

**SCALE FOR ASSESSMENT OF SCREEN TIME EXPOSURE (SASTE) IN
TYPICALLY DEVELOPING CHILDREN**

SARAH ELSA ABRAHAM

18SLP031

A dissertation submitted in part fulfillment of degree of

Master of Science (Speech-Language Pathology)

University of Mysore, Mysuru.



ALL INDIA INSTITUTE OF SPEECH AND HEARING,

MANASAGANGOTHRI,

MYSURU-570006

JULY 2020

CERTIFICATE

This is to certify that this dissertation entitled “*Scale for Assessment of Screen Time Exposure (SASTE) in Typically Developing Children*” is a bonafide work submitted in part fulfillment for the degree of Master of Science (Speech-Language Pathology) of the student Registration Number: 18SLP031. This has been carried out under the guidance of a faculty of this institute and has not been submitted earlier to any other university for the award of any other Diploma or Degree.

Mysuru,

Dr. M. Pushpavathi

July, 2020

Director

All India Institute of Speech and Hearing

Manasagangothri, Mysuru-570006

CERTIFICATE

This is to certify that this dissertation entitled “*Scale for Assessment of Screen Time Exposure (SASTE) in Typically Developing Children*” is a bonafide work submitted in part fulfillment for the degree of Master of Science (Speech-Language Pathology) of the student Registration Number: 18SLP031. This has been carried out under my supervision and guidance. It has also been certified that this dissertation has not been submitted earlier to any other university for the award of any other Diploma or Degree.

Mysuru,

July, 2020

Dr. S. Venkateshan

Guide

Professor and HOD

Department of Clinical Psychology

All India Institute of Speech and Hearing

Manasagangothri, Mysuru-570006.

CERTIFICATE

This is to certify that this dissertation entitled “*Scale for Assessment of Screen Time Exposure (SASTE) in Typically Developing Children*” is a bonafide work submitted in part fulfillment for the degree of Master of Science (Speech-Language Pathology) of the student Registration Number: 18SLP031. This has been carried out under my supervision and guidance. It has also been certified that this dissertation has not been submitted earlier to any other university for the award of any other Diploma or Degree.

Mysuru,

July, 2020

Dr. Hema. N

Co-Guide

AssistantProfessor

Department of Speech-Language Sciences

All India Institute of Speech and Hearing

Manasagangothri, Mysuru-570006.

DECLARATION

This is to certify that this dissertation entitled “*Scale for Assessment of Screen Time Exposure (SASTE) in Typically Developing Children*” is the result of my own study under the guidance of Dr. S Venkateshan, Professor and HOD- Clinical Psychology, and co-guided by Dr. Hema. N, Associate Professor, All India Institute of Speech and Hearing, Mysuru, and has not been submitted earlier to any other University for the reward of any other Diploma or Degree.

Mysuru

Registration No. 18SLP031

July, 2020

THANK YOU JESUS

So do not fear, for I am with you; do not be dismayed, for I am your God. I will strengthen you and help you; I will uphold you with my righteous right hand.

ISAIAH 41:10

I can do all this through him who gives me strength.

PHILLIPIANS 4:13

But they who wait for the LORD shall renew their strength; they shall mount up with wings like eagles; they shall run and not be weary; they shall walk and not faint."

ISAIAH 40:31

Father, thank you because I was a thought in your mind before you brought me into this world. Thank you for planning, preparing, providing, and prospering every step of this journey in my life.

This phase of the journey has taught me lessons of faith, trust, and being still even on days when I felt the waves crashing in.

**ALL THIS I GIVE IT BACK TO YOU, ALL FOR YOUR
GLORY ALONE.**

ACKNOWLEDGMENTS

Reaching here would not have been possible if it were not for each family member and friend who have stood by me to this very point.

APPA, AMMA- There are no words enough to describe how much of this victory is yours. Appa throughout the journey, you have been a constant pillar, and there was never once when you doubted me. Amma, thank you for being AMMA. Every tear that both of you shed for me in prayer, the constant encouragement, the bucket loads of love, and the sacrifices that you have taken to get me where I am today reminds me every day that I am blessed with amazing parents.

SANCHA, SHALNCHA, CHECH- Blessed to be called your baby sister because you have protected, taken care of, teased, and encouraged me to push myself to be the best version of myself I can ever be. Thank you for bearing with all my rants and putting up with me on the days I was frustrated. **TIMOTHY** baby, you have been mai's joy giver during these days. Your smiles, actions, and words were all I needed to give me the energy boost I needed to finish this.

TO THE DIRECTOR- **DR. M PUSHPAVATHI** Thank you, ma'am, for this privilege to complete this project and for the last two years in this esteemed institution.

TO MY GUIDE- **DR. S VENKETASHEN**- Sir, it has been an honor to do this thesis under you. You indeed are an inspiration; every word, idea, a new perspective that you give genuinely amazes me of the wisdom that you have. Your humbleness and approachability at all times gave me an assurance that I have one of the best teachers to

guide me. Thank you for every input, correction, and faith that you had in me to complete this project.

TO MY CO- GUIDE **DR HEMA N**- Maam, I want to say thank you for taking me on as your student, even when you had three other students to guide. You took me in as one of your own and invested all your efforts and knowledge. Your precision, perfection is just the epitome of the person that you are. I never had to think twice before I asked or approached you with doubts, even the most simple ones. Thank you for always being there, you have been actively involved right from the beginning, and you always gave me that constant assurance that I could do it. Thank you for investing in, and imparting your knowledge to me.

TO ALL MY **FACULTY**; THANK YOU for teaching and inspiring. Yeshoda Ma'am, Goswami Sir, Sreedevi Ma'am, Jayshree Ma'am, Swapna Ma'am, Sangeetha ma'am, Jayakumar Sir, Abhishek Sir, Priya Ma'am, Yashomathi Ma'am, Gopishankar sir, Geetha ma'am, Preethi Ma'am, Seema Ma'am, Deepa Ma'am, Pradeep Sir, and Prathima Ma'am.

A special THANKYOU to **Dr. Vasantlakshmi** for all the help and input for the statistical analysis needed for this study.

To all my **participants and their families**, a special shout out to **Hannah, Lagichechi, and Hina** for taking time out to take me around and get my data collection done.

Thank you to a sweet bunch of **juniors** who were there in helping me enter my data, especially **Namitha, Shahana, Rehema**, and the rest of the bunch.

Being here today would not have happened if it wasn't for one person that believed and pushed me to try and reach out higher. *Dr.Swapna Sebastian*, my UG Coordinator- Thank you for believing in me and pushing me to study and work hard. Thank you for all your prayers and encouragement.

Thank you, *CMC*, for instilling a passion to serve those in need to the best of my ability.

To the *churches* that have stood with me in prayer. I know without a shadow of a doubt that it's your prayers, messages, phone calls, and encouragements that have made me excel. ALF, ELIM, CPC, Passion Lighthouse, hostel fellowship and my CPC girls. Thank you.

To *mentors and friends* that push you to succeed, laugh at and with you, giving a shoulder to cry on, prayed and encouraged, and all the phone calls (*Ajucha, Prettachech, Roshnichech, Rosleychech, Naveen Acha, Stan, Christy, Neethu, Grace Muppidi, Grace Gill, Jem, Meena, Praicy, Divya, Angel, Kumuda,*)

To all my *seniors and juniors* both here in AIISH and CMC - Thank you.

To my batch mates – *The Brainiacs*- Two years would not have been the same if it wasn't this exact combination of sweet and spice that each of you brought in—a big shout out to MSc. SLP B section could not have asked for a better class of friends rather than classmates.

To friends here who have stood up through this entire process of doing this dissertation, from meltdowns to laughter, thank you so much- *Pari, Sree, Pauline, Sashi, Neha, Jenny, Binu,* and *Jasper*.

Thank you to everyone that's been a part of this beautiful journey.

TABLE OF CONTENT

Chapter	Title	Page No.
	List of tables	ii-iii
	List of figures	iv
I	Introduction	1-5
II	Review of literature	6-25
III	Method	26-42
IV	Results	43-65
V	Discussion	66-76
VI	Summary and Conclusion	77-82
	References	83-98
	Appendix	I-X

LIST OF TABLES

No.	Title	Page No.
3.1	Details of groups with age range and number of participants	27
4.1	Mean, Median, and standard deviation of SASTE variables	47
4.2	Mean, median, standard deviations of SASTE scores across four age groups (0-1 year,1-2 years,2-3 year,3-4 years)	50
4.3	Mean, Median, and standard deviation of SASTE across gender (male verse female)	51
4.4	Mean, Median, Standard Deviation of SASTE score across language score of ACSLS	52
4.5	Results of Kruskal Wallis for SASTE domains across age groups.	53
4.6	Results of Mann-Whitney U test for SASTE for pairwise comparison	55-57
4.7	Results of Mann-Whitney U test for SASTE by comparing between gender	58
4.8	Results of Mann-Whitney U test for SASTE by comparing between ACSLS receptive language score	59
4.9	Results of Mann-Whitney U test for SASTE by comparing between ACSLS expressive language scores	60

4.10	Results of Kruskal Wallis Test for SASTE by comparing across groups formed based on the onset of screen exposure	62
4.11	Results of Mann Whitney U Test for SASTE by comparing pairwise.	63-64
4.12	Mann Whitney test to compare across groups of family structure.	65

LIST OF FIGURES

No.	Title	Page No.
4.1	Statistical Analysis for the qualitative data (SASTE Score) of the total population	46

Chapter I

Introduction

The advent of this millennial day and age brings us to hike in the use, accessibility, and affordability of various gadgets. Children all across the globe use screen-media, such as smartphones, television, DVDs, tablets, pads, and video games regularly in everyday situations. (Barr & Lerner, 2015). Concerning smartphones, in particular, the usage of ‘YouTube,’ ‘video,’ ‘games’ and ‘animation’ has become the everyday norm. Most infants are exposed to them as early as three months. Studies indicate that children spend the most time using screens approximately around 3-4 hours /day, which is the most time spent on any activity besides sleeping (Conchaiya&Pruksananonda, 2008). The American Academy of Paediatrics (AAP) has given recommendations where children lesser than two years should have not more than 2 hours of screen time per day, and the programs that are watched should be of good content with parent and child interaction being present (Barr et al., 2010). In India, studies done on these themes are limited, although observations suggest that children may have more than 2 hours of TV viewing every day (Arya, 2004).

1.1 Screen Time and Language Development

Regarding watching television, recommendations have been given that children below the age of 2 should not watch television, and the television viewing ought to be time-restricted for children between the ages of 2 and 3 (Barr et al., 2010). Several studies have demonstrated that media has harmful effects on young children leading to attention problems, adverse effects on cognition (Kostyrka-Allchorne, 2017), delayed

language development (DLD) (Chonchaiya&Pruksananonda, 2008), sleep problems, and obesity (Downing et al., 2015). Successful language development relies on overall childhood development. Linguistic development begins from birth, and after five years after the sensitive period, 18-24 months old go through a phase called “word learning explosion.” In this phase, there is a significant vocabulary growth and also begins to combine two words, phrases, and sentences.

The neuro-typical children in the age of 0-2 display several cognitive-linguistic skills like identifying at least three body parts, comprehending actions/verbs and personal pronouns, identifying familiar objects/people amongst the choice of seven pictures, sorting primary shapes and colors, and matching large or small size objects to a picture, and assembling simple 3-4-piece jigsaw puzzles. Typically developing children acquire a lexicon of around 50 words, speak in two-word phrases with the use of nouns, modifiers, and verbs, and can narrate some experiences using jargon words along with the real words, and recite few nursery rhymes from memory. They also ask ‘wh’ questions and will have an emerging expressive lexicon of 300 to 1,000 words. Regarding social skills, the child will imitate doing real-life activities and other housework and involve in symbolic play with similar props. With their peers, they also begin parallel play, use gestures with their peers, and express a wide variety of emotions like joy, anger, fear, and sympathy.

However, the effects of screen time are found to be detrimental to the development and health of a child. The associations have been studied between cognitive development and screen time with variables like memory skills (short term), language development, and academic capabilities in reading and math (Barr et al., 2010;

Tomopoulos et al., 2010; Zimmerman & Christakis, 2005). In early childhood, the high level of screen time appears to show a negative impact on academic and long term social outcomes (Pagani et al., 2010). Beyond the quantity or amount of screen time, the children's developmental outcome has been associated with the content or the quality of screen time (media). Although the screen time concerning television watching is the universal medium at every house, with the increase of handheld devices being used, children also have access to these devices and have catered to their sedentary lifestyles. The association between language development and screen time exposure of young children is still unclear. Although a positive effect on the cognitive and linguistic development with reference to screen time exposure was reported (Linebarger & Walker, 2005), minimal effort has been put to assess the child who is exposed to prolonged screen time usage.

