



# Short Video Use and its Impacts on the Developing Brain: A Multi-centric Study from India (SVUBIN)

SVUBIN Study Protocol Version 1.0

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## **PROTOCOL SUMMARY**

<b>Study Title</b>	Short Video Use and its Impacts on the Developing Brain: A Multi-centric Study from India (SVUBIN)
<b>Introduction</b>	Short-form videos are 15-90 second video clips that are created and shared through social media applications. They have become a growing trend in recent years. The dynamic nature of these videos can make them irresistible to young children and toddlers, who may not be able to regulate their usage themselves. Short-form videos are designed to be addictive, with features such as endless scrolling, personalized recommendations, and short attention spans. The first five years of life are crucial for children's cognitive and psychosocial development. The effects of screen time via smartphones on this group of children can lead to problems in their psychosocial development.
<b>Aim</b>	The aim of this study is to investigate the impact of short-form video use on the mental health of young children aged 1.5 to 5 years, by exploring the patterns, characteristics, and various mental health outcomes related to its usage.
<b>Objectives</b>	<ol style="list-style-type: none"><li>1. To describe the patterns and characteristics of short-form video use in young children aged 1.5 to 5 years.</li><li>2. To identify potential socio-demographic variables that may influence the usage patterns and effects of short-form video use in these children.</li><li>3. To identify problematic use of short-video apps in these children.</li><li>4. To examine the associations between short-form video use and mental health outcomes, such as conduct disorder, hyperactivity, depression, anxiety, and autism in these children.</li></ol>
<b>Study Design</b>	Multi-center, cross-sectional, observational, single-visit study design.
<b>Study Setting</b>	Study will be conducted in multiple centers across India. Data will be collected by collaborators from different centers across the country. They will collect the data from caretakers of pediatric patients who are admitted to pediatric inpatient wards after getting ethical clearance from their respective centers. The questionnaires will be administered to the parents via face-to-face interviews.
<b>Inclusion and Exclusion Criteria</b>	Caretakers of children more than 1.5 years and less than 5 years of age are included in the study. Caretakers of children with medical or neuropsychiatric diagnoses that could affect neuropsychomotor development (intellectual disability, language disorder, psychomotor development delay) are excluded.

<p><b>Outcome methods</b></p>	<p><b>Socio-Demographic details:</b> Caretaker’s age, the highest level of education, relationship to the child (e.g., mother, father, foster parents, other relative, etc.), and family income will be assessed. Caretakers will also report on their child’s sex, age, and other socio-demographic information.</p> <p><b>Problematic Media Use:</b> Caretakers will report on their children's problematic media use using the Problematic Media Use Measure Short Form (PMUM-SF). The PMUM-SF is a nine-item questionnaire developed based on the criteria suggested for internet gaming disorder (IGD) in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5). Parents rate each item on a five-point Likert scale from 1 (Never) to 5 (Always). Items are added up and higher scores indicate increased problematic media use by young children. The scale shows adequate reliability (<math>\alpha = .80</math>).</p> <p><b>Child psychosocial functioning:</b> Caretakers will complete the Strengths and Difficulties Questionnaire [SDQ; Goodman, 1997 (11)], a 25-item instrument that assesses five domains of child functioning: emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and pro-social behaviors. Response options for SDQ are: <i>Not True</i> (= 0), <i>somewhat True</i> (= 1), and <i>Certainly True</i> (= 2). The total difficulty score shows adequate reliability (<math>\alpha = .80</math>).</p> <p><b>Autism-like features:</b> The Modified Checklist for Autism in Toddlers, Revised (M-CHAT-R) is a validated screening tool used to assess the risk of Autism Spectrum Disorder (ASD) in children from 6 months to 6 years old. The M-CHAT-R consists of 20 questions that are answered by a parent or caregiver. It has been used to find an association between device screen time and autism-like features in young children.</p>
<p><b>Sample size</b></p>	<p>A minimum of 275 caretakers needs to be interviewed to find a problematic use of 23.3% of the population with a type I error of 0.05 and precision of 0.05.</p>
<p><b>Ethical consideration</b></p>	<p>Ethical approval will be obtained from each center before the data collection procedure. Consent will be obtained from the caretakers of children willing to participate in the study. All collected data will be kept anonymised through a secure online platform.</p>

## **INTRODUCTION**

Short-form videos have become a growing trend in recent years, with platforms such as TikTok, YouTube Shorts, and Instagram Reels attracting billions of users worldwide. While short videos can provide quick entertainment and information, the dynamic nature of these videos can make them irresistible to young children and toddlers, who may not be able to regulate their usage themselves. Smartphones are like candy for young children's eyes and minds: they can't get enough of them (1,2). It is because they are portable, interactive and ubiquitous with access to the entire world through the internet (3). Parents also love to use smartphones as pacifiers: just hand one over to a restless child and watch them calm down and get distracted, while the parents can get on with their own works (4). The easy availability of short videos in multiple smartphone apps allows them to be accessed and watched frequently while making moderation difficult for parents. The small size and portability of mobile phones make it easy for children to watch videos alone, which makes it even more difficult for parents to supervise and monitor (5).

