be responsible for exaggerated aggressive responses that are justified by the loss of sleep in certain individuals. Accordingly, it is paramount to identify individuals at risk, because if they are identified and treated for their sleep problems, aggressive and violent behaviours can be controlled and downright reduced (Kamphuisa, Meerlob, Koolhaasb, & Lancela, 2012).

1.1. Sleep Quality and Bullying

This research seeks to verify if there is a relationship between: characteristics and quality of sleep and bullying behaviours in school-aged children. This involves ascertaining what the sleep characteristics of aggressive and non-aggressive children, victims and non-victims of bullying, are. This study aims to contribute to a greater knowledge about the manifestations and implications of bullying in school-aged children, as well as to help understand some characteristics of pupils who are victims and aggressors. In this sense, 1109 children who answered the Bullying and Aggressiveness among children Questionnaire were analysed. Olweus' (1989) original questionnaire adapted for the Portuguese language and validated for the school population by Pereira and Tomás (Pereira, 2008) and reviewed by Melim (2010) was used. The instrument used to study the effective sleep quality of children was the Children's Sleep Habits Questionnaire (CSHQ-PT), completed by their parents, a total of 883 parents who returned the questionnaires. Silva, Barbosa, Silva, & Neto (2014) adapted and validated the Children's Sleep Habits Questionnaire (CSHQ). These instruments were administered to Portuguese children (6 to 11 years of

age) attending state schools (n= 403) and private schools (n= 480), distributed by boys (n= 437) and girls (n= 446).

Our study is based on the concept of Sleep Quality and Bullying. The quality, duration and hygiene of sleep are different dimensions of sleep. Sleep hygiene refers to a variety of practices and habits that are required to have good quality night-time sleep and allow for an adequate state of daytime alertness. Quality and duration of sleep are two domains of sleep. Both overlap, differentiate themselves and are extremely important in sleep dynamics. Sleep quality refers to the subjective indexes of how sleep is experienced, such as the feeling of satisfaction and feeling rested upon awakening. Sleep quality influences more the possibility of daytime drowsiness and changes in the emotional and behavioural state and in cognitive functions (Dewald, Meijer, Oort, Kerkhof, & Bogels, 2010). Poor sleep in children, whether due to poor sleep hygiene, restricted sleep or to sleep disturbance, is associated with a wide range of behavioural, cognitive and mood problems. Sleep is a multifaceted phenomenon that influences various dimensions: biological, psychological, social, relational, and behavioural. It is also influenced by environmental and learning factors. As such, sleep should be organized and managed in a healthy way, with parents playing a key role in managing their child's sleep. Parents as sleep managers of their children can influence the quality and duration of sleep, these being two determinants of sleep (Dewald, Meijer, Oort, & Kerkhof, 2010).

A child with chronic sleep disorders may have difficulties in school learning and consolidation of memory of learned content, and experience irritability and mood changes, difficulty in focusing and behavioural changes, such as aggressiveness, hyperactivity or impulsivity (Halal, & Nunes, 2014). Disturbances in sleep quality and duration have a detrimental effect on school performance. There is a strong association between sleep quality and neuro-behavioural functioning in school-aged children (Dewald, Meijer, Oort, & Kerkhof, 2010). The problem of drowsiness in children is multidimensional and may include decreased cognitive functioning and academic performance, increased aggression and other behavioural problems, as well as increased vulnerability to accidents (Angelhoff, 2017).

Some studies have shown a relationship between sleep quality and aggressive behaviours in school-aged children, and particularly between sleep disturbances (SD) and aggressive behaviours. Respiratory sleep disorder (RSD) is organized into a spectrum that includes regular snoring at one end and obstructive sleep apnoea at the other (O'Brien, et al., 2011). Sleep apnoea is characterized by partial or complete obstruction of the upper airway (upper airway = nose, mouth and oropharynx/lower airway = trachea and lungs), disruption of normal ventilation, and hypoxemia (reduced oxygen levels in the blood).

