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The Relationship Between Screen Time, Sleep and Obesity

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Abstract

Introduction

Excessive screen time has emerged as a major public health concern, particularly due to its association with sleep disturbances and the rising prevalence of obesity. Digital technologies have become deeply integrated into daily life, leading to prolonged exposure to screens and subsequent health challenges. This review explores the intricate relationships between screen time, sleep, and obesity, focusing on underlying behavioral, hormonal, and psychological mechanisms, as well as potential interventions to address these interconnected issues.

Materials and Methods

A systematic review of 35 peer-reviewed studies published between 2019 and 2025 was conducted. Sources were identified using PubMed, focusing on studies examining the interplay of screen time, sleep quality, and obesity. Inclusion criteria included studies on children, adolescents, and adults, ensuring a comprehensive understanding of these relationships across age groups.

Analysis of the Literature

The review investigates three main aspects: the impact of screen time on sleep quality, the bidirectional relationship between sleep disturbances and obesity, and how excessive screen time contributes to energy imbalance and weight gain. Mechanistic pathways such as altered circadian rhythms, sedentary behaviors, and exposure to food advertising are also explored.

Conclusions

Screen time significantly affects sleep and obesity through behavioral, hormonal, and psychological pathways. Interventions targeting reduced screen exposure, improved sleep hygiene, and increased physical activity could mitigate obesity risk, especially in vulnerable populations such as children and adolescents. Public health strategies and educational campaigns are essential to raise awareness and promote healthier screen habits. Future research

should focus on longitudinal studies and scalable interventions to effectively address this modern epidemic.

Key Words

Screen time, sleep quality, obesity, circadian rhythms, sedentary behavior, blue light, hormonal dysregulation, energy imbalance, food advertising, public health interventions

Introduction and Purpose

In recent decades, advancements in digital technology have fundamentally transformed daily life, significantly increasing screen exposure across all age groups. From television viewing and smartphone usage to gaming and video conferencing, screens have become an integral part of work, leisure, and education. While these technologies have brought undeniable benefits, they have also introduced significant health challenges. Excessive screen time has been linked to numerous adverse outcomes, including sedentary behavior, disrupted sleep patterns, and a heightened risk of obesity. These issues are particularly concerning as obesity and sleep disorders have simultaneously reached epidemic proportions, becoming major public health concerns globally [1], [2].

The relationship between screen time, sleep, and obesity is complex and multifaceted. Screen exposure, particularly in the evening, has been shown to interfere with sleep quality and duration by delaying bedtimes, reducing melatonin production, and disrupting circadian rhythms. Sleep disturbances, in turn, contribute to hormonal imbalances that increase appetite and reduce energy expenditure, creating a cycle that fosters weight gain. Additionally, screen time often promotes sedentary behavior and unhealthy snacking, further exacerbating the risk of obesity [3], [4].

This review aims to synthesize the current evidence on the interplay between screen time, sleep, and obesity, highlighting key mechanisms that link these factors. By exploring the behavioral, hormonal, and psychological pathways involved, this review seeks to provide a comprehensive understanding of how screen time impacts health outcomes. Furthermore, it emphasizes potential interventions and strategies to mitigate these risks, with a focus on improving sleep hygiene, reducing screen exposure, and promoting healthier lifestyle habits. These insights are

particularly crucial for vulnerable populations, such as children and adolescents, who are most at risk of the negative consequences of excessive screen time.

By examining these interconnections, this review contributes to a growing body of research aimed at addressing the challenges posed by modern digital lifestyles. Understanding the relationship between screen time, sleep, and obesity is essential for developing effective public health strategies to combat these interconnected epidemics and improve overall population health [1], [2], [3], [4].

