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Physical and mental health impact of smart devices and social media usage among children and adolescents – A review

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Abstract
In the modern era, usage of smart devices like smartphones and tablet computers are becoming more prevalent worldwide. The rate of smartphone ownership has increased fast in recent years. Young children are exposed to a wide range of smart devices and their usage of smart devices is rapidly increasing worldwide. In the recent decades, technological developments have increased young people's engagement with screen-based technologies (screen time). The high screen time may affect mental health and well-being of young people. Unfavourable psychological outcomes are associated with high levels of screen time[1]. Many studies are conducted worldwide to examine the physical, mental and social impact of smart devices among children. This review helps to find out the physical and mental health impact of smart devices and social media usage among school children.

Key words: *Physical impact, Mental health impact, Smart devices, Social media, School children*

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I. Introduction

Smart devices are handheld mobile electronic devices with cell-phone capability, having a internet access, a licensed operating system that provides a platform for applications such as multimedia software and games, a touch screen input and output and wireless connections that allow data transfer. Smartphone is considered to be a transformational technology. The benefits of smartphones include immediate and prompt communications and access to information from anywhere while using a simple, graphical and finger-based interface. Use of one smartphone eliminates the need to carry many devices including a phone, camera, speakers, Wi-Fi adapter, and a GPS system. It also allows the user to download and run applications. The built-in sensors can provide measurements and contextual information to the user [2].

The results of a study (2018) conducted among toddlers on electronic media exposure and use (2018) shows that 39.3% watched television almost every day, while 12.0% of children used smartphone on a daily basis. During weekdays, 48% of the children watched television for over an hour. During weekends, 63.1% of them watched television and 23.4% of children used their smartphones for over an hour. Children using smartphones before 24 months of age were 31.3%. The authors concluded that television and smartphones are the most popular digital devices used by toddlers. Using smart devices began at 12-24 months of age among toddlers. It was also recommended that recognizing the rapidly changing use of digital media use is vital in determining how digital media is affecting children's lives. It is the most beginning stage in understanding the impact of smart devices [3].

II. Discussion

Among adolescents, electronic screen-based activities have been found to be related to shorter sleep duration, lower sleep quality and daytime sleepiness. A vast majority of adolescents in Hong Kong uses smart devices. Over half of primary school students and over 90% of secondary school students own smartphones. In Hong Kong, over 80% of school students were regular users of smartphones, and nearly 30% of them used their smartphones for at least four hours every day. The authors believe that frequent and prolonged use of smart devices may increase risks of negative physical and psychosocial outcomes. Use of a handheld electronic device was found to be related to physical discomfort. About 50% of Hong Kong primary school students showed symptoms of unclear vision and felt eye strain related to the use of portable electronic devices. Recent study results shows that 70–80% of under-fives in the United Kingdom use smart devices. A number of studies show the mental health implications of excessive browsing of internet, gaming, texting, emailing, social networking, and phone calling [4].

Digital technology in the daily lives of children and its influence on their cognitive, emotional, and social development continues to increase every day. There are many opportunities for children to play, explore, and learn due to technological development. Since children's brains are extremely flexible, the learning

opportunities constitute a critical developmental point in children and through the natural exploration and discovery of their own world, new connections between neurons are formed and existing connections are strengthened [5].

In the past decade, children's mobile device like smartphone and tablet access and ownership has grown substantially. Concerns exist regarding excessive use and the impact of frequent consumption of mobile media on children's health and well- being. Too few studies were identified to draw conclusions about mobile device use and the following health concerns in children: musculoskeletal outcomes/pain, ocular health, and migraine/headaches[6]. Excessive use of smartphone paired with negative attitude and feeling of anxiety and dependency on gadgets may increase the risk of anxiety and depression[7]. Shoukat S (2019), in the review study has concluded that there is a relationship between cell phone addiction and adolescent's mental or physical health whether they have direct or indirect relation. The adverse effects of usage of smart devices on adolescents cannot be neglected. It is suggested that more studies should be done in this regard to clarify their nature of relations[8]. Sleep deficit, anxiety, stress, and depression are all associated with internet abuse, which have been related to mobile phone usage too [9].

