RESEARCH PAPER

Gadgets Addiction among Nursing Students: A comprehensive review of Its Associations with Sleep Quality, Academic Performance, and Depression

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Abstract
Background: Smartphones, tablets, laptops, gaming consoles and wearable devices have become inseparable from the daily lives of university students. Excessive and compulsive use of these gadgets, often described as gadget addiction or problematic smartphone use, has attracted growing attention because of its possible effects on health and learning. Nursing students are a particularly important group to examine because their programmes combine heavy theoretical loads, clinical placements, irregular schedules and emotionally demanding patient care.
Objective: This review synthesises the available evidence on the associations between gadget addiction and three interrelated outcomes among nursing and other health-profession students: sleep quality, academic performance and depression.
Methods: A narrative review of peer-reviewed literature was conducted, drawing on studies of smartphone addiction, problematic mobile phone use, screen-based media use, sleep, academic achievement and depressive symptoms in adolescents and university students, with emphasis on medical, nursing and other health-science populations.
Results: Across cross-sectional, prospective and meta-analytic studies, higher levels of problematic gadget use are consistently associated with poorer subjective sleep quality, longer sleep latency, shorter sleep duration and greater daytime dysfunction. Problematic use is also associated with lower grade point averages, reduced concentration and academic procrastination, although effect sizes are generally small to moderate and the direction of causality is not firmly established. Depressive symptoms show a robust positive association with problematic use, and poor sleep appears to be an important mediating pathway linking the two. Direct evidence from nursing students remains limited and is largely cross-sectional.
Conclusion: Gadget addiction is a modifiable risk factor that may undermine the sleep, learning and mental health of nursing students. Nursing educators and institutions should consider routine screening, digital-wellbeing education, sleep hygiene promotion and supportive counselling. Longitudinal and interventional studies specific to nursing students are urgently needed.
Keywords: *gadget addiction; smartphone addiction; problematic smartphone use; nursing students; sleep quality; academic performance; depression*
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Introduction

Digital technology has reshaped the way young adults communicate, study, entertain themselves and manage their social lives. Smartphones in particular combine a camera, a library, a communication hub, a bank, a gaming console and a social network in a single pocket-sized device, and for many university students they are the first object touched in the morning and the last one touched at night. Alongside smartphones, tablets, laptops, smartwatches, gaming consoles and earphones now form a dense ecosystem of gadgets that compete for students' attention across waking hours and, increasingly, into the night. Although these devices bring undeniable educational benefits, including instant access to clinical references, drug databases, e-learning platforms and peer discussion, a growing body of research suggests that a subset of users loses control over how much time they spend on them and continues to use them despite clear negative consequences (Busch and McCarthy, 2021; Sohn et al., 2019).

The terminology used to describe this pattern of behaviour is not uniform. Researchers have written about smartphone addiction, problematic smartphone use, nomophobia, mobile phone dependence, compulsive internet use and excessive screen time. In this review the phrase gadget addiction is used as an umbrella term for a pattern of excessive, compulsive and poorly controlled use of digital devices, most commonly smartphones, that produces functional impairment in daily life. It is acknowledged that whether such behaviour constitutes a true addiction is still debated. Some authors argue that the evidence supports a behavioural addiction model, in which features such as tolerance, withdrawal, preoccupation and loss of

control resemble those of substance use disorders (Billieux et al., 2015). Others caution that the term pathologises ordinary behaviour, that much problematic use is a vehicle for underlying conditions such as anxiety or depression, and that the specific content accessed, such as social media or games, may be more important than the device itself (Panova and Carbonell, 2018). Neither gadget addiction nor smartphone addiction is currently recognised as a formal diagnosis in the major classification systems, but validated scales and a large research literature exist to measure and study it.

Nursing students deserve specific attention within this literature. Nursing education is demanding in unique ways. Students are expected to master a large body of biomedical and behavioural knowledge, complete skills laboratories and written examinations, and spend long hours in hospital and community placements where they may work early mornings, evenings or nights. They encounter suffering, death and conflict, often with little control over their environment, and they must balance these demands against family and financial responsibilities. In many countries nursing cohorts are predominantly young women, a group in which several studies have reported higher levels of problematic smartphone use and higher rates of depressive symptoms than in male peers (Chen et al., 2017; Matar Boumosleh and Jaalouk, 2017). Against this background, gadgets may serve simultaneously as a study tool, a coping resource, a source of social support and a source of distraction and sleep disruption.

