Effect of Screen Time and Sleep Quality on Affect, Physical Activity and Quality of Life

A study submitted in the partial fulfillment of the requirement for the degree of

MASTER OF ARTS IN PSYCHOLOGY

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ABSTRACT

The present study aimed to see the effect of screen time on sleep quality, affect, physical activity and quality of life. Further, effect of sleep quality on affect, physical activity and quality of life was also measured. About 170 samples were collected of which 90 identified as females and 80 as males. The data was collected using the google forms. The data was analyzed using the SPSS and SmartPLS. It was concluded that increased screen time results in an increased sleep quality index which signifies a decreased sleep quality. Further, increased screen time was positively correlated to the positive affect experienced by an individual, negatively related to physical activity. Increased sleep quality has a positive correlation with positive affect, physical activity and quality of life but a negative correlation with negative affect. It was also noted that sleep quality mediated the relationship between total screen time and quality of life.

Keywords: Screen time, sleep quality, affect, positive affect, negative affect, physical activity, quality of life.

CERTIFICATE

This is to certify that the thesis entitled, "Effect of Screen time and Sleep Quality on Affect, Physical Activity and Quality of Life" being submitted in partial fulfilment of requirements for the award of degree of Master of Arts in Psychology, submitted in the School of Humanities and Social Sciences, Thapar Institute of Engineering and Technology, Patiala is a bonafide work carried out under the supervision of Dr. Ipshita Chowdhury, Professor, School of Liberal Arts, Thapar Institute of Engineering and Technology, Patiala and that no part of this project has been submitted for the award of any other degree.

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This is to certify that the above statement made by the student concerned is correct and true to the best of my knowledge.

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CANDIDATE'S DECLARATION

I hereby declare that the work presented in this thesis entitled, "Effect of Screen time and Sleep Quality on Affect, Physical Activity and Quality of Life" in partial fulfilment of the requirement for the award of the degree of Master of Arts in Psychology, submitted in the School of Humanities and Social Sciences, Thapar Institute of Engineering and Technology, Patiala, is an authentic record of my own work carried out under the supervision and guidance of Dr. Ipshita Chowdhury, Professor, School of Humanities and Social Sciences, Thapar Institute of Engineering and Technology, Patiala and refers other researcher's work which are duly listed in the reference section.

The matter embodied in this thesis has not formed the basis for the award of any other degree of this or any other university.

Date: May 2022

Place: Patiala

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TABLE OF CONTENTS

List of Tables

List of Figures

Appendix

a. Appendix A: Screen time Questionnaire
b. Appendix B: Pittsburgh Sleep Quality Index (PSQI)
c. Appendix C – Positive and negative affect Scale (PANAS)
d. Appendix D: International Physical Activity Questionnaire
e. Appendix E: WHO Quality of Life Scale - Brief

Chapter 1

INTRODUCTION

With the evolving times, human beings are now more connected than ever. The past year when the whole world suffered at the hands of the pandemic; is a testament to the above-said statement. We have had technology binding us all together even in the loneliest of our times. But, is it a boon or a bane in disguise?

The screen, of a smartphone, a television, or a computer: all symbolize the modern age. For the younger generations, who happen to have been born surrounded with digital information and entertainment on screens, the time they spent watching screens is a good portion of their lives. As adults, our lives are dependent on screens. Ranging from the morning commute to ordering groceries to work on your laptop as you sit in your home/ office. Many jobs require spending a significant number of hours in front of a screen. Post that, the free hours are usually involved in streaming shows on the big screen, going through stories on your smartphones, and scrolling through social media. Everyone has spent long consecutive hours staring at screens particularly during the pandemic when almost all of our social interactions were based online.

A study conducted by CyberMedia Research (CMR) titled, “Smartphones and their impact on human relationships" reported that the average time spent on cellphones in a day has been increasing, with an average of 5.5 hours in March 2020, up 11% (pre-COVID) from roughly 4.9 hours in 2019. From April onwards, this has increased to 6.9 hours, resulting in a 25% increase (post-COVID). When participants were asked if they become angry or worried when they don't use their phones, 74% answered they do, and 73% indicated they feel compelled to check their phones frequently. 74 percent said it's important for them to live in the moment and away from their phones, and 73 percent said they'd be happier if they spent less time in front of their displays. 70% of them believed that their mental or physical health would be harmed if their usage continued at its present rate or increased. A stunning 70% of respondents agreed that their mobile phone usage is negatively affecting their connections with others, particularly with family and friends.

The amount of time spent on a screen device, such as a smartphone, computer, television, or video game console, is referred to as screen time (Merriam-Webster). The notion is being studied in conjunction with similar concepts in digital media and mental health. Screen time has been seen in research to have a direct impact on child development, mental health, and physical health (N. Stiglic and R.M. Viner, 2019). Sleep quality is defined as one's contentment

with the sleep experience, which includes aspects like sleep initiation, sleep maintenance, sleep quantity, and wake-up refreshment; it is critical for our bodies optimal functioning. Because of the blue light emitted by these gadgets, more screen time has been shown to disrupt the natural sleep and waking cycle. This, in turn, lowers a person's energy levels, reducing their physical activity and, as a consequence, lowering their overall quality of life. Sleep is a physiological activity that is critical for the optimal functioning of our bodies, as well as for an individual's health and well-being, and for maintaining the delicate balance of our bodies' biological functions. Sleep is important for cognition and memory, and it regulates cell homeostasis through hormone secretion. The cycle reacts to the immediate environment as well as external stimuli such as light and temperature (Vyazovskiy VV, 2015).

Screen time and the usage of light-emitting devices late at night are substantial contributors to sleep problems. Screens emit short wavelengths of blue light that affect the natural sleep and wake cycle (L. Hale, 2018). The usage of these large bright devices results in a reduced amount of melatonin, a hormone that helps the body with sleep initiation. Further, the phenomenon of time displacement has been attributed to causing sleep disturbance whereby, factors such as the content of the media cause arousal and interfere with the ability to fall asleep. It is also speculated by researchers that the time spent on screen might be taken away from the time one should spend sleeping.

Poor sleep quality is nonrestorative resulting in sleep disorders and is a key symptom of several psychiatric disorders, insomnia, and chronic illness associated with cardiovascular mortality, stroke, impaired glucose tolerance, and immune dysfunction. Disharmony of sleep cycles leads to the erratic secretion of hormones causing desynchronization of time-restricted feeding and nutritionally driven rhythms affecting the dietary pattern and associated determinants.

Poor sleep quality is reflected as daytime sleepiness and fatigue associated with poor concentration, cognition, and emotional dysfunction which contributes to deprived academic and learning skills, low performance in career, and physio-psychological health. Low quality of sleep harms not only academic and career-oriented success but also behavioral and emotional problems, negative emotional states, increase in alcohol and smoking habits. It is further noted that external factors such as gender, academic success, academic background, general health, socioeconomic status, and the stress level of the person happen to have a significant effect on sleep quality.

The unprecedented digital life during the pandemic helped us cope with the hard times, but also gave rise to increased levels of uncertainty, negative emotions like irritability and aggression, anxiety, and sad mood, a normative response to the pandemic (Rajkumar, 2020). However, anxiety and aggression online meant an increase in the incidents of cyber-attacks and cyber-crimes (Lallie et al., 2021) resulting in a cause of concern for the mental health. Previous studies have studied the link between a broad array of psychological health indicators (e.g., anxiety, depression, aggression, attention problems) among children and youth and screen time which has been associated in a moderately strong manner with depressive symptoms and weak evidence for associations of ST with problem behaviors, anxiety, hyperactivity, inattention, and poor sleep.

A critical component of adaptive mental health functioning is an adequate amount of sleep. Insomnia affects approximately 10% of the human population, a chronic sleep disorder with daytime impairments. The most common symptom of insomnia is sleep continuity disruption, whereby inadequate sleep is achieved in fits and starts throughout the night.

Several epidemiological studies indicated that insomnia increases recurrent depression and vulnerability to the incident. Poor mood regulation is characteristic of depression as patients frequently describe frank deficits in a positive mood, a core symptom known as anhedonia. The effects of insomnia and poor sleep quality on a negative mood have been very well characterized.

It is noted that poor sleep and sleep loss quality may be more strongly linked to deficits in a positive mood, relative to a negative mood. Changes in sleep architecture increase the risk for depression. Depression caused a few noted changes in the sleep architecture that include increased REM density and decreased latency to rapid eye movement (REM) sleep and increased rapid eye movement sleep. A few reductions in slow-wave sleep (SWS) have also been observed in depression. Another intriguing finding from Walker and Stickgold revealed that following total sleep deprivation, negative emotional memories were relatively unchanged whereas positive emotional memories were more poorly consolidated.

Longitudinal studies have also shown associations between screen time and poorer development, health-related quality of life (HRQOL), and socio-emotional and behavioral outcomes (Madigan et al., 2019; Gialamas et al., 2019). A critical component of adaptive mental health functioning is an adequate amount of sleep. Insomnia affects approximately 10% of the human population, a chronic sleep disorder with daytime impairments. The most

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The impact of screens on children and people's health has been a growing cause of concern. Evidence for the same states that it is linked to decreased physical activity resulting in reduced metabolic rate and causing obesity in return. Increased screen time is noted to cause irritability, low mood, and slight but noted impairment in socio-emotional and cognitive development leading to poor performance. Here, the displacement effect by Neuman may be brought to attention when they presented the notion that the time spent using technology is the time taken away from potentially "more valuable activities" (Neuman, 1988). Watching television may displace other activities, such as reading, but the overall negative impact of displacement is relatively weak (Evans Schmidt and Anderson, 2009). Research further found that preschoolers were more familiar with digital devices before they are exposed to books (Hopkins, Brookes,

and Green, 2013). The extent of screen time and activities being displaced are quite pivotal in the extent of displacement taking place.

Quality of life (QOL) is defined by the World Health Organization as "an individual's perception of their position in life in the context of the culture and value systems in which they live and concerning their goals, expectations, standards, and concerns". Standard indicators of the quality of life include wealth, employment, the environment, physical and mental health, education, recreation and leisure time, social belonging, religious beliefs, safety, security, and freedom. Quality of life encompasses physical and psychological health, functional status, beliefs, values, and relationships (WHO). Studies examining the link between the quality of life and sleep have primarily examined aspects of health-related quality of life (HRQoL). A large study (n = 19,711; 5,161 with insomnia and 14,550 without insomnia) found that people with insomnia had significantly ($P < 0.01$) lower physical HRQoL, mental HRQoL, and work productivity than people without insomnia. Sleep is a period of inactivity and restoration of mental and physical function. Sleep also is a time when other body systems restore their energy and repair their tissues and is fundamental to well-being and optimal health. People who get enough quality sleep have more energy, better cognitive function, healthier immune systems, and improved memory, alertness, attentiveness, and performance throughout the day. Many hormones, such as growth hormone, another hormone- stress hormone cortisol, begin to increase in preparation for the anticipated stress of the day, usually capped by a particularly large increase (up to 50%) about 20–30minutes after waking, known as the cortisol awakening response. Although sleep is one of the basic needs of human beings and is important to their health, its problem has a wide range of causes including medical and psychological conditions. While sleep problems have existed for centuries, it is only within the last 3 to 4 decades that attention has focused on their diagnosis and classification. To understand and assess sleep at a different level, different methods have been developed to assess duration, distribution during the 24-hour day period, and quality of sleep. Most often, the diagnosis of sleep problem usually is based on adequate sleep history, physical examination, and a sleep diary or sleep log, where in some cases sleep laboratory studies may be needed to arrive at an accurate diagnosis. Currently, the Pittsburgh Sleep Quality Index (PSQI) is an effective instrument used to measure the quality and patterns of sleep-in adults by differentiating poor sleepers from good sleepers. Sleep quality changes as a function of normal aging, in terms both of decreased duration and consolidation. Recent findings suggest that sleep quality plays a critical role in preserving cognitive function in older adults, reducing the risk of dementia, and it is identified to have a

bidirectional relationship with physical activity. The National Sleep Foundation and consensus statement of the American Academy of Sleep Medicine and Sleep Research Society suggest that adults should sleep 7 or more hours per night regularly to promote optimal health. Not getting enough sleep can affect the quality of life and untreated sleep problems can cause serious health problems and medical issues.

