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Original Article

Eating Behavior, Sleep Disorders and Digital Game Addiction in Children and Determination of Associated Factors by CHAID Analysis

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Abstract

Background: Healthy nutrition and good quality sleep are one of the most important factors for growth and development in a child. Digital game addiction may cause some problematic behaviors and affect children's nutrition and sleep. We aimed to investigate the relationship between digital game addiction, eating behavior, and sleep disorders in children.

Methods: The study was conducted with 252 mothers with children between the ages of 4-7 years, selected by convenient sampling methods. The Digital Game Addiction Scale, Children's Eating Behavior Questionnaire and The Sleep Disturbance Scale for Children (SDSC) were used to collect data. The correlation coefficient and the decision tree CHAID algorithm were used in the data analysis.

Results: Digital game addiction negatively affects children's eating behavior and sleep patterns. It was found that there was a mostly positive but weakly significant relationship between digital game addiction and children's eating behaviors ($P<.01$; $P<.05$) and a highly significant relationship was found between the sleep disorder scale sleep hyperhidrosis sub-dimension ($P<.05$). While digital game addiction is affected by gender, the mother's education level, and eating behavior are affected by the mother's age, the parent's education level, and the child's gender ($P<.05$). The child's age is the variable that affects the children's sleep disorder ($P<.05$).

Conclusion: Intervention programs for children and families can be created for the causes of digital game addiction, its effects on child development and the correct use of the digital world.

Keywords: Chaid analysis; Digital addiction; Eating behavior; Sleep disorder

Introduction

Early childhood is a critical period in which the interaction of the child with the social environment is high, and the development is rapid, and it forms the basis for the following years. Children who gain knowledge and experience from their environment are increasingly exposed to digital tools in their living spaces. The fact that children have easy access to digital devices such as mobile phones, tablets, computers, and the internet increases the frequency of playing digital games with these tools (1). These games have various positive or negative effects on the development of children.

While the positive effects of digital technology use are mostly seen in academic and cognitive areas, the negative effects are mostly seen in physical, psychological, and social areas (2). Games played on the digital platform provide children with rich visuals. In recent years, it has revealed excessive and uncontrolled play in children. The Diagnostic and Statistical Manual of Mental Disorders-5 (DSM-5) addressed this situation as digital game addiction (3).

Digital game addiction is defined as excessive and uncontrolled use that causes social and emotional problems and disrupts daily lives (4). The negative effects of uncontrolled digital gaming include aggression, trouble controlling the playing time, addictive and problematic behaviors, lack of communication, attention problems, sleep disorders, and obesity (5-7). Preschoolers with increased use of digital technology tend to be less physically active than expected, increasing their risk of obesity and musculoskeletal problems (6,8).

Eating behavior, which includes biological, psychological, and social effects, is developed towards the end of the preschool period, shaping children's lives in the first years, and is fixed after this period. This period is important for children to gain healthy eating habits that affect their future lives. An unhealthy diet can cause nutritional deficiencies or obesity, health, and sleep problems (9).

Good quality sleep is one of the most important factors for growth and development as well as proper nutrition in childhood. Sleep is also associated with learning, memory and behaviors (10). Inadequate and poor-quality sleep causes decreased concentration, disorders of memory, and learning difficulties. For these reasons, sleep patterns, sleep quality, and sleep disorders in children are among the subjects that are frequently researched. The use of digital tools affects the quality and quantity of sleep and disrupts the circadian sleep rhythm (10,11).

Children who communicate and interact with other people by using digital games turn into digital addiction and may affect their nutrition and sleep patterns (6,12). Although the relationship between digital gaming load, and eating load and sleep problems has been investigated separately after different ages (13-16), extensive literature research has revealed the lack of these issues in the younger age group in Turkey.

The aim of this study was to evaluate the relationship between eating behaviors and sleep disorders and digital game addiction, two developmentally important factors in early childhood. In addition, it is known that young children learn new skills by imitating their parents' digital tool use, eating and sleeping behaviors (1), and parental characteristics are thought to be critical factors in regulating these children's safe digital tool use. The second aim of our research was to determine whether the child's digital game addiction, eating, and sleeping behaviors are affected by family-related variables in our study.