Evaluation of children exposed to increased duration of screen time is studied using telephonic interviews, questionnaires, semi-structured interviews, and direct observations. Children's developmental progress was then co-related using various developmental screeners. Questions included respondent details (family demographics), child details (subject demographics), child-parent interactions, the content of what is watched, types of screen. Zimmerman (2006) made parents fill the short form of the MacArthur-Bates Communicative Development Inventory (CDI; (Fenson, 2007) to monitor television usage. 24-hour television diaries were completed by parents, where they collected information on the same theme in another study (Barr et al., 2010).

Studies have included certain domains, such as environment, parent-child interactions, parent attitudes, demographics, and socioeconomic status, and child-parent

screen time. Elements for the study were taken from a National Survey done of Children's Health (NSCH, 2007,2011). Other studies included the child TV-viewing scale of Viner and Cole (Viner & Cole, 2005), and also a restrictive parental practice scale regarding TV given by Pearson's was also included (Pearson et al., 2011). Studies also developed questionnaires such as the Parent Behavior Importance Questionnaire-Revised (PBIQ-R) (Mowder, &Shamah, 2011). Correlations with language development and other cognitive developments were done through developmental screeners for the same.

1.2 Need for the study

The American Academy of Paediatrics (AAP) has recommended restrictions for the young children's screen time and attempts to decipher the scientific reason behind the same. They considered the neuro-anatomical changes associated with the typically developing children. For example, most of the brain development occurs by the age of 5, the brain size and mass triples in the first 12 months of life as many new neural connections develop. Even with a brain just one third the size of an adult brain, new-borns carry twice as many brain cells than that of an adult. The number of brain cells in these new-borns will be 200 billion, and every second, 10,000 new connections are created in infancy. The increased exposure to screen time will impact this brain development, and the current research points that language, cognitive, and social skills can be affected by repeated exposure. Apart from these anatomical changes in the brain, the studies related to the behavioral observation of screen time exposure in association with language development in typically developing children are present. Still, studies that look into the factors that lead to it are limited or are not studied together. Hence, there is a

need to formally evaluate the contributing factors for the increased amount of screen time usage by the typically developing children in comparison with the children diagnosed with communication disorders. Hence, the contributing factors can be studied in detail to discuss further their importance in the children's speech-language and cognitive development. Therefore, an attempt was made to develop a questionnaire to assess the screen-time exposure in typically developing children, which can also be used in children with communication disorders.

Chapter II

Review of Literature

Language skills in terms of comprehension and expression are the two critical developmental milestones that a child develops over his first three years. Just across the last century, media has combated its way through different modes and has become a quintessential part of a person's life in this day and age. Infant and toddler viewing has dramatically increased over the past decade. Media has an influence on language development through the interactions of the child in the natural environment with their immediate family members.

2.1 Language development

A child's language development is dependent on early learning equally for the acquisition of both receptive and expressive linguistic skills. The acquisition of language takes place through exposure, where the child unconsciously acquires Language (Christakis, 2009). All children develop at different speeds and in different ways. However, there are developmental milestones that allow parents to recognize if their child has a set-back. Development of Language does not happen in isolation; instead, it is a combination of features that arise from the biological structures as well from the environment around the child. An environmental or biological perspective of language development includes not only the quantity but also the quality of verbal and nonverbal social interactions. (Gauvain, 2001; Hart & Risley, 1995; Hoff, 2006; Rogoff, 2003; Vygotsky, 1978). Even before a child can utter his or her first meaningful word, he or she would have attained a substantial knowledge of several words and also use their

pre-linguistic skills to communicate with the intent to another person. Infants perceive and partake in a variety of social interactions as they pick up and understand the various functions of language. Social interactions are the key or the foundation of linguistic assistance, which is required to guarantee that the child is prepared both biologically as well as socially driven to learn and use language (Bruner, 1983). Although the home environment does play an essential role in a child's language development, a study done by Shonkoff and Phillips (2000) suggest that children do acquire language milestones even with minimal linguistic exposure, children do learn the art of talking. Most authors agree that all developmental milestones are acquired through multiple levels and relations that happen with people, objects, incidents, and various other factors that are related to the child's environment and upbringing in their everyday life (Bronfenbrenner, 1979; Carta & Greenwood, 1987; Greenwood et al., 1991).

Nonetheless, interaction is vital for the same (Bronfenbenner, 1979). Some of the significant influences on a child's language development include those who are present in the immediate surrounding or environment, such as siblings, parents, and caregivers. Although cultures countries differ in their languages, it is universally seen that children speak their first word between 10 to 15 months. After which it is followed by a trajectory of learning the language by manipulating simple words, combining the words to form longer phrases and sentences. Around the 18- 22-month mark, a word learning explosion or word spurt occurs. Till the time the child has a vocabulary growth of fifty words, the trajectory moves at a pace of about 8- 11 words every month, after which there is a sudden shift of learning about 22- 37 words every month (Samuelson & McMurray, 2017). The average child experiences a "word-learning explosion," adding an average of

nine new words to the language repertoire daily (Carey, 1978; Shonkoff & Phillips, 2000). By age three, vocabulary acquisition accelerates as most preschoolers have begun to master the rules of language use (Shonkoff & Phillips, 2000). The quantity and nature of words heard in the home are relatively stable over time and predict vocabulary size at age three (Hart & Risley, 1995). Therefore, this language development is exceptionally influenced by not only the quantity but also the quality of the linguistic input heard from both biological and environmental influences.

Various tests have been developed to assess both the comprehension and expression of language. The test that used in the present study is the Assessment Checklist for Speech-Language Skills by Swapna et al. (2015), which was a part of the All India Institute of Speech and Hearing Research Fund project to develop an Intervention Module for preschool children with communication disorders. This checklist was developed as a part of the intervention module for speech and language skills. The checklist assesses children from the age range of 0-6 years and is divided into eighteen different levels. The first three years' levels range for three months, after which the next three years till six years of age levels range for six months. The administration of this checklist is to assess the comprehension and expression of language levels.

Documentation from the lowest level proceeded to the higher levels and is rated as 0 those levels which are not applicable, 0.5 which are dependent/ or requires physical or verbal prompt, and 1 for those levels which are consistent and independent. The administration of the test is stopped at the level when which the child obtains five consecutive failures. If the age group is not at the chronological level, there is a gap between the actual age of the child and the functioning level of the child. This test was

used to assess the language receptive and expressive skills and to check if the exposure to screens and the media affect the child's language development.

2.2 Screen Exposure

Screen exposure is the time or duration that is spent by an individual using electronic gadgets or digital media. Media is an unavoidable part of the child's environment as well and also influences the child's development.

Common-sense media research did a study to understand the media use in children that was initially done in 2011, followed up in 2013, and then again in 2017 showed that there was an increase every two years in the exposure and media use of children aged 0-8 years. In this national survey, 1463 participants were included of all races, and ethnicity was selected. In this study, it was observed that by 2017 that almost 98% of the children use the mobile, which was 63% in 2013 and just 41% in 2011. Similar trends were seen for all devices. The study revealed that children as young as six months old were exposed to media. In the studies, the average exposure of children from birth to 23 months was watching 55 minutes of T.V. In children under 2 years, it was seen the average exposure was 42 minutes per day, and in toddlers, the duration of T.V. exposure was found to be around 90 minutes per day. TV exposure remained almost constant throughout the years, but mobile use and exposure had increased from 8% to 28%. This study did a detailed survey into content, duration, parental reasons, types of devices, etc. which will be discussed below under the various factors involved in the development of the scale.

Major of studies on the impact of T.V. viewing shows the potential for harmful effects on children's attention, cognitive skills, learning, sleep, and even obesity. When or how early to start exposing a child to screen or how much it changes the developing brain is not very clear, especially in the younger age group is not very clear. Children spend a reasonable amount of time with a screen, which can have an impact to support/facilitate language development, or as some researchers suggest, it can hinder their language development. These are the hypothetical questions that can be raised with reference to screen exposure in young children.

A systematic review was done in 2017 by Kostyrka-Allchorne et al. to study the relationship between the cognition and behavior of the child and exposure to screens. The study reviewed 76 articles and involved various cross-sectional, longitudinal, and experimental studies. The researchers studied the effect of T.V. exposure under four broad categories of (i) executive function and academic performance, (ii) attention problems, (iii) language development, and (iv) parent and child interactions. The cross-sectional studies show that there is a negative association between cognitive development and television viewing. Impulsivity, attention issues were reported in the articles. Cross-sectional studies related to language revealed that only content that was directed to children was associated with early language development. It also revealed that children who had high exposure were at risk for language delay.

Most studies revealed that other factors linked with exposure such as socioeconomic status, age, individual, family, and social demographics also play a role in the child's cognitive and behavioral development. These factors, which also play a role in the exposure, have not been taken into consideration. In the cross-sectional studies, even

though validated measures have been taken, most studies have been done through parental reports and reviews, which can be highly subjective. The study also revealed that most research done did not take into consideration the content which was viewed by the child.

The cross-sectional studies showed associations between the same, but direct relations could not be drawn for the same. In the longitudinal studies, it was found that they overcame barriers that were seen in cross-sectional studies; these also are mediated by other social and individual factors. Most studies revealed that there was a negative association between exposure to television and its effects, primarily on attention (Shiue, 2015; Yousef et al., 2014). and language associations (Chonchaiya & Pruksananonda, 2008; Lin et al., 2015). In the experimental studies that were researched, it was shown that most children under three years learned better with real-life interactions rather than and exposure to screen reduced the quality and quantity of parent and child interactions (Setliff & Courage, 2011; Strouse et al., 2013).

In all the articles that were researched and reviewed, they concluded that more than just exposure to multiple factors such as the child and family's features and characteristics, the social environment and context were important. It also stated the content that the child is watching, the editing pace, and also what kind of exposure the child is having are also essential factors that need to be studied. The entire study revealed that the age of exposure, the amount of exposure, and what the child is exposed could have either positive or detrimental effects on a child's development. There are factors which influence language development by screen exposure, and those factors can be listed in the following sections under the headings of child factors and parent factor.

2.2.1 Child factors

2.2.1.1 Age. The child's age plays a very integral role in the amount of screen exposure, and it is seen that as the age of the child increases, the amount of screen exposure also increases (Zimmerman, 2007; Ruangdaraganon, 2009; Kourlaba et al., 2009). In a longitudinal study that was done in 2017 by Barber et al. on consideration of 1558 ethnically diverse mothers participating in their study in which they filled and completed questionnaires at different intervals of 6, 12, 18, 24, and 36 months of their child's life. The questionnaires answered questions, including the mother and child's TV time. The study aimed at finding the trajectory of TV exposure in children. The study revealed that 75% of children younger than 12 months surpassed the given protocol of zero screen time. It also revealed that children aged 12 months had a fast track acceleration of the increase in screen time where it was observed that children at 14 months watched <1 hour/day, which increased to >2 hours/day by 30 months. Another study was by Carson et al. (2017), in which 149 toddlers and parents were involved in the study, in which parents were asked to fill questionnaires showing a positive association between screen time and age. In the study, it showed there is an additional increase of 9.3 minutes/day for every additional month of age.

2.2.1.2 Age of Onset of Exposure. At what age are children first exposed to screens that can influence the child. Various studies in the recent past show that children less than one year are exposed to screens. Zimmerman et al. (2007) found that at least 40% of the infants involved in his study of 1009 children who had been exposed to screens by three months, which got increased to 90% by 24 months. The regular media exposure was seen to begin at around nine months.

