

# LINK BETWEEN PREVALENCE OF EXCESSIVE SMARTPHONE USE, INSOMNIA, AND ACADEMIC PERFORMANCE AMONG MIDDLE SCHOOL ADOLESCENTS IN KENITRA, MOROCCO: A CROSS-SECTIONAL SURVEY

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## Abstract

This study investigates the impact of excessive smartphone use on middle school students in Kenitra, Morocco, focusing on sleep quality and academic performance. Adolescents often struggle with smartphone addiction, which adversely affects their well-being. The research distinguishes between gender and school type (public or private) and their relation to smartphone overuse. It aims to comprehend how frequent smartphone use affects insomnia and academic success, shedding light on the underlying reasons. The study involved 342 middle school students, and data were collected using various assessments. Results indicate that insomnia is slightly higher in girls and significantly more prevalent in public schools. Excessive smartphone users tend to have lower academic performance and more severe insomnia. In summary, the research underscores a significant connection between excessive smartphone use among Kenitra, Morocco's adolescents, and insomnia, along with suboptimal academic performance. Notably, girls and public-school students are more susceptible to these effects. This highlights the need for educational and awareness strategies to encourage a more balanced use of smartphones among young people. Understanding these dynamics is crucial for addressing the issue effectively.

**Keywords:** Smartphone, Adolescents, Insomnia, Academic Performance, Prevalence, Morocco.

## 1. INTRODUCTION

Smartphones have become integral to adolescents' daily lives and academic pursuits. They use these devices to alleviate stress, stay connected with friends and family, and seek information. As smartphones cater to their needs for knowledge, entertainment, and social interaction, they become increasingly significant in their lives. Consequently, adolescents may grow more reliant on smartphones, potentially leading to addiction. This dependency can negatively impact their academic performance, as they might begin to neglect their studies [1, 2]. Nevertheless, there is a growing concern regarding the influence of excessive smartphone use on adolescent health, particularly in relation to sleep and academic performance [1, 3–5]. This concern necessitates a thorough investigation. Studies indicate that excessive smartphone usage is associated with sleep disturbances in adolescents, suggesting that smartphones may disrupt their natural sleep patterns and raise questions about the quality of their sleep. Moreover, recent research has shown a connection between the use of social media on smartphones and mental health issues in adolescents, prompting concerns about the psychological well-being of young individuals exposed to these technologies [3, 6, 7]. Additionally, studies have established links between

excessive smartphone use and suboptimal academic outcomes, leading to the central question of understanding how smartphone use affects the academic success of adolescents [8]. Within this context, the central issue is as follows: How does excessive smartphone use among adolescents impact their sleep, mental health, and academic performance, and what are the interrelationships between these factors? To explore this matter, this study consists of three main objectives. The first objective is to evaluate the prevalence of excessive smartphone use among adolescents. The second objective is to describe the connection between excessive smartphone use and the sleep quality of adolescents. The third objective of the study is to elucidate the relationship between smartphone use and the academic performance of adolescents.

## 2. MATERIALS AND METHODS

### 2.1 Participants

This study is based on the analysis of data previously collected from several public and private middle schools in the Province of Kenitra during the 2021/2022 school year. The studied sample consisted of 342 participants, with an average age of 13.64 years and a standard deviation of 1.29. It's important to note that one participant had missing data, indicating they had not responded to some questions or had left fields blank. Boys represented 49.6% of the sample, while girls constituted 50.4%.

### 2.2 Instruments

#### 2.2.1 Smartphone Addiction Scale (SAS)

The Smartphone Addiction Scale (SAS) serves as a widely utilized assessment tool designed for the evaluation of smartphone addiction levels in individuals. Its primary purpose is to gauge the degree of reliance on smartphones by examining a range of behaviors associated with their usage. Below, you'll find an elaborate breakdown of the SAS scale, encompassing its formulation, evaluation process, and pertinent sources for further insight. Description of the SAS Scale: The SAS scale comprises a series of statements or questions that participants must respond to, reflecting their own behaviors concerning smartphone usage. These statements pertain to behaviors linked to excessive smartphone use, such as an inordinate preoccupation with smartphones, a persistent urge to check the device, emotional dependency on smartphones, and analogous patterns [9]. Scoring Method: In the SAS scale, participants' responses to each question are typically assigned values on a Likert scale, spanning from 1 to 6. These values correspond to:

- 1: Strongly Disagree,
- 2: Disagree,
- 3: Slightly Disagree,
- 4: Slightly Agree,
- 5: Agree and
- 6: Strongly Agree.