Physical activity refers to all movement including during leisure time, for transport to get to and from places, or as part of a person's work. Both moderate- and vigorous-intensity physical activity improve health. High levels of screen-based sedentary behavior, along with insufficient physical exercise, are linked to a wide range of medical and psychological illnesses, all of which can have a severe impact on one's health and well-being. These habits are raising public health concerns, particularly among children, as excessive screen time and a lack of physical activity have been linked to bad habits that can last into adulthood. Moreover, studies have found a link between excessive screen time and lower levels of physical activity in children and adolescents, indicating that sedentary screen time is likely being spent at the expense of other beneficial activities. People with physical inactivity have a 30% risk of death compared with those who are physically active. Low physical activity can increase the risk of obesity due to high screen time and a sedentary lifestyle. Less physical activity and increased screen time have some effects on metabolic risk factors such as overweight and obesity. People with obesity would have benefited from reduced screen time and moderate/vigorous physical activity.

However, low levels of physical activity and excessive quantities of screen time in children and adolescents have been linked in previous research findings. Dahlgreen A. and colleagues (2021) investigated the link between objectively observed smartphone screen time and physical activity in children and adolescents aged 10 to 15. For seven days, the amount of time spent on a smartphone screen and the amount of physical activity were tracked. Furthermore, the children/adolescents and their parents completed a questionnaire that included self-reported screen time, physical activity, sleep, and health-related quality of life, among other things. The study comprised a total of 121 children and adolescents (mean age: 12.1 ± 1.5). The average daily smartphone screen time was 161.2 ± 81.1 min/day. The average daily physical activity was 32.6 ± 16.5 active min/day, according to the SCRIIN activity tracker. Despite being in different socioeconomic locations, the children and adolescents from the two schools had similar amounts of screen usage and physical activity. Furthermore, no link was discovered between smartphone screen time and physical exercise. Girls aged 14–15 years, on the other hand, had significantly more smartphone screen time ($p<0.01$) and were significantly more

physically active ($p<0.01$) than those aged 10–12. Furthermore, boys reported spending more than five times as much time on computers and video games than girls. As a result, children and adolescents aged 10–15 years were found to have no link between smartphone screen time and physical activity levels.

Chapter 2

REVIEW OF LITERATURE

With the increasing use of technology and its involvement in human life, we have witnessed quite a disruption in our daily functioning. We have become more dependent on technology than ever. This has come with its own set of advantages and disadvantages. Screen time has witnessed an increase as discussed earlier, especially in the post covid era whereby the life and working environment have shifted online completely. Excessive screen time has caused quite an unrest in the daily functioning of human beings starting from decreased physical activity, increased lethargic behavior, disrupted sleep cycles to deteriorating mental health, quality of life, and whatnot. Thus, it is safe to say that increased use of technology, i.e., increased screen time has an overall negative implication on health and well-being.

With the excessive and addictive use of digital media and thereby increased exposure to different screens, we have a growing literature associating the same with physical, psychological, social, and neurological consequences of the same. Screen time among adults still indicates a continuous and growing problem concerning health outcomes and behaviors. The common use of mobile phones has been connected to sleep disturbances (Yogesh, 2014), potentially resulting from exposure to radiofrequency electromagnetic fields that can affect brain physiology (Regel, 2007). The key components in determining the screen time effects are mostly focused on the mobile- device use; it being the most accessible form of information, duration of use, content being consumed, after-dark use, type of media, and the number of devices involved. Increased screen time results in poor sleep, increased risk of exposure to cardiovascular diseases like low HDL cholesterol, increased blood pressure, obesity, insulin resistance and poor stress regulation (dysregulation of cortisol and high sympathetic arousal), reduced bone density, and impaired vision (Gadi L, 2018). Higher nighttime eating leads to a higher body mass index (BMI) (Milena F, 2019). Poor sleep affects the internalizing and externalizing behavior of an individual.

Another study conducted by Dr. Varadarajan (2019) evaluated the performance of children under the age of five and their understanding of commands from their mothers, finding that children who had been exposed to several hours of television or mobile phone screens exhibited an inability to comprehend what they were being told. Children who spend several hours a day in front of a screen have trouble understanding what is being spoken to them. Children under the age of five may experience developmental problems as a result of too much exposure to

television or mobile phone screens. 70% of the 718 children evaluated, aged six months to five years, had been exposed to too much screen usage. The development of expressive and receptive language is delayed as a result of excessive screen time (ST). Imitating their parents or caregivers helps children learn to express themselves. They begin to speak a large number of words at the age of three. However, people who are overly exposed to ST are unable to do so. Children exposed to ST tried to copy the slang they learned through watching television, according to the study. They used offensive language and couldn't follow simple instructions.

Long periods of screen time have been linked to poor mental health, notably depression, which can impact immune function and metabolism by disrupting the hypothalamus adrenal axis (Maricarmen V, 2020). It's also worth noting that symptoms like depression, suicidal ideation, and self-injury are likely to be linked to mobile phone dependency, frequent message sending, and prolonged worry about not getting messages, especially before bedtime (Gadi L, 2018). There is a considerable amount of evidence that links physical activity with better mental health, and people with psychiatric illnesses are less likely to be physically active (Mark H, 2010). Early and repeated exposure to violent content has also been related to an increased risk of antisocial behaviour and a reduction in prosocial behaviour. Addictive screen time involves craving behavior thereby decreasing the social coping behavior trait thus resulting in substance dependence behavior which gives rise to disturbed eating patterns. Digital media addiction is linked to anatomical changes in the brain that affect cognitive control and emotional regulation (Lissak G., 2018)

Sleep is critical for the health and well-being of children and adolescents. The question of whether electronic media use impacts the sleep of children and young teenagers are gaining popularity. Lund, I.N. Solvhoj, D. Danielsen, et al. conducted a systematic assessment of the evidence of electronic media consumption and sleep in children aged 0 to 15. Evidence of a link between electronic media use and sleep duration was found, with 6–15-year-olds having more evidence than 0–5-year-olds. The evidence for a link between electronic media consumption and other sleep outcomes was a little more mixed. However, there was evidence of a link between electronic media use and late bedtime and poor sleep quality in children aged 6–12. There was evidence indicating links between screen time and difficulty falling asleep in 13–15-year-olds, as well as between social media use and poor sleep quality. In general, children and adolescents who used electronic media slept less. The evidence for a link between electronic media consumption and other sleep outcomes was mixed.

Another study on teenage screen media habits and sleep by L. Hale, G.W. Kirschen, et al., (2018) found links between the two. As a result of the widespread use of portable electronic devices and the normalization of screen media devices in the bedroom, 30 percent of toddlers, preschoolers, school-age children, and a majority of adolescents experience insufficient sleep. The usage of screen media was linked to later bedtimes and/or reduced total sleep time. Time spent awake rather than sleeping, psychological stimulation and light exposure, and increased physiological alertness were all considered positive. The prevalence of pediatric sleep loss has far-reaching repercussions because of the links between insufficient sleep and a higher risk of childhood obesity, impaired psychological well-being, and poor cognitive/academic functioning.

Excessive screen time is linked to various detrimental well-being and health markers in the younger population, according to a large number of research. Children who reported less screen time than the average in the sample scored considerably higher in the aspects of well-being: physical, parental, peer, and school (as measured by the KIDSCREEN-27), bolstering the evidence that screen time has a negative influence on health. (Belton, Behan, et. al., 2021).

A.K. Przybylski and N. Weinstein (2019) looked into the impact of screen usage on the psychological well-being of young children. In the last month, data was collected from parents of children aged 2 to 5 years old to examine screen time consumption and psychological well-being in terms of caregiver attachment, resilience, curiosity, and positive affect. Once variations in child ethnicity, age, gender, household income, and caregiver educational attainment were examined, the evidence did not support establishing restrictions (one or two hours per day) as advised by the American Academy of Pediatrics. Small parabolic functions, on the other hand, connected screen time with attachment and pleasant effect. The findings indicated that a thorough cost-benefit analysis is required to evaluate whether imposing hard constraints is a wise use of caregivers and professional resources.

In a cross-sectional survey study by P.S. Tandon, C Zhou, AM Johnson, and others (2021), more physical activity and less screen time were associated with better mental health for children, accounting for pandemic stressors. The association between children's physical activity and screen time with mental health was noted. Among the 1000 children included in the analysis, 195 (20.9%) reported at least 60 minutes of physical activity every day. Children reported a mean (SD) of 3.9 (2.2) days per week with at least 60 minutes of physical activity and 4.4 (2.5) h/d of recreational screen time. After accounting for COVID-19 stressors,

engaging in 7 days per week (vs 0) of physical activity was associated with fewer externalizing symptoms in younger children. For older children, engaging in 1 to 6 and 7 days per week (vs 0) of physical activity was associated with lower total difficulties, fewer externalizing symptoms, and fewer internalizing. More screen time was correlated with higher total difficulties among younger children. There were no significant differences by sex.

The psychological effects of "screen time" and "green time" for children and adolescents were researched by T.K. Oswald, AR Rumbold, SGE Kedzoir, and VM Moore (2020). In recent decades, technological advancements have boosted young people's interaction with screen-based devices (screen time), while reducing young people's contact with nature (green time). This combination of excessive screen time and little green time may harm mental health and well-being. High screen time and inadequate green time may disproportionately harm young individuals from low socioeconomic backgrounds. Green time may be an under-utilized public health resource for youth psychological well-being in a high-tech society, based on preliminary evidence that it may buffer the effects of excessive screen time.

As digital technology progressed, excessive screen time has become a big concern. A. Pandya and P. Lodha's (2021) goal was to investigate and comprehend virtual social connectivity, excessive use of digital technology, and its consequences, as well as provide recommendations for maintaining a healthy use of digital technology. Screen time significantly rose during COVID-19, according to the findings. Despite the mixed impacts of excessive screen time and the murky line between beneficial and unhealthy social connectivity via digital media, the evidence of detrimental effects on (physical and) mental health underscores the significance of teaching appropriate digital habits, especially given that digital technology is here to stay and will continue to evolve.