Cheng et al., in 2010, conducted a study to understand how early exposure to television has an impact on a child's behavioral and social outcomes. The study included 316 mothers and children at a baseline questionnaire, which was filled at 4, 9, 18, and 30 months, respectively. The mother and child were also involved in laboratory observations. The final assessment was done at 30 months and strengths, and difficulties questionnaire (Japanese version) was administered along with questionnaires and observation. It was seen that children had an onset of exposure both at nine months and 18 months as well. The children were grouped into four groups based on the amount of exposure the child had at 18 months and 30 months. Those who had less exposure than 4 hours at both times were grouped under the first group or the low-low category, those who had more exposure at 30 months when compared to 18 months were grouped as the high-low group. Those children who had more than 4 hours' exposure at 18 months and less exposure at 30 months were grouped as a high-low group and the final group comprised of children who had high exposure both at 18 as well as 30 months. The research showed that children of the high-high group and high low group had problems with hyperactivity and inattention when compared to the other children who had less exposure. The children of the high low group where the exposure was more, also affected their pro-social behavior when compared to the other groups who had lesser groups. A study was done by Chang et al. in 2017 on 390 toddlers revealed that 65% of the toddlers were exposed before 24 months, 12.2% were exposed to smartphones before 12 months of age, and 31.3% were using smartphones by two years of age.

2.2.1.3 Gender. Carson et al. did a study in 2017 to study the correlates of demographic details and screen time and analyzed 257 families with toddlers in the age

range of 12-35 months. They categorized children based on gender, race, type of parental, or child care; the child spends the most time, age of the child, the number of siblings the child has also were assessed. In this study, the association of gender and screen time showed that females engaged in more screen time than males for about an average of 27.1 minutes more. Other studies state(Kourlaba et al., 2009; Carson et al., 2012;Paudel, 2017) that there is no significant association between gender and screen time.

2.2.1.4 Amount of Screen Exposure on Weekend and Weekdays. The study that was done by Kourlaba et al., in 2009 to examine the factors associated with television viewing, took into its research the participation of 2374 Greek children, age ranging from 1-5 years old. The mean average for these children to watch screens every day was found to be 1.32 hours. 26% of children watched screens or TV for 2 hours per day.

Lauricella et al., in 2014, revealed that television viewing (1.75 hours) was highest, followed by computers (25 minutes), smartphones (15 minutes), and tablet computers (29 minutes).In another study, Chang et al. 2017, stated that 63% of children watch TV, and 23.4 use their smartphones for more than an hour on weekends.

In a survey done by Goncalves et al.(2019), where 318 parent and typically developing children dyads were taken in which it was found that there is a difference of the amount of screen exposure on weekdays and weekends; it was found that children have increased exposure of screens during the weekend when compared to weekdays.

2.2.1.5 Child-directed content. The quality of programs that the child was exposed to influences the child's development. The Office of Communications(Ofcom) which is the regulator of all communication services in 2017 did a survey to study the

media use in children, and parental attitudes showed that 3-7 years old were more likely to watch cartoons, animations, mini-movies, or songs and used platforms such as YouTube to do the same.

The national survey done in the States by Common Sense Media in 2017 also showed that children spend an average of 17 minutes watching videos through online platforms such as YouTube. The majority of children watched videos that were focused on teaching (64%), then animal videos (46%), and videos that focused on creating things were also watched (38%).

2.2.1.6 Cognitive, Learning, and Social Development. The association of cognitive development and screen time has shown that most parents have a positive perspective on using screens as they develop the child's cognition. Studies state that increased exposure to screens at the developmental ages can be found to be detrimental to the child's cognitive and learning development (Shin,2004). Tomopoulous et al. (2010) studied the extent of duration and content of media on children aged six months. It was seen that duration of exposure at six months had an association with lower or reduced cognitive and language development at 14 months. Johnson et al. (2017) took in his study, the participation of 170 children aged 2-4 years old to study the way children used a touchscreen app and what effect it had on their capacity to learn new labels for objects. This was compared in two conditions, one which involved the child by asking the child to tap or drag the named object from one side of the screen to another. The second condition simply required the child to watch the screen. In this study, it was revealed that particularly preschool girls aged two and above had more benefit of learning new names

or words through the interactive method when compared to boys who learned better by watching the screen rather than doing a motoric task.

A controlled study was done by Lina et al. in 2014 to study what effect did TV exposure has on the development of a child, the study involved two equal groups in which 75 children ages ranging from 15 to 35 months were taken. It was seen that the group of children who had more exposure to the screen than those who infrequently were exposed had an increased or higher risk of delays in their cognitive, language, and motor milestones. These delays were associated with the amount of time the child spends watching screens, which were an average of 67 minutes per day before the age of 2. Wu et al. (2014) showed that in children aged 3-6 years, there was an increase in behavioral problems if children were exposed to antisocial behavior programs or cartoons as the child is still developing cognitive and functional abilities at that age.

2.2.1.7 Activities of Daily Living. Screen time has become so frequent and is used throughout the days in the lives of adults and children. Most parents use screen time to help hasten the process of various activities of daily living, such as meal times, sleep, etc. Parents use devices to help them accomplish their parental needs and is mostly given as rewards, during mealtime and bedtime both on weekends and weekdays. Which increased their overall screen time. (Elias & Sulkin, 2019)

A study was done by Emond et al. (2016) on preschoolers showed that children who watched screens one hour before bedtime and those who had (49.6%) screens in their rooms were more prone to sleep deprivation and have a higher chance of household chaos. Another study done by Tombeau et al. (2020) on infants of 7-18 months (n= 1085) to study child screen exposure combined with feeding found that parents who had higher

stress levels and lower household incomes used screens to help in daily activities such as feeding.

2.2.2 Parental Factors

2.2.2.1 Environmental Factors and Socioeconomic Status. To understand the environmental surroundings and screen exposure, there is mixed evidence. A study was done on parents of children aged 0-5 years of age. The study aimed to evaluate the neighborhood surroundings such as walkability, outdoor facilities, recreation facilities were assessed in association with the physical activity and screen time. The study found that none of the physical environment variables were associated with screen time in children. However, lower screen time was observed in children that had higher neighborhood socioeconomic (SES) status, according to Carson et al. (2014). Contrary to this, a study done by the same author in 2010 to study the evaluation of neighborhood SES status and screen time found that girls in low SES neighborhoods engaged significantly in more overall screen time than girls who were of the high neighborhood socioeconomic status. This same association was not seen in boys, but it was observed that boys living in low socioeconomic status indulge more in video games. Carson et al. (2010) evaluated what the parents perceived of the neighborhood environment. They found that children who lived in neighborhoods with better parental satisfaction and services such as sidewalks and parks were more likely to engage in 2 hours or less screen time and more physical activity. Similar findings were found in a longitudinal study conducted in Australia by Sander et al. (2015) that neighborhoods with more green space resulted in a reduction of screen times in boys. Still, no significant associations were seen for girls.

An Indian study done on older children and adolescents in 2016 by Bapati et al. in which they studied children of various socioeconomic status by involving children from private schools and impoverished public schools saw that children in the lower SES status had higher levels of physical activity and higher levels of screen time when compared to their higher SES counterparts.

2.2.2.2 Types of the screen and accessibility. The type of screen the child uses also plays a role in screen exposure. As technology advances, the increase and ease of access to these gadgets make it more accessible for a child to watch. A systemic review is done by Paude et al. (2017) on the use of mobile screen media in children of age range 0-8 years, and it is found that older children were better skilled in using mobiles and children whose parents had higher use of mobile phones were those who had greater accessibility and higher use. The review also stated that there was no association between gender and mobile screen use. Similar findings were seen in a study by Lauricella et al. (2014), children had the highest access to T.V. (99%) followed by computers (89%), they also had access to smartphones (69%), and the least was for tablets (40%).

Barr and Lerner (2014) found that in comparison to the 10% in 2012, there was an increase to 38 % as of 2014, of children who below the age of 2 had used a mobile device. They also found that children aged 2 to 4 years saw the most significant difference, such that, as of 2014, 80% had used a mobile phone when compared to 39% in 2012.

In a study by Bentley et al.(2016) checked to see whether mobile devices were used most often with children. The parents used the mobile as it was more convenient and portable. Most studies showed that T.V. exposure was the highest in younger children

when compared to other screens or devices. 96% watch T.V. on a T.V. set for around 15 hours a week (Office of communication UK, 2017). In the same survey, it was seen that children aged 3-4 at least 1 % have smartphones, 21% had their tablet, 40% used screens to play games for an average of 6 hours a week.

A study was done in Korea by Chang et al. (2017) on parents of 390 toddlers in the age range of 2-5 years of age. It was found that 39% had T.V. exposure every day, whereas only 12% used smartphones every day. It was also found that toddlers began using smartphones in the age range of 12- 24 months.

2.2.2.3 Parental screen viewing. All studies were done under this parental factor associate increase parental screen view with increased screen time in children. Jago et al. (2011) studied 2965 families of children in the age range of 3-10 years. This study revealed that for both the child's weekend and weekday exposure, the parental screen viewing had an impact, more likely that maternal T.V. viewing had a more substantial relation than paternal T.V. viewing. Similar findings were also seen in the GENESIS study by Kourlaba et al. (2009), Lauricella et al. (2014), and Goncalves et al. (2019).

2.2.2.4 Adult Directed Content. It is interesting to look into the quality of T.V. programs and screens watched by the child rather than solely looking at the quantity or amount of exposure that the child has. Various adult-directed content can harm a child's development and studies can support this viewpoint. Tomopoulous et al. (2010) stated that infants were exposed to screen with older children or adult-directed content from 6 months and were associated with having lower cognitive and language scores and development at 14 months. A study (Edwin et al.,2013) that looked into content such as advertisements were found to influence children; those who are below 11 years were

more prone to believe what is seen on the screen and not able to discern that things seen on the screen are an exaggerated form.

2.2.2.5 Child care. In today's day and age, where there is an increase of homes where both parents are working, there are brief periods where children are left to be tended and taken care of by child care centers, home care individuals, which include baby sitters, older family members, etc. The time that the children spend in these areas can also have an association with screen time (Ling et al., 2014). Tandon et al. (2006) studied the amount of screen exposure the child has in a daycare; the study included a sample size of 8950, showed that more than 80% of children were enrolled in some form of child care. It was seen that by these ages, children were watching close to 4.1 hours on average. Home-based care apart from the parents had the highest exposure of an average of 5.5 hours, followed by parental care, which was for around 4.4 hours, and the least was seen in daycare centers where the child was exposed to an average of 3.2 hours on an everyday basis.

2.2.2.6 Parental perceptions of screen viewing. Most studies state that those parents have a positive perception of using screens with their children. Studies (Ruangdaraganon et al., 2009) states that viewing televisions and screens benefitted the child's development. The majority of them feel it is beneficial for purposeful learning through educational games and applications and also believed that it was a device that could not be avoided with children. (Bentley et al., 2016). Most parents would even give screens to engage the child and use screens as a "digital baby sitter" to get or complete their works or chores (Zimmerman et al., 2007). They also perceive it to be educational, as well as provide entertainment for the child (Zimmerman et al., 2007). Parents had

positive attitudes to all types of devices that were used by the child, primarily TV and computers. (Lauricella et al., 2014)

2.2.2.7 Parent-Child Interaction. Social interaction is one of the keys to the development of a child as the child learns and grows. The effect of screen exposure on these interactions is an essential factor to be studied. Research done on the same found that it can limit the quantity and quality of parent-child interactions. (Wu et al., 2014)

Kirkorian et al. did a study in 2009 involving 51 parent and child dyads age ranging from 12- 36 months in a laboratory experiment, which had the resemblance of a family room. The experiment was conducted for 1 hour in which the first half the presence of an adult-directed program was running in the background. In the other half, the T.V. was switched off. The study revealed that in the presence of background television, both the quality and the quantity of parent-child interaction decreased significantly. Parent interactions and co-viewing occurred more than half the time for content that was educational and targeted for younger children. It was reported to be minimal for adult-directed content (Mendelson et al., 2008; Zimmerman, 2007).

2.2.2.8 Parental Stress. Parental stress due to various factors has a due effect on the child and screen exposure. A longitudinal study was done in 2018 by McDaniel and Radesky, in which 183 parents completed surveys at 1, 3 and 6 months, found that higher parental screen time was associated with parental stress which in turn increased the child's external behaviors such as tantrums, attention-seeking behaviors and internal behaviors such as withdrawal.

2.3 Screen Exposure and Language Development

One of the most important aspects is the association of screen exposure and language development and is of central interest in the present study. Studies done on this have mixed evidence in which there are positive gains on language development in terms of vocabulary growth, verb development and content development and in contrast language delay, etc., contrary to which there are studies that portray the negative influence of the same. The following information helps to study the association between screen time exposure and language development.