These problems lead to the interruption of sleep, with awakenings caused by lack of air (O'Brien et al., 2011). Other studies have shown a strong association between respiratory sleep disorder and hyperactivity disorder and attention-deficit hyperactivity disorder (ADHD), with frequent manifestations of aggressive behaviour by children with RSD (O'Brien et al., 2011; Chervin, Ruzicka, Archbold, & Dillon, 2015). It is important to consider that respiratory sleep disorder often goes unnoticed in childhood, and can have significant consequences in school and behavioural life. After all, it can be easily diagnosed and treated.

O'Brien (2011) conducted a study in state schools in the state of Michigan in the USA, and found that school-aged children with behavioural problems or involved in indiscipline and bullying (aggressors) show high symptoms of respiratory sleep disorders compared to their peers. He also found that

somnolence and snoring bridged the risk of RSD and aggressive behaviour. The results of O'Brien's (2011) study are very interesting because they found that common and often unrecognized daytime drowsiness, which may or may not be related to RSD, is in fact the basis of a high number of aggressive behaviours in state schools. Drowsiness is a much more common factor in childhood than RSD, and it is related to a wide range of inappropriate behaviour regarding nocturnal sleep. The same study reports that lower socioeconomic status as well as low levels of education of mothers are both associated with poorer sleep hygiene (O'Brien, et al. 2011).

The characteristics of disturbed sleep include the analysis of sleep duration and sleep disturbances. Sleep disturbances in childhood can be divided into those with physiological and non-physiological aetiology. The physiological aetiology considers: sleep-related respiratory disorders RSD (Parasomnias) (Blunden, 2011). Disorders of non-physiological aetiology are the most common sleep problems in the early years. They include dyssomnia, characterized by difficulty in initiating or maintaining the state of sleep, or excessive drowsiness (Blunden, 2011). Extrinsic dyssomnias include: inadequate sleep hygiene, with daily life activities inconsistent with maintaining good sleep quality and alertness during the day. The sleep adjustment disorder is temporally related to acute stress, conflict, or environmental change that causes emotional arousal. Insufficient sleep syndrome occurs in an individual who persistently fails to achieve adequate night-time sleep necessary to withstand normal waking. Disruption of maximum sleep time setting refers to improper bedtime set by the caregiver, with the child resisting or refusing to go to bed at the appropriate time. In sleep disturbance associated with the onset of sleep, the onset of sleep is compromised by the absence of a certain object or set of circumstances (Blunden, 2011).

School-aged children have consolidated their sleep and are able to calm themselves after a period of interrupted sleep (Mindell et al., 2009). Despite this, sleep disturbance associated with onset of sleep and disturbance of maximum sleep time are still reported (Mindell, 2003). Poor sleep in children, whether due to poor sleep hygiene or a sleep disturbance, is associated with a wide range of behavioural, cognitive and mood problems (O'Brien, et al. 2011).

The literature seems to establish a connection between poor quality of sleep and greater possibility of aggressive behaviour in school-aged children. These aggressive bullying behaviours directed at other children at school include: physical violence (hitting, pushing, pulling), sexual harassment (touching the other sexually) or verbal abuse (insults, jokes, mocking, derogatory nicknames, scorn) (Gomes, 2013). It includes more than one person, and one has power over the other, the victim being the object of aggression and playing this role repeatedly. The aggression can be carried out by one person or a group (Olweus, 1997, quoted in Smith, 2001). Bullying is an intentional behaviour aimed at controlling the other. It is repeated over time and with regularity. It is an unbalanced power relationship, whereby one dominates and the other is dominated. The differentiation criteria between the participants are: size, age, height, and weight, among others (Olweus, 1997, quoted in Smith, 2001). There is bullying in all schools, be them private, state, rural, urban, or religious. Bullying is a human and social phenomenon and the result of interpersonal relationships, where all participate directly or indirectly as observers (Gomes, 2013).