Evidence for the negative impacts of screen time in young children is already well established, but this form of media consumption is incomparable to screen time on television, as short videos are more addictive, personalized, novel, and interactive. Short-form videos are designed to be addictive, with features such as endless scrolling, personalized recommendations, and short attention spans. They present novel user-generated content, which provides almost endless novelty, which can lead to children spending hours each day watching short videos, at the expense of other activities such as playing, learning, and socializing. This can interfere with children's social development, as they may spend less time interacting with others in person.

The widespread use of smartphones and tablets among young children has led to concerns about the potential for negative impacts on their physical and psychosocial development. However, research into the potential benefits and harms of screen time for children is still in its early stages, and the rapid pace of technological development makes it difficult to keep up (6). The first five years of life are crucial for children's cognitive and psychosocial development, as their brains are more flexible and capable of forming new neural connections and acquiring new skills (7-9). During this period, children also develop habits and preferences around screen time that can influence their future screen use, as well as other health-related behaviors such as nutrition and physical activity (5). During this period, children also develop habits and preferences around screen time that can influence their future screen use, as well as other health-related behaviors such as nutrition and physical activity (5). However, there is a lack of research on how smartphone use, which is a common form of screen time, may have positive or negative effects on children's development.

The purpose of this research is to conduct a cross-sectional observational study on the effects of short-form video use on young children on their mental health and development. The study will involve a sample of children aged 1.5-5 years old whose caretakers will be interviewed on their child's short-video usage patterns. The study will also investigate the potential mediating factors of short-form video addiction, such as family environment, socio-economic status, and other demographic details. Caretakers will report on their child's problematic short-form video use using the Problematic Media Use Measure Short Form (PMUM-SF) (10). We will administer the Strengths and Difficulties Questionnaire (SDQ) (11) to assess the psychosocial functioning of the

children. This is a 25-item instrument that evaluates five domains of child behavior: emotional symptoms, hyperactivity/inattention, peer relationship problems, conduct problems, and pro-social behaviors. Autism-like features will be evaluated using Modified Checklist for Autism in Toddlers, Revised (MCHAT-R) (12).

The findings of this study will provide important information about the potential risks of short-form video addiction in young children. This information can be used by policymakers, educators, parents, and health professionals to develop interventions and prevention strategies to protect children from the negative effects of short-form video addiction.

## **AIM**

The aim of this study is to investigate the impact of short-form video use on the mental health of young children aged 1.5 to 5 years, by exploring the patterns, characteristics, and various mental health outcomes related to its usage.

## **OBJECTIVES OF THE STUDY**

1. To describe the patterns and characteristics of short-form video use in young children aged 1.5 to 5 years.
2. To identify potential socio-demographic variables that may influence the usage patterns and effects of short-form video use in these children.
3. To identify problematic use of short-video apps in these children.
4. To examine the associations between short-form video use and mental health outcomes, such as conduct disorder, hyperactivity, depression, anxiety, and autism in these children.

## **BACKGROUND AND RATIONALE**

Short-form videos are 15-90 second video clips that are created and shared through social media applications. They are one of the latest movements in the current social media landscape. Several studies have shown that short videos on mobile devices captivate user attention and engagement more than other forms of content (13–16). TikTok was one of the first applications that started the trend of short video sharing and viewing (17). It allowed users to create 15-second videos that could be enhanced with a variety of features, including filters, emojis, and music. By doing this, TikTok allowed users to create videos that are more creative, engaging, and personal. The app has become immensely popular, with users from all walks of life enjoying it for its entertainment value. India was a major market for TikTok, with over 99 million active users of all ages and genders in 2020 (18). However, the app was banned in India in 2020 following a border conflict between China and India citing concerns about data privacy, and spread of indecent content, and the potential for the app to corrupt young people (19).

The success of TikTok showed that there was a demand for short-form, user-generated video content. This led other social media platforms to invest in their own short-form video products. Instagram Reels and YouTube Shorts are two examples of this trend. Instagram Reels quickly became a potential competitor to TikTok after its launch because it had a similar user interface. (20). Further, the number of active Instagram users in India almost tripled from 80 million in 2020 (21) to 230 million in 2023 (22). This growth made India the country with the most number of Instagram users in the world. The possible reasons for this growth could be the ban of TikTok in 2020, the COVID-19 pandemic, and the increasing internet penetration in the country. Almost nine in ten TikTok users who have used Instagram Reels say that the two platforms are essentially identical (23).

There are several reasons why short-form video applications have gained popularity. They facilitate effortless consumption of an infinite amount of content. To achieve this, users can easily move from one content to the next with a swipe of a finger without an end, something known as “the infinite scroll” (24). First introduced by Aza Raskin in 2006, the infinite scroll has become a ubiquitous feature on social media apps. It allows users to keep scrolling through content without having to worry about running out of new items to see. These apps use data mining (typically algorithms) to track users' behavior and identify usage patterns. This information is then used to recommend videos that the algorithm thinks users will like (25,26). This can be a very effective way to keep users engaged and addicted, as they are constantly being shown videos that they are interested in (27). However, it can also be seen as exploitative, as users are essentially being manipulated into watching more videos, so that these apps can sell more ads to generate revenue. One of the few studies that specifically examined the effects of TikTok on the brain found that personalized videos, which are recommended to users based on their interests, showed higher brain activation in the reward centers of the brain than general-interest videos (28). Moreover, pathological Internet use (29), mobile phone use (30), and social media addiction (31) are already established in the literature. There is an increasing trend in researches on specific problematic online activities, such as online gaming disorder (32), online gambling disorder (33), Facebook addiction (34), Instagram addiction (35), and YouTube Addiction (36,37). It is thereby imperative to discuss the role of short-form videos in these social media applications for their potential to accentuate addictive behaviors (38).