Materials and Methods

The study was conducted using a scanning and relational research model in Istanbul,Turkey. The study group of the research consists of 252 mothers who had a child between the ages of 4 years and 7 years of age that parents provided data for their child. Mothers were selected through convenient sampling. We sent participants an online link to the survey and assured them that the data collected would be kept strictly confidential. Data collection tools prepared by the researchers were sent to the participants' e-mails or phones between June and July 2022. All participants were informed about the research. Socio- demographic characteristics of participants are given in Table 1.

Ethics approval

This study has the ethical approval of the Scientific Research Ethical Committee, in Turkey (approval no. 22/331).

Table 1: Socio-demographic characteristics of participants

Characteristics	*n*	*%*	*Characteristics*	*n*	*%*
Gender			Education status of mothers		
Female	110	43.7	Elementary	30	11.9
Male	142	56.3	High School	66	26.2
Total	252	100.0	University	123	48.8
			Postgraduate	33	13.1
			Total	252	100.0
Child age (year)			Fathers age (year)		
4	28	11.1	20-30	8	43.2
5	83	32.9	31-40	147	58.3
6	131	52.0	41-50	88	34.9
7	10	4.0	51 and above	9	3.6
Total	252	100.0	Total	252	100.0
Mothers age (year)			Education status of fathers		
20-30	46	18.3	Elementary	38	15.1
31-40	160	63.5	High School	72	28.6
41-50	46	18.3	University	110	43.7
Total	252	100.0	Postgraduate	32	12.7
			Total	252	100.0

The Digital Game Addiction Scale (DOBE): DOBE consists of 20 items developed by Budak and Işıkoğlu in 2022 to determine the game addiction level of children. The scale consists of 4 subfactors and a five-point Likert type, as Detached from Life (7 items), Conflict (5 items), Continuous Play (5 items) and Reflecting on Life (3 items). The lowest score taken from the scale is "20" and the highest score is "100". The rating ranges of the scale scores are as follows; "20-35: addiction tendency is the lowest 36-51: addiction tendency is low 52-67: addiction tendency is moderate; 68-83: addiction tendency is high and 84-100: addiction tendency is very high (17).

Children's Eating Behaviour Questionnaire (CEBQ): The CEBQ was developed by Jane Wardle et al. to evaluate children's eating behaviors. The Turkish validity and reliability study was conducted by Yılmaz et al. (2011) Children's Eating Behaviour Questionnaire evaluated in 8 subdimensions with the questionnaire based on parental reporting. Food responsiveness (FR), Enjoyment of food (EF), Emotional over-eating (EOE), Desire to drink (DD), Satiety responsiveness (SR), Slowness in eating (SE), Emotional under-eating (EUE), Food fussiness (FF) are the subdimensions of the scale. 5-point Likert scoring is used in CEBQ.This scale has high reliability and validity. The α coefficient of the scale is 0.61-0.84 (18).

The Sleep Disturbance Scale for Children (SDSC): The SDSC, administered by Bruni, was evaluated for Turkish validity and reliability by Ağadayı et al. in 2020.In the scale, the child's sleep disorders are questioned in 26 items and 6 sub-dimensions. Disorders of initiating and maintaining sleep, sleep breathing disorders, disorders of arousal, sleep-wake transition disorders, disorders of excessive somnolence, sleep hyperhidrosis are the sub-dimensions of the scale. High scores are interpreted in favor of sleep disturbance. It is accepted that those with a score > 70 show sleep disorder symptoms. The internal consistency of the scale was high (Cronbach α = 0.84) (19). The results of the cronbach alpha analysis of the data obtained from this study; 89 for the SDSC total score and .96 for the DGATS total score. The CEBQ sub-dimensions range from .71 to .88.

Statistical Analysis

Before starting analyses, all the variables were checked in terms of lost data, and assumption of normality. Kolmogorov-Smirnov test, skewness, kurtosis, histograms and Q-Q plots normality analyzes were performed to determine whether the data were normally distributed. Data analysis was analyzed in two parts. First, correlations between variables were performed. The distribution of variables was not normal, so to compare between groups, the Spearman Brown Correlation test was performed. Second, data were evaluated using numbers, percentages, means, and chi-square automated interaction detector (CHAID) analysis. Statistical analysis of all the study data was performed using IBM SPSS 22.0 (IBM Corp., Armonk, NY, USA).

Results

Correlation among variables

It is seen that there are positive but weakly significant relationships between DOBE and CEBQ sub-dimensions. The correlation between digital game addiction and the eating behaviors of preschool children is presented in Table 2.

