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# Study of Sleep Duration and Mental Health Characteristics of Preschool Children

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## Abstract

Sleep is one of the most important human physiological states. Little is known about the link between sleep duration and children's mental disorders, external or internal difficulties, and future problems. It is understood that the environment, parents, and cultural aspects could have the greatest impact on children's sleep.

The survey was conducted by an anonymous questionnaire in March-May 2021. All subjects were divided into 3 groups according to the duration of children's sleep: Group I - sleep 10-13 hours; II -8-10 h; III - ≤ 8 h. Aim of the study: to assess sleep duration and mental health characteristics of 4–5-year-old children.

The study analyzed 304 questionnaires. Distribution of children by gender - 48.4% boys 51.6% girls. Group I was 45.1%; II - 44.7%; Group III 10.2%. The median of the internal difficulty scores in the SDQ questionnaire of group I was the lowest (2) and the highest in group III (4) ($p = 0.030$). The median of the external difficulty scores in the SDQ questionnaire of group I was the lowest (5) and the highest in group III (7) ($p = 0.002$).

More than half of the children slept less than 10 hours. It was observed that less than 10 h. sleeping children had higher internalized and externalized difficulties. The research data indicates that it is so important to strengthen and develop better sleep hygiene in children.

**Keywords:** Preschoolers; Sleep Duration; Sleep Quality; Externalized Difficulties; Internalized Difficulties

**Abbreviations:** SDQ: Strengths and Difficulties Questionnaire, M: Median

## Introduction

Sleep is one of the most important physiological states, which is not only responsible for rest, but is also a decisive factor for brain activity, metabolism, appetite regulation, immune, hormonal and cardiovascular system functioning **[1-2]**. However, scientists observe that the sleep duration of adults and children is getting shorter and shorter **[3]**. Such rapid changes in sleep duration were mainly influenced by the increasing amount of artificial light and cultural aspects **[4]**. Despite the fact that the sleep time among children is getting shorter, various scientific studies report that the quality of the sleep itself is also getting worse **[5-7]**. In 2016, the American Academy of Sleep Medicine issued guidelines stating that infants should sleep 12 to 16 hours, toddlers (1-2 years old) 11 to 14 hours, preschoolers (3-5 years old) 10 to 13 hours, school-age children (6-12 years old) from 9 to 12 hours. Adolescents (ages12-18) should be getting 8-10 hours of

sleep, 7-9 hours for young adults and adults, and 7-8 hours for older adults. The guidelines indicate that sleep duration is given in intervals of several hours, as certain fluctuations in sleep duration depend on the individual characteristics of each person **[8]**. An increasing number of epidemiological studies link children's sleep disorders (sleep apnea, non-organic sleep disorder) with various symptoms of mental disorders, such as: depressed mood, increased anxiety, externalizing child problems, hyperactivity **[9,10]**. However, much less is known about the relationship between sleep duration and children's mental disorders, externalizing or internalizing difficulties, and future problems.

Aim of the study: to assess sleep duration and mental health characteristics of 4-5 year old children.

## Methods

The research was conducted by an anonymous questionnaire survey. The questionnaire was compiled with the help of Google forms. In order to collect a representative sample of research subjects, the created questionnaire was sent to kindergartens or pre-school educational institutions in all districts of Lithuania, asking the administrative staff to share the questionnaire with the parents of children attending the kindergarten or pre-school educational institution.

The questionnaire survey was conducted in March - May 2021. The questionnaire consisted of several parts: 1. Children's demographic data (gender, age). 2. Characteristics of children's sleep (sleep duration: 1. sleeps from 10-13 hours; 2. sleeps from 10-8 hours; 3. ≤8 hours). 3. Children's externalizing (difficulties directed outward, i.e., excessive activity, strong expressions of anger, impulsivity) and internalized difficulties (difficulties directed inward, i.e., excessive social withdrawal, anxiety, depressed mood). These difficulties were assessed using the SDQ (T4-16) questionnaire (Strengths and Difficulties Questionnaire) for parents of children aged 4–16 years. A total difficulty index was derived by summing the hyperactivity scale, the emotional symptoms scale, the behavior problems scale, and the peer problems scale of the SDQ questionnaire. Estimates of externalizing difficulties were derived by summing the hyperactivity and conduct problems scales of the SDQ and estimates of internalizing difficulties were derived by summing the scales of emotional symptoms and problems with peers. Higher scores, both on the total scale and on the externalizing and internalizing scales, indicated greater difficulties.

All subjects were divided into 3 groups according to the duration of children's sleep: Group I were children who sleep from 10 to 13 hours; Group II - children who sleep from 8 to 10 hours. Group III - children, who sleep for 8 hours. or less hours According to the guidelines compiled by the American Academy of Sleep Medicine in 2016, which indicate that the recommended duration of sleep for children aged 3-5 years should be between 10-13 hours at night. Therefore, group I children should be considered as sleeping for a sufficient amount of time. Meanwhile, children in groups II and III were those who slept too little.