The ubiquity of smartphones is a major reason for the recent surge in short-form video viewing. Based on a survey conducted in the US in 2020 by the Pew Research Centre, over a third of parents with a kid below 12 confessed that their little one started playing with a phone before turning 5 (39). Apart from using and engaging with a smartphone, nearly one in five parents of a child 11 years or younger (17%) admit that their child has their own smartphone (39). A 2022 study by McAfee found that 83% of Indian children between the ages of 10 and 14 use smartphones, which is 7% higher than the global average of 76% (40). The study was conducted across 10 different countries and surveyed over 10,000 parents and children. Based on a study by the National Commission for Protection of Child Rights (NCPCR) among 1000 members from various places across the country, it was found that 30% of children between the age groups of 8-18 years already possess their own smartphones (41). According to the Economic Survey 2020-21, the percentage of enrolled children from government and private schools in rural India who owned a smartphone increased dramatically from 36.5% in 2018 to 61.8% in 2020 (42). Another survey published in August 2023 conducted by the Delhi-based Development Intelligence Unit (DIU) on children aged 6–16 in rural communities across 20 states and union territories in India revealed that 76.7% of children that have access to smartphones, use them for entertainment (43). This increase can be attributed to the need for smartphones for online learning during the COVID-19 pandemic.

A young child develops in a social environment and learns through relationships (44), and now more than ever, this environment is surrounded by screens. A child's first screen experiences are changeable because the habits of exposure and usage (45,46) that they establish at this age can become habitual and become a potential for problematic use and associated problems later on in life (47,48). Because parents are mostly in charge of screens at this age, children's screen time is easier to change than it will be later (49,50). Several studies have suggested that increased screen time in young children is associated with negative health outcomes (51,52) such as decreased cognitive ability (53–55), impaired language development (56,57), autistic-like behavior (58) including hyperactivity(59), and short attention span (60) and social/emotional delays (61–64) leading to mood-related issues and irritability. Studies on older children have shown that excessive screen time can be linked to behavioral and developmental problems. However, the research on infants and toddlers is less clear, as there is not enough data to draw firm conclusions.

The American Academy of Pediatrics (AAP) recommends that toddlers under the age of 18 to 24 months should not have access to digital media, except for video chatting. For preschoolers (ages 2 to 5 years), the AAP recommends limiting screen time to one hour per day of high-quality programming. (65). The French Academy of Sciences recommends completely avoiding screens before the age of 24 months (66). However, it is alarming to note that almost all parents proudly report that their children aged below 2 years can enjoy electronic media without effort. Prior research suggests that children's screen use reflects their parent's use (67–69). In fact, parents' mobile phone use can also influence children indirectly by affecting parent-child interactions (70). Smartphone use can have a two-way relationship with child- and parent-related factors (71). For instance, parents might hand over a screen to calm down a fussy child, and then get used to using devices as a quick fix for behavior problems (6,72,73). Research has shown that using smartphones as electronic pacifiers, shut-up, or babysitters can slow down the growth of self-control skills (6). Parents might also keep their child indoors because they worry about their child's safety. This kind of over-anxious parenting has been referred to as helicopter parenting.



While being over-protective on their children, they may limit their children's opportunities to explore and play independently. Thereby it affects how parents choose to substitute outdoor play with indoor play on smartphones and tablets for their children (74).

Although there are several studies on the effects of screen time on television, studies on the impact of mobile phone use are limited and widely underestimated. New guidance is needed for the regulation in use of smartphones by infants, toddlers, and preschool-aged children because it differs from television in its multiple modalities, interactive capabilities, personalized content, and near ubiquity in their lives. The effects of screen time via smartphones on this group of children are potentially more pronounced, so it is especially crucial to provide recommendations for its use.

## **REVIEW OF LITERATURE**

Works of literature on the impacts of short-form videos are limited. One of the few studies that specifically examined the effects of TikTok on the brain found that personalized videos, which are recommended to users based on their interests, showed higher brain activation in the reward centers of the brain than general-interest videos (28). The results of this study suggested that the recommendation algorithm of these apps helps activate a specific set of brain regions, including the default mode network and the ventral tegmental area, which can reinforce the behavior of watching more videos. There is existing literature that documents addiction-like behaviors associated with other digital applications, such as internet gaming (32,75,76), Facebook (34,77,78), and YouTube (36,37,79). However, there are very few studies on problematic short video-watching behaviors, partly because short-video apps have only been emerging in recent years.

Substance use disorders are often thought to progress from initial reinforced learning to habit, and then to compulsive use with prolonged engagement (80). Similarly, it is theorized that excessive use of digital apps like TikTok may alter learning systems and memory circuits, gradually transforming recreational use into a habit, and then into compulsion in vulnerable individuals (81). However, the initial reinforcement and corresponding neural activation elicited by recommended contents have not been fully understood. Rapid and constant switching of images may have a direct negative impact on the development of young children's brains predisposing them to attention deficit and hyperactivity features later on in life (82).