Evidence collected by Jean M. Twenge and W. Keith Campbell (2018) from a population-based study established an association between screen time and lower psychological well-being among children and adolescents. A large (n = 40,337) national random sample of 2- to 17-year-old children and adolescents in the U.S. was examined in 2016 that included comprehensive measures of screen time (including cell phones, computers, electronic devices, electronic games, and TV) and an array of psychological well-being measures. After one hour per day of use, more hours of daily screen time were associated with lower psychological well-being, including less curiosity, lower self-control, more distractibility, more difficulty making friends, less emotional stability, being more difficult to care for, and inability to finish tasks. Among

14- to 17-year-olds, high users of screens (7+ h/day vs. low users of 1 h/day) were more than twice as likely to ever have been diagnosed with depression, ever diagnosed with anxiety, treated by a mental health professional, or have taken medication for a psychological or behavioral issue in the last 12 months. The moderate use of screens (4 h/day) was also associated with lower psychological well-being. Non-users and low users of screens generally did not differ in well-being. Associations between screen time and lower psychological well-being were larger among adolescents than younger children.

M.D. Guerrero, J.D. Barnes, and J.P. Chaput (2019) investigated the relationship between ST kinds and content and problem behaviors, as well as whether these relationships were mediated by sleep duration. Parents self-reported their children's emotional and behavioral syndromes via the Child Behavior Checklist and sleep duration using one item from the Parent Sleep Disturbance Scale, and children self-reported their ST behavior, which included ST types (television/movies, videos, video games, and social media) and content (mature-rated video games and R-rated movies). Watching television/movies was linked to an increase of 5.9% in rule-breaking, 5% in social problems, 4% in aggressive behavior, and 3.7 percent in thought problems. Playing mature-rated video games for longer periods of time was linked to more somatic complaints, aggressive conduct, and shorter sleep duration. Although the impact sizes were minor, sleep duration moderated the association between ST (type and content) and problem behaviors. The most significant associations were seen between sleep length and all issue behaviors, with longer sleep duration predicting a reduction of 8.8–16.6 percent in problem behaviors. Children's bad behaviors were connected with more time spent in ST behavior. Longer sleep duration was linked to fewer negative behaviors, according to the data.

K.C. Madhav, Shardulendra Prasad Sherchand, and Samendra Sherchan (2017) looked into the relationship between depression and screen use among Americans. Sedentary behaviour is a substantial risk factor for adult depression, according to a growing body of evidence. The relationship between watching television or using a computer and sadness in Americans is yet unknown. The researchers wanted to discover if there was a link between watching television and using the computer and depression. The survey included 3201 people in the United States aged 20 and higher. The Patient Health Questionnaire-9 [PHQ-9] was used to determine depression levels, as well as self-reported television and computer viewing hours each day. Females were shown to have much higher levels of depression than males. The findings found that having moderate or severe depression was connected to spending more time (> 6 hours per day) watching TV and using the computer. Screen time length was found to be strongly

associated when all parameters were considered. The amount of time adults spend watching television and using computers can predict their depression levels. Prospective research and assessments of workplace sitting, social interactions, and family depression are all needed.

Sleep is a vital indicator of overall health and well-being. It plays a key role in physical, behavioral, emotional, and cognitive development (Brand, Kirov,2011). Today all over the world adults are facing a common issue regarding sleep, they suffer from delayed sleep-wake patterns, inadequate sleep, and other sleep disturbances (Lauren, 2015). Sufficient sleep is necessary for the growth, maturation, proper functioning, and health of young adults. Inadequate sleep duration can harm health and well-being. (Soffia, 2020). An abnormal sleep duration, such as too much sleep or too little sleep —involves changes in physical and mental health, including diabetes, hypertension, hypercholesterolemia, obesity, depression, and substance use, among others (Cappuccio, D'Elia, et.al., 2010). Insufficient sleep quantity is negatively related to multiple areas of development and adjustment, including physical health, learning and school attendance, and emotion regulation (Bauducco, Tillfors, Linton et.al, 2015; Shochat, Cohen-Zion, & Tzischinsky, 2014).

Early studies show reliable increases in function in limbic and anterior paralimbic cortex in rapid eye movement (REM) sleep and a decrease in function in higher-order cortical regions in known thalamocortical networks during non-REM sleep. Sleep and sleep disorders have traditionally been viewed from a polysomnographic perspective. Although these methods provide information on the timing of various stages of sleep and wakefulness, they do not provide information regarding function in brain structures that have been implicated in the generation of sleep and that may be abnormal in different sleep disorders. Functional neuroimaging methods provide information regarding changes in brain function across the sleep-wake cycle that provides information for models of sleep dysregulation in a variety of sleep disorders. (E. A. Nofzinger, 2005).

The widespread presence of media items in our households can be hypothesized as a leading cause of insufficient and low-quality sleep, operating through several mechanisms (Cain N, 2010). The first potential mechanism would be time displacement – the more time spent in front of the screen replaces the time they should be sleeping. Secondly, physical and psychological arousal due to the content shown in the media (Lauren H,2015) and primarily to video games, may therefore affect their sympathetic regulations and may also interfere with their ability to stay and fall asleep (Gadi L, 2018). And finally, the effect of light on circadian

rhythm and alertness. Our bodies are structured around a 24-hour “body clock” referred to as a circadian rhythm. For every hour we are awake throughout the day, the body naturally develops a drive for sleep which is further controlled through a hormone that is secreted called adenosine (Nicholas T, 2020). This hormone builds continuously in our brain until the body naturally shifts to desired sleep. While we are sleeping the body works to lower the amount of adenosine and properly trigger an awakening in the morning with a certain increase in another hormone called cortisol (Nicholas T, 2020). It is also said as humans age, their need for sleep often decreases. For instance, infants can sleep almost anywhere from 12-16 hours daily, while adults above 18yrs of age can function quite efficiently with 7-8 hours of sleep daily (National Heart, Lung, and Blood Institute, 2018).

Sleep quality refers to how well an individual sleep. For adults, good quality sleep means that an individual typically falls asleep in 30 minutes or less, sleep soundly through the night with no more than one awakening, and drifts back to sleep within 20 minutes if s/he does wake up. On the flip side, bad sleep quality is the kind that leaves an individual staring at the ceiling or counting sheep. It may be characterized by trouble falling asleep and staying asleep, restlessness, and early awakenings (National Sleep Foundation). Over the last 10–20 years, developments in a fast-paced modern lifestyle have seen a decline in sleep quantity (Keyes, Maslowsky, Hamilton, & Schulenberg, 2015). Many argue that advances in technology, including 24/7 access to the internet and social media, have played a substantial role in the reduction of sleep duration (Keyes et al., 2015; Kronholm et al., 2015).

Sleep quality in nursing students is affected by smoking habits, total daily sleeping hours, efficient waking up times, and average daily coffee intake, according to a study by D. Yilmaz, F. Tanrikulu, and Y. Dikmen (2017). According to the findings, there are no significant differences in age, gender, location of residence, napping during morning classes, the presence of chronic conditions, or daily average tea consumption. Nursing students have poor sleep quality, according to the findings of this study.

J. Liu, L. Zhu, and C. Liu (2020) investigated the impact of sleep quality on positive and negative moods. Self-report questionnaires evaluating sleep quality, positive and negative effects, and self-control were completed by 1,507 Chinese adults (37 percent men; mean age = 32.5 years). Sleep deprivation was linked to negative affect and was found to be negatively linked to positive affect and self-control. Self-control was shown to be positively connected with positive affect, while negative affect was found to be adversely correlated with self-

control. The association between sleep quality and self-control was strongly influenced by both positive and negative impacts. Individuals with better sleep quality may experience more positivity and less negative emotional states, and these mood shifts may boost self-control resources. Regulating positive and negative affect may help to mitigate the detrimental consequences of insufficient sleep on self-control.

D. F. Dinges, F. Pack, K. Williams, K.A. Gillen, JW Powell, et al. (1997) studied how a cumulative sleep debt would result in cumulative changes in measures of psychomotor vigilance and mood disturbance. The sleep of the subjects was restricted to 4-5 hours every night for 1 week while being monitored by staff and actigraphy. Three times each day (1000, 1600, and 2200 hours) subjects were assessed for subjective sleepiness (SSS) and mood (POMS) and were evaluated on a brief performance battery that included psychomotor vigilance (PVT), probed memory (PRM), and serial-addition testing, once each day they completed a series of visual analog scales (VAS) and reported sleepiness and somatic and cognitive/emotional problems. The temporal profiles of cumulative changes in neurobehavioral measures of alertness as a function of sleep restriction were generally consistent. Subjective changes tended to precede performance changes by 1 day, but overall changes in both classes of the measure were greatest during the first 2 days (P1, P2) and the last 2 days (P6, P7) of sleep restriction. Data from subsets of subjects also showed: 1) that significant decreases in the MSLT occurred during sleep restriction, 2) that the elevated sleepiness and performance deficits continued beyond day 7 of restriction, and 3) that recovery from these deficits appeared to require two full nights of sleep. These findings suggest that cumulative nocturnal sleep debt had a dynamic and escalating analog in cumulative daytime sleepiness and that asymptotic or steady-state sleepiness was not achieved in response to sleep restriction.

K O'Leary, BJ Small, and others (2017) researched to see if sleep quality in healthy and mood-disordered people predicted daily life emotional reactivity. They found that sleep difficulties were associated with higher negative affect across all types of everyday life events in mood-disordered people. As a result of depression, poor sleep quality has a varied impact on daily emotional reactions. Sleep disturbances have been linked to poor emotional functioning in both healthy and depressed people (Bower et al, 2010; van der Helm & Walker, 2010). Using a computerized Experience Sampling, participants with major or minor unipolar depressive disorder (n = 60) and healthy controls (n = 35) reported sleep and emotional responses to daily life events. The researchers wanted to see if poor sleep quality affected emotional reactivity to everyday events and if this link was impacted by unipolar mood disorders. Sleep problems

were linked to increased negative affect in reaction to unpleasant events and a blunted response to neutral events in healthy people.

Sleep disruptions have a significant impact on daily mood and vice versa. However, due to a paucity of daily assessment data, the causal day-to-day interaction between sleep and mood has not been adequately investigated. We can collect ecological momentary assessment data daily using mobile phones in a noninvasive manner. S. Triantafillou, S. Saeb, EG Lattie, DC Mohr, and KP Kording (2019) researched to see if there was a link between self-reported daily mood and sleep quality. A total of 208 adult participants were enlisted to report their mood and sleep patterns daily for six weeks using their mobile phones. Depressed and anxious participants were divided into four groups: depressed and anxious, depressed only, anxious, and controls. Mixed-effects models and propensity score matching were used to examine the impact of daily mood on sleep quality and vice versa. All of the methods revealed that sleep quality had a considerable impact. All of the methods revealed that sleep quality has a considerable impact on mood and vice versa. However, the influence of sleep quality on next-day mood was substantially greater than the effect of previous-day mood on sleep quality among individuals. The impacts of previous mood and sleep quality, as well as other variables such as stress, physical activity, and meteorological conditions, were not found to be confounded. Daily sleep quality and mood were found to be linked, with the influence of sleep quality on mood being substantially larger than the opposite. Correcting for participant fixed effects had a significant impact on the outcomes. Environmental characteristics included in the study, as well as sleep and mood history, does not appear to mitigate the association, according to causal analysis.