Analysis of the Literature

Impact of Screen Time on Sleep Quality

Excessive screen time, especially in the evening, disrupts sleep through various mechanisms, including delayed bedtimes, reduced melatonin production, and altered circadian rhythms [5], [6]. Exposure to blue light emitted by screens has been shown to suppress melatonin levels, a hormone critical for initiating sleep, leading to increased sleep latency and shorter sleep durations. These effects are particularly pronounced in children and adolescents, whose sleep-wake cycles are more vulnerable to environmental disruptions [7], [8]. Smith et al. demonstrated that smartphone usage within one hour of bedtime reduces sleep efficiency, further supporting the link between evening screen use and impaired sleep [9]. Additionally, prolonged screen exposure contributes to fragmented sleep by disrupting circadian rhythms, the body's internal clock that regulates sleep-wake cycles [10].

Beyond the physiological effects, screen-related activities, such as social media usage or gaming, often increase cognitive and emotional arousal, further delaying the onset of sleep. This dual impact of screen time both physiological and psychological poses significant challenges

Bidirectional Relationship Between Sleep and Obesity

Sleep disturbances contribute to obesity through hormonal dysregulation. Insufficient sleep increases ghrelin levels, which stimulate hunger, and decreases leptin levels, which signal satiety, promoting overeating and calorie consumption [11], [12]. These hormonal shifts are compounded by reduced physical activity and a greater preference for energy-dense, sugary foods, common behaviors among sleep-deprived individuals [13], [14].

Conversely, obesity exacerbates sleep disturbances, with conditions like obstructive sleep apnea (OSA) becoming more prevalent among individuals with higher body mass indices (BMI). This bidirectional relationship creates a vicious cycle, as sleep disorders contribute to weight gain, and obesity worsens sleep quality [15]. Johnson et al. highlighted that children experiencing persistent sleep deficits face a significantly higher risk of obesity, emphasizing the importance of addressing sleep issues early [16], [17].

The interplay of these factors underscores the need for integrated interventions that simultaneously improve sleep quality and address weight management, particularly in high-risk populations such as children and adolescents.

Role of Screen Time in Energy Imbalance and Weight Gain

Screen time contributes significantly to energy imbalance and weight gain through multiple pathways, including sedentary behavior, increased caloric intake, and exposure to persuasive food advertising [18], [19]. Prolonged sedentary activities reduce overall energy expenditure by displacing opportunities for physical activity. Instead of engaging in energy-consuming tasks like walking, sports, or outdoor play, individuals often remain seated for hours while using screens, leading to lower overall caloric burn. This sedentary behavior is further exacerbated by the simultaneous consumption of unhealthy snacks and sugary beverages, a common behavior associated with screen-related activities. Watching television, gaming, or scrolling through social media often creates a passive environment where individuals mindlessly consume energy-dense foods, significantly increasing daily caloric intake [20].

A longitudinal study by Perez et al. revealed that adolescents with high levels of screen exposure consistently consumed more sugary beverages and processed snacks, contributing to a measurable increase in weight over time [21]. This study underscores the strong association between screen habits and unhealthy dietary behaviors, particularly among younger populations. Compounding this issue is the pervasive exposure to food advertising during television viewing and digital media consumption. These advertisements often target children and adolescents with visually appealing and emotionally charged messages, promoting products that are typically high in sugar, fat, and calories. By exploiting emotional and psychological triggers, these marketing strategies effectively encourage cravings and unhealthy eating patterns, making them especially detrimental for younger audiences who may lack the critical skills to resist such influence [22], [23].

Moreover, the timing of these behaviors can amplify their negative effects. Snacking during evening screen use, for instance, not only increases daily caloric intake but also disrupts metabolic processes that are naturally lower during nighttime hours. This misalignment with the body's circadian rhythms can contribute to fat storage and weight gain.

Addressing this issue requires targeted strategies that aim to reduce sedentary behaviors, discourage unhealthy snacking, and promote healthier food choices during screen use. One promising approach involves implementing "active screen time," such as integrating movement-based gaming or encouraging regular physical breaks during prolonged screen use. Educational programs for parents and caregivers can further empower families to create screen-free zones during meals, thereby reducing the association between screen use and eating.

