Predicting Obesity Rates in Children with Autism Spectrum Disorder Using Artificial Intelligence Algorithms: A Study on Physical Activity, Nutrition, and Sleep HabitS.

التنبؤ بمعدلات السمنة لدى الأطفال المصابين باضطراب طيف التوحد باستخدام خوارزميات الذكاء الاصطناعي: دراسة حول النشاط البدني، والتغذية، وعادات النوم.

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Obesity, Autism Spectrum Disorder, Childhood Obesity, Artificial Intelligence.	السمنة، اضطراب طيف التوحد، السمنة في الطفولة، الذكاء الاصطناعي، النشاط البدني، سلوكيات الأكل، عادات النوم.

ABSTRACT:

Obesity rates among children with autism spectrum disorder (ASD) have consistently been higher compared to general childhood obesity rates. While hypotheses regarding this gap point to insufficient physical activity, inadequate sleep, and poor dietary behaviors, there is no definitive study linking these factors to obesity in children. This study aims to address this research gap by managing obesity in children through analyzing data related to diet, physical activity, and sleep habits using Decision Trees, Random Forests, and Artificial Neural Networks. The study is a quantitative analysis of data collected through questionnaires to determine obesity rates and any relationships with the mentioned factors. The study sample includes parents of children with ASD, aged 2 to 19 years, registered at Prince Nasser bin Turki Center and the Autism Academy in Riyadh. Data analysis will be conducted using AI techniques such as Decision Trees, Random Forests, and Artificial Neural Networks, providing accurate, data-driven predictions. The goal of this study is to pave the way for effective interventions that can be used to reduce obesity in children with ASD. The results will be useful in guiding public policies and designing programs to reduce obesity among children with this disorder using AI-based analyses, enhancing the ability of researchers and specialists to identify influencing factors and offer targeted, precise solutions.

مستخلص البحث:

تُظهر معدلات السمنة بين الأطفال المصابين باضطراب طيف التوحد (ASD) ارتفاعاً مستمراً مقارنةً بمعدلات السمنة لدى الأطفال بشكل عام. غالباً ما تُعزى أسباب هذه الفجوة إلى عوامل مثل نقص النشاط البدني، قلة النوم، والعادات الغذائية السيئة. ومع ذلك، فإن هناك نقصاً في الأبحاث التي تربط هذه العوامل بشكل شامل بالسمنة في الأطفال المصابين بالتوحد. تهدف هذه الدراسة إلى سد هذه الفجوة من خلال فحص العلاقة بين السمنة وبعض العوامل السلوكية الرئيسية ـ وهي النشاط البدني، التغذية، وعادات النوم ـ باستخدام تقنيات الذكاء الاصطناعي المتقدمة، بما في ذلك أشجار القرار، الغابات العشوائية، والشبكات العصبية الاصطناعية. سيتم استخدام تصميم بحثي كمي لتحليل البيانات التي تم جمعها من آباء الأطفال المصابين بالتوحد، الذين تتراوح أعمارهم بين ٢ إلى ١٩ عامًا، والمسجلين في مركز الأمير ناصر بن تركي لاضطراب التوحد وأكاديمية التوحد بالرياض. سيتم جمع البيانات من خلال استبيانات تقيم النشاط البدني، سلوكيات الأكل، وعادات النوم، بهدف تحديد العلاقات والنماذج التنبؤية لمخاطر السمنة. سيمكن التحليل القائم على الذكاء الاصطناعي من فهم أعمق للتفاعلات المعقدة بين هذه العوامل، وتوفير تنبؤات مدعومة بالبيانات وتحديد الأنماط القابلة للتنفيذ. من المتوقع أن تسهم نتائج هذه الدراسة في تحديد التدخلات الفعّالة والموجهة للحد من السمنة لدى الأطفال المصابين بالتوحد، والمساهمة في استراتيجيات الصحة العامة التي تستهدف هذه الفئة الضعيفة. من المتوقع أن تعزز هذه الدراسة قدرة المهنيين في مجال الرعاية الصحية وصانعي السياسات على تصميم حلول دقيقة وشخصية تعزز أنماط الحياة الصحية وتمنع السمنة لدى الأطفال المصابين بالتوحد.