Three outcomes are of special interest. First, sleep is fundamental to memory consolidation, emotional regulation and attention, and it is highly sensitive to the timing and content of evening screen use (Chang et al., 2015; Hale and Guan, 2015). Second, academic performance is a direct indicator of whether students are able to achieve the competencies required for safe professional practice. Third, depression is among the most common mental health problems in university populations and is associated with attrition, impaired clinical performance and, in the longer term, burnout among practising nurses. These three outcomes are tightly interwoven: poor sleep impairs learning and mood, depression disturbs sleep and motivation, and academic difficulty can in turn heighten distress and drive further escapist device use. Examining them together provides a more integrated picture than studying each in isolation.

The purpose of this review is therefore to bring together and critically appraise the evidence on the associations between gadget addiction and (i) sleep quality, (ii) academic performance and (iii) depression among nursing students and comparable university populations. The specific objectives are to describe the concept and measurement of gadget addiction, to summarise its prevalence in student groups, to explain why nursing students may be especially vulnerable, to review the evidence for each of the three outcomes and the mechanisms that link them, to outline preventive and therapeutic strategies, and to identify gaps that future research should address.

Review Approach

This article is a narrative review. Narrative reviews are well suited to topics in which the literature is heterogeneous in design, measurement and population, and in which a single pooled estimate would be of limited value. The review drew on peer-reviewed articles accessible through major bibliographic sources, including PubMed, Scopus, Web of Science, PsycINFO and Google Scholar. Search terms combined concepts relating to the exposure (smartphone addiction, problematic smartphone use, mobile phone dependence, gadget use, screen time, electronic media use) with concepts relating to the population (nursing students, medical students, university students, young adults, adolescents) and the outcomes (sleep quality, insomnia, sleep duration, academic performance, grade point average, depression, depressive symptoms).

Priority was given to systematic reviews and meta-analyses, large cross-sectional surveys, prospective cohort studies and experimental studies, and to studies that used validated instruments such as the Smartphone Addiction Scale, the Pittsburgh Sleep Quality Index and the Patient Health Questionnaire-9. Because direct evidence from nursing students is sparse, studies of medical students, health-science students and general university students were included to supply context, and findings from adolescents were used where they illuminate mechanisms, with appropriate caution about generalisation. Articles were selected for relevance, methodological clarity and contribution to the argument rather than by a formal quality-scoring tool, and the synthesis is thematic rather than quantitative. Readers should therefore interpret the review as an interpretive overview and not as a systematic estimate of effect.

Conceptualising Gadget Addiction

From technology use to problematic use

It is important to distinguish heavy use from problematic use. A nursing student who spends several hours a day on a smartphone reading journal articles, communicating with preceptors and using clinical reference applications is not necessarily addicted. Problematic use is characterised not by the number of hours but by the quality of the relationship with the device: persistent preoccupation, difficulty controlling use, using the device to escape negative moods, irritability or anxiety when it is unavailable, repeated unsuccessful attempts to cut down, and continued use despite harm to relationships, health or studies.

Reviews of the field have therefore emphasised that problematic smartphone use is better defined by its functional consequences than by screen time alone (Busch and McCarthy, 2021; Elhai et al., 2017).

Theoretical perspectives

Several theoretical frameworks have been used to understand why some individuals develop problematic patterns. The behavioural addiction perspective draws analogies with substance and gambling disorders, highlighting reward-driven reinforcement from notifications, social approval and variable-ratio rewards such as the unpredictable appearance of messages, likes and new content. Compensatory and pathway models propose that excessive use is not a primary disorder in many individuals but rather a way of coping with stress, loneliness, anxiety or low mood, and that different users follow different routes, such as an impulsive pathway, a relationship-seeking pathway and an extraversion pathway (Billieux et al., 2015). The Interaction of Person-Affect-Cognition-Execution framework, widely applied in this field, similarly suggests that predisposing personality traits, affective states and cognitive biases interact to produce habitual and eventually compulsive use. A fourth perspective, sometimes called the displacement hypothesis, focuses on the time cost of gadget use, arguing that hours spent on devices displace sleep, study, exercise and face-to-face contact, which in turn harms outcomes (Twenge and Campbell, 2018).

The critical view, represented by Panova and Carbonell (2018), is a useful counterweight. They argue that many instances of apparent smartphone addiction are better understood as addiction to specific applications, such as social networks or games, or as problematic use of the internet accessed via the phone. They also note the absence of consensus diagnostic criteria, the risk of over-pathologising common behaviour and the frequent confusion between frequency of use and loss of control. For researchers working with nursing students, this critique supports the use of validated multi-item scales and caution in interpreting hours of use as a proxy for addiction.