Results are presented as percentages, continuous variables are expressed as means or medians with standard deviation. Student's test was used to compare the means of two independent samples, one-way ANOVA was used for three, Bonferoni's test was used for comparisons between groups. Pearson's $\chi 2$, Fisher's criteria were used to assess the relationship between rank variables. Normal distribution of the data was assessed using the Kolmogorov and Smirnov test. Non-normally distributed groups of continuous variables were evaluated for ranks using the Mann–Whitney U test for two samples, and the Kruskal Wallis test was used for three-sample evaluation. Spearman analysis was used to check the correlation. The level of statistically significant difference was considered to be $p < 0.05$. Microsoft Excel 2010 and IBM SPSS 20.0 programs were used for statistical data analysis.

## Results

304 questionnaires were included in the study, which satisfied the desired sample of subjects - 4–5-year-old children. 295 (97.0%) mothers and 9 (3.0%) fathers participated in the survey. The gender distribution of children was: 147 (48.4%) boys and 157 (51.6%) girls. The average age of children 4.55 ± 0.49.

The subjects were divided into 3 groups according to the duration of children's sleep: Group I (children who sleep from 10 to 13 hours), there were 137 of them (45.1%); Group II (children who sleep from 8 to 10 hours), there were136 of

them (44.7%). Group III (children who sleep 8 hours or less), there were 31 of them (10.2%). Group I children slept a sufficient amount of time (137 (45.1%)), while group II and III children (167(54.9%)) were the ones who slept too little.

Comparing the distribution of groups I, II and II by gender, it was found that mostly girls slept for 8-10 hours. (Group II) 46.5%, while boys slept more often between 10 and 13 hours. (Group I) 46.9%, but no statistically significant difference was found (p = 0.800).

Evaluating 4-5-year-old children according to the scores of the SDQ questionnaire, the average of the sample was 8.84 ± 4.45, median (M) - 8, (minimum estimate was 2, maximum 23). Unfortunately, the data is not distributed according to the normal distribution (p < 0.001), so further results should be presented not as the mean, but as the median.

Assessing the estimates of general difficulties according to SDQ risk groups, it is observed that 277 (91.1%) children received normal (with scores from 0 to 15) estimates, while borderline (with scores from 16 to 18) – 19 (6, 3%) and deviation (with scores from 19 to 40) - 8 (2.6%). Comparing the distribution of scores according to children's sleep duration, a statistically significant difference between the groups was obtained (p = 0.030). More detailed information is given in **table 1**.

| | **Normal (scores from 0 to 15)** | **Borderline (score 16 to 18)** | **Deviation (19 to 40)** |
|---|---|---|---|
| **I group (10-13h.)** | 129 (46,6%) | 7 (36,8%) | 1 (12,5%) |
| **II group (8-10h.)** | 124 (44,8%) | 9 (47,4%) | 3 (37,5%) |
| **III group (≤ 8h.)** | 24 (8,7%) | 3 (15,8%) | 4 (50,0%) |
| **p** | p = 0,030 | | |

**Table 1**: Risk group comparison of total scores of the SDQ questionnaire in children with sleep duration

The Kruskal Wallis test was used to compare how SDQ scores for internalizing difficulties were distributed between sleep duration groups. The obtained results showed that the distribution of medians between groups is statistically significant (p = 0.030). The lowest median (M) - 2, was observed at 10-13 hours. (Group I) among sleeping children, while the highest median (M) - 4 was - ≤ 8 hours. (group III) among sleeping children. More detailed information is presented in **figure 1**.