Table 2 shows that there are mostly significant but weak correlations between DOBE and CEBQ sub-dimensions.

Table 2: Correlation among DOBE and CEBQ scale scores

DOBE		***CEBQ***							
		Food Responsiveness	Emotional Over-Eating	Enjoyment of Food	Desire to Drink	Satiety Responsiveness	Slowness in Eating	Emotional Under-Eating	Food Fussiness
Detached From Life	r	.098	.202**	-.124	.212**	.376**	.297**	.307**	-.124
	P	.121	.001	.050	.001	.000	.000	.000	.050
Conflict	r	.142*	.189**	-.072	.308**	.354**	.196**	.252**	-.097
	P	.024	.003	.253	.000	.000	.002	.000	.125
Continuous Play	r	.037	.152*	-.156*	.298**	.320**	.259**	.155*	-.205**
	P	.563	.016	.013	.000	.000	.000	.014	.001
Reflect to the Life	r	.082	.131*	-.041	.249**	.303**	.270**	.279**	-.088
	P	.194	.038	.513	.000	.000	.000	.000	.165
Total	r	.104	.190**	-.115	.299**	.395**	.287**	.293**	-.145*
	P	.100	.002	.068	.000	.000	.000	.000	.021

** *P*<.01, **P*<.05

Table 3 shows that there was a significant correlation between DOBE and SDSC. There is a highly significant correlation between SHY and DOBE Detached from Life (r=.873, *P*=.000), DOBE Conflict (r=.776, *P*=.000), DOBE Continuous Play (r=.823, *P*=.000), DOBE Reflect to the Life(r=.638, *P*=.000), DOBE and SHY (r=.898, *P*=.000). There are significant but weak correlations between other sub-dimensions.

Table 3: Correlation among DOBE and SDSC Scale Scores

DOBE		***SDSC***						
		DIMS	SBD	DA	SWTD	DOES	SHY	TOTAL
Detached From Life	r	.365**	.259**	.249**	.311**	.303**	.873**	.416**
	P	.000	.000	.000	.000	.000	.000	.000
Conflict	r	.397**	.230**	.217**	.309**	.269**	.776**	.411**
	P	.000	.000	.001	.000	.000	.000	.000
Continuous Play	r	343**	.131*	.149*	.191**	.234**	.823**	.307**
	P	.000	.038	.018	.002	.000	.000	.000
Reflect to the Life	r	.300**	.265**	.282**	.332**	.222**	.638**	.405**
	P	.000	.000	.000	.000	.000	.000	.000
Total	r	.394**	.256**	.257**	.331**	.298**	.898**	.438**
	P	.000	.000	.000	.000	.000	.000	.000

** *P*<.01, **P*<.05

Chaid analysis of demographic information and scales

As a result of CHAID analysis, the maximum tree depth is 3, the minimum value at the top node is 40, and the minimum value at the bottom node is 20. In the sub-dimensions, DOBE Conflict, Continuous Play, and Reflect to the Life, a tree structure consisting of two levels and 3 nodes has emerged. It is given in Figs. 1, 2 and 3.