Jones (2014) conducted a survey and found that students seemed to be addicted to their mobile phones. The author concluded that the excessive smartphone use had a negative psychological effect[10]. An online study by Parasuraman et al. (2017) on Malaysian population stated that heavy mobile phone usage may lead to physiological and psychological complications [11]. Shan et al. conducted a survey among 3016 Chinese adolescents aged 15–19 and found that the odds of neck or shoulder pain related to mobile phone use for over 2 hours per day on average was 1.49, and the odds of low back pain related to mobile phone and tablet computer use were over 1.83 respectively[12].

Social media use is highly prevalent among children, youth, and their caregivers[13]. Lenhart et al. reported that when teens possess a smartphone, more than 90% use it to connect with social networking sites. Even without such a highly connected mobile device, 77% of teens still logged into social networking sites, and overall, almost 50% sent text messages to their friends daily [14]. Using social media web sites is among the most common activity of today's children and adolescents. Web site that allows social interaction is considered a social media site, including social networking sites such as Facebook, Myspace, and Twitter; gaming sites and virtual worlds such as Club Penguin, Second Life, and the Sims; video sites such as YouTube; and blogs. Such sites offer today's youth a portal for entertainment and communication and have grown exponentially in recent years[15].

Television viewing frequently limits children's time for vital activities such as playing, reading, learning to talk, spending time with peers and family, storytelling, participating in regular exercise, and developing other necessary physical, mental and social skills [16].

The influence of the media on the psychosocial development of children is deep. Television has the potential to generate both positive and negative effects, and many studies have looked at the impact of television on society, particularly on children and adolescents. In addition to the amount of time spent in front of the television, other factors that influence the medium's effect on children include the child's developmental level, individual susceptibility and whether children watch television alone or with their parents[17].

Radio, television (TV), movies, video games, cell phones, and computer networks have assumed central roles in our children's daily lives. In the United States (US) over 80% of adolescents own at least one form of new media technology (e.g., cell phone, personal data assistant, computer for Internet access), and they are using this technology with increasing frequency to text and instant message, e-mail, blog, and access social networking websites. A national Kaiser Family Foundation (US) survey found that children aged 8 to 18 years had an average media usage time of 6 hours and 21 minutes daily. Total media exposure time for most of the children exceeded the time spent in all other activities except sleep. Although data from India is limited, a significant portion of children also have considerable TV viewing per day i.e. >2 hours/day.

Effects of the mass media have been found to be far reaching and potentially harmful in influencing the health-related behaviours of children and adolescents, Furthermore, time spent with media decreases the amount of time available for pursuing other healthier activities such as sports, physical activity, community service, cultural pursuits, and family time. Viewing television causes poor peer relationships and thereby increases the risk for social isolation, anxiety disorder, agoraphobia, and antisocial behaviour, including aggression and gang involvement [18].

Over the last decade, there has been a sharp increase in the availability and use of electronic media devices, such as smartphones, tablet devices, portable games, home video games, and computers, which have all had a strong influence on children's lives. It has been reported that American children and adolescents aged between 8 and 18 years spend an average of 7 hours a day on entertainment media, including television, computers, and handheld and other electronic devices[19]. Additionally, evening exposure to bright light from a television or computer screen may suppress melatonin and consequently disrupt the circadian rhythm [20].

Vijaisakkhana et al. reported that, in infants at 12 months of age, screen exposure in the evening affected night-time sleep duration [21]. The American Academy of Pediatrics guidelines recommend that children younger than 2 years should not spend time on electronic media, and media usage of children aged 2 or older should be restricted to <2 hours per day [22,23].

Studies also show their sleeping habits of children are affected due to exposure to electronic media. Children are increasingly exposed to electronic media, which can potentially influence their sleep habits. Different life patterns affect electronic media usage among preschool children, especially those attending kindergarten. Particular attention should be given to the higher usage of electronic media devices by pre-schoolers. The study findings conducted among Japanese pre-schoolers on sleep habits and electronic media usage revealed that sleep habits and electronic media usage differed according to the age and life patterns of preschool children. A greater number of children attending kindergarten used portable games and home video games than the number of children attending nursery school or those who stayed at home. The researchers suggested that it is crucial to take into consideration children's individual lifestyle patterns when advising families on appropriate electronic media use for their children. The authors also suggested for further studies to determine the most beneficial aspects of electronic media use among preschool children with regard to their lifestyle patterns [24].