2.3.1 Vocabulary Development

A study by Zimmerman et al. 2006 attempted to find if any interaction between language development and screen exposure exists. Infants in the age range of 2-24 months (n=1008) were taken. Parents filled the questionnaires, and the results of the studies showed that vocabulary acquisition in children ages ranging from 8-16 months was negatively associated with watching baby videos. The authors narrowed down possible explanations for this finding to be due to less motivated parents, environmental influences, and heavy exposure to a device that was not helping the child's development.

Another study by Kirkorian et al. (2016) on 116 children in the age range of 2-3-years old with different experimental conditions were given to the child with and without verbal interactions and instructions. Parental and child demographics were also recorded, exposure to screens, accessibility, types of devices, and content and applications used in the devices were also tabulated. Vocabulary development was also assessed. Three different experimental conditions- without any interaction, with instruction to touch anywhere on the screen and specific direction to touch a particular place on the screen,

were used. Results revealed that children picked or learned better with interactive videos. There is a variation to the extent that the child can learn from interactive and non-interactive videos across the 3rd year of life.

2.3.2 Verb development

Three studies were done by Roseberry et al. (2009) to evaluate if children of the age range 30-42 months could learn verbs from videos. The first two experiments were conditions with and without the presence of live social interaction, and the third experimental condition studied to see whether live social interaction was better in person or through screens. In this study, it was shown that younger children could only pick up verbs when the verbs were paired with live social interactions, and older children could pick up the verbs without social interaction. It was also seen that children would be more attentive to adults both on screen as well as in live interaction.

2.3.3 Content effect on language

Longitudinal studies that were done for ten years by Linebarger and Walker (2005-2015), where they measured multiple outcomes such as parent and child demographics, interactions, developmental tests, play assessments, amount of exposure, and the appropriate content of exposure and its intended audience and the type of program. The entire study revealed that the children began paying attention at an average of 9 months, and there was an acceleration in the amount of time that the child watched screens from 18 months onwards. Language had either a positive or negative interaction with the individual programs rather than broad content categories. Content that was child-focused and given at age two helped children achieve better vocabulary and later school readiness than children who were exposed earlier and those with frequent viewing.

Wright et al. (2001) also support these findings. Programs that had stable narrative structures, visually appealing images, new vocabulary words along with definitions helped in language development. On the other hand, cartoons that did not fulfill these criteria and had poor language models did not help children in comprehension and expression of learning new words.

2.3.4 Language delay

Many authors state that exposure to screens can have a detrimental effect on the child's language development and can cause delays. This is supported in a study by Conchaiya et al. (2008), where they compared children who had language delays (n= 56) across a control group (n=110). The children were taken in the age range of 15-48 months. The results of this study showed that those children who had language delays started watching screens much earlier (7.22 ± 5.52 months) than compared to their counterparts (11.92 ± 5.86 months). It was also observed that these children had more prolonged durations of exposure than the control group (3.05 ± 1.90 hours/day vs. 1.85 ± 1.18 hours/day).

A similar study was done in 2013 by Dusch et al. in which 119 infants and toddlers were enrolled for the study. It was a cross-sectional and longitudinal study with developmental assessments that were done after a year from the baseline. The children saw an average of 3.29 hours of screen media in the study, and children who watched more than two hours of television in a day had low communication scores.

An Indian study aimed at finding the impact and the link between early exposure of screens on language development and autistic-like behavior and the results showed that children who viewed television for ≤ 3 hours per day had short attention span and

language delay, while children who viewed for ≥ 3 hours per day had, short attention span, language delay, and hyperactivity. All cases reported speech delayed and short attention, and hyperactivity was found in 66.6% of children. Parent-child interaction during the exposure was said to be absent in more than half of children (66.6%) (Hermawathi&Rahmadi, 2018).

From this extensive review, we see that screen exposure is determined by numerous factors and can have both beneficial as well as detrimental effects on a child and his/her language development even though numerous international studies are aiming at the same by considering only a few factors and not a single study with multiple factors in one attempt. Hence, there is a need for more Indian research. To date, a complete assessment or standardized scale has not been developed to assess all these factors and its effects on the child's overall development. With the present trends of hike in the use of technology in this day and age, it brings us to the need of the hour to develop a tool to assess the factors and impact of screen time on child's overall development and, at the same time, provides guidelines for intervention.

Chapter III

Method

3.1 Aim of the Study

To develop and standardize a “Scale for Assessment of Screen Time Exposure (SASTE)” in typically developing children.

3.2 Objectives of the Study

1. To develop an assessment scale that evaluates the contributing factor under the variable ‘screen time exposure’ and ‘language development’ in typically developing children.

3.3 Null Hypotheses

There are no significant contributing factors under the variable ‘screen time exposure’ and ‘language development’ in the scale for assessment of screen time exposure (SASTE) in typically developing children.

3.4 Research Design

This descriptive study employs a cross-sectional survey design. The study was conducted in the following distinct but interconnected phases,

Phase 1: Construction of Scale (including item pooling, arrangement, scoring, and estimation of content validity)

Phase 2: Pilot study

Phase 3: Administration of the scale on typically developing children

3.5 Participants

A total of 51 typically developing children in the age range of 0-4 years were taken as participants. These participants were further divided into four groups based on their chronological age and constituting Group I, Group II, Group III, and Group IV comprising a specific number of participants in each Group, and the details are in Table 3.1. Informed consent was obtained from the parents or guardians before considering the present study. AIISH Ethics Protocol for Bio-behavioral Sciences for human subjects was followed (AEC, 2009) (See Appendix A). Participants were selected from the local vicinity, colonies, and preschools in the district of Mysuru.

Table 3.1

Details of Groups with Age Range and Number of Participants

Groups	Age Range	No. of participants
Group I	0-12 months	9
Group II	>12 months to 24 months,	15
Group III	>24 months to 36 months	14
Group IV	>36 months to 48 months	13

3.5.1 Participant inclusionary criteria

- There was no significant medical history covered under the extensive review of prenatal, perinatal, and postnatal history, developmental milestones, developmental delay or regression, and behavioral problems, in addition to a review of systems, and medication use.

- The Socioeconomic Status of the parents of these typically developing children was assessed using the NIMH SES scale (Venkatesan, 2011), and all belonged to middle and high socioeconomic levels. (See Appendix B)
- A Speech-Language Pathologist evaluated children, and the Assessment Checklist for Speech-Language Skills- ACSLS (Swapna et al., 2010) was administered.

3.5.2 Participant Exclusion Criteria

- Children with significant medical history related to their prenatal, perinatal, and postnatal development according to ‘general childhood case history proforma’ of OPD, AIISH, Mysore were excluded from the study.
- Children with a history of delay or regression in their developmental milestones (speech-language and motor) were excluded from the study.
- Children with any behavior problem and is under medication were excluded from the study.

3.6 Procedure

3.6.1 Phase 1: Scale construction

The scale comprised of various variables obtained from an extensive review article by Stiller and Moble (2018), this was named as “Scale for Assessment of Screen Time Exposure (SASTE)” to assess typically developing children with and without the exposure of screen time. The full assessment scale is shown in Appendix –C. SASTE consists of two major sections; Section I- Qualitative Information and Section II- Quantitative Information.

Under Section, I- Qualitative Information, the details are under the sub-sections like Sub-Section A- Individual Child's Demographic Details include age, date of birth, gender, number of siblings, birth order, onset age of screen usage, number of hours spent in a day using the screen on weekdays, number of hours spent in a day using screens on weekends. Sub-Section B- Informant's/ Family Demographic Details include mother's age, father's age, educational qualification of mother and father, professional qualification of mother and father, family structure, socioeconomic status of the family, residential area of living, number of hours' mother spends in a day using screen time on weekdays and weekends, number of hours' father spends in a day using screen time on weekdays and weekends

Under Section II-Quantitative Information,the details are under the sub-sections like Sub-Section A- Neutral variables corresponding to screen time exposure of the child.This assesses information regarding the accessibility and frequency of usage of different types of gadgets (laptops, cell phones/mobiles, tabs, and television), usage of these gadgets during various activities of the day (mealtime, sleep time, and playtime), screen time given in the home, or outside environment. Sub-section B- Screen time exposure concerning positive parental factors/opinions.This assesses information regarding parent interaction with the child to teach educational concepts thereby improving the child's cognitive and attentional skills through the use of memory games and videos, child interacting with the content of the screen and thus helping the child to pick up new sounds, language, and vocabulary and thus parents monitor the speech-language development regularly and finally child capable of navigating, browsing and exploring through applications. Sub- Section C- Screen time exposure concerning

negative parental factors/opinions. This assesses information regarding parents coping mechanism from their busy day or strategy used by the caretaker/baby sitter to handle the child at home or daycare, to control child's temper tantrum, to carry out activities of daily living, parents encouraging adult-directed program (serials, advertisement, songs/music), parent-child residential environment and surrounding are not child friendly, parents professional and household chore work completion, parent-child interaction during screen time (verbal/nonverbal), inadequate supervision to facilitate joint interaction and finally parents exposed to screen time due to their depression or distress and child being the passive observer. Sub-Section D- Screen time exposure concerning positive child factors/opinions. This assesses information regarding child using gadgets that are borrowed (from parents, friends, peers), child acquired knowledge to access the gadgets and navigate through the application, child enjoying watching videos with music and animation, a child watching the child-directed program (cartoon, animations, games, educational content) which is colorful/black and white visuals with auditory listening and finally enjoy sharing the same with peer groups. Sub-Section E- Screen time exposure concerning negative child factors/opinions. This assesses information regarding child insisting on the use of the fixed gadget and program, child self-motivated as screen time is the best source of entertainment, screen time is the way to reduce the infant/toddler/child crying episode. One has acquired stereotypic knowledge to access the gadgets, child spending most of the time watching the various screen without being monitored or exposed to background screen during the child's routine work, the child's screen time exposure leading to poor verbal or non-verbal communication and leading to inadequate exposure to adapt to other activities, screen

time exposure leading to deprived sleep habit, child attaching to the family member who facilitates screen time exposure thus leading to reduced socialization, the child being hypersensitive to sounds leading to watch videos without music and finally, hypersensitive to visuals and like watching still images without any animation.

3.6.2 Scoring criteria of the developed SASTE

The constructed SASTE was used to assess the children's' screen time usage (its intensity, duration, and frequency) by the Speech-Language Pathologist based on the parental interview and observational for 30-40 minutes. As a further report, the Speech-Language Pathologist could infer the implication of screen time exposure on the child's cognitive-linguistic development. The participants (children) were observed in their natural environment, home settings, and in their schools for older children. This SASTE assessing screen time exposure uses a qualitative five-point perceptual rating scale for each factor under the sub-sections of qualitative information (A, B) and quantitative information (C, D, E, F, G). Sub-sections would assess information listed as aspects that contribute to screening time exposure as parent-child neutral, parent-child positive, and parent-child negative was scored separately. A final index was obtained for them.

The five-point perceptual rating scale consists of a uniform rating of 0, 1, 2, 3, and 4 where 'Score 0' is when the behavior (skill) or factor is absent for 0% of the time, or the child does not exhibit the behavior pattern. 'Score 1' is when the behavior (skill) or factor is rarely seen for up to 25% of the time, or the child exhibit the behavior pattern for up to 25% of the time. 'Score 2' is when the behavior (skill) or factor is sometimes seen for up to 26-50 % of the time, or the child exhibit the behavior pattern for up to 26-50 % of the time. 'Score 3' is when the behavior (skill) or factor is frequently seen for up to 51-

75% of the time, or the child exhibit the behavior pattern for up to 51-75% of the time. 'Score 4' is when the behavior (skill) or factor is very frequently seen for up to 76-100% of the time, or the child exhibit the behavior pattern for up to 76-100% of the time.

Thus, the questionnaire measures several intrapersonal (child demographics), interpersonal (family demographics, parental cognitions, parental behavior), physical environment (television, computer, or video games in the bedroom) factors within the home setting and external settings. Parents report the average amount of time per day their child spends watching television and playing video/computer games and other miscellaneous factors, etc.

3.6.3 Content validity of the developed SASTE

The created or formation of item pool, initial and final field try-out of selected items was done with the help of the experienced speech-language pathologists (SLPs) and clinical psychologists. The prepared stimulus was given to five SLPs and three clinical psychologists for validation. The professionals were asked to judge each item on a 3 point Likert rating scale for familiarity, that is, Score- 0 is least relevant; Score- 1 is relevant but can be modified, and Score- 2 is very relevant. The remark section was provided to provide any suggestions or justification. Those items that had the least relevance with proper justification from the majority of the professionals were revised if necessary, and only the validated items were selected. The modified finalized SASTE is seen in Appendix A, which was used for the present study.