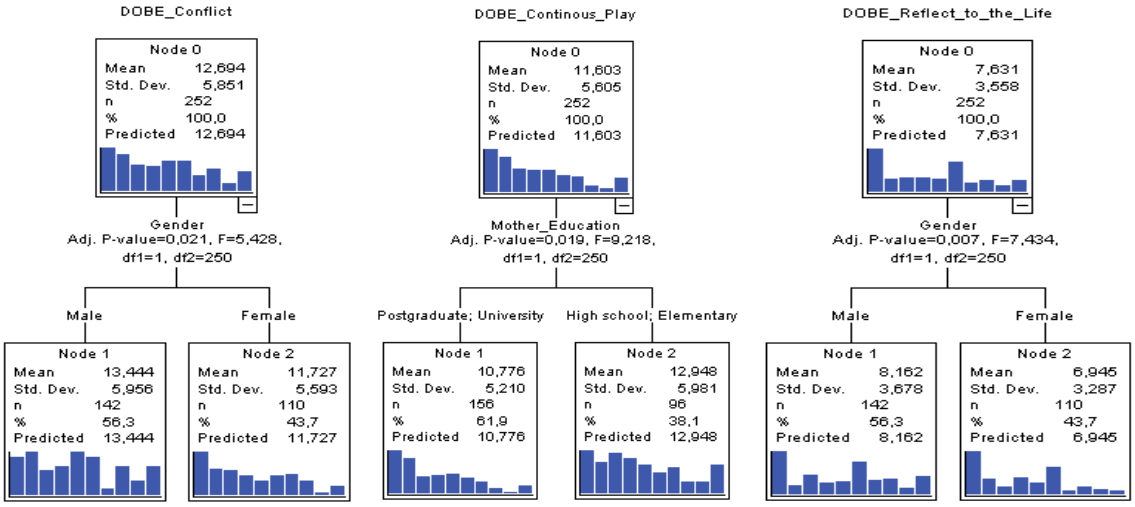

Fig. 1: The CHAID decision tree structure of variables affecting children's DOBE Conflict scores

Fig. 2: The CHAID decision tree structure of variables affecting children's DOBE Continuous Play scores

Fig. 3: The CHAID decision tree structure of variables affecting children's DOBE Reflect to the Life scores

As seen in Fig. 1, there is a significant difference in children's Conflict scores according to their gender (F=5.428; *P*=0.021). Boys (56.3%) have a predicted score of 13.444 and girls (43.7%) have a predicted score of 11,727, boys having a significantly higher Conflict score than girls.

The most important variable affecting the DOBE Continuous Play score of children is the education

level of the mothers. Children's Continuous Play-scores differ significantly according to the education level of their mothers (F=9.218; *P*=0.019). The Continuous Play predicted score of children whose mothers are elementary-high school (38.1%) is 12,948, and the predicted score of children whose mothers are university-postgraduate (61.9%) is 10,776 (Fig. 2)

In Fig. 3, the most important variable affecting children's DOBE Reflect to the Life score is their gender, and children's Reflect the Life scores differ significantly according to their gender (F=7.434; *P*=0.007). The predicted score for boys (56.3%) is 8.162 and for girls (43.7%) the predicted score is 6.945. Boys have a significantly higher Reflect to the Life score than girls.

The Emotional Over-Eating, Desire to Drink, and Emotional Under-Eating sub-dimensions each had two levels and three nodes; the Slow Eating sub-dimension had four levels and nine nodes as a result of the CHAID analysis (Fig. 4-7).

As seen in Fig. 4, the most important variable affecting children's CEBQ Emotional Over-Eating score is the age of children, and children's emotional overeating differs significantly according to their age (F=11.394; *P*=0.006). CHAID analysis divided children into two clusters, 4-6 years old and 5-7 years old. The desire to Drink predicted score is 6.063 for children aged 4-6 (63.1%) and the predicted score for children aged 5-7 (36.9%) is 7.194.

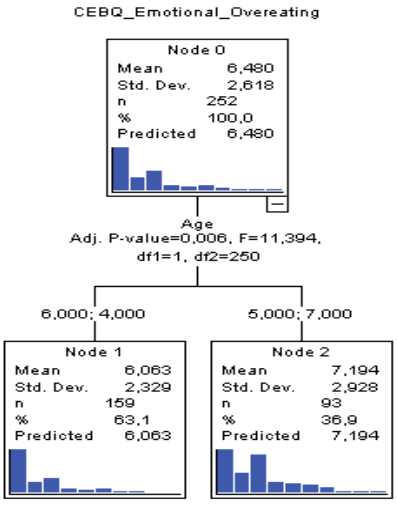

Fig. 4: The CHAID decision tree structure of variables affecting children's CEBQ Emotional Over-Eating scores

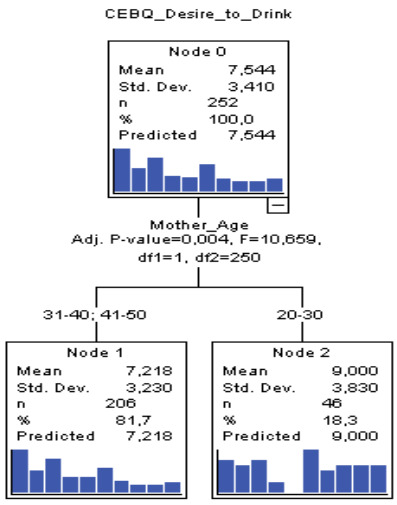

Fig. 5: The CHAID decision tree structure of variables affecting children's CEBQ Desire to Drink scores