Bullying is a worrying and complex phenomenon that can have serious consequences on the victim, the aggressor and the observers. They are all affected by the negative consequences associated with these aggressive behaviours. Victims may develop psychopathological conditions and escape

behaviours vis-a-vis the school. The observers may experience intense fear of being the next victim and may misbehave, and offenders may organize themselves and become delinquents at a later stage. Espelage, Sung Hong & Meban (2016) examined the association between bullying victimization in childhood with multiple forms of victimization, and current psychological functioning in a sample of young adults attending university. The findings indicated that bullying victimization in childhood significantly increased levels of depression, anxiety and post-traumatic stress disorder (PTS). Childhood bullying was considered a strong predictor of post-traumatic stress (PTS) in adulthood.

The different groups involved in childhood bullying behaviours (victims and aggressors) later presented risk profiles for psychopathology. Victims are at high risk for internalizing disorders. The perpetrators appear to be at risk for criminality, especially violent crime and misuse of illicit drugs. Many children who are intimidated suffer in silence. Being a victim of bullying can lead to higher levels of anxiety, depression, psychotic episodes, and even suicide (Klomek, Sourander, & Elonheimo, 2015).

Researchers at the University of Warwick in the United Kingdom found that nightmares or night terrors were more common in children who were victims of bullying when they were 8 and 10 years old. If night terrors occur frequently or over an extended period of time, they may indicate that a child or adolescent has been or is being bullied by peers. Children who are victims of bullying will be more likely to suffer from parasomnias, including nightmares, night terrors, and somnambulism (Lereya, 2014). Thus, it seems that victims of bullying may also have some indicators of disturbed sleep.

2. Problem Statement

Do children who practice bullying have more sleep disturbances than those who do not practice bullying?

- It is expected that there will be differences in the quality of sleep between aggressive and non-aggressive children and between victims and non-victims of bullying.

3. Research Questions

This study aims to analyse whether there is a relationship between sleep quality and bullying behaviours in school-aged children.

- Are there differences in sleep quality between victims and non-victims of bullying?
- Are there are differences in sleep quality between aggressors and non-aggressors?
- Do aggressors have higher SDI than non-aggressors?
- What are the sleep characteristics in aggressors, non-aggressors and victims and non-victims of bullying?

4. Purpose of the Study

This study has the following objectives:

- To analyse whether school-aged children who practice bullying have worse sleep quality than those who do not practice it;

- To analyse the sleep characteristics of aggressive and non-aggressive children;
- To analyse the sleep characteristics of children who are victims and non-victims

5. Research Methods

5.1. Participants

Participants are divided into two major groups, one of which composed of the children who answered the Pittsburgh Sleep Quality Index (PSQI) (n= 1109), divided into 546 girls and 563 boys from state schools (n= 538) and from private schools (n= 571). The other group refers to parents who answered the Children's Sleep Habits Questionnaire (QSHQ-PT), totalling 883, since not all parents of the 1109 evaluated children returned the questionnaires. These 883 children evaluated by their parents for sleep quality are divided into 437 (49.5%) boys and 446 (50.5%) girls. The mean age is 8 years \pm 1,241 and 99.5% of the participants are between 6 and 10 years of age.