Other works of literature on short video overuse include one done by Zhang, Wu, and Liu, who concludes that attachment to other users and to the app itself had a significant positive impact on short-form video app addiction (38). Another study by Yang et al. evaluates several forms of videos including short-form videos and concludes that short-form video use was associated with addiction-like symptoms (83). Huang, Hu, and Chen identify that stress is associated with problematic short video use in middle-aged adults (84). Based on a study conducted on Chinese vocational college students it was found that short video flow and addiction can have a negative impact on learners' motivation and well-being (85). It was also noted in the study that the short-video flow experience contributed to short-video addiction. However, there has not been any detailed research on the impact of short videos, particularly in young children. It should be considered that infants and toddlers may exhibit problematic or at-risk media patterns without necessarily being addicted. These early patterns can lead to disordered or addictive media patterns in adolescence or adulthood (86).

Problematic media use is when a child's media use is so excessive that it interferes with their social, behavioral, and/or academic development (86). This can include behaviors such as losing interest in other activities, being preoccupied with media, withdrawing from others, having a high tolerance for media, and lying about their media use (10). Although the use of media devices has become common among people of all ages, most studies on problematic online behaviors have focused on adolescents, young adults, and adults. Extensively studied problematic online behaviors include Internet addiction (87–90), problematic Internet use (91–94), problematic gaming (95,96), gaming addiction (97,98), problematic smartphone use (99), and problematic social media use (100). However, there have been very few studies on Problematic Media Use in children (10,101), even though researchers and pediatricians have

warned about the risks associated with excessive media exposure in children (102). Although there have been some literature reviews on problematic smartphone use (103) and Internet gaming disorder (104) in both children and adolescents, these studies have focused on children over the age of 10. There is little research on Problematic Media Use in children under the age of 10 because this is a relatively new area of research (10,101). The COVID-19 pandemic has led to increased use of digital devices in all age groups, and this may have increased the risk of problematic and addictive media use in children (105–108). More research is needed to understand if this prevalence is significant (109).

Moreover, there are several studies on the impacts of young children on excessive screen use. Although evidence on the neuroanatomical and physiological effects of early, intensive exposure to screen media is mixed (110–112), research on how children younger than 5 years old learn from screens has advanced in recent years (6,113,114). Babies cannot absorb screen content, but digital media can catch and hold their attention. Children under 2 years old can remember brief sequences and imitate screen behaviors and emotions (114,115). By the end of their second year, toddlers begin to understand screen content (47,116), but they still have difficulty transferring what they see from screens to real life and do not learn efficiently from screen media (115,117–119). On the other hand, they learn intensely through face-to-face interaction with parents and caregivers. Early learning is easiest, most enlightening, and most efficient developmentally when experienced live with real people (65,120–122).

### **Impact on Development**

A recent meta-analysis found that babies who were exposed to more screen time had lower language skills at 3 to 4 years old (123). Other studies have also found a link between early screen exposure and delayed language acquisition, as well as lower vocabulary and grammar scores (65,123–125). One study found that 18-month-old children who used mobile media devices had lower expressive language skills (126). The article published by Madigan et al suggests that increased screen time precedes any developmental delays, rather than children with poor developmental performance subsequently engaging in more screen time (127). One study found that toddlers who were exposed to multiple media forms had shorter attention spans (128). Attention is important for the development of executive function skills in later childhood, and toddlerhood may be a critical period for establishing these skills (129). Studies suggest that there is no evidence for the benefits of screen time for infants and toddlers, except for interactive video chatting with loved ones who are far away (53,123,124,126,130).

Studies have shown that excessive screen time is associated with an increased risk of autism spectrum disorder (ASD) and other negative developmental outcomes (53,56,58,60,111,131). Recent studies have found that Screen time can hinder the development of social skills in young children and make it difficult for them to learn how to interact with others (132–134). A recent study found that toddlers who watched TV or videos for three hours per day at 12 months of age had a slightly higher risk of exhibiting autism-like symptoms at 2 years old, as measured by the Modified Checklist for Autism in Toddlers (M-CHAT). However, toddlers who had increased parental play with them every day were significantly less likely to exhibit autism-like symptoms (133).

Screens can interfere with parent-child interactions and offer little opportunity for learning for infants and toddlers compared to real-life social interactions (135,136). Children who spend a lot of time on screens may process information differently in their brains (111). This is because screens can overload the visual processing parts of the brain, which can lead to increased neural connections in these areas (137). This overgrowth is one of the earliest signs of autism spectrum disorder (ASD) (138). However, it is not clear whether screen time causes ASD, or whether children who are predisposed to ASD are more likely to prefer screens (73). Other factors that can affect how much screen time children have included their mothers' screen time and their mothers' beliefs about children's screen time (139,140). Socially engaged parenting, on the other hand, has been associated with positive child developmental outcomes (141–143).

## **Psychosocial impact**

Parents can have a positive impact on their children's language development, social skills, sleep patterns, and behavior by setting limits on the amount of screen time that their children are exposed to (116,144). Research suggests that as the number of media devices in a household increases and devices become more accessible and unmonitored, parents may be less likely to share screen time with their children (123,145,146). In addition, many children as young as 3 and 4 years old are using mobile devices without any help from adults (2,147). Individual and family factors, such as stress, may contribute to parents excessively relying on digital media to cope with children's mood or behavior (148–150).