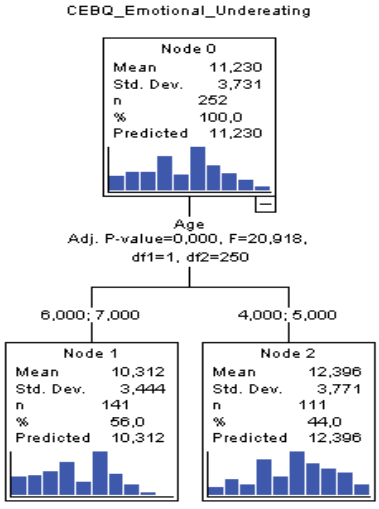

Fig. 6: The CHAID decision tree structure of variables affecting children's CEBQ Emotional Under-Eating scores

The most important variable affecting the CEBQ Desire to Drink sub-dimension score of children is the age of the mother, and the Desire to Drink sub-dimension score of children differs significantly according to the age of their mothers (F=10.659; *P*=0.004). The predicted score of children whose mothers are between 31-50 years of age (61.7%) predicted score is 7.218 and for those whose mothers are between 20-30 years of age (18.3%) predicted score is 9.00 (Fig. 5).

Fig. 6 shows that the most important variable affecting children's CEBQ Emotional Under-Eating score is the age of the children, and it differs significantly according to the children's Emotional Under-Eating age (F=20.918; *P*=0.000). CHAID analysis divided children into two clusters, 4-5 years old and 6-7 years old. Emotional Under-Eating

predicted score is 12.396 for 4-5-year-old children (44%) and 10.312 for 6-7-year-old children (56%).