The overall score is computed by summing the responses to all questions. Consequently, the resultant total score can vary from 6 (indicative of no dependency) to 36 (indicative of a high level of dependency). Interpreting the Scores: A typical interpretation of SAS scores might be as follows: 6-17: Absence of smartphone

dependency, 18-24: Standard smartphone usage, 25-30: Moderate smartphone usage, 31-36: Elevated smartphone dependence. Higher scores denote more pronounced smartphone usage and a heightened level of dependency [10–12].

### **2.2.2 Insomnia Severity Index (ISI)**

The Insomnia Severity Index (ISI) is a widely used questionnaire for assessing the severity of insomnia symptoms in individuals. It typically consists of seven questions that assess various aspects of insomnia symptoms, and responses are used to calculate a total score. Here's an explanation of the coding, scoring, and interpretation of the ISI scale, along with recent references to support the information: Description of the ISI Scale: The ISI scale usually includes seven questions that evaluate the severity of insomnia symptoms. Respondents are asked to rate the impact of their insomnia on various aspects such as sleep onset, sleep maintenance, early morning awakenings, satisfaction with their current sleep pattern, interference with daily functioning, noticeability of impairments due to insomnia, and distress caused by insomnia. Coding: For each ISI question, participants provide responses on a Likert scale. The coding is as follows:

- 0: No problem.
- 1: Slight problem.
- 2: Moderate problem.
- 3: Moderately severe problem.
- 4: Severe problem.

Scoring: The total score on the ISI is obtained by summing the responses to the seven questions. Therefore, the overall score can range from 0 to 28, with higher scores indicating more severe insomnia. Interpretation of Scores: Interpreting ISI scores can be as follows: 0-7: No clinically significant insomnia. 8-14: Subclinical insomnia. 15-21: Clinical insomnia (moderate severity). 22-28: Clinical insomnia (severe severity). These categories help classify individuals into different levels of insomnia severity based on their ISI scores [13, 14] additionally, academic performance was assessed using grades from the second semester of the 2020/2021 school year. We chose the results of the second semester of the previous year because they closely align with the timing of our questionnaire distribution to students, as we employ a cross-sectional study approach

### **2.3 Statistical Analysis and Ethics**

Data processing was conducted using the SPSS software (IBM SPSS Statistics 21), which involved standard descriptive analyses (mean, standard deviation, percentage, etc.) [15–18]. The Chi-Square test of Independence was employed to compare the qualitative variable of each instrument (SAS and ISI) based on gender and school type.

### **2.4 Ethical Considerations**

To conduct this study, authorization was obtained for data collection. Furthermore, the participant is free to decide whether or not to take part in the questionnaire and to withdraw at all times and without prejudice. To encourage them to reply truthfully, all participants are asked not to reveal their identity when answering.

### 3. RESULTS

#### 3.1 Description of Insomnia in the General Population

Among the 332 valid responses, the majority of participants (115, or 34.6%) do not experience any insomnia, suggesting that nearly one-third of the participants have good sleep quality. Approximately half of the participants (163, or 49.1%) exhibit mild insomnia, indicating that this group faces sleep difficulties, although less severe than moderate or severe insomnia. A significant proportion of participants (50, or 15.1%) suffer from moderate insomnia, which can have a noticeable impact on their sleep quality. Only a small number of participants (4, or 1.2%) display severe insomnia, suggesting that this level of insomnia is less common in the sample.

**Table 1: Prevalence of Insomnia in the General Population**

Insomnie-Severity		Counts	Percentage	Valid Percentage	Cumulative Percentage
Valid	No Insomnia	115	33,6	34,6	34,6
	Mild Insomnia	163	47,7	49,1	83,7
	Moderate Insomnia	50	14,6	15,1	98,8
	Severe Insomnia	4	1,2	1,2	100,0
	Total	332	97,1	100,0	
Missing	Data Missing	10	2,9		
Total		342	100,0		

#### 3.2 Description of Insomnia by Gender

This table provides insight into the distribution of insomnia levels among boys and girls, with a focus on valid responses. Among boys, 35.8% have reported no insomnia, 54.9% experience mild insomnia, and 8.6% face moderate insomnia, while only 0.6% exhibit severe insomnia. For girls, 33.7% do not report any insomnia, 43.8% have mild insomnia, 20.7% experience moderate insomnia, and 1.8% display severe insomnia. Notably, girls exhibit a slightly higher prevalence of mild and moderate insomnia compared to boys, while boys have a slightly higher percentage of severe insomnia. The presence of missing data is minimal in both groups.