Studies have found that when parents spend a lot of time on their mobile devices, their children are more likely to engage in attention-seeking behaviors, act out, and have negative interactions with their parents (115,151). This is because children may learn that the only way to get their parents' attention is by acting out or demanding their parents' phones. Additionally, the frequent use of phones to reward or distract young children can lead to children becoming more demanding of phones and more upset when they are refused (152). A cross-sectional study done by Iqbal et al. showed that mobile phone use was associated with social isolation, aggression, irritability, and rude behavior towards parents (153).

However, the most serious consequence of too much screen time for young children is the loss of opportunities for social learning and practice (150). When children are constantly using screens, they have less time to interact with other people and to learn how to regulate their emotions healthily. This can lead to overdependence on screens for emotional regulation and to lower self-regulation skills (150,154). In fact, one study found that children who were exposed to more screen time at age 2 had lower self-regulation skills (4).

Studies have shown that children who use screens for more than 30 minutes a day are more likely to exhibit externalizing behaviors, such as aggression and defiance, and psychosocial difficulties, such as anxiety and depression (132). Additionally, excessive screen time (more than 2 to 3 hours a day) has been linked to lower inhibition scores, greater emotional lability, and lower self-regulation in preschoolers (155,156). These effects are especially pronounced when children use screens alone (4,156). A recent study in Ireland found that screen time exposure was associated with internalizing behaviors, such as withdrawal and sadness, in preschoolers. This

suggests that screen time and internalizing behaviors may be mutually reinforcing, meaning that each can contribute to the other (150). Another cross-sectional study from China pointed out the increase screen time with decreased sleep duration and thereby an increased risk of behavioral problems and autism-like features in young children (157). The systematic review by Sahu, Gandhi, and Sharma found that excessive or overuse of mobile phones can lead to several negative consequences, including feelings of insecurity, staying up late at night, impaired parent-child relationships, impaired school relationships, psychological problems such as behavioral addiction, low mood, tension and anxiety, leisure boredom, and behavioral problems, most notably conduct disorder and hyperactivity (158).

A recent study in Britain found that children who used screens more at age 2 were more likely to have lower executive function skills at age 3. Executive function is a set of skills that allow people to control their thoughts and actions, and it is important for social learning and skills. The study's authors suggest that this lag may be explained by the fact that screens often displace children's play and other social activities, which are key for developing executive function skills (129).

### **Impact on Physical Health**

A 2017 systematic review found that screen time is linked to a variety of health factors, including weight gain, motor and cognitive development, and psychosocial health (159). Studies have shown that spending more time on screens and less time outdoors can increase the risk of developing myopia (160,161). Preschoolers who spend more time on screens tend to have lower fundamental motor skills and manual dexterity scores on standardized tests. This trend is particularly evident in boys as young as 3 years old (162). A recent study found that screen time and unhealthy dietary behaviors tend to go together in children as young as 5 years old (163). Another study found that children whose parents used screens during mealtimes had significantly higher total screen time on weekdays than children whose parents did not use screens during mealtimes (50). The link between screen time before bedtime and sleep problems in children aged 0 to 4 years old has been more consistently observed than the links between screen time and physical activity or weight gain (164). The presence of screen media in children's bedrooms has been shown to be a strong predictor of shorter sleep duration. This is likely due to a combination of factors, including the stimulating effect of screen viewing, the suppression of melatonin, and the displacement of sleep (164,165).

## **MATERIALS AND METHODS**

### **SOURCE OF DATA:**

A multi-center study will be conducted in multiple centers across India. The study will collect data from caretakers of pediatric patients who are admitted to pediatric inpatient wards in tertiary hospitals across the country. The questionnaires will be administered to the parents via face-to-face interviews.

### **DATA COLLECTION:**

Collaborators from various centers nationwide will obtain ethical clearance from their respective centers before collecting data. Investigators from tertiary health centers who can conduct surveys in their centers can participate in the study. Each center will have a study team that will secure local approval, select patients for inclusion, and collect data. The data will be anonymised and uploaded to a secure online platform.

### **INCLUSION CRITERIA**

1. Caretakers of children more than 1.5 years and less than 5 years of age
2. Caretakers consenting to the study.

### **EXCLUSION CRITERIA**

1. Caretakers of children with medical or neuropsychiatric diagnoses that could affect neuro-psychomotor development (intellectual disability, language disorder, psychomotor development delay).
2. Caretakers those are not compliant with the study.

### **STATISTICAL ANALYSIS**

The collected data will be analyzed using advanced statistical analysis software like SPSS.

### **SAMPLE SIZE CALCULATION**

As this is an observational study exploring problematic short video use among children, this study does not require any power analysis or a definitive sample size. However, we aim to interview at least 2000 caretakers from various hospitals across India. However minimum number of samples to be collected was calculated.

<b>Sample size</b>	
2-side significance level	0.05
p	0.233
d	0.05
<b>Result</b>	
Total sample size	275

- The sample size was estimated using an open-source tool: <https://riskcalc.org/samplesize/> using the calculator under Survey (Cross-sectional) design.
- The formula used is based on: Sampling Techniques by Cochran WG (Professor of Statistics, Emeritus at Harvard University). John Wiley & Sons; 1977 (166).