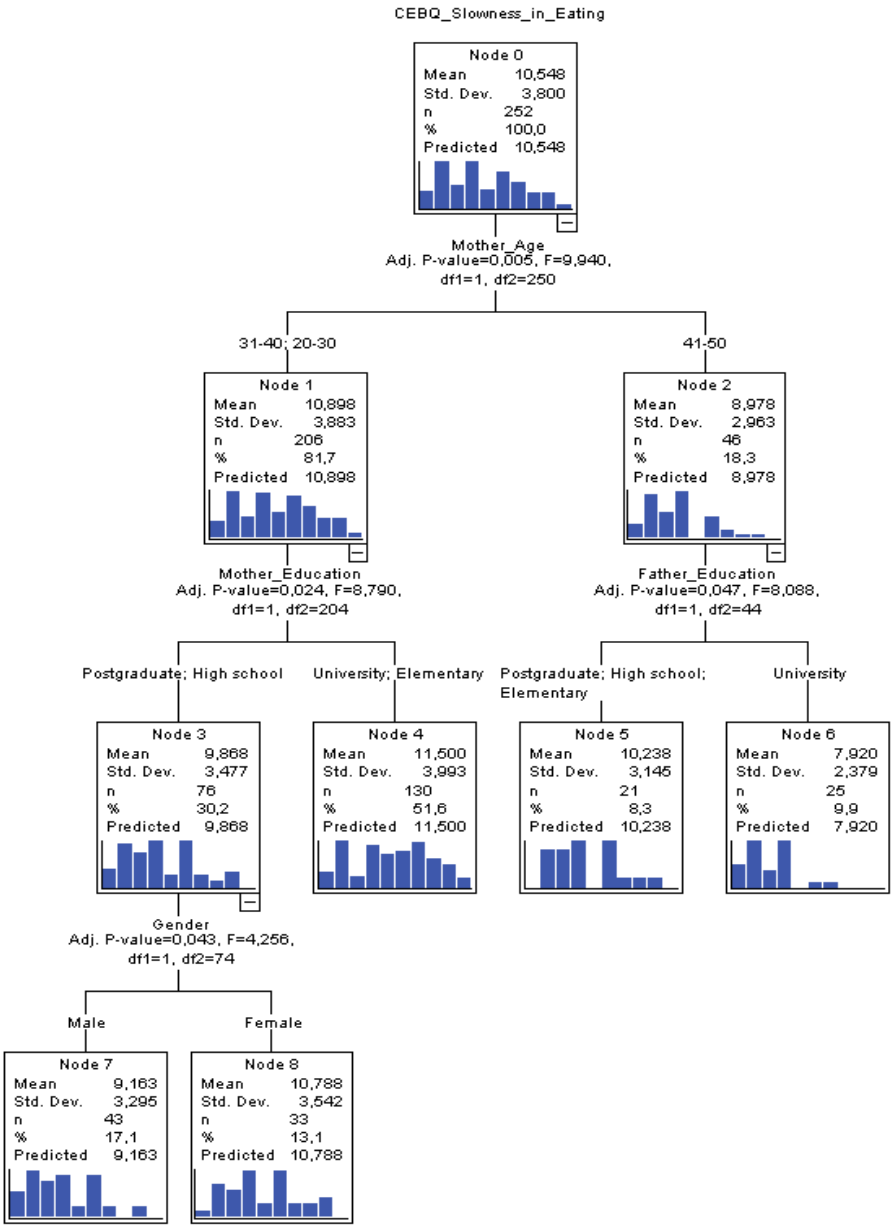

Fig. 7: The CHAID decision tree structure of variables affecting children's CEBQ Slowness in Eating scores

In accordance with the age of their mothers, the children's Slowness in Eating scores differs significantly (F=9.940; *P*=0.005), as shown in Fig. 7. The average score of the children whose mothers are in the range of 20-40 (81.7%) is 10.898, and the predicted score is 8.978 for the children whose mothers are over the age of 41 (18.3%). The most important variable affecting the Slowness in Eating score of children whose maternal age is

between 20-40 is the education level of the mothers. The predicted score of the children whose mothers are at elementary and university level (51.6%) is predicted score 11.500 and the predicted score of children whose mothers are in high school and postgraduate (30.2%) is 9.868. The most important variable affecting the Slowness in Eating average score of children whose mothers are high school-postgraduate level education is the gender of the children. Boys (17.1%) predicted score is 9.163, and girls (13.1%) is 10.788. The most important variable affecting the Slowness in Eating score of children whose father's age is between 41-50 is the education level of the fathers. The predicted score of children whose fathers are at elementary, high school, and postgraduate levels (8.3%) is 10.238, and the predicted score of children whose fathers are bachelor's degrees (9.9%) is 7.920.

In the CHAID analysis carried out to determine the factors affecting the DIMS and STWD subdimension score of SDSC, the decision tree structure is given in Fig. 8 and 9.

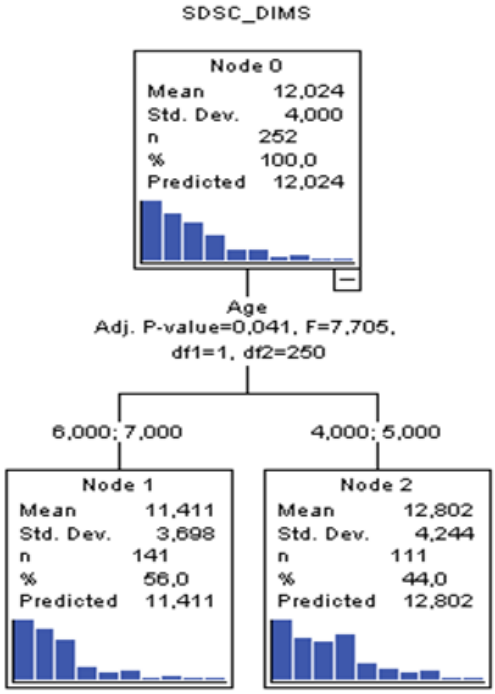

Fig. 8: The CHAID decision tree structure of variables affecting children's SDSC_DIMS scores

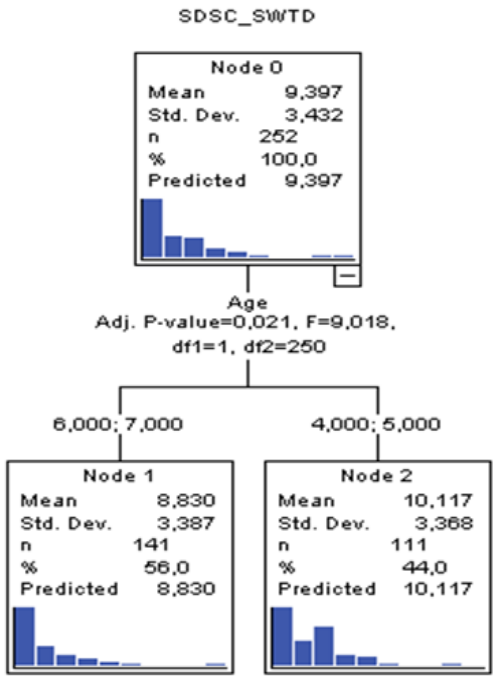

Fig. 9: The CHAID decision tree structure of variables affecting children's SDSC_SWTD scores