**Table 2: Prevalence of Insomnia by Gender**

Gender			Counts	Percentage	Valid Percentage	Cumulative Percentage
Boys	Valid	No Insomnia	58	34,3		35,8
		Mild Insomnia	89	52,7		90,7
		Moderate Insomnia	14	8,3		99,4
		Severe Insomnia	1	0,6		100,0
		Total	162	95,9		
	Missing	Missing System	7	4,1		
Total			169	100,0		
Girls	Valid	No Insomnia	57	33,1	33,7	33,7
		Mild Insomnia	74	43,0	43,8	77,5
		Moderate Insomnia	35	20,3	20,7	98,2
		Severe Insomnia	3	1,7	35,8	100,0
		Total	169	98,3	54,9	
	Missing	Missing System	3	1,7	8,6	
Total			172	100,0		

#### 3.3 Description of Insomnia by Type of Institution

The table 3 provides an overview of insomnia levels based on the type of institution, whether public or private, with a focus on valid responses. In public schools, 31.3% of students report no insomnia, 50.5% experience mild insomnia, 16.2% face moderate

insomnia, and 2% exhibit severe insomnia. Conversely, for private schools, 39.6% of students do not report any insomnia, 47% have mild insomnia, and 13.4% experience moderate insomnia. It's important to note that data for severe insomnia in private schools is unavailable. Missing data is minimal in both groups. Overall, students in private schools appear to have a slightly higher prevalence of mild insomnia compared to those in public schools, while public school students have a slightly higher proportion of moderate insomnia.

**Table 3: Prevalence of Insomnia by Type of Institution**

Type of Institution		Counts	Percentage	Valid Percentage	Cumulative Percentage	
Public	Valid	No Insomnia	62	31,0	31,3	31,3
		Mild Insomnia	100	50,0	50,5	81,8
		Moderate Insomnia	32	16,0	16,2	98,0
		Severe Insomnia	4	2,0	2,0	100,0
		Total	198	99,0	100,0	
	Missing	Missing System	2	1,0		
Total		200	100,0			
Private	Valid	No Insomnia	53	37,3	39,6	39,6
		Mild Insomnia	63	44,4	47,0	86,6
		Moderate Insomnia	18	12,7	13,4	100,0
		Severe Insomnia				
		Total	134	94,4	100,0	
	Missing	Missing System	8	5,6		
Total		142	100,0			

### 3.4 Description of Insomnia by Type of Institution

The table 4 displays insomnia distribution for non-excessive and excessive smartphone users, based on valid responses. Non-excessive users: 37.4% no insomnia, 50.8% mild, 11.8% moderate. Severe insomnia data is missing. Excessive users: 30.7% no insomnia, 45.7% mild, 20.5% moderate, 3.1% severe. Missing data is minimal. In summary, non-excessive users exhibit slightly higher mild insomnia, while excessive users show slightly more moderate insomnia.

**Table 4: Prevalence of Insomnia among Excessive and Non-Excessive Smartphone Users**

Type of Institution		Counts	Percentage	Valid Percentage	Cumulative Percentage	
Non-excessive Smartphone users	Valid	No Insomnia	70	36,5	37,4	37,4
		Mild Insomnia	95	49,5	50,8	88,2
		Moderate Insomnia	22	11,5	11,8	100,0
		Severe Insomnia				
		Total	187	97,4	100,0	
	Missing	Missing System	5	2,6		
Total		192	100,0			
Excessive Smartphone users	Valid	No Insomnia	39	30,5	30,7	30,7
		Mild Insomnia	58	45,3	45,7	76,4
		Moderate Insomnia	26	20,3	20,5	96,9
		Severe Insomnia	4	3,1	3,1	100,0
		Total	127	99,2	100,0	
	Missing	Missing System	1	0,8		
Total		128	100,0			

### 3.5 Analysis of Sleep Quality Variation According to Academic Performance

This table reveals that students without insomnia achieved higher average grades (Mean of 15.243), while those with mild insomnia had slightly lower results (Mean of 14.434). Students with moderate insomnia scored even lower on average (Mean of 13.508). Severe insomnia was not considered in this analysis. In summary, there is a negative correlation between the level of insomnia and academic performance, with a tendency for grades to decrease as insomnia becomes more severe.

**Table 5: The Relationship between Sleep Quality and Academic Performance**

Second-Semester-Last-Year-Average			
Insomnia Threshold	Counts	Average	Standard Deviation
No Insomnia	108	15,243	2,749
Mild Insomnia	162	14,434	2,671
Moderate Insomnia	49	13,508	2,645
Severe Insomnia	4	11,087	3,068
Total	323	14,522	2,773

### 3.6 The Relationship between Excessive and Non-Excessive Smartphone Use and Academic Performance

This table reveals that students with non-excessive smartphone usage (187 participants) achieved an average score of 14.949 with a standard deviation of 2.824. In contrast, students with excessive smartphone usage (124 participants) obtained a lower average score of 13.915, with a standard deviation of 2.550. These results indicate a negative correlation between excessive smartphone usage and academic performance, with non-excessive users having higher average scores in the previous year's second semester.