- The prevalence used was 23.3% (problematic smartphone users) based on observations from a study on Prevalence of problematic smartphone usage and associated mental health outcomes amongst children and young people: a systematic review and meta-analysis (167).
- Type I error rate ( $\alpha$ ) taken into consideration was 0.05
- The absolute error/Precision considered was 0.05

## **STUDY DESIGN:**

Multi-center, cross-sectional, observational, single-visit study design.

## **OUTCOMES METHODS**

The data collection methods will include standardized measures and caretaker reports for assessing mobile short video use habits and outcome variables to assess psychosocial and development issues in the child. The questionnaires will be administered to the parents via face-to-face interviews.

**Socio-Demographic details** (Appendix 2): Caretaker's age, the highest level of education, relationship to the child (e.g., mother, father, foster parents, other relative, etc.), and family income will be assessed. Caretakers will also report on their child's sex, age, and other socio-demographic information. Demographic questions will be used to screen out ineligible participants.

**Problematic Media Use** (Appendix 3): Caretakers will report on their children's problematic media use using the Problematic Media Use Measure Short Form (PMUM-SF) (10). The PMUM-SF is a nine-item questionnaire developed based on the criteria suggested for internet gaming disorder (IGD) in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) (168). However, some modifications were made to the PMUM to account for the fact that parents are reporting on their child's media use, rather than the child reporting on their own use. The Problematic Media Use Measure (PMUM) is the most widely used screening tool for detecting problematic media use (PMU) from a parental perspective (154,169–171). The questionnaire assesses multiple domains of media interference associated with addiction or problematic use in children under twelve, including loss of interest in other activities, preoccupation with media, withdrawal, tolerance, deception, and serious problems due to use. Parents rate each item on a five-point Likert scale from 1 (Never) to 5 (Always). Items are added up and higher scores indicate increased problematic media use by young children. The scale shows adequate reliability ( $\alpha = .80$ ).

**Child psychosocial functioning** (Appendix 4): Caretakers will complete the Strengths and Difficulties Questionnaire [SDQ; Goodman, 1997 (11)], a 25-item instrument that assesses five domains of child functioning: emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and pro-social behaviors. The SDQ also provides a total difficulty score, which is calculated by summing the scores of all subscales except pro-social behaviors. The SDQ is a widely-used instrument that has been shown to be valid and reliable (172). The subscales of the SDQ reflect constructs that have been used to test the validity of measures of internet gaming disorder(173) and social media disorder (174). The total difficulty score of the

SDQ is a useful measure of overall child functioning. A higher score indicates more difficulties in child functioning. The SDQ can be used to identify children who may be at risk for developing mental health problems. It can also be used to track changes in child functioning over time. Response options for SDQ are: *Not True* (= 0), *somewhat True* (= 1), and *Certainly True* (= 2). The total difficulty score shows adequate reliability ( $\alpha = .80$ ).

#### **Autism-like features** (Appendix 5):

The Modified Checklist for Autism in Toddlers (175), Revised (M-CHAT-R) is a validated screening tool used to assess the risk of Autism Spectrum Disorder (ASD) in children from 6 months to 6 years old. The M-CHAT-R consists of 20 questions that are answered by a parent or caregiver. It has been used to find an association between device screen time and autism-like features in young children (133).

The M-CHAT-R is scored as follows:

- Low risk: A total score of 0-2. If the child is younger than 24 months, no further action is required. If the child is 24 months or older, the M-CHAT-R/F follow-up test is recommended.
- Medium risk: A total score of 3-7. The M-CHAT-R/F follow-up test is recommended. If the score is 2 or higher after the follow-up test, further action is required. If the score is 0-1 after the follow-up test, no further action is required.
- High risk: A total score of 8-20. Further action is recommended immediately.

#### **ETHICAL APPROVAL**

Different institution will have specific requirements to provide permission for this study. Collaborators are advised to comply with their local and regional regulations. Local investigators must gain study approval from one of the following departments, guided by local policy:

- Institutional Review Board (IRB)
- Research Ethics Committee (EC)
- Permissions from concerned departments.

Local investigators are solely responsible for ensuring they have followed the correct mechanisms for obtaining permission to conduct this study and they will be asked to provide a proof of approval when their data is submitted.



## **PUBLICATION**

Our goal is to publish this study in a high-impact internationally recognized peer-reviewed PubMed-Indexed journal. The authors who will appear on the by-line of the publications will follow the international committee of medical journal editors (ICMJE) authorship guidelines. All collaborators who contributed to the study will be known under the group name as a single author “SVUBIN Collaborative” representing all collaborator efforts. All collaborator names along with their detailed contributions will be listed at the end of the publications. Every member of the local study team and independent validators at each institution will be listed as PubMed citable collaborator status authors on all publications resulting from this study, along with other individuals who contribute substantially to the study including principal and chief investigators mentioned below. This collaborative authorship model aims to reduce conflicts and to encourage collaborators to participate by using a single group name and maintaining a list of what everyone has done.

Chief Investigators:

Faheem Vellekkat, Vivek Sanker, Vinay Suresh, Favaz Vellekkatt, Vijay Chavada

## **APPENDIX 1**

### **CONSENT FORM**

The details of the study have been provided to me in writing and explained to me in my own language. I confirm that I have understood the above study and had the opportunity to ask questions. I understand that my participation in the study is voluntary and that I am free to withdraw at any time, without giving any reason, without the medical care that will normally be provided by the hospital being affected. I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s). I have been given an information sheet giving details of the study. I fully consent to participate in the above study.