Introduction:

Overweight and obesity increase the risk of cardiovascular diseases, certain types of cancer, diabetes, and low self-esteem. In children, obesity and overweight significantly affect how they interact with others and how they experience life in general. Therefore, obesity is a serious health and lifestyle issue among children that should be addressed to enhance their quality of life. According to the Executive Office of the Gulf Health Ministry's Council (2013), the number of obese children in Saudi Arabia has reached about 3.5 million, with the obesity rate representing 36% of the total population in the kingdom. Similarly, according to the Centers for Disease Control and Prevention (CDC) in the U.S. (2019), obesity rates among children in the United States have risen, with 18.5% of children aged 2 to 19 being obese. Although these rates are lower than those in adults, childhood obesity is still on the rise. More concerning is the fact that childhood obesity has been identified as one of the main risk factors for obesity in adulthood, highlighting the importance of addressing this issue early.

Obesity poses an even greater challenge among children with developmental disabilities, especially those with autism spectrum disorder (ASD). Research has shown that obesity rates among children with autism are generally higher than those in the general child population (Hill, Zuckerman, & Fombonne, 2015). Children with ASD appear to be at a higher risk of obesity compared to their typically developing peers. This study addresses this problem through a quantitative study involving children with ASD and their families.

Artificial Intelligence (AI) technologies can play a pivotal role in predicting the development of childhood obesity at an early age, thus facilitating early identification, prevention, and management of obesity in children with ASD. By analyzing data related to diet, physical activity, sleep habits, and other factors using Decision Trees and Random Forests, it is possible to predict obesity rates and offer targeted interventions. Additionally, Artificial Neural Networks can be used to study the behaviors of children with ASD in greater depth, understand the factors influencing their weight, and provide personalized recommendations to improve their health outcomes.

The research aims to manage the prevalence of obesity among children with ASD using AI techniques, comparing them to the general child population. The main research question focuses on comparing the rates of obesity and overweight among children with ASD to national obesity records of the general population, by analyzing data using Decision Trees and Random Forests. The study also seeks to explore whether there is a correlation between physical activity, sleep habits, and obesity and overweight rates in children with ASD using Artificial Neural Networks. Previous studies have shown a connection between ASD and higher obesity rates, with difficulties in social functioning identified as a potential contributing factor. This study is significant not only because it confirms obesity rates among children with ASD but also because it explores the potential links with physical activity and sleep habits. It further enhances

the understanding of how AI techniques can be used as innovative solutions in managing obesity among these children

Literature Review:

In this section of the proposal, a review of current knowledge on ASD and complications that children with he disorder face is presented. I highlight the quality of life for these children and the challenges that they face in daily operations and lifestyle. I also review the pertinent issues that may be crucial in understanding the challenge of autism in children and how it affects them. The literature review is aimed at showing that a gap in research exists and providing a guideline for performing such research countrywide for effective data on obesity among children with ASD.

Challenges Introduced by ASD:

A lot of research has been performed on the challenges that people with ASD face. Specifically, Anderson (2015) focused on definition challenges since the basic manifestation of ASD is in communication and interaction skills of the affected person. The main challenge of autism is that it cannot fit the narrow definitions that have been developed in social skills. The word 'spectrum' means that the manifestation of ASD may be unique in different children and hence it is not a fixed disorder. While all people with ASD may have challenges with social skills and communication, no two people are alike and hence every child with ASD has characteristics that are slightly different from others' (Anderson, 2015). The first major lifestyle challenge is thus the fact that ASD may be quite difficult to understand since a single definition is not possible for all children with the disorder.

Secondly, children with ASD generally experience challenges in interaction and hence may fail to fit in peer groups due to these challenges. Childhood is a crucial stage of life as in social connections and peer groups (Peterson et al., 2016). The sense of belonging that comes from peer interactions is crucial in developing self-esteem for children and hence enhancing the social and emotional development of the children. As such, it is crucial for children to grow up while feeling a sense of belonging to peer groups. However, with challenges in social skills and communication, it might be quite challenging for children with ASD to effectively fit in such groups (Peterson et al.,2016). The result is that the children may not effectively develop social connections with peer groups and hence may be challenged socially and in the interactions with others in their environment.

Another major challenge associated with ASD is anxiety and depression. Identifications of higher levels of anxiety among children diagnosed with ASD have been recorded in the past (Bruggink et al., 2016). These levels of anxiety are generally caused by the child's inability to socially fit and function in a conventional environment. High levels of anxiety are also intricately linked to depression and other adverse mental health outcomes. As such, based on the lifestyle challenges of ASD in children, the challenge of anxiety and depression becomes more prevalentamong children with ASD. Newschaffer & Curran (2003) identify the connection between ASD and more adverse health outcomes based on lifestyle choices and challenges and hence partly points towards the problem of obesityand overweight among ASD children.