Measurement of gadget addiction

Most studies rely on self-report scales. The Smartphone Addiction Scale developed by Kwon et al. (2013b) is a 33-item instrument covering daily-life disturbance, positive anticipation, withdrawal, cyber-oriented relationships, overuse and tolerance. A 10-item short version for adolescents, the SAS-SV, was subsequently validated and has become popular because of its brevity (Kwon et al., 2013a). Other commonly used instruments include the Smartphone Addiction Inventory, the Problematic Mobile Phone Use Questionnaire, the Mobile Phone Problem Use Scale and the Nomophobia Questionnaire. Cut-off scores differ between scales, sexes and countries, which complicates comparison of prevalence estimates. Objective measures, such as application-logged screen time and the number of device pick-ups, are increasingly used but may correlate only modestly with self-reported problematic use. Researchers have therefore recommended combining validated scales with passive data where feasible (Rod et al., 2018).

Prevalence of Gadget Addiction in Student Populations

Prevalence estimates vary widely because of differences in instruments, cut-offs, sampling frames and cultural context. A systematic review and meta-analysis of studies in children and young people estimated the pooled prevalence of problematic smartphone use at around one in four, with considerable heterogeneity between studies (Sohn et al., 2019). Studies of university students report a broad range. A Swiss survey of young people found that roughly one in six met criteria for smartphone addiction (Haug et al., 2015), whereas a large study of university students in Riyadh, Saudi Arabia, reported substantially higher proportions of problematic users (Alosaimi et al., 2016). Among medical students at King Abdulaziz University in Jeddah, a considerable proportion screened positive for smartphone addiction, and the risk was higher among students who spent long periods on their phones each day (Alhazmi et al., 2018). Similar high-risk proportions have been reported among medical students in India (Kumar et al., 2019).

Several correlates recur across studies. Female sex is frequently, though not universally, associated with higher problematic use, which appears to be driven by greater use of social networking and communication applications, whereas male students are more likely to report problematic gaming (Chen et al., 2017; Matar Boumosleh and Jaalouk, 2017). Younger age, higher daily screen time, use of social media, depressive and anxiety symptoms, impulsivity, low self-esteem and poor perceived social support have all been identified as risk factors, while protective factors include self-control, social support and academic engagement (Choi et al., 2015; Elhai et al., 2017).

Direct prevalence estimates in nursing students are fewer, and most come from single-institution surveys with convenience samples. Nevertheless, because nursing cohorts share demographic characteristics, such as young age and a high proportion of women, with the medical and general university samples described above, it is reasonable to expect broadly comparable rates, and clinicians and educators should not assume that students in health professions are protected by their training. A further caution is that prevalence figures reported after the global COVID-19 pandemic may be inflated by the rapid move to online learning, which increased device dependence for all students. Comparisons across time periods should therefore be made with care.

Why Nursing Students May Be Especially Vulnerable

Evidence specific to nursing students is limited, but several features of nursing education plausibly increase vulnerability to problematic gadget use and to its consequences. These are discussed here as hypotheses supported by the broader literature and not as established findings.

Academic and clinical stress

Nursing programmes typically combine intensive coursework with mandatory supervised clinical hours. Students must perform in unfamiliar clinical environments, meet the expectations of preceptors and manage the emotional impact of patient suffering. Because stress and negative affect are among the strongest predictors of problematic smartphone use, students who rely on gadgets to escape or regulate these feelings may be at particular risk (Elhai et al., 2017). The device offers immediate, low-effort relief, but the relief is short-lived and may reinforce avoidance of study or of necessary rest.

Irregular schedules and circadian disruption

Early-morning clinical shifts, evening and night placements, and examination periods create irregular sleep opportunities. Late-night smartphone use has been shown in working adults to be associated with poorer sleep and with reduced work engagement the following day (Lanaj et al., 2014). Nursing students who attempt to wind down after a late shift by scrolling through a phone may therefore compound circadian misalignment that is already present, and the resulting fatigue may in turn increase reliance on the device for stimulation during the day.

Professional and social use of devices

Unlike many other student groups, nursing students are encouraged to use mobile devices as clinical tools, for example for drug calculations, guidelines and communication with teams. This legitimate use makes it harder to set boundaries: a student who picks up the phone to check a drug dose may find that ten minutes later they are still browsing social media. In addition, group chats about assignments, clinical rotations and duty rosters create a perceived obligation to remain continuously available, which fuels notification checking and fear of missing out.

Demographic and psychological factors

As noted, nursing cohorts often contain a high proportion of young women, a group that reports higher rates of both problematic smartphone use and depressive symptoms in several samples (Chen et al., 2017; Matar Boumosleh and Jaalouk, 2017). Students who live away from home in hostels for the first time may experience loneliness and may turn to devices to maintain connection with family and friends. Financial strain, limited leisure time and a culture that valorises self-sacrifice can also discourage students from seeking help for sleep or mood problems, thereby allowing problematic patterns to become entrenched.