Over the past decade, the use of digital tools has grown and research evidence suggests that traditional media and new media offer both benefits and health risks for young children. Operto et al. (2020) in their study found that a longer time of use of digital devices was related to lower mimic-gestural skills in children from 8–17 months and to lower language skills in children between 18 and 36 months, regardless of age, gender, socio-economic status, content, and modality of use. Further studies are needed to confirm and better understand this relationship, but parents and paediatricians are advised to limit the use of digital devices by children and encourage the social interaction to support the learning of language and communication skills in this age group [25].

There are also studies done to examine the symptoms exhibited due to the mobile phone usage. Durusoy R (2017) conducted a cross- sectional survey among 2150 high school students in Izmir on 'Mobile phone use, school electromagnetic field levels and related symptoms. Among the participants, 2021 (94.0%) were using mobile phones and 129 (6.0%) were not. Among users, 49.4% were speaking <10 min and 52.2% were sending/receiving 75 or more messages per day. Headache, fatigue and sleep disturbances were observed more among mobile phone users. The researchers found an association between mobile phone use and especially headache, concentration difficulties, fatigue, sleep disturbances and warming of the ear showing also dose-response. Decreasing the numbers of calls and messages, decreasing the duration of calls, using earphones, keeping the phone away from the head and body and similar precautions might decrease the frequencies or prevalence of the symptoms [26].

Studies also show significant association in the changes of vision due to smart phone usage. A recent study (2020) examined the association between smart device usage and the 1-year change in refractive error among a representative sample of Hong Kong children and adolescents aged 8-14 years. A total of 1597 participants who completed both baseline (2017-2018) and 1-year follow-up (2018-2019) eye examinations were included in the study. The non-cycloplegic auto-refractive error was measured and the average spherical equivalent refraction (SER) was analysed. A self-report was made on their smart device usage at baseline. The caregiver-reported socio-economic status showed that, compared with the reference group (<2 h per day on both smartphone and tablet usages), those who spent ≥2 h per day using a smartphone and <2 h per day using a tablet had a significantly negative shift in refractive error (1-year change in SER -0.25 vs. -0.09 D, $p = 0.01$) for the right eye, while the level of significance was marginal (1-year change -0.28 vs. -0.15 D, $p = 0.055$) for the left eye [27].

III. Conclusion

With all the above reviews, it's found that the media has demonstrated potentially profound effects, both positive and negative, on children's cognitive, social, and behavioural development. Mass media and social media have thoughtful influence on child health, including violence, obesity, tobacco and alcohol use, and risky sexual behaviours. There should be more understanding on how to reverse the negative impact of media and make it more positive. According to Holloway et al. (2013), the use of smart devices by young children has not been studied comprehensively, because the introduction of smart devices is relatively recent and their usage are difficult to evaluate [28].

In recent years, over-exposure to smart devices has become an important area in the public mental health field. The majority of children spend more time watching screen media than ever before. Despite concerns about overuse of smart devices by children, most smart device overexposure studies are being conducted in the United States and Europe and research conducted in Asian countries is very limited. The

findings do not examine the impact of smart devices on children and families. They simply describe the characteristics and usage patterns of smart device exposure. Although television is still the most common type of screen device that exposes children, researches also show that smartphones are the second most commonly used screen media in addition to televisions. Research shows that over the weekend, television viewing and smartphone usage are particularly high, so weekend can be an important goal in mediation to reduce screen time.

To encourage healthy screen habits from childhood, the Paediatricians, Nurses and other healthcare professionals should educate parents about the impact that media exposure can have on their children and be aware of their importance. Awareness of parents about their children using smart devices and social media sites is important, given that not all of them are healthy environments for children and adolescents. Community and Paediatric health care professionals are in a unique position to help families understand these sites and to encourage healthy use and urge parents to monitor for potential problems with usage of social media inappropriately.

AUTHOR'S CONTRIBUTIONS

The author reviewed many literatures and contributed to the write up related to the usage of smart devices and social medial and their impact on physical and mental health among children and adolescents.

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CONFLICT OF INTEREST

There is no conflict of interest

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