Poor sleep and/or sleep loss (voluntary or involuntary) has a significant detrimental impact on one's health and well-being. Zhao et al. (2019) found that people with insomnia and short sleep duration were less happy. We now know that lack of sleep increases the risk of weight gain due to increased food intake in response to ghrelin (the hunger hormone) and leptin (the satiety hormone) declines. These physiological findings support the notion that short sleep duration predicts a higher BMI by showing a link between short sleep duration and increases in BMI. We're also aware that sedentary habits, which result in lower energy expenditure and increased food intake, may play a role in the link between short sleep duration and obesity. Garfield (2019) points out that this association could be bidirectional, with obesity (as measured by BMI cut-off points) perhaps predicting short sleep duration. Longitudinal research utilizing objective sleep metrics will aid in determining whether or not there is a causal association between sleep duration and BMI.

S. Lee, JH Kim, and JH Chung (2021) conducted a cross-sectional study with 225,541 adults who participated in the 2018 Korean Community Health Survey (101,133 men, 124,408 women). Multiple sociodemographic and psychosocial characteristics were assessed and compared between participants with poor (n = 67,619) and good (n = 157,922) sleep quality; sleep quality was judged subjectively using the Pittsburgh Sleep Quality Index (PSQI). The EuroQol five-dimension (EQ-5D) index scores were compared between the excellent and poor sleep quality groups after adjusting for different confounding factors. The poor sleep quality group's mean EQ-5D index scores were considerably lower than the excellent sleep quality groups. Participants with poor sleep quality were more likely to have some or severe issues with physical activity, self-control, daily activity, pain, and anxiety/depression than those with good sleep quality. Sleep deprivation is linked to a lower quality of life, especially if you have moderate to severe anxiety or depression.

O. Rezaei, Y. Mokhayeri, et al. (2020) looked at the relationship between sleep quality and the likely drivers of quality of life among public health students. This study employed data from a cross-sectional survey of 275 students, which used random stratified sampling amongst different classes of college students at Shahid Beheshti University of Medical Sciences' public health faculty. A structured questionnaire with modules on socio-demographic factors, the Petersburg Standardized Sleep Quality Questionnaire (PSQL), and the World Health Organization Quality of Life Questionnaire were used to collect data (WHOQOL-BREF). This study included a total of 275 students. Sleep deprivation and sleep disorders can harm family health and interpersonal relationships. The standard deviation (SD) of the mean age was 22.1 ± 3.6 years. In the univariable model, students who lived in their own homes had 2.18 times the chance of having a higher quality of life than those who did not. Furthermore, sleep disorders were linked to a lower quality of life.

Andrew Steptoe, Kathryn O'Donnell, Michael Marmot, and Jane Wardle conducted a cross-sectional study. (2008) sought to determine if positive affect and life purpose (eudaimonic well-being) are linked to excellent sleep regardless of health problems or socioeconomic level, as well as their function in mitigating the impact of psychosocial risk factors on poor sleep. Positive affect was estimated by aggregating ecological momentary samples with 736 men and women aged 58-72 years. The Jenkins Sleep Disorders Scale was used to assess sleep problems, and standardized questionnaires were used to analyze psychosocial risk factors. After controlling for age, gender, household income, and self-rated health, both good affect and eudaimonic well-being were found to be inversely related to sleep issues. Financial

hardship, social isolation, low emotional support, unfavorable social interactions, and psychological distress were all found to be associated with reported sleep issues. When positive affect and eudaimonic well-being were taken into consideration, the intensity of these relationships was lowered by 20-73 percent, implying that positive psychological states were partially mediating effects. The findings imply that adequate sleep is linked to positive affect and eudaimonic well-being, which may mitigate the effects of psychosocial risk factors. The links are most likely bidirectional, with disturbed sleep leading to lower positive affect and psychological well-being, and favorable psychological states leading to better sleep.

W. O'Brien (2018) investigated further the link between physical activity, overall screen time, and weight status among early Irish teenage youth in a study. Physical activity, screen time (self-report), and anthropometric measures were among the data collected in this study. When compared to their normal-weight counterparts, obese and overweight participants acquired much more daily screen time. Among girls, there was a link between physical activity and daily television consumption. When analyzing the relationship between daily physical activity and overall screen time in the prediction of early adolescent BMI, no significant interaction was found. The results pointed out the importance of limiting screen usage in helping teenagers achieve a better weight status. Furthermore, physical activity appears largely unrelated to overall screen time in predicting adolescent weight status, suggesting that these variables may be independent markers of health in youth.

The association between screen-based sedentary behavior, physical activity, and physical fitness among Chinese adolescents was investigated in another study by X. Dong and L. Ding (2021). The data collection techniques used in this study were for demographic and other factors (gender, age, BMI, and socioeconomic status), PA (PAQ-A), screen-based sedentary behavior (YRBSS), and physical fitness (NSPFH 2014). A total of 10,002 teenagers (14.39 years 1.79) took part in the study. The findings showed that having a high BMI and watching a lot of TVs had a substantial negative relationship with physical fitness, however, there was no link between the amount of time spent playing computer/video games and physical fitness in adolescents. Most measures of physical fitness were strongly related to high SES and physical exercise in leisure time five or more times per week. The findings imply that to enhance the physical fitness of Chinese teenagers, we must not only focus on adolescent risk behaviors associated with poor socioeconomic status and obesity but also impose physical exercise and reduce sedentary television viewing behavior.

Health-related quality of life (HRQoL) research has primarily focused on specific growth stages of childhood or adolescence, with no mention of trends in HRQoL's links with sleep duration, physical activity, or screen time. Another study looked at the relationships between screen time, sleep length, physical activity, and HRQoL in children and adolescents aged 6–17 years old. Carlos & Wong, Wong, and others surveyed a total of 7555 people (mean age 11.5, SD 3.2; 55.1 percent female) (2021). Sleep duration and moderate/vigorous activity were positively connected with their EQ-VAS scores, PedsQL physical summary scores, and psychosocial summary scores, whereas screen time was adversely correlated. According to the PedsQL and EQ-5D-Y-5L, children and adolescents with more screen time, shorter sleep duration, and lower physical activity levels had poorer HRQoL. Screen time allocation advice and support for children and adolescents should be provided at the school, community, and family levels.

CHAPTER 3 - RESEARCH GAPS, MOTIVATION FOR THE STUDY, OBJECTIVES, THEORETICAL FRAMEWORKS, CONCEPTUAL FRAMEWORK, AND HYPOTHESES

RESEARCH GAPS

In response to the review of literature studied, an indirect relationship has been established between screen time, sleep quality, physical activity, and quality of life. Some studies have been conducted in this area, with a few of them being conducted in the Indian context that takes the effect of screen time on the quality of sleep, physical activity, and quality of life, especially with increased exposure to screen time in the post covid era. Further, no scale has an adapted Indian version for the appropriate measurement of the variables. Therefore, this study conducted in the Indian context aims to investigate the relationship between screen time and sleep quality on physical activity and quality of life.

MOTIVATION FOR THE STUDY

Given the current situation of the pandemic, screens have become the new norm for social interaction. The entire workforce has shifted online resulting in increased exposure to total screen time. With people being limited to their spaces, the daily physical activity was reduced and the social interaction was very much reduced. This resulted in an overall impact on the quality of life experienced by the individuals. Hence stemmed the motivation for this study is to see the impact of total screen time and sleep quality on the affect, physical activity, and quality of life experienced by the individuals. Further, a closely related variable – the sleep quality index is proposed as a mediating variable based on the extent of literature.

OBJECTIVES

1. To study the effect of screen time on the quality of sleep of an individual.
2. To study the effect of screen time on the affect experienced by an individual.
3. To study the effect of screen time on the physical activity of an individual.
4. To study the effect of screen time on the quality of life of an individual.
5. To study the effect of quality of sleep on the affect experienced by an individual.
6. To study the effect of quality of sleep on the physical activity of an individual.
7. To study the effect of quality of sleep on the quality of life of an individual.
8. To investigate the mediating role of sleep quality between total screen time and affect experienced by an individual.
9. To investigate the mediating role of sleep quality between total screen time and physical activity of an individual.
10. To investigate the mediating role of sleep quality between total screen time and quality of life.

THEORETICAL FRAMEWORK

3.1 System theory

Systems theory is the interdisciplinary study of systems, or cohesive groups of interrelated, interdependent elements that might be natural or man-made. Every system is defined by its structure and purpose, constrained by space and time, impacted by its surroundings, and expressed through its operation. A system that exhibits synergy or emergent behavior could be more than the sum of its parts. Changing one system component may have an influence on other system components or the entire system. It's possible to predict these changes in behavioral patterns.

Failure of functioning of any of these elements, can results in troubles for the whole system, in this example, the whole human body. To understand the functioning and habits or recurring behavior of adolescents, it is important to understand that there are a series of transactions with distal antecedents (Sameroff & Fiese, 2000).

The degree to which systems that learn and adapt grow and adapt is determined by how well they are involved with their surroundings. Some systems assist others, guaranteeing that the latter does not go down. Systems theory aims to represent a system's dynamics, limitations, and circumstances, as well as elucidate principles (such as purpose, measure, methods, and tools) that can be discerned and applied to other systems at all levels of nesting and in a wide range of domains to reach optimal equifinality. The purpose of general systems theory is to develop broadly applicable notions and principles rather than concepts and principles that are specific to one field of knowledge. It distinguishes between active (dynamic) and passive (static) systems.

Therefore, it is important to have a vertical analysis i.e., a level of explanation that considers the bio-psycho-social interplay of interaction (Rönnberg, 2004). Vertical analysis can help to understand the relationships between several factors. As an example, how do developmental changes or disabilities (biologic components) interact with depression and anxiety (psychological components) and with social media use (social component) and how do these components relate to lifestyle habits.

The ICF framework (WHO, 2007), which is strengthened by Bronfenbrenner's ecological theory, is an extensively used approach in vertical analysis (Bronfenbrenner & Morris, 2006).

3.2 Bronfenbrenner ecological systems theory

"Human development occurs through more complicated reciprocal connections between an active evolving biopsychological human being and the people, things, and symbols in its immediate external environment" (Bronfenbrenner, 2005, p. 6). This concept specifies different levels of interaction between children and a range of systems in their living arrangements as well as in their daily lives. Microsystems, mesosystems, exosystems, macrosystems, and chronosystems are the different kinds of systems. Microsystems allude to a child's engagement with their local environment, which includes, among other things, the child's biology, family, school, and friends. Mesosystem interactions include, for example, a family's relationship with a child's instructors or friends. Exosystem includes the factors that have an indirect impact on children, such as parental leave or vacation policies, or parental commuting patterns to work. Finally, the macrosystem refers to culture or national policies, and the chronosystem alludes to what occurs in the child's immediate environment. The idea of Bronfenbrenner is beneficial for understanding the setting in which children and teenagers develop their lifestyle habits.