Childhood Obesity:

The problem of childhood obesity has been explored at length in the literature and there is an increased focus on this epidemic. Santiago-Torres et al. (2016) studied the main predictors of obesity among children and realized that the prevalence of childhood obesity decreases with an increasing level of education for the family head in the children's family. In addition to education, obesity in children has also been linked to the income level with higher income groups portraying lower levels of childhood obesity. Obesity in children has thus been linked to the socioeconomic status of the children's families and parents (Fradkin et al., 2015).

Moreover, research has revealed that obesity in early life is a precursor for adult obesity. Study performed by Fradkin et al. (2015) showed that children who were overweight and obese were more likely than healthy-weight children to become obese as adults. The risk of obesity in adulthood can thus be traced to childhood weight and the ability to maintain a healthy weight as a child. Childhood obesity affects adulthood obesity and hence increases the risk of diabetes, dyslipidaemia, heart disease, hypertension, and some types of cancer (Newschaffer & Curran, 2003). Therefore, basically, childhood obesity is a predictor for adulthood lifestyle diseases and hence is a major problem in the later health of the children. The current increasing rates of childhood obesity thus present challenges in the health-related spending in the future of the nation. The prevalence of childhood obesity further increases the burden on the health sector and spending expected in the future.

The Role of Sleep:

One of the complications that may be associated with ASD is sleep problems among children with ASD.Essentially, research shows that sleep deprivation increases the production of hormones that reduce hunger awareness. Therefore, people who are sleep deprived are more likely to overeat and indulge when compared to others (Rahe et al., 2015). Sleep disturbance is a major health issue for children and adults with ASD. Therefore, it is hypothesized that sleep deprivation, the lack of enough sleep among these children, may be a crucial contributor to higher levels of obesity and unhealthy weight in general. Approaches to ensuring that ASD children get enough sleep are thus used as a major control strategy for weight watching and reduction of the potential adverse effects of sleep

deprivation on the child (Gee et al., 2018).

Feeding Behavior:

Moreover, research into feeding behavior and its relation to ASD shows that oral sensory processing is considered different or abnormal among people with ASD compared to the general population (Berding & Donova,2018). This abnormal oral sensory processing has been linked to a higher oral seeking which means that a child with ASD is more likely to put things in their mouth than the general child population. Secondly, it has also been linked to oral defensiveness which is characterized by the avoidance of certain food taste and textures and hence the child may be limited in the variety of foods that they take (Shmaya et al., 2017). The result of limited food varieties may be shown in the lack of a balanced diet or nutrient consumption in the person with ASD.

While several studies have reviewed the effect of feeding habits on weight and nutrition, there is no sufficient research linking obesity and overweight in children with ASD to the difficulties in feeding. However, studies into feeding habits have linked ASD with poor feeding habits among children and hence hypothesized a connection to weight differences. However, a gap in research shows that there is no conclusive connection between ASD feeding habits and the outcomes of being overweight. This study will thus be crucial in investigating such a connection in children with ASD. The study will be crucial in investigating correlations and hence promoting an understanding between the two factors that have been linked in the past.

Methodology:

The proposed study is based on the need to conduct a clear correlational analysis between obesity in children with autism spectrum disorder (ASD) and physical activity and feeding behaviors. This section outlines the specific steps that will be followed in the research process and how they will be used to produce reliable research on the topic. The methodology section presents the research design, participants and setting, procedures used, and the data collection and analysis approaches to be applied in the research.

Research Design:

A quantitative research design will be used in this study. The essence of quantitative research lies in the use of research methods that allow for the measurement of variables and the analysis of relationships between them. According to Creswell & Creswell (2017), quantitative research design is used to determine how many people act, think, or feel in a particular way or how many people exhibit a certain

characteristic in a population. This design is suitable for this study because of its correlational nature and the aim to test the relationship between obesity and feeding behaviors and physical activity in children with ASD.

The study will utilize Artificial Intelligence (AI)techniques such as Decision Trees and Random Forests to analyze data from children with ASD. These techniques are capable of identifying patterns and correlations between various factors like physical activity, dietary habits, sleep patterns, and obesity, helping to predict obesity rates and offer targeted interventions. Additionally, Artificial Neural Networks will be used to study children's behaviors in more depth, understand the factors affecting their weight, and provide personalized solutions to improve health outcomes.