3.7 Pilot study

After the construction of the scale, before the final administration, a pilot study was conducted on ten typically developing children within the age range of 0-4 years. Based on the results of the pilot study, minor modifications with the SASTE were incorporated. For example, questions were rephrased to make it more understandable for the parents.

3.7 Data collection

The SASTE was administered on typically developing children in the age range of 0-4 years and constituting as Group I (9), Group II (15), Group III (14), Group IV (13). The obtained scores were recorded on a score sheet; responses/observation of the child's behavior or skill were marked under each subdomain. The total of all the subsections was tabulated. Thus, the responses in terms of screen time exposure by these typically developing children were recorded, and the data were subjected to statistical analysis using SPSS 21.

The finalized SASTE scale was mainly subdivided into three primary domains. The First domain A was 'neutral variables' related to child use of screens. The second primary domain dealt with parental attitude and was about parental behaviors and perspectives, which were subdivided into 'Parent-positive' and 'Parent-negative' factors (B, C), respectively. The third domain was developed with child factors and perspectives, which was again subdivided into 'Child-positive' and 'Child-negative' subdomains (D, E).

The definitions of each of these variables under the domains of SASTE are as follows:

A: - Neutral Variables corresponding to screen time exposure of the child

1: - Accessibility and frequency of usage of gadget such as mobile: -

Child's level of accessibility / how easily does he/she get the mobile and how frequently does he/she use the same.

2: - Accessibility and frequency of usage of gadget such as TV: -

Child's level of accessibility / how easily does he/she get to watch the TV and how frequently does he/she use the same.

3: - Accessibility and frequency of usage of gadget such as computers/Laptops: -

Child's level of accessibility / how easily does he/she get to use the laptop/computer and how frequently does he/she use the same.

4: -Accessibility and frequency of usage of gadget such as tabs: -

Child's level of accessibility / how easily does he/she get to watch the tab and how frequently does he/she use the same.

5: - Child has access to these gadgets during various activities of the day (ADL) such as meal times

The child uses the device or screen time if required for ADL activities such as meal times.

6: -Child has access to these gadgets during various activities of the day such as playtime

A child uses the device, or screen time is required for ADL activities such as playtime.

7: -Child has access to these gadgets during various activities of the day such as sleep time

The child uses the device, or screen time is required for ADL activities such as sleep time.

8: -Screen time is given in the home environment

Screen time is given to the child only in the home environment.

9: -Screen time is given in the outdoor environment

Screen time is given in the outdoor environment, such as in cars, restaurants, etc. to reduce hyperactivity and distraction.

B: -Screen time exposure with reference to positive parental factors/opinions

1: -An interactive way for education-based teaching

Parents use screens as an interactive and exciting way to teach children.

2: -Improves the child's cognition and attention through memory games and videos

Parents can use the various devices and screens to occupy the child in games or videos that increase attention, improve cognitive skills.

3: - Increases an opportunity for the child to interact with the content of the screen

The child can imitate/ or relate to events/activities and contents of the screen into real life.

4: -The child is capable of navigation, browsing and exploring through applications

The child has the cognitive skills required to access the gadget and has learned to navigate and operate the various applications and browsers.

5: -Helps your child pick up new speech sounds

Exposure to screens and content have allowed your child to pick up new speech sounds.

6:-Helps your child pick up new language and vocabulary

Exposure to screens and content have allowed your child to pick up new languages and increase their language repertoire.

7: -Helps to monitor and facilitate speech and language development regularly

Parents can use screens and devices to keep a regular check and monitor the speech and language development of their child.

C:-Screen time exposure with reference to negative parental factor/opinions

1:- Cope (parent resting time) from their busy day

Parents use screen time to keep the child engaged after a busy day at work.

2: -A strategy used by the caretaker/baby sitter to handle the child at home or daycare

The caretaker or daycare facility uses the screen to keep the child occupied during the day.

3:-Controls the temper tantrum or fussy behaviors of the child

Parents need to use screen time to control/reduce the tantrums of the child as it diverts the child's attention.

4:- Screen time is required for activities of daily living.

The child is not motivated or does not involve in ADL's without the use of screen time.

5: -Adult directed programs- serials

The child is exposed to either direct or indirect exposure as and when parents are watching adult-directed content, such as serials.

6: - Adult directed programs- advertisement

The child is exposed to either direct or indirect exposure as and when parents are watching adult-directed content such as advertisements

7: -Adult directed programs- songs/music

The child is exposed to either direct or indirect exposure as and when parents are watching or listening to songs or music that are adult-directed or have an adult-directed content.

8: -Environment and surrounding is not child-friendly; Apartment stay

The child is given screen time as an alternative to playing outside, etc., as the child stays in an apartment and does not have a friendly environment to interact.

9: -Environment and surrounding is not child-friendly; Single house

The child is given screen time as an alternative to playing outside, etc., as the child stays in a single house and does not have a friendly environment

to interact: an unsafe neighborhood, no age-matched peers/neighbors to play.

10: -Professional (work at home) work completion using screens with the child as a passive observer.

Parents work from home or have work completion after they come home, and the child engages by watching parents work on the laptop/screen.

11: -Completion of household chores by engaging the child with a screen.

Parents keep the child engaged and occupied by using TV/screens to help in faster completion of household work.

12: -Poor parent-child verbal interaction during screen time

There is no verbal interaction or conversation between the child and parents, e.g., - parents do not explain contents seen on screen; the child does not engage in asking questions.

13: -Poor parent-child non-verbal interaction during screen time

There is no verbal interaction or conversation between the child and parents. No gestures, imitation, etc. happens when the child is watching screens.

14: - Inadequate supervision to facilitate joint interaction

There is no one to supervise screen time and engage in mutual interaction with the content of the screens.

15: - Parental exposure to excessive screen time due to depression or distress.

Parents engage in excessive screen time as a form of relief from emotional and mental stress in which the child is being exposed to the screen at the same time.

D: Screen time exposure with reference to positive child factors/opinions

1: -Child uses gadgets that are borrowed from parents

The child has access to use gadgets that are borrowed from the parents.

2: - Child uses gadgets that are borrowed from friends and peers

The child has access to or borrows devices/consoles from friends and peers.

3: -The child has acquired knowledge to access the gadgets and navigate through applications.

The child has become proficient in accessing gadgets and knows how to navigate through applications, screens, etc.

4: -Child enjoys videos with music

The child prefers enjoying watching videos that have music.

5: - Child enjoys watching videos with animation

The child prefers watching videos that have animated content.

6: -Child-directed Program- Cartoon and animation

The child watches child-directed content such as age-appropriate cartoons and animation

7: - Child-directed programs- Games

The child engages in child-directed games.

8: -Child-directed program- educational content

The child watches videos that have educational content such as rhymes, shapes, alphabets numbers, etc.

9: - Child-directed age-appropriate Content with colorful visuals

The child watches age-appropriate content that has colorful visuals.

10: -Child-directed age-appropriate content with black and white visuals

The child watches age-appropriate content that has black and white visuals

11: -Child-directed age-appropriate content with only auditory listening

The child prefers listening to age-appropriate Content

12: - Child enjoys sharing with peer groups

The child enjoys sharing the screen experiences with other children.

E: -Screen time exposure (STE) with reference to negative child factors/opinions

1:-Insists on the use of the same gadget and program

The child has the insistence of a particular program, cartoon and will watch it only through a particular gadget.

2: -Self-motivated, as the child finds it the best source of entertainment.

The child is motivated only to screen time and prefers it over other activities.

3: -Reduction of infant/toddler/child crying episode

Screen time is used to reduce child crying episodes by diverting their attention.

4:- Acquired stereotypic knowledge to access the gadgets

The child has learned negative patterns, such as crying and tantrums, to access and view the gadget.

5:- The child spends most of the time watching various screens without being monitored (direct exposure)

The child is exposed to screens without having anyone to monitor what the child is watching.

6:-Exposed to background running screen during the child's routine work (indirect exposure)

Screens are running throughout the day, even without the child directly watching the screen.

7:-STE leading to poor verbal communication by the child

The child has poor verbal communication or reduced communication intent due to prolonged exposure to screen.

8:-STE leading to poor non-verbal communication

The child has poor nonverbal communication, such as using gestures to express needs due to prolonged exposure to screens.

9:-STE leading to inadequate exposure to adapt to other activities

Due to prolonged exposure, the child has difficulty shifting to other activities.

10:- Screen time exposure leading to deprived sleep habits.

Due to excessive screen time, a child has difficulty with sleep patterns.

11:- Attachment to the family member who only facilitates screen time exposure leading to reduced socialization.

The child is attached to the family member who gives the child screen time and which reduces social interaction with other children.

12:- Hypersensitive to sounds which lead to watching videos without music

The child has abnormal sensory issues with loud sounds leading to a child preferring to watch videos without music.

13:-Hypersensitive to visual stimuli and likes watching still images /without any animation

The child has abnormal sensory issues with moving images leading the child to watch still pictures or videos without animation.

(See Appendix C for finalized scale)

Chapter IV

Results

The present study aimed to develop and standardize a "Scale for Assessment of Screen Time Exposure (SASTE)" in typically developing children in the age range of 0-4 years. Thus, evaluate the contributing factor under the variable 'screen time exposure' in relation to 'language development' in typically developing children. This association between screen time exposure and language development includes other factors like the chronological age, gender, language age, family structure, and the onset of screen time usage of the typically developing children,

The perceptual rating scores on the administration of SASTE on typically developing children were tabulated and subjected to statistical analysis using SPSS Version 21. The scale score with reference to the ACSLS scores (language age- receptive level and expressive level), number of minutes the child spent watching the screen on weekend and weekday, of the qualitative section was majorly considered for statistical analysis along with the subsections like Neutral variables total, Parental Positive Variables, Parental Negative Variables, Child Positive Variables, Child Negative Variables, Combined Positive score (parental positive plus child positive), Combined negative score (parental negative plus child negative) of the quantitative section of the scale. Thus, the data were tabulated under these sections. The same data was subjected to statistical analysis, primarily the normality test. Shapiro Wik's test for normality was administered, and the results revealed that the data did not follow a normal distribution ($p < 0.05$).

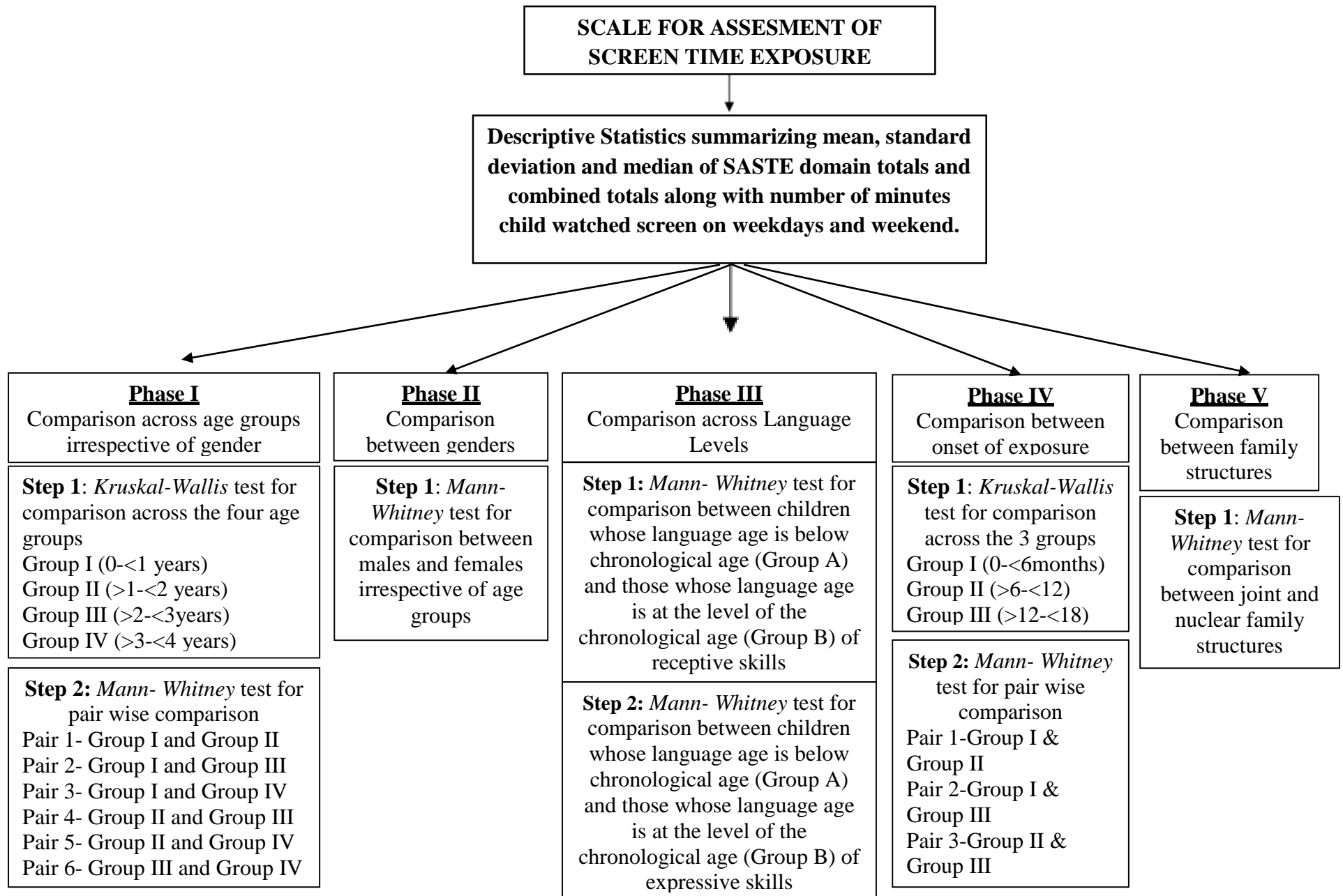
SECTION I- The descriptive statistics were performed. The mean, median, standard deviation of the SASTE parameter totals (Number of minutes the child spends watching the screen on the weekday and weekend, Neutral variables total, Parental Positive Variables, Parental Negative Variables, Child Positive Variables, Child Negative Variables, Combined Positive score, Combined negative score).