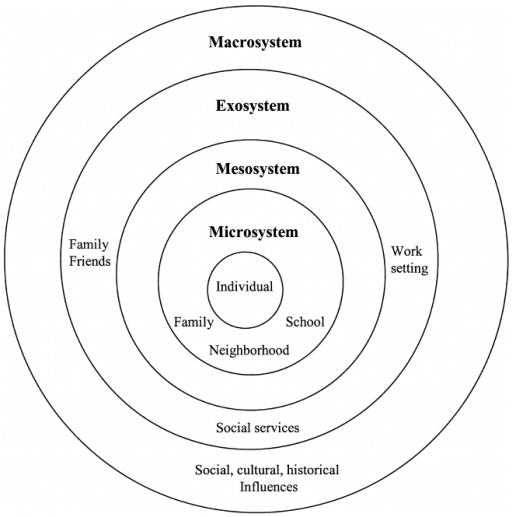

Figure 1: Bronfenbrenner ecological model

Screen time is considered as a part of the exosystem as it may not include the individual themselves but indirectly influences them as the other microsystems. Sleep is not just a homeostatic and chronobiologic mechanism, family, or school (microsystems) but also the specific national environment including infrastructures for technology and affordability (macrosystem). Similarly, vigorous physical activity is not only biological factors (microsystem) and culture (macrosystem) but also the trends and facilities of carrying out vigorous physical activities. While the quality of life is a part of the macrosystem as it is influenced by all the components of the ecological systems that influence an individual’s

immediate environment. The data in this study consists of screen time, sleeping habits, vigorous physical activity, and quality of life experienced by Indian adolescents and young adults.

3.3 ICF

The ICF is a classification and categorising system providing information on functioning and impairment. It defines and assesses health and disability using a standard syntax and conceptual framework. This method considers every aspect of a vertical biopsychosocial study.

The goals of the ICF (WHO 2001:5) are:

to provide a scientific foundation for understanding and studying health and health-related states, outcomes, determinants, and changes in health status and functioning;

establish a common language for describing health and health-related states to improve communication between different users, such as health care workers, researchers, policymakers, and the general public, including people with disabilities; and allow comparison.

Functionality and disability are multi-dimensional notions in the ICF, referring to:

- people's body functions and structures, as well as deficiencies in those functions and structures.
- people's activities (individual functioning) and the activity limitations they face;
- people's participation or involvement in all aspects of life, and the participation restrictions they face (person functioning as a member of society); and
- environmental factors that influence these experiences (and whether these factors are facilitators or barriers).

The ICF views a person's level of functioning as a dynamic interaction between their health, their environment, and their personal variables. It is a biopsychosocial paradigm of disability that combines social and medical approaches to impairment.

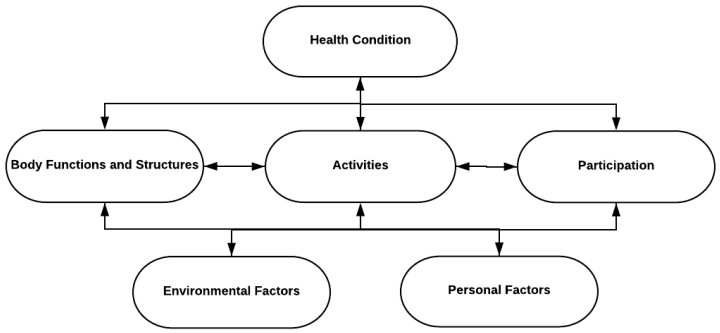

Figure 2: ICF Framework

As noted earlier, sleep is a homeostatic and chronobiologic mechanism (biological) and can be affected by socio-cultural, familial, and developmental changes (personal and environmental factors). Since screen time and sleep-related issues can cause depression, insomnia, and anxiety

and have other biological & psychological consequences; therefore, it is quite relevant to use Bronfenbrenner's theory and ICF framework. ICF-CY can also be used to analyze/include quality of life due to technology and social media (social) since this is an environmental factor. Physical activities are also related to the physical ability to participate (activity) as well as the willingness and actual behavior (participation), and they can also be analyzed/included in the ICF. Physical activity not only consisted of physical ability but also cognitive ability.

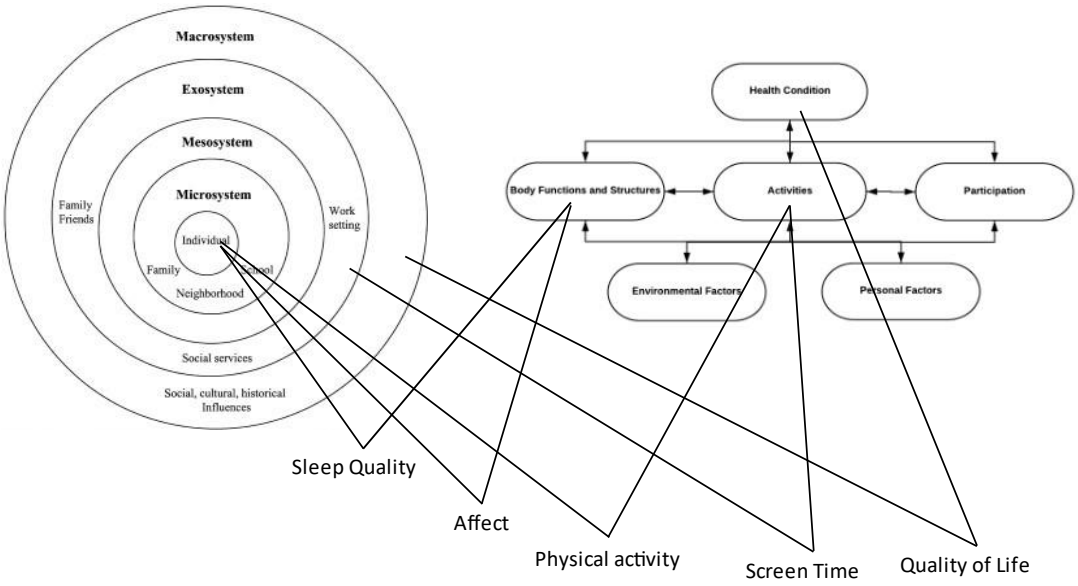

Figure 3: Framework from Bronfenbrenner model and ICF framework

For this study, adolescents' and young adults' bodies are considered as systems, and their current habits are considered the results of their behavioral patterns and habits over the past years. A vertical analysis is made using Bronfenbrenner and ICF integrated framework, which considers bio-psycho-social aspects of the human bodies of the individuals for understanding lifestyle habits of screen time, sleep, physical activity, and quality of life.

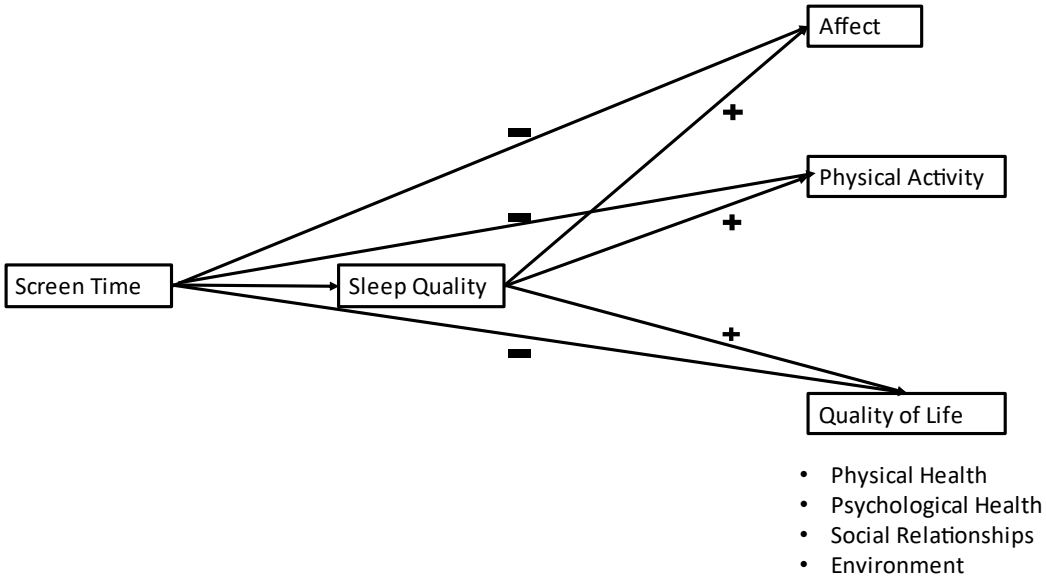

Figure 4: Mediation Framework

HYPOTHESES

H1: Total screen time will be negatively correlated with sleep quality.

H2: Total screen time will be negatively correlated with positive affect.

H3: Total screen time will be positively correlated with negative affect.

H4: Total screen time will be negatively correlated with the physical activity of an individual.

H5: The sleep quality of an individual will be positively correlated with positive affect.

H6: The sleep quality of an individual will be negatively correlated with negative affect.

H7: The sleep quality of an individual will be positively correlated with the physical activity of an individual.

H8: The sleep quality of an individual will be positively correlated with the quality of life of an individual.

H9: Sleep Quality will mediate the relationship between total screen time and affect experienced by an individual.

H10: Sleep quality will mediate the relationship between total screen time and the physical activity of an individual.

H11: Sleep quality will mediate the relationship between total screen time and quality of life experienced by an individual.

CHAPTER 4

METHODOLOGY

SAMPLE

A sample of 170 individuals within the age range of 18 to 40 was taken randomly. The participants were selected using convenience sampling, due to the pandemic situation.

DESIGN

The design of the study comprises the mediation model whereby the total screen time (TST) is the independent variable, sleep quality index (PSQI) is the mediating variable, and affect (PAS, NAS), physical activity, and quality of life are the dependent variables.

Independent variable – Screen Time

Mediating Variable – Sleep Quality

Dependent Variable – Affect, Physical Activity, and Quality of life.

STATISTICAL ANALYSIS

Correlational Analysis was done using SPSS 22.0

Mediation analysis was performed using SmartPLS.

TOOLS USED

SCREEN TIME QUESTIONNAIRE:

All of the items used to quantify the use of modern screen-based gadgets are included in the questionnaire. The use of common screen devices (e.g., television, smartphone, tablet) is quantified using an 18-item screen-time questionnaire at various times during the week (e.g. weekday, weeknight, weekend). With the exception of the item asking about smartphone use on a typical weekend day (ICC = 0.16, p = 0.069), all questions in the screen time questionnaire had reasonable to outstanding relative reliability (ICCs = 0.50–0.90; all 0.000). Across the different study periods, the SEM values were large for all screen types.

PITTSBURG SLEEP QUALITY INDEX:

The Pittsburgh Sleep Quality Index (PSQI) is a one-month self-report questionnaire that evaluates sleep quality. The test consists of 19 distinct items that combine to form seven components that result in a single overall score. It takes 5–10 minutes to complete. The PSQI was created by University of Pittsburgh researchers as a standardized sleep questionnaire for physicians and researchers to utilize with ease. It is used for a variety of groups. The PSQI is a 19-item questionnaire that assesses several aspects of sleep and yields seven component scores and one composite score. Subjective sleep quality, sleep latency (how long it takes to fall asleep), sleep duration, habitual sleep efficiency (the percentage of time spent in bed sleeping), sleep disruptions, usage of sleeping medicine, and daytime dysfunction are among the component scores. Each item is rated on a 0–3 scale. The total of the seven component scores yields a global PSQI score ranging from 0 to 21, with lower numbers indicating better sleep quality. Internal consistency and test-retest reliability are satisfactory. The test has strong discriminative and construct validity.