Participants:

The participants in this study will be parents of children diagnosed with ASD between the ages of 2 and 19. The study aims to collect data from at least 300 participants to ensure a diverse population and provide a robust data set to analyze the relationship between obesity and children's behaviors with ASD. Participants will be recruited through convenient sampling from parents of children attending specialized centers for ASD care, such as Prince Nasser bin Turki Autism Center and the Special Education Academy for Autism in Riyadh.

Setting:

The research will take place in Riyadh, where participants will be recruited from autism care centers like the Prince Nasser bin Turki Autism Center and the Special Education Academy for Autism. The city is chosen because it offers a large population of children with ASD, including

those who are obese or overweight, and represents a cross-section of the larger Saudi population. The use of this setting will reduce bias in the data and ensure that the study findings are applicable to the broader population of children with ASD in Saudi Arabia.

Data Collection:

Data will be collected using digital tools, including electronic surveys targeting three key variables: physical activity, feeding behaviors, and sleep habits. The Physical Activity Questionnaire for Children (PAQ-C) will be used to measure physical activity levels in children aged 8 to 14 years.

The Children's Sleep Habits Questionnaire (CSHQ) will be used to assess sleep disturbances among the children. The Brief Autism Mealtime Behavior Inventory (BAMBI) will measure mealtime behavior problems in children with ASD. These tools will provide a comprehensive view of the behaviors that might influence obesity rates in children with ASD. These surveys will be distributed online to parents and the data will be securely collected through digital platforms that ensure confidentiality.

Data Analysis:

The data will be analyzed using advanced artificial intelligence techniques to classify children based on obesity risks. Decision trees and random forests will be applied to analyze the data and identify the factors influencing obesity, such as physical activity, eating behaviors, and sleep habits. These algorithms will help predict obesity rates based on the collected data.

Additionally, artificial neural networks will be used to understand the complex relationships between children's behaviors and environmental factors, enabling the extraction of hidden patterns that may not be evident using traditional methods. These

networks will also contribute to providing personalized recommendations for improving each child's health behaviors.

The analysis is expected to reveal strong correlations between obesity and three key variables: physical activity, eating behaviors, and sleep habits. The results will help identify early interventions and provide targeted strategies to improve overall health and reduce the risk of obesity in children with autism spectrum disorder (ASD).

Expected Results:

1.Correlation Between Obesity and Physical Activity:

It is anticipated that children with ASD who engage in lower levels of physical activity will have a higher likelihood of obesity. Based on previous research, children with ASD often face difficulties with motor skills and engaging in structured physical activities. The study is expected to reveal a negative correlation between physical activity levels (as measured by the PAQ-C) and obesity rates, suggesting that lower physical activity contributes to higher obesity risk.

2.Correlation Between Obesity and Feeding Behaviors:

It is expected that children with ASD will show unique feeding behaviors, such as selective eating or food aversions, which may contribute to poor nutritional intake and obesity. The use of the Brief Autism Mealtime Behavior Inventory (BAMBI) is likely to show significant links between mealtime behavioral problems (such as food refusal or restrictive eating patterns) and obesity. These behaviors, combined with restricted or unbalanced diets, are expected to correlate with higher obesity rates in children with ASD.

3. Sleep Patterns and Obesity Risk:

Given the established relationship between sleep disturbances and weight

gain, the study may find a significant correlation between poor sleep habits (as assessed by the Children's Sleep Habits Questionnaire, CSHQ) and increased obesity rates in children with ASD. Children with sleep disturbances may experience hormonal imbalances that influence appetite regulation and metabolism, leading to weight gain. Thus, it is expected that children with disrupted sleep patterns will also be at higher risk for obesity.

4.Complex Interactions Through AI Analysis:

The use of artificial intelligence, particularly decision trees, random forests, and neural networks, will likely uncover intricate, multidimensional relationships between physical activity, feeding behaviors, and sleep habits. AI models will provide a nuanced understanding of how these factors interact and may reveal complex patterns that are not immediately visible through conventional statistical methods. Additionally, these models may identify subgroups of children with ASD who are more susceptible to obesity due to particular combinations of behavioral and environmental factors.

Recommendations:

1.Tailored Interventions for Physical Activity:

Based on the anticipated findings, it would be recommended that future interventions focus on improving physical activity levels in children with ASD. These interventions should be personalized to account for the child's unique motor abilities and preferences, incorporating activities that are enjoyable and engaging for children with ASD, such as swimming, dance, or sensory-friendly exercises. Programs should also involve parents and caregivers in promoting consistent, structured activity routines.