**Table 6: The Relationship between Excessive and Non-Excessive Smartphone Use and Academic Performance**

Second-Semester-Last-Year-Average			
SAS-Threshold-Population	Counts	Average	Standard Deviation
Non-excessive smartphone users	187	14,949	2,824
Excessive smartphone users	124	13,915	2,550
Total	311	14,537	2,761

## 4. DISCUSSION

The findings of this study shed light on the intricate relationship between smartphone usage, insomnia, and academic performance among adolescents, particularly in Kenitra, Morocco. The prevalence of excessive smartphone usage and its impact on students' sleep quality and academic results in the local middle school raise growing concerns.

Interestingly, our study has shown that a significant proportion of middle school students, engage in excessive smartphone usage, corroborating prior research that has reported a notable prevalence of smartphone addiction among adolescents. Furthermore, consistent with our findings, numerous studies have concluded that smartphones are linked to a decline in sleep quality. Prolonged use of smart devices, including smartphones and portable smart TVs, has been associated with altered sleep and wake times, deteriorating health, and disruptions to daily life [19]. A study by Soni et al. demonstrated that smartphone dependence significantly affects sleep quality [20]. The research found that heavy smartphone users tend to experience



poorer sleep quality [21]. Night-time smartphone use is linked to lower sleep quality, later wake-up times, and increased sleep latency [22]. Individuals who use smartphones right before sleep or while trying to fall asleep may suffer from reduced sleep efficiency and prolonged sleep latency [20]. As known, sleep quality is crucial for everyone, as it helps maintain heart health, prevent cancer, reduce stress, improve memory, brain diseases, and aid in weight loss [23–25]. In experimental animal models, several studies have highlighted the importance of controlling room light and the negative effects of light exposition on animal health.

However, many people today stay up late for various reasons, negatively impacting their sleep quality. One significant factor contributing to poor sleep quality is smartphone addiction, which often causes individuals to stay up late and disrupt their sleep patterns. In this sense, several studies have indicated that the blue light emitted by smartphones affects sleep quality. According to Swiner, blue light exposure can disrupt sleep. At night, blue light exposure interferes with the body's biological clock by inhibiting melatonin production, which is essential for falling asleep [26]. Consequently, the amount of screen time can significantly impact sleep quality. Adolescents who use their smartphones at bedtime are likely to experience poorer sleep quality.

Additionally, consistent with our results, slightly higher rates of insomnia are observed among girls compared to boys. This gender difference can be attributed to variations in smartphone usage patterns, as suggested by prior research [27, 28]. Interestingly, our study revealed a significant difference in the prevalence of insomnia between students in public and private schools, with a higher prevalence among students in public schools. This aligns with reports of lower academic performance among students in public schools, indicating a need for targeted interventions in these settings [1, 29].

On the other hand, in addition to smartphone addiction, sleep quality can impact the educational performance of adolescent students [30]. In this regard, our findings indicated a significant relationship between sleep quality and academic performance: the poorer the sleep quality, the lower the academic performance. Adolescents with good sleep quality achieve better academic results than those with poor sleep quality, highlighting the negative correlation between smartphone usage, sleep quality, and academic achievement. Our findings align with several studies. For example, Maheshwari and Shaukat's research indicates a significant association between sleep quality and academic performance [31]. Similarly, Becker et al. also found a correlation between sleep quality and academic performance [32]. Good sleep is often associated with better physical health, which is a predictor of academic achievement. The findings also indicate that good sleepers may experience lower anxiety, better physical health, and increased energy when studying. Poor sleep quality is significantly related to higher stress levels [33]. Excessive smartphone use can lead to poor sleep quality, which in turn may impair memory, decision-making, learning, and concentration [22, 34]. This can result in students receiving lower grades in their studies [31]. Several analyses have also suggested that stress-related poor sleep quality negatively impacts academic performance [33, 35]. This study concludes that poor sleep quality reduces daytime alertness and memory performance, contributing to attention deficits and academic impairments [36, 37].

## 5. CONCLUSION

The study highlights the negative impact of smartphone addiction and poor sleep quality on the academic performance of adolescents. It also indicates that smartphone addiction affects not only academic performance but also sleep quality among adolescent students in Kenitra, Morocco. Therefore, it is crucial to take precautionary measures against smartphone addiction. The study's findings will be beneficial for the government, particularly the Ministry of Education of Morocco. By understanding the association between smartphone addiction, sleep quality, and academic performance, the ministry can develop effective strategies to enhance the academic outcomes of adolescents.

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