POSITIVE AND NEGATIVE AFFECT SCHEDULE (PANAS-SF):

The Positive and Negative Affect Schedule (PANAS) is a 10-item self-report questionnaire that measures both positive and negative affect. It is the most widely used and widely utilised scale for measuring an individual's positive and negative affect. There are a total of 20 items in this self-report questionnaire, ten for each positive and negative affect. These questions must be graded on a 5-point Likert scale. Internal consistency for the PANAS, according to Watson, Clark, and Tellengen (1988), varied from 0.86 to 0.90 for positive affect and 0.84 to 0.87 for negative affect. The PANAS (1 week) has a test-retest reliability of 0.79 for positive affect and 0.81 for negative affect (Watson et al., 1988).

WHO QUALITY OF LIFE SCALE (WHOQOL – BRIEF):

The WHO Quality of Life Scale-Brief (WHOQOL-Brief) is a subset of 26 items from the WHOQOL-100 that is still under field trials. The WHOQOL-Brief creates a profile of an individual's overall perception of quality of life and health, including four domain scores and two individually scored items. The four domain ratings are all rated positively, with higher scores indicating better quality of life. Discriminant validity, content validity, internal consistency, and test-retest reliability were all high in the WHOQOL-BREF domain scores.

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE – SHORT FORM

The short form is based on the International Physical Activity Questionnaire, which was published in 1998. It comprises of seven items and open-ended questions on people's recent seven days of physical activity. This is a paper-pencil self-report version of the test. This metric evaluates the forms of physical activity and sitting time that people engage in on a daily basis in order to calculate total physical activity in MET-min/week and sitting time. The test has high reliability (.80) and good test-retest reliability. Predictive validity, concurrent validity, convergent validity, criterion validity, and discriminant validity are also seen.

PROCEDURE

The survey was administered using Google Forms. It consisted of 90 questions, 18 items for measuring total screen time (TST), 19 items measuring Pittsburgh Sleep Quality Index (PSQI), 10 items each measuring the positive and negative affect, 7 items measuring the physical activity of an individual, and 26 items measuring the quality of life experienced by an individual, along with a few demographic questions. The instructions were defined at the beginning of the survey and informed consent was obtained. The participants were assured that their data will be kept confidential. The following instructions were given to the subjects - "Given below are some simple questions related to your daily routine and a few things you might experience daily. Please describe the answers to the best of your abilities or select the option that describes you the best. There are no right or wrong answers. The survey will take approximately 20 minutes to answer". After the collection and scoring of the responses, the correlation analysis was done using SPSS Software and the mediation analysis was done using SmartPLS Software.

ANALYSES

The data was analyzed using Statistical Package for Social Science (SPSS 21.0) where descriptive statistics and correlations test were used. Further, SmartPLS software was used to analyze the data using bootstrapping for conduction of mediation analysis and PLS algorithm for the calculation of model fit.

CHAPTER 5

RESULTS

Table No. 1 – Descriptive Statistics

	Mean	Std. Deviation	N
Total Screen Time	1706.4235	937.48038	170
Pittsburgh Sleep Quality Index	8.0353	4.69407	170
Positive Affect Scale	30.8824	7.08430	170
Negative Affect Scale	16.1176	3.70323	170
Physical Activity	1646.9882	912.23546	170
Physical Health	78.7749	12.71825	170
Psychological Health	68.9369	17.44143	170
Social Relationships	59.4604	18.59952	170
Environment	81.1471	12.45437	170

Table No. 1 shows the descriptive statistics. The sample included 170 participants. Mean score for total screen time is 1706.4235 (SD = 937.480), Pittsburgh sleep quality index was calculated at 8.0353 (SD = 4.694), positive affect scale with 30.882 (SD = 7.084), negative affect scale is 16.118 (SD = 3.703), physical activity is 1646.988 (SD = 912.235), physical health is 78.774 (SD = 12.718), social relationships at 59.461 (SD = 18.599) and environment with a mean score of 81.147 (SD = 12.454).

Table No. 2 – Correlations

	TST	PSQI	PAS	NAS	PA	PhyH	PsyH	SR	E
Total Screen Time (TST)	1								
Pittsburgh Sleep Quality Index (PSQI)	.304**	1							
Positive Affect Scale (PAS)	-.316**	-.291**	1						
Negative Affect Scale (NAS)	.055	.128	-.159*	1					
Physical Activity (PA)	-.462**	-.524**	.429**	-.071	1				
Physical Health (PhyH)	-.074	-.403**	.446**	-.188*	.435**	1			
Psychological Health (PsyH)	.033	-.222**	.442**	-.110	.279**	.604**	1		
Social Relationships (SR)	-.028	-.299**	.282**	-.135	.199**	.461**	.445**	1	
Environment (E)	.143	-.242**	.232**	.158*	.191*	.320**	.455**	.290**	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table No. 2 shows the correlations between the variables. Total screen time has a positive correlation with Pittsburgh sleep quality index ($r = 0.304$, $p<0.01$) and has a negative correlation with positive affect scale ($r = -0.316$, $p<0.01$) and physical activity ($r = -0.462$, $p<0.01$). Thus, we observe that total screen time has a negative correlation with sleep quality, positive affect and physical activity. Pittsburgh sleep quality index has significant negative correlations with positive affect scale ($r = -0.291$, $p<0.01$), physical activity ($r = -0.524$, $p<0.01$), physical health ($r = -0.403$, $p<0.01$), psychological health ($r = -0.222$, $p<0.01$), social relationships ($r = -0.299$, $p<0.01$) and environment ($r = -0.242$, $p<0.01$). therefore, it is concluded that sleep quality has a direct positive correlation with positive affect, physical activity and all the components of quality of life. Positive affect scale is negatively correlated with negative affect scale ($r = -0.159$, $p<0.05$) and positively correlated with physical activity ($r = 0.429$, $p<0.01$), physical health ($r = 0.446$, $p<0.01$), psychological health ($r = 0.442$, $p<0.01$), social relationships ($r = 0.282$, $p<0.01$) and environment ($r = 0.232$, $p<0.01$). thereby, it is noted that positive affect has a positive correlation with physical activity and the components of quality of life. Negative affect scale has a significant negative correlation with

physical health (r = -0.188, p<0.05) and a positive correlation with environment (r = 0.158, p<0.05). Physical Activity has a significant positive correlation with physical health (r = 0.435, p<0.01), psychological health (r = 0.279, p<0.01), social relationships (r = 0.199, p<0.01) and environment (r = 0.191, p<0.05). Physical Health has a significant positive correlation with psychological health (r = 0.604, p<0.01), social relationships (r = 0.461, p<0.01) and environment (r = 0.320, p<0.01). Psychological health has a significant positive correlation with social relationships (r = 0.445, p<0.01) and environment (r = 0.455, p<0.01). Social Relationships were found to have a significant positive correlation with environment (r = 0.290, p<0.01).

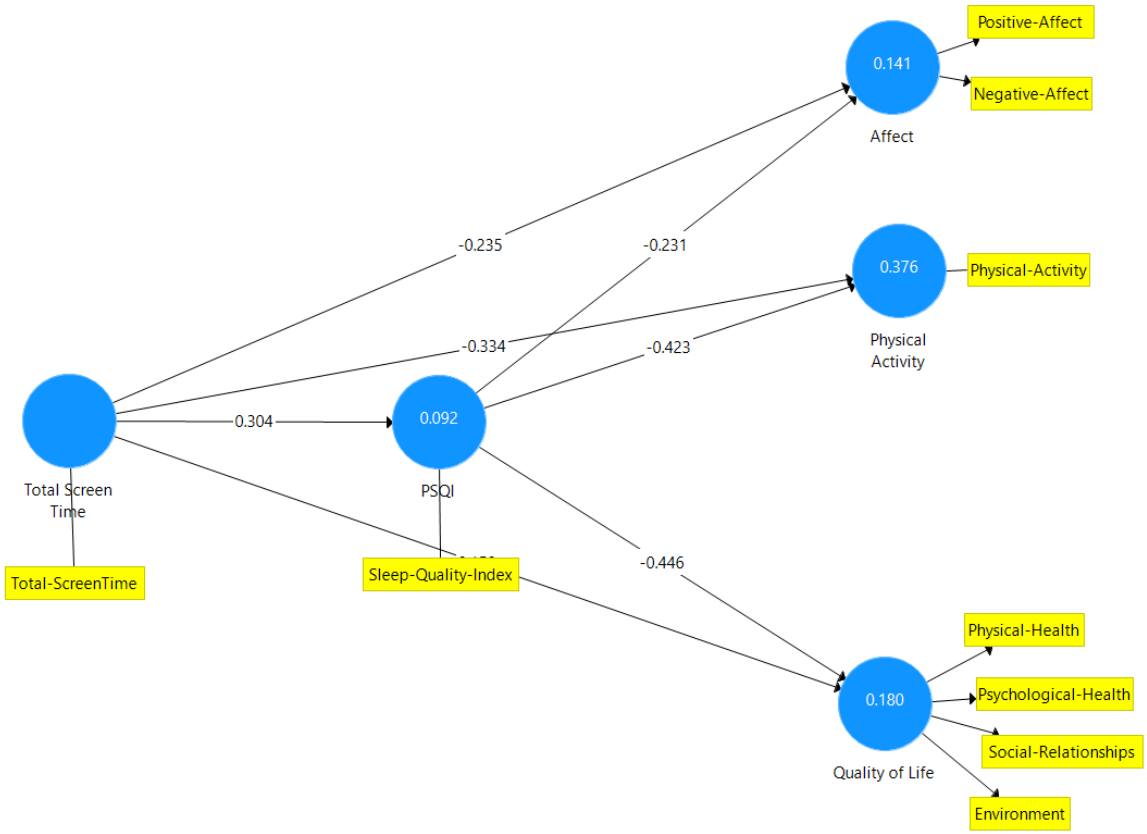

Figure No. 5 – Path Model showing results of mediation analysis

Figure 5 shows the mediation model, with total screen time as the independent variable, Pittsburgh sleep quality index as the mediating variable, affect, physical activity, and quality of life as the dependent variable. It shows the path coefficients and the R-square values. Here mediation analysis has been performed wherein the mediating effect of PSQI is observed. The direct, as well as indirect path coefficients, can be delineated from the figure.

Table No. 3 – Mediation Analysis- consistent bootstrap results for Path Coefficients between PSQI and Total screen time on Affect, Physical Activity and Quality of Life separately.

	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values
PSQI => Affect	-0.231	-0.236	0.084	2.740	0.006
PSQI => Physical Activity	-0.423	-0.429	0.051	8.245	0.000
PSQI => Quality of Life	-0.446	-0.451	0.071	6.243	0.000
Total Screen Time => Affect	-0.235	-0.236	0.078	3.027	0.003
Total Screen Time => PSQI	0.304	0.302	0.084	3.627	0.000
Total Screen Time => Physical Activity	-0.334	-0.332	0.059	5.665	0.000
Total Screen Time => Quality of Life	0.150	0.148	0.090	1.667	0.096

Table No. 4 – Mediation Analysis- consistent bootstrap results for indirect effects between Total screen time and affect, physical activity and quality of life through PSQI.