2. Addressing Feeding Behaviors:

Recommendations for addressing mealtime behavior problems could involve specialized feeding therapy or behavioral interventions aimed at increasing the variety and nutritional quality of food consumed by children with ASD. Strategies might include gradual exposure to different foods, improving food acceptance, and focusing on creating calm and structured mealtime environments. Healthcare providers could collaborate with dietitians to create individualized meal plans to address both the sensory preferences and nutritional needs of children with ASD.

3. Sleep Management Strategies:

Given the expected correlation between sleep disturbances and obesity, it will be crucial to recommend sleep hygiene interventions. These could include strategies for improving bedtime routines, reducing screen time before sleep, and employing sensory-friendly practices that cater to children with ASD's unique sensory needs. Behavioral interventions and therapies, such as cognitive behavioral therapy for insomnia (CBT-I), may be explored to improve sleep quality and duration.

4.Comprehensive, Multi-Disciplinary Approach:

The results from the study suggest that a multi-disciplinary approach involving psychologists, dietitians, physical therapists, and sleep specialists could be essential in addressing the complex factors contributing to obesity in children with ASD. Such an approach would allow for targeted interventions that account for physical, behavioral, and environmental contributors to obesity. This approach should be embedded within both clinical settings and community-based programs for ASD care.

Suggestions:

1. Longitudinal Studies:

A suggestion for future research is to extend the study into a longitudinal design to track changes in physical activity, feeding behaviors, sleep habits, and obesity over time. This would help establish causal relationships and examine how these factors evolve as children with ASD grow older. A longitudinal approach would also allow researchers to assess the long-term effectiveness of intervention programs on reducing obesity.

2. Exploring Genetic and Environmental Factors:

Another suggestion is to expand the research to include genetic factors or a deeper investigation of environmental influences, such as parental practices or socio-economic status, which could play a significant role in obesity in children with ASD. Identifying genetic predispositions or environmental risk factors could enhance the precision of targeted interventions.

3. Incorporating Additional Variables:

Future studies could include additional variables that might influence obesity, such as medication use, screen time, or sensory processing disorders, which are often associated with children with ASD. A more comprehensive dataset could provide deeper insights into the multifactorial nature of obesity in this population.

4. Expanding Sample Diversity:

While the current study focuses on participants from Riyadh, it may be valuable to extend the research to other regions within Saudi Arabia, or even internationally, to ensure a more diverse and representative sample. This could help assess whether the identified patterns hold true across different cultural contexts and healthcare systems.

5. Evaluation of Intervention Programs:

The study could also suggest the development and evaluation of specific intervention programs based on the findings. These programs should integrate physical activity, dietary management, and sleep hygiene, and their effectiveness could be assessed through randomized controlled trials (RCTs) to determine the best combination of interventions for reducing obesity in children with ASD.

Conclusion:

This study holds the potential to significantly enhance our understanding of the complex relationship between obesity and key behavioral factors in children with ASD. By applying innovative AI techniques, the study will provide valuable insights into how physical activity, feeding behaviors, and sleep habits contribute to obesity risk, ultimately leading to more effective, personalized interventions that can improve health outcomes for children with ASD. The findings and recommendations from this research can inform clinical practices and future studies aimed at addressing childhood obesity within this unique population.

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Appendix A

Factors Loading for Brief Autism Mealtime Behavior Inventory (BAMBI)

Table 1 Factor loadings for the BAMBI (Three-Factor Solution)

Item	Factor		
	Limited variety	Food refusal	Features of autism
My child...			
1. cries or screams during mealtimes	−.15	**.74**	.21
2. turns his/her face or body away from food	.27	**.69**	−.06
4. expels food that he/she has eaten	.05	**.37**	.12
7. is disruptive during mealtimes	−.06	**.53**	.37
8. Closes mouth tightly when food is presented	.46	**.42**	−.17
3. remains seated at the table until meal is finished	−.18	−.25	**−.26**
5. is aggressive during mealtimes	−.11	.26	**.65**
6. displays self-injurious behavior during mealtimes	−.13	.33	**.31**
9. is flexible about mealtime routines	−.15	.09	**−.51**
12. refuses to eat foods that require a lot of chewing	.36	−.23	**.50**
10. is willing to try new foods	**−.78**	−.07	−.17
11. dislikes certain foods and won't eat them	**.63**	.23	.03
13. prefers the same foods at each meal	**.81**	.13	.04
14. prefers "crunchy" foods	**.54**	.25	−.11
15. accepts or prefers a variety of foods	**−.76**	−.02	−.27
16. prefers to have food served in a particular way	**.53**	.01	.13
17. prefers only sweet foods	**.37**	.22	−.12
18. prefers food prepared in a particular way	**.37**	.10	.14