Online learning and the post-pandemic context

The expansion of blended and online learning after the COVID-19 pandemic has increased the amount of time that nursing students spend on screens for legitimate educational purposes. Lectures, simulations, assessments and group work may all take place on laptops, tablets and phones, which blurs the boundary between study and leisure on the same device. A student who opens a laptop to attend a virtual class is one notification away from social media or streaming, and the resulting pattern of frequent task switching can gradually build habits of compulsive checking. Educators should therefore be mindful of the cumulative screen exposure that their curricula demand, and should build in offline learning activities and breaks.

Gadget Addiction and Sleep Quality

Evidence from systematic reviews and meta-analyses

The association between gadget use and poor sleep is among the best-replicated findings in this field. A systematic review and meta-analysis of studies on problematic smartphone use reported significant positive associations with poor sleep quality, depression and anxiety across a large number of samples, although the authors emphasised that the included studies were mostly cross-sectional (Yang et al., 2020). Reviews on screen-based media use in children and adolescents likewise found that the large majority of studies reported adverse associations between screen time and sleep outcomes such as shorter duration, delayed bedtime and longer sleep latency (Hale and Guan, 2015; Cain and Gradisar, 2010). A meta-analysis of portable screen-based devices found that having a device in the bedroom or using it around bedtime was associated with increased odds of inadequate sleep quantity and quality and with excessive daytime sleepiness (Carter et al., 2016). Although these reviews concern younger populations, the behaviours they describe, such as late-night browsing and bedroom device access, are equally common in university students.

Evidence from university and health-science students

Studies in university students corroborate these patterns. In a study of Turkish university students, higher smartphone use severity was associated with worse sleep quality, as measured by the Pittsburgh Sleep Quality Index, and with higher depression and anxiety scores (Demirci et al., 2015). Among medical students in India, smartphone addiction was examined in relation to sleep quality, and problematic users were more likely to report poorer sleep (Kumar et al., 2019). Large population-based studies of adolescents have found that using electronic devices in bed, particularly for long periods, is associated with shorter sleep duration,

longer sleep onset latency and greater insomnia symptoms (Hysing et al., 2015). Taken together, these data strongly suggest that nursing students with higher levels of gadget addiction will experience poorer sleep, although direct studies in this population are required.

Mechanisms linking gadget use to sleep disturbance

Several mechanisms have been proposed, and they are not mutually exclusive. First, time displacement: hours spent in bed on devices simply delay sleep onset and reduce total sleep time, particularly when use occurs in a cycle of just one more video or message (Cain and Gradisar, 2010). Second, psychological and physiological arousal: emotionally engaging content, competitive gaming, stressful messages and social comparison increase cognitive and autonomic arousal, which makes it harder to fall asleep. Third, light exposure: short-wavelength light from light-emitting screens suppresses melatonin and shifts circadian phase. In a controlled laboratory experiment, participants who read from a light-emitting e-reader before bed took longer to fall asleep, showed suppressed evening melatonin, had delayed circadian timing, reduced rapid eye movement sleep and reduced alertness the next morning compared with when they read printed books (Chang et al., 2015). Fourth, nocturnal interruptions: notifications and the compulsion to check messages fragment sleep. A study using high-resolution smartphone data from young adults showed that overnight smartphone use is common and examined its relation to sleep-related outcomes, which underlines the importance of night-time interruptions (Rod et al., 2018).

Fifth, an emotional pathway links sleep with the content and context of use. Problematic users often turn to their phones when anxious or low, and rumination, social comparison and fear of missing out may extend night-time wakefulness. Sleep loss in turn impairs emotion regulation and self-control, which may weaken the ability to resist further use, creating a self-perpetuating cycle. Recommended sleep durations for young adults are generally in the range of seven to nine hours (Hirshkowitz et al., 2015), a target that is difficult to achieve for nursing students if substantial portions of the evening are lost to devices.

Directionality and confounding

Most evidence is cross-sectional, so it is not possible to determine whether gadget addiction causes poor sleep, whether poor sleep drives gadget use, or whether both are produced by a third factor such as stress or depression. Prospective evidence offers some support for a causal contribution of device use. In a one-year prospective cohort of young adults, frequent mobile phone use at baseline predicted later sleep disturbances and depressive symptoms in at least some subgroups, although the pattern differed by sex and by type of use (Thomée et al., 2011). Conversely, sleepless individuals often use devices to fill wakeful time or to relieve boredom, so the relationship is likely to be bidirectional. In practice, the distinction matters less for intervention than it does for research: both pathways suggest that reducing evening device use and improving sleep should be pursued together.