	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values
Total Screen Time => PSQI => Affect	-0.070	-0.072	0.035	2.010	0.045
Total Screen Time => PSQI =>Physical Activity	-0.129	-0.129	0.039	3.285	0.001
Total Screen Time => PSQI => Quality of Life	-0.135	-0.138	0.049	2.786	0.006

Table No. 3 shows the path coefficients. The direct effect of Pittsburgh sleep quality index (PSQI) was found to be significant on affect (β =-0.231, t = 2.740, p<0.01), physical activity (β = -0.423, t = 8.245, p<0.01) and on quality of life (β = -0.446, t = 6.243, p<0.01). The direct effect of total screen time was found to be significant on affect (β = -0.235, t = 3.027, p<0.01), PSQI (β =0.304, t = 3.627, p<0.01) and physical activity (β = -0.334, t = 5.665, p<0.01). However, the direct effect of total screen time on the quality of life was found to be insignificant

(β =0.150, t = 1.667, p<0.01). Thus, it can be concluded that there is a direct effect between PSQI and affect physical activity, and quality of life. Also, a significant direct effect was noted between total screen time and PSQI, affect, and physical activity. However, no direct effect was observed between total screen time and quality of life.

Table No. 4 shows that the indirect effect of total screen time via the mediating role of sleep quality index was found to be significant on affect (β = -0.070, t = 2.010, p<0.01), physical activity (β = -0.129, t = 3.285, p<0.01) and quality of life (β = -0.135, t = 2.786, p<0.01). Therefore, it is concluded that total screen time has a significant indirect effect on affect, physical activity, and quality of life via PSQI.

Thus, PSQI fully mediates the relationship between total screen time and quality of life. However, PSQI partially mediates the relationship between total screen time, affect, and physical activity.

Table No. 5 – Model Fit (Affect, physical activity, quality of life)

	Saturated Model	Estimated Model
SRMR	0.093	0.137
NFI	0.790	0.650
RMS Theta	0.253	

Table No. 5 shows the model fit. The SRMR value was calculated to be 0.093, the NFI value was calculated to be 0.790 and the RMS Theta value was calculated to be 0.253. For the model fit to be significant, the value of NFI needs to be above 0.9, the value of SRMR needs to be below 0.1 and the RMS Theta value needs to be below 0.05. Thus, the overall mediational model is not significant.

CHAPTER 6

DISCUSSION

The study was conducted to study the effect of screen time and sleep quality on affect, physical activity, and quality of life. Accordingly, it was hypothesized that total screen time will be negatively correlated with sleep quality. This hypothesis was accepted as sleep quality was found to be negatively correlated to the total screen time. Another study conducted by Y. Mao and B. Chen (2022), and others delved into the impact of sleep quality on the link between electronic screen media consumption and academic achievement among college students. The conclusion was that increased usage of electronic screen media for enjoyment resulted in decreased academic performance in college students, which was substantiated by its link to poor sleep quality. Therefore, it was concluded that the exposure to electronic screen media should be reduced before bedtime in college students and would prove to be quite beneficial.

The second hypothesis stated that total screen time will be negatively correlated with positive affect and positively correlated with negative affect. It was noted from the results that total screen time had a positive correlation with negative affect and a negative correlation with positive affect. Therefore, the second and third hypotheses were accepted. In a study by Li Xian, M. Buxton and others did research whereby they kept the sleep as the mediating variable and studied the association between the time spent viewing screens and the resultant depressive symptoms experienced by adolescents. The study examined the sleep characteristics such as sleep duration and other insomniac symptoms mediating the associations between depressive symptoms and screen-based activities. In the format of the result, it was noted that there was a comparative decrease in the depressive symptoms when we took both screen-based activities and sleep behaviors as the potential intervention targets.

Another hypothesis stated that total screen time had a negative correlation to physical activity. The result showed that there was a significant negative correlation between total screen time and the physical activity of an individual. Therefore, the fourth hypothesis was accepted. W.T. Barham, D.J. Buysse, and colleagues (2021) investigated how sleep health influences the association between physical activity and depression symptoms. Physical exercise and sleeping habits were found to be both predictors and mediators of depressive symptoms.

However, another hypothesis stated that the sleep quality of an individual will be positively correlated with positive affect. It was noted that the sleep quality index was negatively correlated with positive affect and therefore, hypothesis five was accepted. In the next

hypothesis, it was stated that the sleep quality of an individual will be positively correlated with physical activity and quality of life. On proper correlation, it was found that the sleep quality of an individual has a significant positive correlation with physical activity and quality of life. Therefore hypotheses, six and seven were accepted. Another hypothesis stated that the sleep quality of an individual will be positively correlated with the quality of life experienced by an individual. Therefore, the eighth hypothesis was accepted as there was a significantly positive correlation between sleep quality and all the four components of quality of life. When sleep was used as a mediator, N.D. Barlett, D.A. Gentile, and others (2012) looked at the impacts of screen time. It was discovered that screen time was negatively associated with health outcomes, with displaced sleep being one of the key mediators.

The ninth hypothesis stated that sleep quality would mediate the relationship between total screen time and the affect experienced by an individual. This hypothesis was partially accepted. It was noted that total screen time had a significant direct relationship as well as an indirect relationship via PSQI with affect. Therefore, partial mediation was observed in the scenario. A. Vandendriessche, A. Ghekiere, and colleagues (2019) investigated the relationship between school pressure, physical activity, screen time, and physiological symptoms in early adolescents, using sleep as a mediating component. School pressure and screen time were shown to be favourably associated with psychological symptoms in this 12-country study, but physical exercise was reported to be negatively associated. Except for sleep duration, sleep duration on weekdays and weekend days, as well as sleep initiation difficulties, all interactions between physical activity and psychological symptoms were significantly mediated. This study helps to explain how teenage psychological disorders are linked to school pressure, physical activity, and screen use. Another hypothesis stated that sleep quality would mediate the relationship between total screen time and the physical activity of an individual. However. It was observed that there was a direct relationship between both sleep quality and physical activity and total screen time and physical activity, thereby facilitating partial mediation. Thus, the tenth hypothesis was partially accepted. H. Xu, L.M. Wen, and colleagues (2016) investigated the relationship between outdoor play and screen time and nocturnal sleep duration and pattern in young children. It was concluded that cutting down on screen time and boosting outside playing could help children sleep better.

The last hypothesis hypothesized that sleep quality mediated the relationship between total screen time and the quality of life experienced by an individual. This hypothesis was accepted. It was noted that total screen time didn’t have a direct relationship with quality of life until

mediated by the sleep quality index. A study by L. Lund, D. Danielsen, and others systematically reviewed electronic media use and sleep in children and adolescents in western countries. It was concluded that shorter sleep duration was usually associated with electronic media use in both children and adolescents. The studies with higher quality and a stronger research design would require drawing solid conclusions about the impact of electronic media on sleep outcomes. The possible detrimental influence of electronic media devices used excessively and close to bedtime on children's sleep could be promoted through interventions. Thus, one may say for a good study structure, one would require to focus more on the time spent on electronic media usage.

CHAPTER 7: CONCLUSION, IMPLICATIONS, LIMITATIONS AND DIRECTIONS FOR FUTURE WORK

CONCLUSION

The present study aimed to study the effect of total screen time and sleep quality on affect, physical activity, and quality of life of an individual. The study was designed keeping in mind the current pandemic situation and therefore the increased exposure to screens daily. Keeping the results in view, it can be said that increased screen time significantly impacts various aspects of human life ranging from all physical impacts to the mental impact on an individual. It was noted that increased total screen time resulted in a decreased quality of sleep, increased negative affect experienced by individuals, lower engagement in physical activity, and turn a decreased quality of life. As the situation keeps on evolving and the dependence on screens and emphasis stays on online work mode, further investigation is called for.

IMPLICATIONS

The findings indicate that increased screen time negatively impacts the sleep quality of an individual which therefore impacts the quality of life experienced by an individual. More studies and research should be conducted considering the recent increase in exposure to screen time considering the whole world shifting to online work mode for function. The increased screen time leads the individuals to an increased negative affect. People spending more time on the screen engage in lower amounts of physical activity. However, those with a good sleep quality were noted to have experienced higher positive affect and engaged in a greater amount of physical activity, therefore a better quality of life. Therefore, it may be safe to imply that total screen time impacts the sleep quality, affect, physical activity, and quality of life of an individual negatively. More literature should be provided in the Indian context. The Western scales may be developed further to have an Indian adaptation. Increasing the sample size may yield better results. In this study, only literate adults were considered. The aspect of exploring more dimensions too seems promising.

LIMITATIONS

The lockdown imposed due to the worldwide covid-19 pandemic proved to be a challenge while conducting the study. This resulted in an inability to conduct face-to-face interviews preventing us from obtaining any qualitative data. Random sampling could not be done and convenient sampling had to be employed since the experiment was conducted online which thereby may have shortcomings. The purpose of the study was heavily reliant on technology. The selection of responses by the individuals for the google forms could have fallen prey to the struggle with technology. A scale for measuring the sleep quality index, particularly of the Indian population wasn't available. The exact amount of exposure to the screen can not be measured precisely. Also, the sample size is not large enough to promise generalizability to the Indian population. Furthermore, there is little amount of literature available in the Indian context. The latest data of research hasn't been explored to its full capacity. This study has been performed using western scales which may or may not be completely applicable to the Indian context.

SCOPE FOR FUTURE RESEARCH

The present study investigated the effect of total screen time and sleep quality with effect, physical activity, and quality of life in the post-pandemic era. However, with the ever-changing time and increased exposure to screens, further investigation is called for. This study considered only three factors that were influenced by total screen time and sleep quality and future research should consider including other factors that are impacted by increased exposure to screens or by decreased sleep quality and, whether the reasons for observed differences, if any, are similar to or different to the present study. Also, the increased screen time exposure seems to be a promising area of research given the current trend of the world functioning online. Sleep quality may be continued to be used as a sensitive measure for studying the same. Further, variables other than effect, physical activity, and quality of life can be undertaken with an aim to further delineate the causal relationship between total screen time and quality of sleep. Additionally, the sleep quality index as a mediating variable needs to be explored further across affect and physical activity engaged by an individual in-depth. A reliable Indian version measuring the sleep quality index might offer immense promise for future research.

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APPENDIX A: TOTAL SCREEN TIME QUESTIONNAIRE

For the following set of questions, ***primary activity*** is defined as the main activity you are engaged in rather than using a television/other screen in the background while performing another activity such as cooking or exercising.

Screen use on an average weekday

Thinking of an average weekday (from when you wake up until you go to sleep), how much time do you spend using each of the following types of screen as the primary activity?
You must answer both hours and minutes. **If zero please type "0" in the box.**

	Hours	Minutes
Television		
TV-connected devices (e.g. streaming devices, video game consoles)		
Laptop/computer		
Smartphone		
Tablet		

Screen use on an average weeknight

Now, thinking of an average weeknight (from when you return from work until you go to sleep), how much time do you spend using each of the following types of screen as the primary activity?
You must answer both hours and minutes. **If zero please type "0" in the box.**

	Hours	Minutes
Television		
TV-connected devices (e.g. streaming devices, video game consoles)		

Laptop/computer		
Smartphone		
Tablet		

Screen use on an average weekend day

Now, thinking of an average weekend day (Saturday or Sunday), how many hours over the course of the whole day (from when you wake up until you go to sleep) do you spend using each of the following types of screen as the primary activity? You must answer both hours and minutes. **If zero please type "0" in the box**.