Note: Bolded numbers denote items loading on that factor

(Lukens & Linscheid, 2008)

Appendix B

Unadjusted Means, Standard deviations for individual items and subscales, N, F values, Test-retest, and Alpha coefficients for the Subscales of the CSHQ

Subscale Item	Control Sample			Clinic Sample			F	df	Z	Control Test-retest r^c	Test-retest N	Control α	N	Clinic α	N
	Mean	SD	N	Mean	SD	N									
1. Bedtime Resistance	7.06	1.89	382	9.43	3.49	128	65.74	3, 506	--	0.676**	56	0.70	441	0.83	142
Goes to bed at same time	1.18	0.53	402	1.30	0.57	130			3.57	0.163	60	---	---	---	---
Falls asleep in own bed	1.21	0.57	400	1.52	0.81	129			5.10	0.335	58	---	---	---	---
Falls asleep in other's bed	1.21	0.52	401	1.48	0.76	129			4.53	0.580	59	---	---	---	---
Needs parent in room to sleep	1.17	0.48	390	1.57	0.82	129			6.67	0.886	58	---	---	---	---
Struggles at bedtime	1.13	0.41	392	1.70	0.86	130			9.50	0.265	58	---	---	---	---
Afraid of sleeping alone	1.19	0.49	388	1.85	0.91	128			9.60	0.597	59	---	---	---	---
2. Sleep Onset Delay	1.25	0.53	403	1.80	0.88	128			7.58	0.620**	60	---	---	---	
Falls asleep in 20 minutes															
3. Sleep Duration	3.41	0.93	398	4.94	1.98	122	102.68	3, 516		0.400	60	0.69	459	0.80	137
Sleeps too little	1.21	0.42	400	1.78	0.86	127			7.69	0.420	60	---	---	---	---
Sleeps the right amount	1.13	0.43	400	1.73	0.84	124			9.73	0.452	60	---	---	---	---
Sleeps same amount each day	1.07	0.34	398	1.42	0.63	125			8.84	0.062	60	---	---	---	---
4. Sleep Anxiety	4.89	1.45	374	7.09	2.44	119	114.13	3, 489		0.790**	56	0.63	432	0.68	132
Needs parent in room to sleep	1.17	0.48	390	1.57	0.82	129			6.67	0.886	58	---	---	---	---
Afraid of sleeping in the dark	1.38	0.68	387	2.08	0.87	129			9.23	0.585	59	---	---	---	---
Afraid of sleeping alone	1.19	0.49	388	1.85	0.91	128			9.60	0.597	59	---	---	---	---
Trouble sleeping away	1.17	0.44	386	1.56	0.79	120			6.10	0.551	58	---	---	---	---
5. Night Wakings	3.51	0.89	384	5.69	1.60	120	278.99	3, 500		0.634**	56	0.54	437	0.44	135
Moves to other's bed in night	1.17	0.44	392	1.76	0.82	126			9.58	0.584	59	---	---	---	---
Awakes once during night	1.31	0.55	393	2.13	0.76	121			11.45	0.682	58	---	---	---	---
Awakes more than once	1.03	0.16	385	1.86	0.83	126			15.19	0.018	57	---	---	---	---
6. Parasomnias	8.11	1.25	371	11.22	2.53	117	229.21	3, 484		0.618**	57	0.36	425	0.56	132
Wets the bed at night	1.12	0.43	380	1.30	0.61	125			4.48	1.000	58	---	---	---	---
Talks during sleep	1.22	0.44	393	1.72	0.77	127			7.97	0.392	58	---	---	---	---
Restless and moves a lot	1.37	0.58	390	2.26	0.83	127			11.30	0.572	59	---	---	---	---
Sleepwalks	1.04	0.22	384	1.36	0.65	128			8.76	1.000	58	---	---	---	---
Grinds teeth during sleep	1.25	0.52	386	1.50	0.70	124			5.07	0.668	57	---	---	---	---
Awakens screaming, sweating	1.02	0.12	385	1.50	0.77	125			12.03	1.000	58	---	---	---	---
Alarmed by scary dream	1.10	0.30	389	1.53	0.73	126			8.72	0.858	60	---	---	---	---

(Owens et al., 2000)