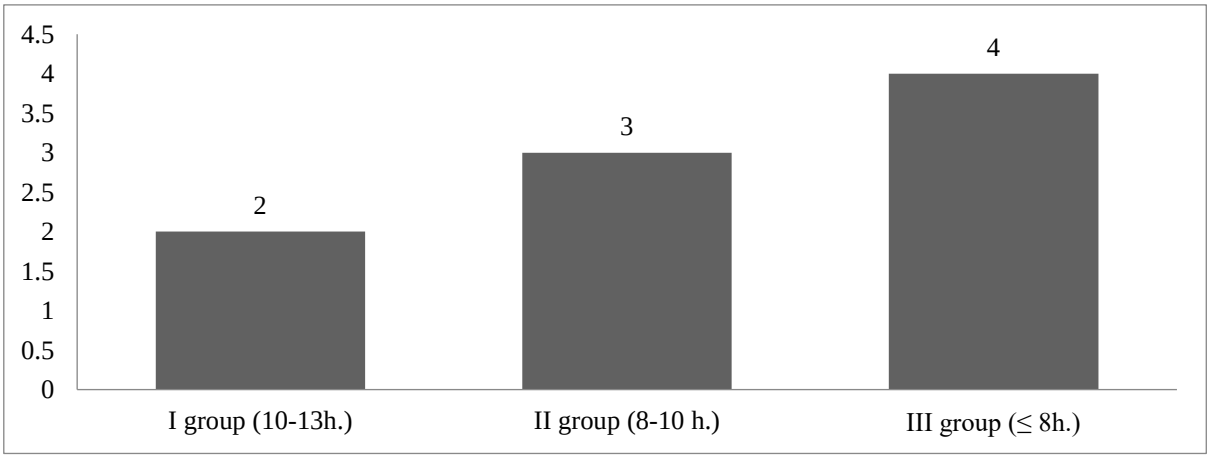


**Figure.1:** Comparison of Median Internalizing Difficulties Scores of Children's SDQ Questionnaire with Sleep Duration

The Kruskal Wallis test was used to compare how SDQ externalizing difficulty scores were distributed between sleep duration groups. The obtained results showed that the distribution of medians between groups is statistically significant (p=0.002). The lowest median estimate (M) - 5, was observed at 10-13 hours (Group I) among sleeping children, while the highest median (M) - 7 was - ≤8 hours (group III) among sleeping children. More detailed information is presented in **figure 2**.

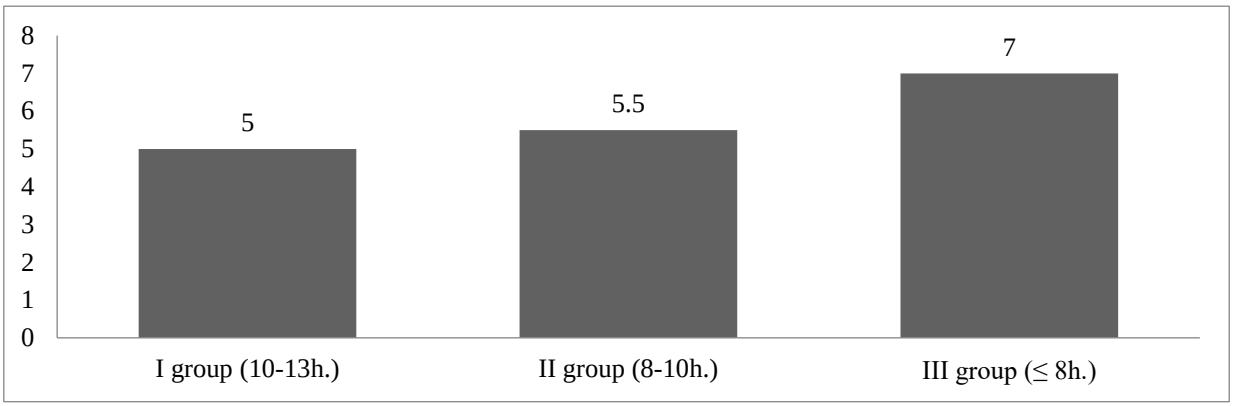


**Figure.2:** Comparison of Median Scores of Externalizing Difficulties on the Children's SDQ Questionnaire with Sleep Duration.

## Discussion

After analysing the data, it was observed that only 45.1% of 4–5-year-old children slept between 10 and 13 hours, while even 54.9% of children slept less than 10 hours. According to the guidelines published by the American Academy of Sleep Medicine in 2016, children aged 3-5 should sleep from 10 to 13 hours **[8]**.

In our study, it was observed that 10-8 hours and less than 8 hours. groups of sleeping 4-5-year-old children had higher overall SDQ scores (median scores were 8.5 and 11) than those sleeping 10-13 hours. (Median of estimates - 7). We obtained similar results after evaluating internalized (children who slept 10-8 hours: median SDQ score was 3; less than 8 hours – 4; whereas 10-13 hours – 2) and externalized difficulties (children who slept 10-8 hours: SDQ score the median was 5.5; less than 8 hours - 7, while 10-13 hours - 5). Similar data were observed in a study conducted in China, which examined the sleep duration of 8,900 3-6-year-old children and assessed the children with the SDQ questionnaire. Estimates of overall difficulties obtained when children slept less than 9.15 hours were 11.31, while those sleeping more than 9.15 hours were 10.75 **[11]**. In a 2011 study of 6-11-year-old children, assessing their internalized and externalized difficulties and sleep duration, it was observed that children who slept 1 hour less than the average sleep duration for that age had greater externalizing behavior problems (children more often were irritable, angry) **[12]**. In a study conducted in Australia, children were observed in two stages: in the first stage, the sleep characteristics of 4-5-year-old children were studied, and in the second stage, when the children were 12-13 years old, their internalizing and externalizing difficulties were studied. It was observed that children who had sleep disorders at the age of 4-5, as a result of which they slept less, at the age of 12-13, suffered more often from externalizing and internalizing difficulties **[13]**. A systematic literature review indicates that poor quality and insufficient sleep in children may be associated with attention problems, irritability and emotional instability, as well as low anxiety and fear thresholds **[14]**.

## Conclusion

More than half of the children slept less than 10 hours, while the guidelines published by the American Academy of Sleep Medicine in 2016 recommend that children aged 3-5 should sleep between 10 and 13 hours. Both boys and girls were observed to sleep for a similar amount of time. It was observed that less than 10 h. sleeping children had higher internalized and externalized difficulties. The data of the study indicate that it is important to strengthen and develop better sleep hygiene for children, as well as parents' knowledge about children's sleep.

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