	Hours	Minutes
Television		
TV-connected devices (e.g. streaming devices, video game consoles)		
Laptop/computer		
Smartphone		
Tablet		

For the following set of questions, **background screen** is defined as the use of a television or another screen near you while performing other activities such as exercising, cooking, and interacting with family/friends.

Thinking about a regular weekday (Monday through Friday), on average, how many hours **over the course of the whole day** (from when you wake up until you go to sleep) are you exposed to background screen use?

Example: If you exercise in the morning for one hour while watching the TV news, you use your smartphone for one hour while eating lunch and an additional 30 minutes while eating dinner, you would estimate that you are exposed to 2 hours and 30 minutes of background screen use per day.

	Hours	Minutes
Background screen use on a regular weekday		

Now we want to ask about background screen use **during the evening specifically**. On average, how many hours per evening (Monday through Friday) are you exposed to background screen use from when you return from work until you go to sleep?

Example: If you regularly prepare dinner with the television on for one hour, and you keep the television on for an additional hour while using your smartphone for social media use, you can estimate that you are exposed to 2 hours of background screen use every evening.

	Hours	Minutes
Background screen use on a regular weeknight		

Now we want to ask about background screen use **during the weekend**. Thinking about a regular weekend day (Saturday or Sunday), on average, how many hours over the course of the whole day (from when you wake up until you go to sleep) are you exposed to background screen use?

Example: If you have the television on while you do some online shopping for two hours, and you keep the television on when friends come over to visit for an additional two hours, you can estimate that you are exposed to 4 hours of background screen use every evening.

	Hours	Minutes
Background screen use on a regular weekend day		

APPENDIX B: PITTSBURGH SLEEP QUALITY INDEX (PSQI)

PITTSBURGH SLEEP QUALITY INDEX (PSQI)

INSTRUCTIONS: The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

1. During the past month, when have you usually gone to bed at night?

   USUAL BED TIME _____

2. During the past month, how long (in minutes) has it usually take you to fall asleep each night?

   NUMBER OF MINUTES _____

3. During the past month, when have you usually gotten up in the morning?

   USUAL GETTING UP TIME _____

4. During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spend in bed.)

   HOURS OF SLEEP PER NIGHT _____

INSTRUCTIONS: For each of the remaining questions, check the one best response. Please answer all questions.

5. During the past month, how often have you had trouble sleeping because you...

	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
(a) ...cannot get to sleep within 30 minutes	☐	☐	☐	☐
(b) ...wake up in the middle of the night or early morning	☐	☐	☐	☐
(c) ...have to get up to use the bathroom	☐	☐	☐	☐
(d ...cannot breathe comfortably	☐	☐	☐	☐
(e) ...cough or snore loudly	☐	☐	☐	☐
(f) ...feel too cold	☐	☐	☐	☐
(g) ...feel too hot	☐	☐	☐	☐
(h) ...had bad dreams	☐	☐	☐	☐
(i) ...have pain	☐	☐	☐	☐
(j) Other reason(s), please describe _____ _____				
How often during the past month have you had trouble sleeping because of this?	☐	☐	☐	☐

	Very good	Fairly good	Fairly bad	very bad
6. During the past month, how would you rate your sleep quality overall?	☐	☐	☐	☐

	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
7. During the past month, how often have you taken medicine (prescribed or "over the counter") to help you sleep?	☐	☐	☐	☐
8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?	☐	☐	☐	☐

	No problem at all	Only a very slight problem	Somewhat of a problem	A very big problem
9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?	☐	☐	☐	☐

	No bed partner or roommate	Partner/ roommate in other room	Partner in same room, but not same bed	Partner in same bed
10. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?	☐	☐	☐	☐

If you have a roommate or bed partner, ask him/her how often in the past month you have had...

	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
(a) ...loud snoring	☐	☐	☐	☐
(b) ...long pauses between breaths while asleep	☐	☐	☐	☐
(c) ...legs twitching or jerking while you sleep	☐	☐	☐	☐
(d) ...episodes of disorientation or confusion during sleep	☐	☐	☐	☐
(e) Other restlessness while you sleep; please describe	☐	☐	☐	☐

_____

_____

APPENDIX C: POSITIVE AND NEGATIVE AFFECT SCALE

THE OHIO STATE UNIVERSITY

Positive and Negative Affect Schedule (PANAS-SF)

Indicate the extent you have felt this way over the past week.		Very slightly or not at all	A little	Moderately	Quite a bit	Extremely
PANAS 1	Interested	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PANAS 2	Distressed	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PANAS 3	Excited	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PANAS 4	Upset	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PANAS 5	Strong	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PANAS 6	Guilty	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PANAS 7	Scared	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PANAS 8	Hostile	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PANAS 9	Enthusiastic	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PANAS 10	Proud	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PANAS 11	Irritable	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PANAS 12	Alert	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PANAS 13	Ashamed	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PANAS 14	Inspired	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PANAS 15	Nervous	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PANAS 16	Determined	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PANAS 17	Attentive	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PANAS 18	Jittery	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PANAS 19	Active	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PANAS 20	Afraid	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

APPENDIX D: INTERNATIONAL PHSYICAL ACTIVITY QUESTIONNAIRE

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

1. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

   _____ **days per week**

   ☐ No vigorous physical activities → ***Skip to question 3***

2. How much time did you usually spend doing **vigorous** physical activities on one of those days?

   _____ **hours per day**

   _____ **minutes per day**

   ☐ Don't know/Not sure

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

3. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

   _____ **days per week**

   ☐ No moderate physical activities → ***Skip to question 5***

SHORT LAST 7 DAYS SELF-ADMINISTERED version of the IPAQ. Revised August 2002.

4. How much time did you usually spend doing **moderate** physical activities on one of those days?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.

5. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time?

_____ **days per week**

☐ No walking → ***Skip to question 7***

6. How much time did you usually spend **walking** on one of those days?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

The last question is about the time you spent **sitting** on weekdays during the **last 7 days**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7. During the **last 7 days**, how much time did you spend **sitting** on a **week day**?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

This is the end of the questionnaire, thank you for participating.

APPENDIX E: WHO QUALITY OF LIFE SCALE - BRIEF

WHO Quality of Life Scale-Brief

Before we begin we would like to ask you to answer a few general questions about yourself by circling in the correct answer or by filling in the space provided.

1. What is your gender? Male Female

2. What is your date of birth? _____ / _____ / _____
Day Month Year

3. What is the highest education you received?
None at all
Elementary School
High School
College
Graduate/Professional Degree

4. What is your marital status?
Single Separated
Married Divorced
Living as Married Widowed

5. Are you currently ill? Yes No

6. If something is wrong with your health, what do you think it is? _____ illness/problem

Instructions: This questionnaire asks how you feel about your quality of life, health, or other areas of your life. Please answer all of the questions. If you are unsure about which response to give to a question, please choose the one that appears most appropriate. This can often be your first response.

Please keep in mind standards, hopes, pleasures, and concerns. We ask that you think about your life in the last two weeks. For example, thinking about the last two weeks a question might ask:

Do you get the kind of support from others that you need?

(Please circle the number)				
Not at all	A little	Moderately	Mostly	Completely
1	**2**	**3**	**4**	**5**

You should circle the number that best fits how much support you got from others over the last two weeks. So you would circle the number 4 if you got a great deal of support from others.

Do you get the kind of support from others that you need?

(Please circle the number)				
Not at all	A little	Moderately	Mostly	Completely
1	**2**	**3**	**(4)**	**5**

You would circle number 1 if you did not get any of the support that you needed from others in the last two weeks.

Do you get the kind of support from others that you need?	*(Please circle the number)*				
	Not at all	A little	Moderately	Mostly	Completely
	①	2	3	4	5

Please read each question, assess your feelings, and circle the number on the scale that gives the best answer for you for each question.

lse

1. How would you rate your quality of life?

(Please circle the number)				
Very poor	Poor	Neither poor nor good	Good	Very Good
1	2	3	4	5

lse

2. How satisfied are you with your health?

(Please circle the number)				
Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
1	2	3	4	5

The following questions ask about **how much** you have experienced certain things in the last two weeks.

	(Please circle the number)				
	Not at all	A little	A moderate amount	Very much	An extreme amount
lse 5 **3.** To what extent do you feel that physical pain prevents you from doing what you need to do?	1	2	3	4	5
lse .4 **4.** How much do you need any medical treatment to function in your life?	1	2	3	4	5
lse 2 **5.** How much do you enjoy life?	1	2	3	4	5
lse 1.3 **6.** To what extent do you feel your life to be meaningful?	1	2	3	4	5
lse 6 **7.** How well are you able to concentrate?	1	2	3	4	5

	(Please circle the number)				
	Not at all	Slightly	A moderate amount	Very much	Extremely
	1	**2**	**3**	**4**	**5**
8. How safe do you feel in your daily life?					
9. How healthy is your physical environment?	**1**	**2**	**3**	**4**	**5**

The following questions ask about **how completely** you experience or were able to do certain things in the last two weeks.

	(Please circle the number)				
	Not at all	A little	Moderately	Mostly	Completely
10. Do you have enough energy for everyday life?	**1**	**2**	**3**	**4**	**5**
11. Are you able to accept your bodily appearance?	**1**	**2**	**3**	**4**	**5**
12. Have you enough money to meet your needs?	**1**	**2**	**3**	**4**	**5**
13. How available to you is the information that you need in your day-to-day life?	**1**	**2**	**3**	**4**	**5**
14. To what extent do you have the opportunity for leisure activities?	**1**	**2**	**3**	**4**	**5**

	(Please circle the number)				
	Very poor	Poor	Neither poor nor well	Well	Very well
15. How well are you able to get around?	**1**	**2**	**3**	**4**	**5**

The following questions ask you to say how **good** or **satisfied** you have felt about various aspects of your life over the last two weeks.

	(Please circle the number)				
	Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
16. How satisfied are you with your sleep?	**1**	**2**	**3**	**4**	**5**
17. How satisfied are you with your ability to perform your daily living activities.	**1**	**2**	**3**	**4**	**5**

	(Please circle the number)				
	Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
18. How satisfied are you with your capacity for work?	**1**	**2**	**3**	**4**	**5**
19. How satisfied are you with yourself?	**1**	**2**	**3**	**4**	**5**
20. How satisfied are you with your personal relationships?	**1**	**2**	**3**	**4**	**5**
21. How satisfied are you with your sex life?	**1**	**2**	**3**	**4**	**5**
22. How satisfied are you with the support you get from your friends?	**1**	**2**	**3**	**4**	**5**
23. How satisfied are you with the conditions of your living place?	**1**	**2**	**3**	**4**	**5**
24. How satisfied are you with your access to health services?	**1**	**2**	**3**	**4**	**5**
25. How satisfied are you with your mode of transportation?	**1**	**2**	**3**	**4**	**5**

The following question refers to **how often** you have felt or experienced certain things in the last two weeks.

	(Please circle the number)				
	Never	Seldom	Quite often	Very often	Always
26. How often do you have negative feelings, such as blue mood, despair, anxiety, depression?	**1**	**2**	**3**	**4**	**5**

Did someone help you to fill out this form? *(Please circle Yes or No)* Yes No

How long did it take you to fill out this form? _____minutes