5.1.1. Instrument and Procedures

To assess the bullying behaviours the Bullying and Aggressiveness among children Questionnaire was administered to a sample of 1109 children. Olweus' (1989) original questionnaire was used, adapted for the Portuguese language and validated for the school population by Pereira and Tomás (Pereira, 2008) and reviewed by Melim (2010). The questionnaire is organized in four areas: the first refers to socio-metric data. The second identifies victimization behaviours, their frequency, how and where they took place, characterizes aggression regarding the number, gender, age, and class of the aggressors, and ascertains whether teachers and school officials usually intervene in these situations, if the victims complained, if a colleague tried to defend them during the aggression, and finally what his/her attitude is when seeing a colleague being a victim of bullying. The third part of the questionnaire identifies the respondent's aggression behaviours, the frequency with which they occur, motivation for aggression, and the existence of bullying behaviours in a group. The questionnaire ends by asking the student if he or she would help to assault a classmate for not liking him (Melim, 2011). As to the reliability of the instrument, a high average correlation coefficients was obtained in the instrument's various questions. The Cronbach alpha coefficient that measures the overall internal consistency of the items in the questionnaire was 0.78 (Moreira, 2007).

To operationalize the dimensions associated with bullying and to understand the data statistically, it is important to clarify and differentiate the concepts of:

- Students who are victims of bullying - those who stated that they have been bullied at least once during the defined period;
- Non-victimized students - those who stated that they were never beaten during the defined period;
- Bullying students - those who admitted having made at least one aggression during the defined period;
- Non-aggressor students - those who reported that they never assaulted colleagues during the defined period.

The Children's Sleep Habits Questionnaire (CSHQ-PT) was the instrument used to study the effective sleep quality of children, and was completed by the children's parents, a total of 883 parents

who returned the questionnaires. The adaptation and validation of the questionnaire for the Portuguese population was made by Silva, Barbosa, Silva, & Neto (2014). In this process, the authors made a broad characterization of sleep habits in children from 2 to 10 years of age. The CSHQ-PT internal consistency (Cronbach's α) was 0.78 for the total scale and ranged between 0.44 and 0.74 in the subscales. The reliability test-retest for subscales (Pearson's correlations, $n = 58$) ranged between 0.59 and 0.85. The CSHQ-PT showed psychometric properties that are comparable to the versions of other countries and suitable for the evaluation of sleep disturbances in children (Silva, Barbosa, Silva, & Neto, 2014). The analysis and processing of statistical data was carried out using the SPSS programme, version 23. In order to analyse the Children's Sleep Habits Questionnaire (CSHQ-PT), a descriptive statistic was made, with mean, standard deviation, asymmetry, and kurtosis of the 33 CSHQ-PT items in the global sample. To compare the two groups, the non-parametric Mann-Whitney U test was used. The Kruskal-Wallis non-parametric H test was used to compare more groups; 3 degrees of freedom. However, it should be noted that in this paper we only present a small part of the data analysis conducted.

6. Findings

A summary of the results obtained from the study is presented next in order to answer the four main research questions.

6.1. Results

For the Children's Sleep Habits Questionnaire (CSHQ-PT), only 883 complete responses were received, representing 77% of the total sample. In this instrument, the mean value of the Sleep Disturbance Index (SDI) is 46.12 ± 7.78 , so 50.6% of the sample is significantly above the cut-off point of 44.00, t , indicating that these children generally have poor sleep quality. The children who were victims of bullying represent 69.5% of the sample and the non-victims account for 30.5% ($n=883$). The group of children victims of bullying has a SDI of 46.68 ± 8.05 , with 74.5% of the sample above the cut-off point (44.00, t) and non-victims showing a SDI of 44.86 ± 6.96 , with 25.5% of children above the cut-off point. It is clear that bullying victims have a significantly higher SDI than non-victims ($p=.001$). The Children's Sleep Habits Questionnaire (CSHQ-PT) assesses 8 dimensions, which are: resistance to going to bed, onset of sleep, sleep duration, sleep-associated anxiety, nocturnal awakenings, parasomnias, respiratory sleep disorder, and daytime drowsiness. There are significant differences in 4 of the 8 dimensions between children who are not victims of bullying and victims of bullying. Children who are victims of bullying go to bed at the same time less frequently ($p=.020$), sleep less ($p=.030$), are more afraid of sleeping in the dark ($p=.007$), wake up more during the night ($p=.020$), wet the bed more often ($p=.011$), wake up frightened by nightmares more often ($p=.038$), have more difficulty getting out of bed in the morning ($p=.002$), take longer to be well awake ($p=.015$), appear more tired ($p<.001$), and fall asleep more in the car ($p=.006$).