SECTION II- The non-parametric tests was the further statistical analysis, due to a higher standard deviation. The same non-parametric statistical analysis of the qualitative scores was done in FIVE phases, as represented in Figure 4.1. In Phase I-*Step 1*, comparison across the age groups formed with reference to four different age ranges irrespective of the gender using Kruskal- Wallis test. In *Step 2*, pairwise comparison with reference to four different age range irrespective of the gender using Mann- Whitney U test. In Phase II- *Step 1*, the comparison was made between the gender irrespective of the age using Mann- Whitney U test. In Phase III-*Step 1*, the comparison was made between the children with language age at below chronological age versus children with language age at the level of the chronological age of receptive skills and *Step 2*, expressive skills as per the administration of ACSLS. In Phase IV-*Step 1*, the comparison was made between three age range with reference to the onset of screen time exposure irrespective of age, gender and language age using Kruskal-Wallis test and *Step II*, the comparison was made between two age ranges with reference to the onset of screen time exposure irrespective of age, gender and language age using Mann-Whitney U test. In Phase V- *Step 1*, the comparison was made between joint and nuclear family information by grouping the participants into two groups based on their parent's family structure, and Mann-Whitney

U test was administered for the same to see the difference between joint and nuclear family.

Figure 4.1

Statistical Analysis for the Qualitative Data (SASTE Score) of the Total Population.



4.1 Section I- Descriptive Statistics for SASTE Scores of Typically Developing

Children.

The results of descriptive statistics in terms of mean, median, the standard deviation of the totals number of participants (N- 51) at all sub-domains of the SASTE parameter

totals in terms of different sub-domains like the number of minutes the child spends watching the screen on the weekday and weekend, Neutral variables total, Parental Positive Variables, Parental Negative Variables, Child Positive Variables, Child Negative Variables, and the further derived variables were Combined Positive score, Combined negative score are shown in Table 4.1.

Table 4.1

Mean, Median, and Standard Deviation of SASTE Variables

SASTE sub-domains	Mean	Median	SD
Number of minutes child watch screen on a weekday	89.47	50.00	88.81
Number of minutes child spends watching screens on the weekend	98.92	60.00	102.77
Neutral variables total	11.06	12.00	4.77
Parental positive variable total	8.16	6.00	7.22
Parental negative variable total	13.20	14.00	9.86
Child positive variable total	19.05	20.00	8.14
Child negative variable total	8.27	7.00	7.25
Combined Positive total	27.22	26.00	14.17
Combined Negative total	21.47	21.00	15.81

The descriptive statistics showed that the children spent more time in watching and using screens during the weekend than compared to weekdays. Children using screens appropriately and watching appropriate content (Child positive variable) had the highest mean followed by parental negative variable, neutral variable, child negative, and parental positive variable. Parent and child combined positive factors were higher when compared to the negative factors. This shows that the typically developing children showed very few features related to the abnormal effect of screen time.

Descriptive statistics separately were done for Group I, Group II, Group III, Group IV formed with reference to their age range is shown in Table 4.2. The mean, standard deviation, and median are represented for all the sub-domains of the SASTE parameter totals with respect to their specific number of participants in each group. From Table 4.2, for the sub-domain A, B, D, E, F, and G Group IV had the highest mean followed by Group III, Group II, and Group I. For the sub-domain C, SWD, and SWE, Group III had the highest mean followed by Group IV, Group II, and Group I. Overall, the screen time usage was reported to be more in Group IV and Group III, the age range from 2-4 years.

Descriptive statistics was done by grouping the participants based on gender and irrespective of age. Table 4.3 represents the descriptive statistics that showed females having higher mean for the domains of SASTE, suggesting increased screen time compared to males.

Descriptive statistics was done by considering the receptive language score and expressive language score on the administration of ACSLS in relation to the SASTE score for typically developing children, and the results are represented in Table 4.4. It

was observed that children who had receptive skills below their chronological age had more prolonged exposure to screen time on weekdays and weekends when compared to children whose receptive language age was age adequate. It was also observed that subdomain positive parental factors were the least scored in these children. It was inferred that the child did not use the positive parental support in the use of screen time to acquire speech and language skills, how performed poorly in ACSLS receptive language. Similarly, Table4.4 represents the descriptive statistics for the expressive language score in relation to the SASTE score, and it was observed that children who had expressive skills below their chronological age had more prolonged exposure to screen time on weekdays and weekends when compared to children whose expressive language age was age adequate. It was also observed that subdomain child negative factor was the least scored in children with age adequate language.

Table 4.2 Mean, Median, Standard deviations of SASTE Scores across Four Age Groups (0-1 year,1-2 years,2-3 year,3-4

SASTE Sub- variables/ Age range	Age group											
	Group I			Group II			Group III			Group IV		
	0-1 (N=9)			1-2 (N=15)			2-3 (N= 14)			3-4 (N= 13)		
	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
A	5.22	4	3.07	10.80	12.00	4.47	12.43	12.0	4.36	13.92	13	2.84
B	0.89	0.00	1.69	5.67	5	6.12	10.07	8	6.23	14	15	6.42
C	4	4	2.44	12.73	11	9.61	17.79	16.50	10.38	15.15	17.	9.17
D	10.11	9	5.96	16.33	13	8.03	22.07	22.50	3.47	25.15	26	6.66
E	2	1	2.64	7.67	7	4.93	9	5.50	9.05	12.54	11	6.83
F (Derived)	11	9	6.70	22	16	13.04	32.14	30	8.53	39.15	40	10.77
G (Derived)	6	5	4.92	20.40	22	12.88	26.79	22.50	18.46	27.69	29	14.38
SWD	17	10	11.11	77.33	75	77.75	123.57	55	119.65	116.92	90	62.63
SWE	18.33	15	10.30	81	40	83.67	141.43	75	141.90	129.62	120	74.56

Note: A- Neutral variables total, B- Parental positive factors total, C-Parental negative factors total, D-Child positive factors total, E-Child negative factors total, F- Combined Positive (derived from B+D), G-Combined Negative(derived from C+E), SWD- No. of minutes child watches screen on a weekday, SWE- No. of minutes child spends watching screens on the weekend

Table 4.3 *Mean, Median, and Standard deviation of SASTE across Gender (male verse female)*

SASTE VARIABLES	Mean		Median		SD	
	Male (N- 25)	Female (N- 26)	Male (N- 25)	Female (N- 26)	Male (N- 25)	Female (N-26)
A	10.96	11.15	12.00	10.50	5.35	4.24
B	6.28	9.96	6.00	7.00	6.38	7.64
C	10.84	15.46	8.00	16.50	8.48	10.70
D	16.88	21.15	19.00	20.50	9.34	6.29
E	8.04	8.50	7.00	7.00	6.86	7.73
F (Derived)	23.16	31.12	20.00	29.50	14.46	13.00
G (Derived)	18.88	23.96	20.00	22.50	13.48	17.67
SWE	78.00	119.04	50.00	70.00	76.34	121.12
SWD	66.52	111.54	40.00	70.00	60.90	105.74

*Note:*A- Neutral variables total, B- Parental positive factors total, C-Parental negative factors total, D-Child positive factors total, E-Child negative factors total, F-Combined Positive (derived from B+D), G-Combined Negative(derived from C+E), SWD- No. of minutes child watches screen on a weekday, SWE- No. of minutes child spends watching screens on the weekend

Table 4.4 Mean, Median, Standard Deviation of SASTE Score across Language Score of ACSLS

SASTE Variables	ACSLS score at Below Chronological Age						ACSLS score at the Level of Chronological Age					
	Receptive Age(n=15)			Expressive Age(n=18)			Receptive Age (n=36)			Expressive age (n=33)		
	M	SD	Med	M	SD	Med	M	SD	Med	M	SD	Med
SWD	139.00	123.43	90.00	138.61	116.46	125.00	68.83	60.69	50.00	62.67	54.94	50.00
SWE	151.33	134.67	120.00	155.56	131.23	120.00	77.08	78.53	45.00	68.03	67.58	40.00
A	11.53	3.79	12.00	11.56	4.48	12.50	10.86	5.16	12.00	10.79	4.97	12.00
B	7.33	6.49	6.00	8.33	7.24	6.00	8.50	7.57	6.00	8.06	7.33	6.00
C	17.20	12.95	14.00	16.89	12.33	15.50	11.53	7.88	12.00	11.18	7.70	10.00
D	20.13	7.26	20.00	20.55	8.94	21.50	18.61	8.54	19.00	18.24	7.70	19.00
E	11.80	8.76	12.00	11.28	8.393	11.50	6.81	6.07	6.50	6.64	6.07	6.00
F	27.47	12.85	29.00	28.89	15.381	30.50	27.11	14.86	25.00	26.30	13.63	25.00
G	29.00	20.16	22.00	28.17	19.306	23.00	18.33	12.65	20.50	17.82	12.39	20.00

Note: A- Neutral variables total, B- Parental positive factors total, C-Parental negative factors total, D-Child positive factors total, E-Child negative factors total, F-Combined Positive (derived from B+D), G-Combined Negative(derived from C+E), SWD- No. of minutes child watches screen on a weekday, SWE- No. of minutes child spends watching screens on the weekend

4.2 Section II- Non-Parametric Tests

4.2.1 Phase I- Step I- Comparison between the Four Age Groups of typically developing children for SASTE variable scores.

In the present study, the results on the domains under SASTE and the number of minutes the child watches screens on weekdays and weekends were studied in this section. Kruskal Wallis test was administered to observe the differences between the four age groups, and the results are shown in Table 4.5. The significant difference ($p < 0.005$) across the age group was seen for all the sub-domains of the SASTE parameter totals listed under the sub-domains like the number of minutes the child spends watching the screen on the weekday and weekend, Neutral variables total, Parental Positive Variables, Parental Negative Variables, Child Positive Variables, Child Negative Variables, and the further derived variables were Combined Positive score, Combined negative score.

Table 4.5 Results of Kruskal Wallis for SASTE Domains across Age Groups.