The most important variable affecting children's DIMS and SWTD scores is their age. DIMS and SWTD scores of children differ significantly according to their ages (F=7.705, *P*=0.041; F=9.018; *P*=0.021). Both of the subtitles CHAID analysis divided children into two clusters, 4-5 years old and 6-7 years old. The DIMS predicted score of children aged 4-5 (44%) is 12.802 and the predicted score of children aged 6-7 (56%) is 11.411. The SWTD predicted score of 4-5-year-olds (44%) is 10.117 and the predicted score of 6-7 year-olds (56%) is 8.830 (Fig. 8 and 9).

Discussion

In this study, the relationship between digital game addiction with eating behaviors and sleep disorders in preschool children was examined.

There was a weak positive correlation between digital game addiction and eating behavior. Previous studies have found that excessive time spent on digital games is associated with physical inactivity, obesity, and sleep problems (6,20). Spending too much time using media or watching television may cause high-energy unhealthy diets in children (21). Similarly, exposure of children to media-containing food advertisements was associated with lower diet quality (22). It was documented that children have fast eating habits in order to watch television or play computer games (23).

In our study, it was seen that there are significant positive relationships between children's digital game addiction and sleep disorders. Sleep hyperhidrosis during sleep was found to be highly correlated with all sub-dimensions of digital game addiction. Sleep problems such as difficulty falling asleep, disorders of initiating and maintaining sleep, and arousal disorders are very common problems in children (24,25). Approximately half of the children had sleep problems (25). In another study, it was determined that 50% of young children with digital screen exposure had poor sleep habits (26). In a study of children up to 5 years old in the USA, it was found that those who spent more time watching TV and playing with digital tools slept fewer hours than their peers (27). A positive strong relationship has been shown between spent time watching TV and sleep disturbance in Chinese young children (24). Our study findings are consistent with previous studies.

As a result of the CHAID analysis, boys are more affected by the sub-dimensions of digital game addiction, conflict, and reflection on life than girls. Similarly, it has been stated that boys have more game-playing behavior than girls (28). Other researchers found that boys spend more time playing games than girls and are pathologically addicted to gaming. Daily gaming frequency or daily play time indicates an increase in digital game addiction in children (29). In addition, in our study, as the education level of the mothers decreases, the time for children to play on the computer increases. Lauricella, Parental attitudes highly affect the duration of children's use of digital devices. There was a high level of correlation between the duration of parents' use of digital devices and their children's (1). On the other hand, Livingstone et al (30), pointed out a significant relationship between parental attitudes and beliefs and how much time children spend on digital media. They found that families with higher education levels have a higher awareness about digital use (30). Another study, showed that age and mother's digital gameplay were effective on children's digital game addiction levels (30). In this study, it was found that the gender and age of the child and the educational status of the parents affect the eating behaviors. In a related study, while the education level of the mother was significant, the education level of the father and the parents' ages were not (31). Children's eating behavior in early childhood can be affected by gender, family, disease status, environmental factors, and psychosocial factors (9).

Many factors affect children's sleep habits and cause sleep problems in children. A study stated that the children of mothers who graduated from high school had the most sleep problems, while children of mothers who graduated from university or above had the least sleep problems (25). In our study, we found that the most important factor affecting sleep was the age of the child. We could not detect a significant difference in the other maternal and paternal variables. It can be said that the diversity in the factors affecting all results is due to the difference in the study group.

Conclusion

As a result, digital game addiction could negatively affect young children's eating behavior and sleep disorders. While gender and the mother's education level affect digital game addiction, it was found that eating behavior is affected by the mother's age and education level, the father's education level, and the child's gender. The age of the

child is the variable that affects sleep disorders. Considering all the points, families should not forget their responsibilities so that children can be conscious digital tool users and protect them from negative effects. In addition, it is important to evaluate the effect of digital addiction, which has been increasing in recent years, on children's sleep and eating behaviors in healthy child follow-ups, identify problems at an early stage and provide counseling to families.

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of interest

The authors declared no conflict of interest

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