Table 1. Differences between victims and non-victims regarding the 8 dimensions of the CSHQ and the SDI

Dimension	Victim		Non-victim		Mann-Whitney U		
	M	SD	M	SD	U	Z	p
Resistance to going to bed	8.13	2.63	7.79	2.45	76149.50	-1.923	.054
Onset of sleep	1.94	0.87	1.97	0.89	81186.50	-0.429	.668
Sleep duration	3.84	1.21	3.65	1.08	75209.00	-2.395	.017*
Sleep-associated anxiety	5.92	2.02	5.72	2.14	75350.50	-2.142	.032*
Nocturnal awakenings	3.75	1.16	3.61	1.04	78046.00	-1.509	.131
Parasomnias	8.65	1.77	8.40	1.63	75551.00	-2.080	.038*
Respiratory sleep disturbance	3.43	0.93	3.40	0.83	82301.50	-0.105	.917
Daytime drowsiness	13.89	3.16	13.13	2.87	72188.50	-2.996	.003*
Sleep Disturbance Index	46.68	8.05	44.86	6.96	70969.00	-3.334	.001*

Note. N = 883. M = mean; SD = standard deviation. Cell with ‘*’ = Statistically significant difference at the level of the dimension.

The aggressors represent 49.4% of the sample and the non-aggressors account for 50.6% (n=883). The SDI of the children who report having committed aggressions (aggressors) is not significantly different from the SDI of non-aggressors (p=.083). The aggressors report an SDI of 46.70 ± 8.35 and the non-aggressors of 45.56 ± 7.14. However, by comparison with non-aggressors, aggressors go to bed at the same time less frequently (p=.002), struggle more not to go to bed (p=.042), sleep little (p=.025), (p=.030), wet the bed at night more often (p=.030), have a more restless sleep and move about in bed a lot (p=.011), wake up frightened by nightmares more often (p=.017), and in the morning, wake up grumpier (p=.045).

Table 2. Differences between aggressors and non-aggressors regarding the 8 dimensions of the CSHQ and the SDI

Description	Aggressor		Non-aggressor		Mann-Whitney U		
	M	SD	M	SD	U	Z	p
Resistance to going to bed	8.13	2.67	7.93	2.49	93024.00	-1.217	.224
Onset of sleep	1.94	0.88	1.95	0.87	96631.50	-0.230	.818
Sleep duration	3.86	1.21	3.71	1.13	90723.00	-2.010	.044*
Sleep-associated anxiety ¹	5.89	2.05	5.84	2.07	95284.50	-0.589	.556
Nocturnal awakenings	3.77	1.21	3.65	1.05	94683.00	-0.846	.397
Parasomnias	8.76	1.89	8.39	1.55	87005.50	-2.843	.004*
Respiratory sleep disturbance	3.44	0.89	3.40	0.91	94778.00	-0.914	.361
Daytime drowsiness	13.78	3.15	13.54	3.04	93989.00	-0.917	.359
Sleep Disturbance Index	46.70	8.35	45.56	7.14	90895.50	-1.731	.083

Note. N = 883. M = mean; SD = standard deviation. Cell with ‘*’ = Statistically significant difference at the level of the dimension