Parameters	Chi-Square	Df	p-value
No. of minutes child watches screen on a weekday	19.705	3	0.000**
No. of minutes child spends watching screens on the weekend	20.374	3	0.000**
Neutral variables total	18.824	3	0.000**
Parental positive factors total	24.247	3	0.000**
Parental negative factors total	11.461	3	0.009**
Child positive factors total	21.987	3	0.000**
Child negative factors total	16.843	3	0.001**
Combined Positive	26.599	3	0.000**
Combined Negative	15.107	3	0.002**

4.2.2 Phase I- Step II- Pairwise Comparison between the Four Different Age Ranges Irrespective of the Gender

The pairwise comparison was made between the four age ranges of typically developing children's scores on the administration of SASTE. For the same Mann-Whitney U test was administered and the results on the quantitative domains of SASTE and the qualitative domains of SASTE like the number of minutes the child watches screens on weekdays and weekends are listed in Table 4.6. The pairwise comparison was made between Group I versus Group II (Pair 1), Group I versus Group III (Pair 2), Group I versus Group IV (Pair 3), Group II versus Group III (Pair 4), Group II versus Group IV (Pair 5), Group III versus Group IV (Pair 6).

From Table 4.6, it is seen that for Pair 1, the significant difference was found in all the subdomains of SASTE- neutral variables, parent positive, parent negative, child negative, combined positive, combined negative except child positive scores. This difference when seen along with the raw score that the age range >1-<2 years used screens to a greater extent compared to the other group 0-<1 year, and it also shows that children have not learned to use screens positively in the age range 0- <1 and >1-<2 years.

In Pair 2 and Pair 3, there was a significant difference across the age ranges for all the sub-domains of SASTE. This significant difference is seen with an additional explanation from the raw score that the age range 0-<1 years used less screen time compared to >2-<3 years and >3-<4 years, where this age range >2-<4 years have mastered in the use of screen time. In Pair 4, there was a significant difference for the sub-domain parental decisive factor, child positive factor, and combined/derived positive

parent-child factor only. In this age range of >1-<2, the parents are not positive in the use of screen time, and the child may not be positive in use. Whereas in the age range >2-<3 years the parents are positive in the use of screen time and the child is also positive to use screen time to learn concepts as we found more scores for combined positive parent-child factor for this age range of >2->3. This might have contributed to a significant difference. Age range secondly the parents encourage the child to use the screen time. In **Pair 5**, the sub-domain parental positive factor, child positive factor, and combined positive parent-child factor, the number of minutes the child spends watching screen during the weekend were found to show significant difference across the age range. This could be because of the vast difference between the age range >1-<2 and >3-<4 years and the higher age range >3->4 are more positively monitored and use screen time more effectively to learn some concepts. In **Pair 6**, there was no significant difference seen for none of the subdomains of SASTE.

Table 4.6

Results of Mann-Whitney U test for SASTE for Pairwise Comparison

Group I versus Group II (Pair 1)		
Parameters of SASTE	Z	P value
No. of minutes child watches screen on a weekday	2.921	0.003**
No. of minutes child spends watching screens on the weekend	2.677	0.007**
Neutral variables total	2.828	0.005**
Parental positive factors total	2.864	0.004**
Parental negative factors total	2.218	0.027**
Child positive factors total	1.853	0.64

Child negative factors total	2.921	0.003**
Combined positive total	2.391	0.017**
Combined negative total	2.749	0.006**

Group I versus Group III (Pair 2)

Parameters of SASTE	Z	P value
No. of minutes child watches screen on a weekday	3.589	0.000**
No. of minutes child spends watching screens on the weekend	3.733	0.000**
Neutral variables total	3.561	0.000**
Parental positive factors total	3.823	0.000**
Parental negative factors total	3.251	0.001**
Child positive factors total	3.730	0.000**
Child negative factors total	2.567	0.010**
Combined positive total	3.912	0.000**
Combined negative total	3.344	0.001**

Group I and Group IV (Pair 3)

Parameters of SASTE	Z	P value
No. of minutes child watches screen on a weekday	3.858	0.000**
No. of minutes child spends watching screens on the weekend	3.856	0.000**
Neutral variables total	3.862	0.000**
Parental positive factors total	3.568	0.000**
Parental negative factors total	2.710	0.007**
Child positive factors total	3.619	0.000**
Child negative factors total	3.651	0.000**
Combined positive total	3.747	0.000**
Combined negative total	3.350	0.001**

Group II and Group III (Pair 4)		
Parameters of SASTE	Z	P value
No. of minutes child watches screen on a weekday	1.23	0.218
No. of minutes child spends watching screens on the weekend	1.64	0.100
Neutral variables total	1.10	0.271
Parental positive factors total	2.306	0.021**
Parental negative factors total	1.09	0.275
Child positive factors total	2.214	0.027**
Child negative factors total	0.154	0.878
Combined positive factors total	2.449	0.014**
Combined negative factors total	0.699	0.485
Group II and Group IV (Pair 5)		
Parameters of SASTE	Z	P value
No. of minutes child watches screen on a weekday	1.900	0.057
No. of minutes child spends watching screens on the weekend	1.992	0.046**
Neutral variables total	1.715	0.086
Parental positive factors total	2.888	0.004**
Parental negative factors total	0.692	0.489
Child positive factors total	2.798	0.005**
Child negative factors total	1.942	0.052
Combined positive factors total	3.366	0.001**
Combined negative factors total	1.291	0.197

4.2.3Phase II- Step I- Comparison Between Male and Female of Typically Developing Children for SASTE Scores

The results pertaining to the scores under SASTE and the number of minutes the child watches screens on weekdays and weekends were studied in this section to note the

difference between the gender of typically developing children irrespective of age. Mann Whitney test was administered to observe the difference in the same. Table 4.7 represents the results of the Mann Whitney test, and it was noted that there was no significant difference seen across gender.

Table 4.7.

Results of Mann-Whitney U test for SASTE by Comparing between Gender

SASTE VARIABLES	Z	P-value
No. of minutes child watches screen on a weekday	1.627	0.104
No. of minutes child spends watching screens on the weekend	1.541	0.123
Neutral variables total	0.028	0.977
Parental positive factors total	1.695	0.090
Parental negative factors total	1.651	0.099
Child positive factors total	1.576	0.115
Child negative factors total	0.217	0.828
Combined positive scores	1.942	0.052
Combined negative scores	1.009	0.313

4.2.4 Phase III- Step I- Comparison across Receptive Language Age on the Administration of ACSLS in Typically Developing Children

The language assessment was done using ACSLS in typically developing children who were grouped as receptive language below their chronological age and the receptive language age at the level of chronological age. The results pertaining to the scores under the subdomains of SASTE and the number of minutes' children were exposed to screen during weekdays and weekends for the total participants with respect to the ACSLS receptive language age on the administration of Mann Whitney test is presented in Table 4.8. From Table 4.8, it is observed that the significant difference across the groups (based on ACSLS- Receptive score) was seen only for the number of minutes the child spends watching the screen on weekends and the child's negative factors.

Table 4.8- *Results of Mann-Whitney U test for SASTE by Comparing ACSLS Receptive Language Scores.*

4.2.5 Phase III - Step II- Comparison across Expressive Language Age on the ACSLS –Receptive Language age

SASTE VARIABLES	Z	P-value
No. of minutes child watches screen on a weekday	-1.785	0.074
No. of minutes child spends watching screens on the weekend	-2.023	0.043*
Neutral variables total	-0.426	0.670
Parental positive factors total	-0.291	0.771
Parental negative factors total	-1.304	0.192
Child positive factors total	-0.746	0.456
Child negative factors total	-2.043	0.041*
Combined positive scores	-0.134	0.893
Combined negative scores	-1.510	0.131

Administration of ACSLS in Typically Developing Children

The language assessment was done using ACSLS in typically developing children who were grouped as expressive language below their chronological age and the expressive language age at the level of chronological age. The results pertaining to the scores under the subdomains of SASTE and the number of minutes' children were exposed to screen during weekdays and weekends for the total participants with respect to the ACSLS expressive language age on the administration of Mann Whitney test is presented in Table 4.9. From the Table 4.9, it is observed that the significant difference across the groups (based on ACSLS- Expressive score) was seen only for the number of minutes the child spends watching the screen on weekdays and weekends and the child negative factors.

Table 4.9-

Results of Mann-Whitney U test for SASTE by Comparing between ACSLS Expressive Language scores

ACSLS –Expressive Language age		
SASTE VARIABLES	Z	P-value
No. of minutes child watches screen on a weekday	-2.236	0.025*
No. of minutes child spends watching screens on the weekend	-2.502	0.012*
Neutral variables total	-0.703	0.482
Parental positive factors total	-0.238	0.812
Parental negative factors total	-1.530	0.126
Child positive factors total	-1.136	0.256
Child negative factors total	-2.156	0.031*
Combined positive scores	-0.572	0.567
Combined negative scores	-1.716	0.086

4.2.6Phase IV- Step I - Comparison across Group Formed Based on the Onset of Screen Exposure

On consideration of the total population of typically developing children considered for the present study, six groups were formed based on the factor called "onset of screen exposure" since this was an interesting variable to be studied in this present data. It was interesting to group the individuals based on their screen exposure at the age of 0- ≤6 months (N- 8) (Group I), >6-≤12 months (N-26) (Group II) and >12-≤18 months (N- 12) (Group III), >18-<24 months (N- 3) (Group IV), >24-< 30 (N- 1) (Group V), and >31-<36 (N- 1) (Group VI). The first three groups with a minimum 8 number of participants were only considered for comparison. Kruskal-Wallis test was administered to observe the difference among these 3 age groups as the other group had three and only one participant, respectively. The results pertaining to the domains under SASTE and the number of minutes the child watches screens on weekdays and weekends are explained based on the onset of screen exposure in the child's speech-language developmental period is listed in the following Table 4.10. However, this was not the objective of the present study. The significant difference across the group was seen for the number of minutes the child spends watching screens on weekdays and weekends, subdomain child positive child factors, and combined parent-child positive factors, as seen in Table 4.10.

Table 4.10

Results of Kruskal Wallis Test for SASTE by Comparing across Groups Formed based on the Onset of Screen Exposure

SASTE VARIABLES	Chi-Square	df	Asymp. Sig.
No. of minutes child watches screen on a weekday	10.030	2	0.007*
No. of minutes child spends watching screens on the weekend	10.351	2	0.006*
Neutral variables	5.539	2	0.063
Parent positive variables	4.799	2	0.091
Parent negative variables	2.678	2	0.262
Child positive variables	8.785	2	0.012*
Child negative variables	4.968	2	0.083
Combined positive scores	7.471	2	0.024*
Combined negative scores	4.260	2	0.119

4.2.6 Phase IV- Step I - Comparison across Group Formed Based on the Onset of screen Exposure

The pairwise comparison was also studied for the variable called the onset of screen time exposure. To examine the difference in SASTE scores and the number of minutes exposed to screen across weekdays and weekends between Group I (0-<6 months) versus Group II (>6-12months)-PAIR 1, Group I (0-<6 months) and Group III (>12-<19 months) –PAIR 2, Group II (>6-<12 months) and Group III (>12-<19 months) PAIR 3, the Mann Whitney U test was administered, and the results are tabulated in Table 4.11. In the first pair, only the number of minutes the child is exposed to screen during the weekdays and weekends were found to be significant. This could be as the onset in both these groups are at a much younger age before the parents or child starts

positively using the screen. In Pair 2, all domains except subdomain negative parental factors and combined negative scores were found to be significant. This could be as in group III; the parent might start to use screens to teach children early school concepts etc. due to the age difference. In Pair 3, only the number of minutes the child was exposed on weekdays and weekends and subdomain child positive factors were found to be significant.