Gadget Addiction and Academic Performance

Evidence from correlational studies

Many studies have examined the relationship between mobile phone use and grades. In a study of American college students, higher cell phone use was negatively related to grade point average and positively related to anxiety, and higher anxiety and lower grades were in turn associated with lower satisfaction with life (Lepp et al., 2014). Two studies conducted among university students in Lebanon reported that smartphone addiction scores were inversely related to academic performance, with addicted students showing lower grade point averages, and that addiction was also related to higher stress and lower satisfaction with life (Samaha and Hawi, 2016; Hawi and Samaha, 2016). The latter study described strong evidence for an adverse effect of smartphone addiction on academic performance, though it is important to note that it was cross-sectional and based on self-reported grades. A systematic review of antecedents and consequences of problematic smartphone use concluded that negative academic outcomes, including lower achievement and reduced productivity, are among the more consistently reported consequences, although they noted considerable variability in measurement (Busch and McCarthy, 2021).

Evidence from health-profession students is more limited, but several studies show that problematic use is common among medical students, which makes its educational correlates an important area of concern (Alhazmi et al., 2018; Kumar et al., 2019). Whether such findings can be extrapolated to nursing students is unclear, though the shared demands of rigorous examinations and clinical placements make it likely that the same mechanisms apply.

Mechanisms

The mechanisms linking gadget addiction with lower academic performance are partly behavioural and partly cognitive. At a behavioural level, time spent on entertainment, social media and gaming displaces time available for reading, revision and practice. Students who are addicted to their devices are more likely to procrastinate, to defer assignments to the last moment and to multitask while studying, for example by switching between a textbook and social media. Multitasking is inefficient because each switch incurs a cognitive cost, and interrupted study tends to be shallower and less well retained. Even the mere presence of a phone and the anticipation of notifications can divert attention.

At a physiological level, sleep is the most important mediator. Insufficient and fragmented sleep impairs attention, working memory and the consolidation of newly learned material, so students who sacrifice sleep to use their devices are likely to experience impaired learning the next day. Evidence in working populations supports the plausibility of this chain: employees who used smartphones late at night reported poorer sleep, less energy and lower engagement at work the following day (Lanaj et al., 2014). Finally, an affective pathway operates through stress and depression. Students who are anxious or depressed concentrate poorly and have lower motivation, and may use devices as an escape, which further erodes performance.

Nuances and counter-evidence

The relationship between device use and academic outcomes is not uniformly negative. When devices are used deliberately for learning, they can enhance engagement, access to information and collaboration. Reviews have emphasised that the purpose and pattern of use, and not just its quantity, determine the educational consequences (Busch and McCarthy, 2021). Effect sizes in correlational studies are typically small to moderate, and in some samples associations are attenuated after adjusting for covariates such as sex, prior achievement and mental health. Furthermore, grade point average is a coarse outcome and may poorly capture competence in clinical practice, communication and critical thinking, which are central to nursing education. For this reason, future studies should include measures such as clinical placement assessments, objective examination results and attendance in addition to self-reported grades.

Gadget Addiction and Depression

Strength of the association

The link between problematic gadget use and depressive symptoms is robust across settings. A systematic review of problematic smartphone use concluded that it is positively associated with both depression and anxiety, although the review emphasised that the association was typically modest to moderate and that most evidence was cross-sectional (Elhai et al., 2017). The more recent meta-analysis by Yang et al. (2020) confirmed significant positive associations with depression and anxiety as well as with poor sleep. Meta-analytic evidence in children and young people likewise shows that problematic use clusters with poorer mental health outcomes (Sohn et al., 2019).

Primary studies in university students are consistent with this pattern. In Lebanon, a cross-sectional study found that smartphone addiction was associated with higher depression and anxiety scores and with female sex (Matar Boumosleh and Jaalouk, 2017). Among Turkish university students, smartphone use severity correlated positively with depression and anxiety scores (Demirci et al., 2015). A study of South Korean adolescents reported that smartphone addiction was related to symptoms of depression, anxiety and attention-deficit and hyperactivity features (Kim et al., 2019). Studies comparing different forms of problematic technology use have also found that depressive symptoms and impulsivity feature among the risk factors for smartphone addiction (Choi et al., 2015). A large national sample of American children and adolescents showed that heavier screen use was associated with lower psychological wellbeing, including lower self-control and more difficulty finishing tasks, with stronger associations among adolescents than among younger children (Twenge and Campbell, 2018).

Directionality and the role of emotional regulation

As with sleep, the direction of the association is contested. The compensatory use hypothesis proposes that depressed or anxious individuals turn to their devices to escape negative feelings, seek social contact or relieve boredom, and that this pattern gradually becomes habitual. Under this model depression leads to problematic use. The alternative hypothesis, sometimes called the displacement or social comparison hypothesis, proposes that heavy use produces depression by displacing healthy activities such as sleep, exercise and face-to-face contact, by exposing users to idealised representations of peers, and by promoting rumination and cyberbullying exposure. Prospective data have given some support to each pathway, and the most plausible interpretation is a reciprocal relationship in which depression and problematic use reinforce each other over time (Elhai et al., 2017; Busch and McCarthy, 2021).