7. Conclusion

It is clear that there are differences in the quality of sleep between children who are victims of bullying and non-victims. The results of this study assume that children who are victims of bullying show significant differences in the quality of sleep and have a higher SDI in 4 dimensions in 8 of the Children's Sleep Habits Questionnaire (CSHQ-PT). These findings are in line with those from the University of Warwick's study that found that nightmares or night terrors were more common in children who were victims of bullying and that they will be prone to suffer from parasomnias, including nightmares, nocturnal terrors and somnambulism (Lereya, 2014). In our study, there were no significant cases of somnambulism in the victims, but as part of the parasomnias there was increased tendency of the victims to wet the bed at night and wake up frightened by nightmares. The fact that children who are victims of bullying have lower sleep quality than non-victims may mean that the sleep characteristics of these children are a predictor of depression, anxiety and post-traumatic stress disorder (PTS). As Espelage, Sung Hong & Meban (2016) state, childhood bullying can be considered a strong predictor of the existence of posttraumatic stress (PTS). Moreover, childhood bullying victims have a higher risk profile for psychopathology (Klomek, Sourander, & Elonheimo, 2015).

There are no significant differences between aggressive and non-aggressive children with regard to the Sleep Disturbance Index (SDI). Therefore, it seems that sleep quality does not influence the behaviour of children regarding aggression and bullying. These results are not in line with the literature (O'Brien, et al. 2011; Kamphuisa, Meerlob, Koolhaasb, & Lancela, 2012; Halal et al, 2014; Chervin, Ruzicka, Archbold, & Dillon, 2015; Angelhoff, 2017).

Although the SDI of aggressor children was not significantly higher than the SDI of non-aggressors, the aggressors show significant differences in seven of the eight dimensions of the Children's Sleep Habits Questionnaire (CSHQ-PT), particularly in the following: resistance to going to bed; here the aggressors find it harder to go to bed at the same time, and are more resistant to going to bed. In the duration of sleep dimension, they sleep less than other children. In the parasomnias, the aggressors wet the bed more often, have a more agitated sleep and wake up frightened by nightmares more often. In the daytime drowsiness dimension, aggressors wake up in a bad mood more often.

We cannot fail to mention that in general the SDI of the children in this sample is quite high in 50.6% of the sample, indicating that they have poor sleep quality. We emphasize that in the global sample, sleep problems are frequent, and may constitute an "invisible risk" for other problems (Carli, Hoven, Wasserman, Chiesa, Guffanti, & Sarchiapone, 2014). These results are in line with recent findings, which report the high frequency of sleep disturbances in today's Western society (Pyper, Harrington & Manson, 2017; Cheung, Bedford, Urabain, Karmiloff-Smith, & Smith, 2017). Therefore, we cannot ignore the sleep difficulties that these children have and we must reflect about the relationships between this general sleep poor quality and other types of behaviour and disturbances. As Gregory & Sadeh (2016) write, it is increasingly evident that childhood sleep disturbances are predictors of a wide range of psychopathologies and behavioural problems, although some associations are little known and are yet to be explored.

This study did not confirm the relationship between sleep problems and aggressive or bullying behaviours in school-aged children, but the aggressors stand out a little more in some disturbed sleep

dimensions, such as parasomnias. Conducting an early assessment of each child's sleep can significantly help improve future sleep behaviours and enhance sleep quality. It is only with early intervention that it will be possible to identify and curb the possible relationships between sleep and behavioural problems in childhood (Wang, Isensee, Becker, Wong, Eastwood, Huang, Runions, Stewart, Meyer, Brüni, Zepf, & Rothenberger, 2016). On the other hand, parents should be made aware of the importance of their children having a good night's sleep, and the need to establish well-defined bedtime rules for children on weekdays should be emphasized, thus helping them to sleep enough and have adequate and good quality sleep. This awareness should be seen as an important effort to promote public health to enable the healthy development of children. This research has several limitations, such as the fact that it has used a convenience sample. We obtained an initial sample of 1160 participants, but 51 protocols were immediately invalidated and we were only able to have 883 questionnaires from the Children's Sleep Habits Questionnaire (CSHQ-PT) returned by the parents. Although our sample is approximately representative of Portugal's population, the proportion of ethnic minorities was relatively small and was not a controlled variable, for which reason we did not examine differences between ethnic minority groups.

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