Policies regulating food advertising aimed at children also hold significant potential in mitigating the obesogenic effects of screen exposure. Restricting advertisements for unhealthy foods during programming and digital content targeted at children can help reduce the pervasive influence of marketing on dietary behaviors. Additionally, public health campaigns can promote awareness about the risks of sedentary screen use and the importance of adopting active lifestyles and healthier eating habits. These multifaceted strategies offer a comprehensive approach to tackling the intertwined challenges of screen time, sedentary behavior, and obesity.

Interventions and Recommendations

Effective interventions to address the interconnected challenges of screen time, sleep, and obesity include behavioral, educational, and policy-based approaches. Limiting screen time, especially during evening hours, has been shown to improve sleep quality and reduce BMI [24], [25]. Establishing screen-free periods before bedtime, coupled with the use of blue light filters, can mitigate the adverse effects of evening screen use on sleep latency and duration [26].

Parental involvement is critical in managing children screen exposure and fostering healthier lifestyle habits. Educating parents about the risks of excessive screen time and the importance of sleep hygiene has proven to be an effective strategy in reducing screen use among younger populations [27], [28]. Schools and community programs can also promote digital literacy and encourage children to balance screen-related activities with physical exercise.

Public health initiatives play a crucial role in addressing the broader societal factors contributing to this issue. Awareness campaigns highlighting the risks of excessive screen time

and promoting healthier screen habits can help shift behaviors at a population level. Additionally, regulating food advertising targeting children and promoting active screen use (e.g., using fitness apps) are potential strategies to combat the obesogenic effects of prolonged screen exposure [29], [30].

The integration of these strategies- behavioral interventions, educational efforts, and policy changes offers a multifaceted approach to mitigating the adverse health effects of screen time and fostering a healthier digital lifestyle.

Conclusions

Excessive screen time has emerged as a significant public health challenge, negatively impacting both sleep and obesity through a combination of behavioral, hormonal, and psychological mechanisms. Evening screen use disrupts sleep patterns by delaying bedtimes, suppressing melatonin production, and altering circadian rhythms, leading to shorter sleep durations and poorer sleep quality. These sleep disturbances, in turn, contribute to hormonal imbalances, such as increased ghrelin and decreased leptin levels, which drive overeating and energy-dense food consumption. Concurrently, prolonged screen exposure promotes sedentary behavior and unhealthy snacking habits, further exacerbating the risk of weight gain and obesity.

The interplay between these factors highlights the need for comprehensive and integrative interventions. Reducing screen time, especially during the evening, is a critical step toward improving sleep hygiene and preventing obesity. Behavioral strategies, such as implementing "screen-free" periods before bedtime, using blue light filters, and promoting alternative activities like reading or mindfulness practices, can mitigate the adverse effects of screen exposure. Additionally, encouraging regular physical activity and educating individuals about the health risks associated with prolonged sedentary behaviors are essential components of any intervention strategy.

Public health initiatives have a crucial role to play in addressing this modern epidemic. Educational campaigns targeting children, parents, and educators can raise awareness about the detrimental effects of excessive screen time and promote healthier lifestyle choices. Schools, community organizations, and healthcare providers can collaborate to implement programs that

emphasize the importance of sleep hygiene, balanced screen use, and physical activity. Moreover, policy changes, such as regulating food advertising aimed at children and promoting digital literacy, can help create an environment that supports healthier behaviors.

Future research should focus on longitudinal studies that explore the long-term impacts of screen time on sleep and obesity across diverse populations. Such studies are necessary to better understand the cumulative effects of screen exposure and to identify the most effective intervention strategies. Additionally, scalable interventions that leverage technology, such as apps that monitor screen time and encourage healthier habits that offer promising opportunities to address these challenges at a population level.

By integrating behavioral, educational, and policy-based approaches, society can effectively combat the negative health consequences of excessive screen time. This multifaceted approach not only has the potential to improve individual health outcomes but also to address broader public health concerns, paving the way for healthier digital lifestyles and a reduction in the prevalence of sleep disorders and obesity.

Disclosures

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