Evidence from a prospective cohort of young adults suggested that high mobile phone use at baseline was associated with later symptoms of depression in some subgroups, consistent with a contribution of use patterns to mood (Thomée et al., 2011). Nevertheless, residual confounding by personality, stress and other conditions cannot be ruled out. Adolescent studies of electronic media use at night suggest that disturbed sleep is an important intermediate step: young people who used media at night reported more sleep disturbance, which in turn was related to higher depressive symptoms (Lemola et al., 2015). This sleep-mediated pathway is of particular interest for nursing students, whose schedules already restrict sleep.

Specific considerations for nursing students

Depression in nursing students has implications that extend beyond the individual. Depressive symptoms reduce concentration, motivation and capacity for empathy, impair clinical performance and are associated with attrition from programmes. Over the longer term, early patterns of unhealthy coping may carry into professional life, where nurses are at risk of burnout, anxiety and depression. When a student with low mood uses a smartphone to withdraw from stress, the immediate relief may reduce engagement

with supportive relationships and with healthier forms of coping. Social media may also expose vulnerable students to unfavourable social comparison, particularly in relation to peers' achievements, bodies and lifestyles. Because female students predominate in nursing cohorts and often show higher levels of both problematic use and depressive symptoms (Chen et al., 2017; Matar Boumosleh and Jaalouk, 2017), nursing educators should be alert to this overlap.

It is also important to recognise that gadgets can have mental health benefits. Staying in contact with family, accessing peer support, using mindfulness or sleep applications and finding information about mental health can all be beneficial. The difference between helpful and harmful use lies in whether the device is used flexibly and deliberately or compulsively and as the only means of coping. Educators should therefore avoid blanket condemnation of technology and instead promote balanced, intentional use.

Sleep as a bridge between gadget use and depression

Sleep deserves particular emphasis as a bridge between problematic gadget use and depressive symptoms. Insomnia and short sleep are well-recognised risk factors for the onset and persistence of depression, and depression itself disrupts sleep architecture and produces early waking and daytime fatigue. When problematic gadget use reduces sleep, it therefore may increase vulnerability to low mood through a biological route that is independent of the content viewed on the screen. Evidence from adolescents is consistent with this possibility, since night-time media use was related to sleep disturbance and depressive symptoms in the same samples (Lemola et al., 2015). For nursing students, this suggests that interventions aimed at sleep may yield mental health benefits even when the gadget habits themselves are slow to change.

Sociocultural and contextual influences

The associations summarised above are not identical across settings. Cultural norms about device use, the availability of mobile data, family expectations, gender roles and the structure of nursing education vary between countries and institutions, and all may influence both the prevalence of problematic use and its consequences. Studies from the Middle East, Europe, Asia and North America have generally found similar directions of association, but the magnitude differs, and cut-off scores validated in one culture may not transfer to another (Alosaimi et al., 2016; Haug et al., 2015). Researchers in India and other low- and middle-income countries, where mobile phones are often the primary means of internet access and where nursing students may live in crowded hostels with limited privacy, should therefore be cautious in applying thresholds developed elsewhere and should invest in local validation.

Interrelationships: An Integrated View

The three outcomes reviewed in this article are best understood as parts of a connected system and not as independent consequences of gadget addiction. Figure 1 presents a conceptual model synthesising the evidence. Problematic use, driven by stress, loneliness, impulsivity and the design features of applications, delays and fragments sleep through time displacement, arousal, light exposure and night-time interruption (Chang et al., 2015; Cain and Gradisar, 2010). Poor sleep reduces attention, memory consolidation and emotional regulation, which impairs academic performance and raises vulnerability to depressive symptoms (Lemola et al., 2015; Lanaj et al., 2014). Depression and academic difficulty create distress that motivates further escapist device use, closing the loop. Moderators such as sex, coping style, social support, sleep hygiene habits and the purpose of use are likely to influence the strength of each link.

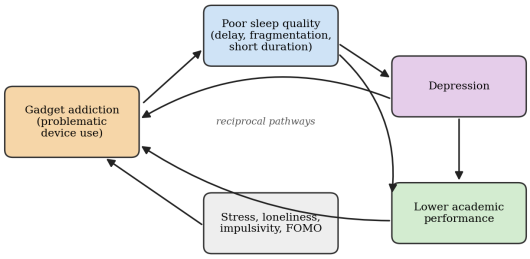


Figure 1. Conceptual model of the proposed relationships between gadget addiction, sleep quality, academic performance and depression among nursing students.