Participant's name:

Address:

Name and address of the witness:

Date:

Signature of the Principal Investigator:

**Appendix 2: Socio demographic details:**

1. Unique ID	
2. Name of Caretaker	
3. Age of Caretaker	
4. Relationship to Child	
5. Socio economic status	1= Lower
	2= Middle
	3= Upper
6. Caregiver education level	
1=	Did not graduate high school
2=	High school diploma only
3=	Some college courses
4=	2-year college degree
5=	4-year college degree
6=	More than a 4-year college degree
7. Age of Child	
8. Sex of Child	1= Male
	2= Female
9. Child started using mobile phone at age	
0 =	Does not use
1 =	1-2 years
2 =	2-3 years
3 =	3-4 years
4 =	4-5 years
10. Uses mobile phone without supervision	Yes/No
11. Parental motivation for allowing smartphone to child	
To entertain	Yes/No
To calm down	Yes/No
During mealtime	Yes/No
To let the child sleep	Yes/No
Others	Specify

12. Most commonly used activity on mobile phones by the child	
0 =	Does not use
1 =	<b>Short-Videos</b> /fast scrolling
2 =	Videos (of about 10 minutes)
3 =	Games
4 =	Others, specify
13. Approximate Daily Screen Time on Mobile Phones in child	
0 =	No Screen time
1 =	0-1 hour
2 =	1-2 hour
3 =	2-3 hour
4 =	more than 3 hours
14. Approximate daily screen time on <b>short-videos</b> /fast scrolling in child	
0 =	No Screen time
1 =	0-1 hour
2 =	1-2 hour
3 =	2-3 hour
4 =	more than 3 hours
15. Approximate daily time spent in social activities (interaction with other children)	
0=	No social interaction
1=	0-1 hour
2=	1-2 hour
3=	2-3 hour
4=	more than 3 hours
16. Approximate daily screen time on mobile phones for the primary caretaker (primary caretaker who spends most time with the child)	
0 =	No Screen time
1 =	0-1 hour
2 =	1-2 hour
3 =	2-3 hour
4 =	more than 3 hours

**Appendix 3: Problematic Media Use Measure (PMUM) Short Form (9 items)**

1. Unique ID:
2. Problematic media: 1. Short Videos/Fast Scrolling 2. Long Videos 3. Games

<b>Items</b>	<b>1 (never)</b>	<b>2 (rarely)</b>	<b>3 (sometimes)</b>	<b>4 (often)</b>	<b>5 (Always)</b>
1. My child sneaks using screen media. (Deception)					
2. Screen media is all that my child seems to think about. (Preoccupation)					
3. It is hard for my child to stop using screen media. (Unsuccessful control)					
4. When my child has had a bad day, screen media seems to be the only thing that helps him/her feel better. (Escape/relieve mood)					
5. My child's screen media use causes problems for the family. (Serious problems due to use)					
6. Screen media is the only thing that seems to motivate my child. (Loss of interest)					
7. My child's screen media use interferes with family activities. (Psychosocial consequences)					
8. The amount of time my child wants to use screen media keeps increasing. (Tolerance)					
9. My child becomes frustrated when he/she cannot use screen media. (Withdrawal)					

# Strengths and Difficulties Questionnaire

For each item, please mark the box for Not True, Somewhat True or Certainly True. It would help us if you answered all items as best you can even if you are not absolutely certain or the item seems daft! Please give your answers on the basis of the child's behaviour over the last six months.

Child's Name .....

Male/Female

Date of Birth.....

	Not True	Somewhat True	Certainly True
Considerate of other people's feelings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Restless, overactive, cannot stay still for long	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Often complains of headaches, stomach-aches or sickness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shares readily with other children (treats, toys, pencils etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Often has temper tantrums or hot tempers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rather solitary, tends to play alone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Generally obedient, usually does what adults request	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Many worries, often seems worried	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Helpful if someone is hurt, upset or feeling ill	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Constantly fidgeting or squirming	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Has at least one good friend	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Often fights with other children or bullies them	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Often unhappy, down-hearted or tearful	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Generally liked by other children	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Easily distracted, concentration wanders	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nervous or clingy in new situations, easily loses confidence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Kind to younger children	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Often argumentative with adults	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Picked on or bullied by other children	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Often volunteers to help others (parents, teachers, other children)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Can stop and think things out before acting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Can be spiteful to others	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gets on better with adults than with other children	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Many fears, easily scared	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sees tasks through to the end, good attention span	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Do you have any other comments or concerns?

Please turn over - there are a few more questions on the other side

Overall, do you think that your child has difficulties in one or more of the following areas: emotions, concentration, behaviour or being able to get on with other people?

No	Yes- minor difficulties	Yes- definite difficulties	Yes- severe difficulties
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If you have answered "Yes", please answer the following questions about these difficulties:

• How long have these difficulties been present?

Less than a month	1-5 months	6-12 months	Over a year
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

• Do the difficulties upset or distress your child?

Not at all	Only a little	Quite a lot	A great deal
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

• Do the difficulties interfere with your child's everyday life in the following areas?

	Not at all	Only a little	Quite a lot	A great deal
HOME LIFE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FRIENDSHIPS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LEARNING	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LEISURE ACTIVITIES	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

• Do the difficulties put a burden on you or the family as a whole?