Table 1 summarises selected studies that illustrate the principal findings. The table is not exhaustive, but it shows that associations are consistent across countries, instruments and populations, while also showing that the design of most studies is cross-sectional and that nursing-specific evidence is lacking.

Table 1. Selected studies on gadget addiction and its associations with sleep, academic performance and depression

Study	Population	Design	Principal finding
Demirci et al., 2015	Turkish university students	Cross-sectional	Greater smartphone use severity linked with poorer sleep

			quality, more depression and anxiety
Lepp et al., 2014	US college students	Cross-sectional	Higher cell phone use related to lower GPA and higher anxiety
Samaha and Hawi, 2016	Lebanese university students	Cross-sectional	Smartphone addiction related to higher stress, lower academic performance and lower life satisfaction
Matar Boumosleh and Jaalouk, 2017	Lebanese university students	Cross-sectional	Smartphone addiction associated with depression, anxiety and female sex
Alhazmi et al., 2018	Medical students, Saudi Arabia	Cross-sectional	Considerable proportion screened positive for smartphone addiction
Thomée et al., 2011	Young adults, Sweden	Prospective cohort (1 year)	Mobile phone use predicted later sleep disturbance and depressive symptoms in some subgroups
Chang et al., 2015	Healthy adults (laboratory)	Experimental	Evening light-emitting e-reader use delayed circadian timing and reduced next-morning alertness
Yang et al., 2020	Multiple samples	Systematic review and meta-analysis	Problematic smartphone use positively associated with poor sleep, depression and anxiety

A further point concerns mediation. Because sleep sits between device use and both academic and mental health outcomes in the proposed model, improving sleep may be the most effective single target for intervention. If students are helped to remove devices from the bedroom and to protect a consistent sleep window, part of the harm of

problematic use on grades and mood may be reduced even if overall screen time does not change. This hypothesis remains to be tested in nursing populations through randomised trials.

Prevention and Management Strategies

Because gadget addiction is a modifiable risk factor, prevention and management strategies deserve attention in nursing education. Evidence from intervention trials in nursing students is scarce, so the recommendations below draw on general principles of sleep health, behavioural change and mental health promotion, and on the associations described in earlier sections.

Individual-level strategies

Self-monitoring is a sensible first step. Students can use built-in screen time dashboards to understand their usage patterns and identify triggers such as boredom, stress or late-night habits. Practical measures include charging the phone outside the bedroom, switching off non-essential notifications, using greyscale or night-shift modes, setting app limits, and establishing a screen-free wind-down period of at least thirty to sixty minutes before sleep. Given the evidence that evening exposure to light-emitting screens delays circadian timing and impairs next-morning alertness (Chang et al., 2015), reading from paper or listening to relaxing audio content may be preferable to scrolling before bed. Students should be encouraged to schedule dedicated study blocks in which the phone is out of sight, and to use deliberate breaks for physical activity and face-to-face social contact in place of passive scrolling.

For students whose use is compulsive, cognitive behavioural approaches that address underlying thoughts and emotions, such as the belief that one must be constantly reachable or the use of devices to avoid distress, may be helpful. Because problematic use frequently coexists with depression, anxiety and insomnia, treatment of those conditions is part of managing the behaviour (Elhai et al., 2017; Yang et al., 2020). Cognitive behavioural therapy for insomnia, mindfulness-based approaches and stress management training offer additional options, although their effectiveness specifically in nursing students has yet to be tested.

Institutional and educational strategies

Nursing schools can integrate digital wellbeing and sleep health into the curriculum, for example within courses on health promotion, mental health nursing and professional development. Students who understand the effects of sleep loss and problematic device use on their own learning and wellbeing are more likely to model healthy behaviours for patients. Institutions can also set clear and fair policies on device use in classrooms and clinical areas, balancing the educational value of devices against distraction, and can schedule academic and clinical activities in ways that protect adequate sleep opportunity. Peer support programmes, mentoring and accessible counselling services are important because students with problematic use often hide it or are unaware of its effects.

Screening and referral

Brief screening can be incorporated into existing student health or wellness checks. Short instruments such as the 10-item SAS-SV (Kwon et al., 2013a) for problematic use, the Pittsburgh Sleep Quality Index (Buysse et al., 1989) for sleep quality and the Patient Health Questionnaire-9 (Kroenke et al., 2001) for depressive symptoms are practical and have been widely used across settings. The Beck Depression Inventory (Beck et al., 1961) remains another well-established option. Screening should always be coupled with clear pathways to support, as identifying a problem without offering help may do more harm than good. Cut-off scores should be interpreted with caution because most were derived in specific populations, and a positive screen should prompt a conversation and, if appropriate, a clinical assessment, rather than a label.

Using technology constructively

Management need not be limited to restriction. Digital tools can also support healthy behaviour, for example sleep-tracking applications, guided relaxation and mindfulness programmes, and reminders that prompt a regular bedtime. Such tools should be recommended with care, because poorly designed applications can themselves become a source of distraction or anxiety about sleep. Students are most likely to benefit when they choose tools that match their own goals and when the use of these tools is reviewed periodically with a mentor or counsellor.

Implications for Nursing Education, Practice and Policy

For nursing educators, the evidence suggests that gadget addiction should be treated as a student health and academic success issue and not merely as a matter of classroom discipline. Awareness-raising, early identification and supportive responses are likely to be more effective than punitive measures. Educators can model healthy technology habits, design assessments and learning activities that reduce the need for late-night device use, and promote a culture in which seeking help for sleep or mood problems is normal.

For clinical practice, nursing students who have developed healthy habits are better prepared to counsel patients, many of whom also struggle with screen use and sleep problems. Nurses are frequently the health professionals best placed to deliver sleep hygiene advice, and their credibility is enhanced when they are able to apply the advice to themselves. Because fatigue and impaired attention are risks to patient safety, helping students develop good sleep and technology habits before they enter the workforce is also a patient safety investment.

At the policy level, universities and professional bodies can support research on digital wellbeing, include student mental health and sleep indicators in

quality monitoring, and encourage the design of timetables and placements that respect circadian needs. Technology designers also bear responsibility, since features such as infinite scrolling, autoplay and streak rewards are intentionally engineered to maximise engagement; students and educators may benefit from advocacy for more ethical design.

Gaps in the Evidence and Directions for Future Research

Several important gaps limit the strength of current conclusions. First, there is a shortage of studies conducted specifically in nursing students, and the available evidence is dominated by cross-sectional surveys with convenience samples. Large, multi-centre studies using probability sampling are needed to estimate prevalence and to examine variation by year of study, gender, residential status and clinical placement type. Second, longitudinal designs, including cohort studies and ecological momentary assessment, are required to clarify temporal ordering and to model the reciprocal relationships among problematic use, sleep, academic performance and depression. Third, the reliance on self-report is a major concern: social desirability, recall bias and the inaccuracy of estimated screen time can distort associations. Studies that combine validated scales with objective device logs and actigraphy-based measures of sleep would be particularly valuable (Rod et al., 2018).

Fourth, measurement of academic performance should extend beyond self-reported grade point average to include examination results, clinical competency assessments and progression outcomes. Fifth, the content and context of use, for example social media, gaming, video streaming or study use, should be disentangled, as different activities may have distinct consequences (Panova and Carbonell, 2018). Sixth, mediation and moderation analyses are needed to test whether sleep truly mediates the associations with academic and mental health outcomes, and to identify protective factors such as resilience, social support and mindfulness. Finally, well-designed randomised controlled trials of interventions, such as bedtime device restriction, sleep hygiene education and cognitive behavioural programmes, should be undertaken in nursing students, with attention to feasibility within the demands of clinical education. Cross-cultural research is also essential, since social norms, device access and health systems vary considerably between countries.

Limitations of This Review

This review has several limitations. It is a narrative review and did not follow a registered protocol, a formal quality appraisal or a quantitative synthesis, so selection bias cannot be excluded. The scarcity of studies specifically on nursing students meant that evidence from medical students, general university students and adolescents had to be used, and generalisation to nursing populations should be made with caution. Heterogeneity in definitions and instruments, and the predominance of cross-sectional designs, limit the ability to draw causal conclusions. Publication bias, in which studies with significant associations are more likely to be published, may also have inflated the apparent strength of the relationships.

Conclusion

The available evidence indicates that gadget addiction among university students, including those in health professions, is common and is consistently associated with poorer sleep quality, lower academic performance and higher levels of depressive symptoms. Sleep disturbance appears to be a central pathway linking problematic use to learning and mood, and the relationships among the three outcomes are likely to be reciprocal and self-reinforcing. Nursing students may be especially exposed because of demanding academic and clinical schedules, high levels of stress, irregular sleep opportunities and a predominantly young, female demographic, although direct evidence in this group is still limited.

Because gadget addiction is modifiable, it offers a practical target for prevention. Nursing educators and institutions can promote balanced digital habits, protect sleep, provide accessible screening and offer supportive mental health services. Future research should prioritise longitudinal and interventional studies in nursing students, with objective measures and clinically meaningful outcomes. Supporting nursing students to use technology wisely is not only a matter of student wellbeing but also an investment in a healthier and safer nursing workforce.

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