Not at all	Only a little	Quite a lot	A great deal
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Signature .....

Date .....

Mother/Father/Other (please specify:)

Thank you very much for your help

## M-CHAT-R™

Please answer these questions about your child. Keep in mind how your child usually behaves. If you have seen your child do the behavior a few times, but he or she does not usually do it, then please answer **no**. Please circle **yes** or **no** for every question. Thank you very much.

- |  |     |    |
|--|-----|----|
| 1. If you point at something across the room, does your child look at it?<br>( <b>FOR EXAMPLE</b> , if you point at a toy or an animal, does your child look at the toy or animal?)  | Yes | No |
| 2. Have you ever wondered if your child might be deaf?   | Yes | No |
| 3. Does your child play pretend or make-believe? ( <b>FOR EXAMPLE</b> , pretend to drink from an empty cup, pretend to talk on a phone, or pretend to feed a doll or stuffed animal?)                                      | Yes | No |
| 4. Does your child like climbing on things? ( <b>FOR EXAMPLE</b> , furniture, playground equipment, or stairs)   | Yes | No |
| 5. Does your child make <u>unusual</u> finger movements near his or her eyes?<br>( <b>FOR EXAMPLE</b> , does your child wiggle his or her fingers close to his or her eyes?)   | Yes | No |
| 6. Does your child point with one finger to ask for something or to get help?<br>( <b>FOR EXAMPLE</b> , pointing to a snack or toy that is out of reach)   | Yes | No |
| 7. Does your child point with one finger to show you something interesting?<br>( <b>FOR EXAMPLE</b> , pointing to an airplane in the sky or a big truck in the road)   | Yes | No |
| 8. Is your child interested in other children? ( <b>FOR EXAMPLE</b> , does your child watch other children, smile at them, or go to them?)   | Yes | No |
| 9. Does your child show you things by bringing them to you or holding them up for you to see – not to get help, but just to share? ( <b>FOR EXAMPLE</b> , showing you a flower, a stuffed animal, or a toy truck)          | Yes | No |
| 10. Does your child respond when you call his or her name? ( <b>FOR EXAMPLE</b> , does he or she look up, talk or babble, or stop what he or she is doing when you call his or her name?)                                  | Yes | No |
| 11. When you smile at your child, does he or she smile back at you?  | Yes | No |
| 12. Does your child get upset by everyday noises? ( <b>FOR EXAMPLE</b> , does your child scream or cry to noise such as a vacuum cleaner or loud music?)   | Yes | No |
| 13. Does your child walk?  | Yes | No |
| 14. Does your child look you in the eye when you are talking to him or her, playing with him or her, or dressing him or her?   | Yes | No |
| 15. Does your child try to copy what you do? ( <b>FOR EXAMPLE</b> , wave bye-bye, clap, or make a funny noise when you do)   | Yes | No |
| 16. If you turn your head to look at something, does your child look around to see what you are looking at?  | Yes | No |
| 17. Does your child try to get you to watch him or her? ( <b>FOR EXAMPLE</b> , does your child look at you for praise, or say “look” or “watch me”?)   | Yes | No |
| 18. Does your child understand when you tell him or her to do something?<br>( <b>FOR EXAMPLE</b> , if you don’t point, can your child understand “put the book on the chair” or “bring me the blanket”?)                   | Yes | No |
| 19. If something new happens, does your child look at your face to see how you feel about it?<br>( <b>FOR EXAMPLE</b> , if he or she hears a strange or funny noise, or sees a new toy, will he or she look at your face?) | Yes | No |
| 20. Does your child like movement activities?<br>( <b>FOR EXAMPLE</b> , being swung or bounced on your knee)   | Yes | No |



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**INSTITUTE ETHICS COMMITTEE (HUMAN STUDIES)**  
**"Protecting Participants', Guiding Researchers"**

No.544/IEC – 38/IGMC&RI/PP-42/2023/

Dated 19.9.2023

**STUDY APPROVAL CERTIFICATE**

To

Krishna Vardhan M.S.S.,  
III-MBBS, IGMC & RI, Puducherry- 9.

The Project Proposal No.544/IEC-38/PP-42/2023 "Short Video Use in Young Children and its Impacts on the Developing Brain: A Multi-centric Study from India" submitted by you has been approved by Institute Ethics Committee in its meeting held on 5<sup>th</sup> September - 2023 under the following terms and conditions.

- This approval is valid for one year or duration of the project, whichever is less.
- Study completion report with summary of findings should be submitted within two months of study.
- If the study is taking more than a year, information to the IEC in writing regarding extension period along with study progress report to be submitted.
- No deviations or changes of the protocol or informed consent document should be initiated without prior written approval by the IEC.

**Co- Investigators:**

1. Dr. Thiagarajan,  
Associate Professor,  
Dept. of Paediatrics,  
IGMC & RI, Puducherry.

2. Dr. Vijay Chavada,  
Professor,  
Community Medicine,  
IGMC & RI, Puducherry- 9.

  
Dr. I. Joseph Raajesh  
(Member Secretary)

Member Secretary  
Institute Ethics Committee  
Indira Gandhi Medical College  
& Research Institute  
Puducherry - 605 009.

  
Dr. J. Shanmugam  
(Chairman)

Chairman  
Institute Ethics Committee  
Indira Gandhi Medical College  
& Research Institute  
Puducherry - 605 009.