Table 4.11

Results of Mann Whitney U Test for SASTE by comparing Pairwise

Group I versus Group II (Pair 1)		
SASTE VARIABLES	Z	P-value
No. of minutes child watches screen on a weekday	2.168	0.030*
No. of minutes child spends watching screens on the weekend	2.267	0.023*
Neutral variables total	1.834	0.067
Parental positive factors total	1.209	0.227
Parental negative factors total	1.506	0.132
Child positive factors total	1.485	0.138
Child negative factors total	1.389	0.165
Combined positive scores	1.606	0.108
Combined negative scores	1.687	0.092
Group I versus Group III (Pair 2)		
SASTE VARIABLES	Z	P- value
No. of minutes child watches screen on a weekday	2.405	0.016*
No. of minutes child spends watching screens on the weekend	2.406	0.016*
Neutral variables total	2.372	0.018*
Parental positive factors total	2.099	0.036*
Parental negative factors total	1.468	0.142
Child positive factors total	2.367	0.018*

Child negative factors total	2.017	0.044*
Combined positive scores	2.471	0.013*
Combined negative scores	1.897	0.058
Group II versus Group III (Pair 3)		
SASTE VARIABLES	Z	P-value
No. of minutes child watches screen on a weekday	2.292	0.022*
No. of minutes child spends watching screens on the weekend	2.306	0.021*
Neutral variables total	0.806	0.420
Parental positive variables total	1.452	0.147
Parental negative variables total	0.189	0.420
Child positive variables total	2.409	0.016*
Child negative variables total	1.450	0.147
Combined positive scores	1.855	0.064
Combined negative scores	0.817	0.414

4.2.7 Phase V- Comparison across Group Formed Based on the Structure of the Family

On consideration of the total population of typically developing children considered for the present study, two groups were formed based on the factor called "structure of family" since this was another interesting variable to be studied in this present data. It was interesting to group the individuals based on their family structure as Nuclear Family and Joint Family. To compare the difference between these two groups, Mann Whitney U test was administered, and the results are shown in Table 4.12. It was noted that there was no significant difference between the two groups consisting children belonging to nuclear families and joint families for all the domain of SASTE except child

negative factor total which when compared along with the raw scores shows that the child negatively using the screen was higher in the nuclear family group.

Table 4.12

Mann Whitney test to Compare across Groups of Family Structure

SASTE VARIABLES	Z	P-value
No. of minutes child watches screen on a weekday	0.722	0.470
No. of minutes child spends watching screens on the weekend	0.465	0.642
Neutral variables total	0.884	0.377
Parental positive factors total	1.236	0.216
Parental negative factors total	0.749	0.454
Child positive factors total	0.019	0.985
Child negative factors total	2.222	0.026*
Combined positive scores	0.796	0.426
Combined negative scores	1.525	0.127

Chapter V

Discussion

The present study aimed to develop and standardize a “Scale for Assessment of Screen Time Exposure (SASTE)” in typically developing children in the age range of 0-4 years and also to evaluate that the results of the present study suggest that there are factors of screen time that can enhance as well as be detrimental to a typically developing children’s speech-language development. The SASTE parameter totals Number of minutes the child spends watching the screen on the weekday- SWD and weekend- SWE, Neutral variables total- A, Parental Positive Variables -B, Parental Negative Variables- C, Child Positive Variables- D, Child Negative Variables- E, Combined Positive Score-F, Combined negative score- G is represented with the abbreviations for easy description in the further sections.

The results reveal a linear developmental trend as the age of the child increase in the amount of exposure the child has with screens. The findings of the study are explained under the following headings

- Performance on SASTE by typically developing children
- Performance on SASTE in relation with different age range and gender of typically developing children
- Performance on SASTE in relation to language scores obtained from ACSLS
- Performance of SASTE in relation to demographic details of typically developing children

5.1 Performance on SASTE by Typically Developing Children

The factors of SASTE which were analyzed for the total number of participants (N= 51) at all sub-domains of the SASTE parameter totals in terms of different sub-domains like the number of minutes the child spends watching the screen on the weekday and weekend, Neutral variables total, Parental Positive Variables, Parental Negative Variables, Child Positive Variables, Child Negative Variables, and the further derived variables were Combined Positive score and Combined negative score.

The descriptive statistics showed that the children spent more time in watching and using screens during the weekend than compared to weekdays, reasons pertaining to the same could be because children spend more time at home away from school, some studies also state increase in screen time during weekends can be due to increased parental viewing during weekends along with which children also view the screens (Elias et al., 2019). Children using screens appropriately and watching appropriate content (Child positive variable) had the highest mean. This domain answered questions of the type of content (educational, child-appropriate content), the child watches, and uses, as other studies also state that this enhances a child's language and cognitive development (Linebarger et al., 2001).

This is followed by negative parental variables in which the parents use digital media as a coping mechanism from their stressful days, or to get work done. It also shows that children are exposed to the screen due to increase parental use of the screen and exposed to adult-directed content which is not appropriate for the child, reduces the quality and quantity of parent-child interaction. The parents give more screen time due to

environment in which the child stays such as apartments or single houses with no appropriate facility to engage the child in physical activities such as parks etc.(Bentley et al., 2016; Elias et al., 2019; Carson et al., 2010; Gonclaves et al., 2019;Kirkorian et al., 2017).

The parental negative factors are then followed by the neutral variables such as where and when the child is given and what type of the screen the child watches, child negative this domain consisted of children throwing tantrums to watch screens, there is very poor social interaction from the child, the presence of background television that can affect the attention of a child. No monitoring or shared viewing of what the child watches on the screen, and was finally parental positive variable in which the parents gave screen with intention to increase interaction with the child, improves their cognition, language, and vocabulary (Beatty et al., 2018). Parent and child combined positive factors were higher when compared to the negative factors. This shows that the typically developing children showed very few features related to the abnormal effect of screen time.

5.2 Performance on SASTE in relation with different age range and gender of typically developing children

Overall, the screen time usage was reported to be more in Group IV and Group III, the age range from 2-4 years. This finding is supported by other studies, which also state that as the age of the child increases, screen time also increases. The time spent by children 3-5 years was longer than 2hours/day than those aged 1-2 years (Korulaba et al., 2009, Ofcom2017). In the present study, Group III, with the age range (>2-<3 years), spent watching the screen for a duration of 123 and 141 minutes during weekdays and

weekends, respectively. Group IV with the age range (>3-<4 years) spent watching the screen for a duration of 116 and 129 minutes during weekdays and weekends, respectively. Overall, the children used to spend nearly 2 hours/day (weekend/weekdays) on the administration of the SASTE.

The significant difference ($p < 0.005$) across the age group was seen for all the sub-domains of the SASTE parameter totals listed under the sub-domains like the number of minutes the child spends watching the screen on the weekday and weekend, Neutral variables total, Parental Positive Variables, Parental Negative Variables, Child Positive Variables, Child Negative Variables, and the further derived variables were Combined Positive score, Combined negative score.

In Pair 1, the significant difference was found in all the subdomains of SASTE. This difference when seen along with the raw score, the age range >1-<2 years used screens to a greater extent compared to the other group 0-<1 year, and it also shows that children have not learned to use screens positively in the age range 0- <1 and >1-<2 years. This significant difference could be attributed to the fact that children as young as 0-1 years do not have the attention span, the cognitive development that is required to watch screens which will be better developed in the older age group. Children will not be able to comprehend transitions, a quick change in audio or visual modes, pay attention to both space and time (Anderson et al., 2010). In 6 months, even though the child has the auditory and visual capacity to watch television, there is minimal proof that children can comprehend and relate what is seen or heard. Although a study was done by Barr et al. in 2007 states that 6 months are probable to imitate simple actions when videos are simple, and it has multiple repetitions.

In Pair 2 and Pair 3, there was a significant difference across the age ranges for all the sub-domains of SASTE. This significant difference is seen with an additional explanation from the raw score that the age range 0-<1 years used less screen time compared to >2-<3 years and >3-<4 years, where this age range >2-<4 years have mastered in the use of screen time. By age, cognitive, behavioral, and language development has changed drastically when compared to the younger age groups (Anderson et al., 2010). The younger age group, explore themselves and their physical surroundings; different types of play emerge, as all their senses are being fed by what they hear, see, taste, touch, and smell, their exploration and curiosity make them interact with the world more. This age is a very critical and crucial age for language development, and infant's interactions should teach them better than what screens and gadgets can do at this age. They are drawn to can comprehend what they see and hear much better.

In Pair 4, there was a significant difference for the sub-domain parental decisive factor, child positive factor, and combined/derived positive parent-child factor only. In this age range of >1-<2, the parents are not positive in the use of screen time, and the child may not be positive in use too. Whereas in the age range >2-<3 years, the parents are positive in the use of screen time, and the child is also positive to use screen time as we found more scores for combined positive parent-child factor for this age range of >2->3. The reasons pertaining to it can be the fact that children of this age are more exposed to educational media, which has benefits for the toddlers and pre-schoolers. This helps in the development of their literacy, math skills, and social behaviors, etc. (Wartella, 2012). This might have contributed to a significant difference. Also, the younger children have difficulty transferring what is seen on 2D to 3D or as what authors call as video deficit

and that child learned better with real-life adult and child interactions rather than that from the screen (Strouse et al., 2008; Barr et al., 1999; Hayne et al., 2003; Deocampo et al., 2005).

In Pair 5, the sub-domain parental positive factor, child positive factor, and combined positive parent-child factor, the number of minutes the child spends watching screen during the weekend were found to show significant difference across the age range. This could be because of the vast difference between the age range $>1-<2$ and $>3-<4$ years and the higher age range $>3->4$ are more positively monitored and use screen time more effectively to learn concepts for school. In Pair 6, there was no significant difference seen for none of the subdomains of SASTE.

Descriptive statistics was done by grouping the participants based on gender and irrespective of age. Table 4.3 represents the descriptive statistics that showed females having higher mean for the domains of SASTE, suggesting increased screen time compared to males. Most international studies (Carson et al., 2010) state that boys had a higher mean score of exposure, and they engaged in an hour more than girls. However, another study was done by Carson et al. in 2017 states that girls from lower-income families or those from an ethnic minority had higher screen time exposure. Our findings are similar to this study; that is, girls had higher exposure to screens. This only leads us to wonder whether our culture and society play a role in this in which girls are not allowed or given permission easily to engage in play activities outside the home without supervision due to negative parental perceptions. Highly unsafe neighborhoods and limited extracurricular activity can lead to an increase in sedentary indoor activity such as

watching screens, etc. This requires more in-depth research to find the reasons for the same.

In our study, it was noted that there was no significant difference seen across gender. This finding is supported by a study done by Carson et al. in 2012, where there was no significant difference to associate screen time and an intrapersonal factor such as gender.

5.3 Performance on SASTE in Relation to Language Scores Obtained from ACSLS

Descriptive statistics was done by considering the receptive language score and expressive language score on the administration of ACSLS with regard to the SASTE score for typically developing children, and the results are represented in Table 4.4. It was observed that children who had receptive skills below their chronological age had more prolonged exposure to screen time on weekdays and weekends when compared to children whose receptive language age was age adequate. This finding is supported by many studies that state that children who have prolonged exposure to screens are at a higher risk of having a language delay. A cross-sectional survey in Korea revealed that toddlers who had more than 2 hours of watching TV were at a 2.7 times risk of a language delay than those who had less than one hour and those who had more than 3 hours were at 3 times more risk (Byeon et al.,2015). There can be various factors that contribute to this prolonged exposure. In our study, it was also observed that subdomain positive parental factors were the least scored in these children. It can be inferred that the parents did not positively engage the child to watch screens or choose appropriate content, or there was reduced interaction from the parents during the screen time. Parents who thought that media could help in enhancing language development might make their

children watch TV for a more protracted amount of time. Another factor can be that the nature of TV cannot substitute the nature of communication, as the exchange of information primarily unilateral, which therefore reduces or doesn't increase the child's opportunities to communicate. These can be a few of the reasons why the child performed poorly in ACSLS receptive language. Similarly, Table 4.5, represents the descriptive statistics for the expressive language score in relation to SASTE score and it was observed that children who had expressive skills below their chronological age had more prolonged exposure to screen time on weekdays and weekends when compared to children whose expressive language age was age adequate. It was also observed that subdomain child negative factor was the least scored in children with age adequate language.

From Table 4.10, it is observed that the significant difference across the groups (based on ACSLS- Receptive score) was seen only for the number of minutes the child spends watching the screen on weekends and the child negative factors

From the Table 4.11, it is observed that the significant difference across the groups (based on ACSLS- Expressive score) was seen only for the number of minutes the child spends watching the screen on weekdays and weekends and the child negative factors. Most studies state that children's language was dependent on the amount of exposure the child had and also the content of what the child was exposed (Linebarger, 2005;KostyrkaAllchorne, 2017) and found that children who were exposed to adult or older viewing content had a reduced vocabulary when compared to appropriate child-directed content. Studies also state that comprehension and expression of new vocabulary increased when a child was being read to, more than watching child-directed content.

(Robb et al., 2009) The negative child factors in which the child is only motivated to screen time, and the child has learned tantrums on how to access screens, and the screen is required every time the child cries to calm him down are few of the negative factors that can increase the risk of language delay.

The present findings can be supported by various studies and also by the guidelines given by the American Academy of Paediatrics of the amount of exposure that the child has. When compared between the two groups of our study, it is seen that children who have age adequate receptive and expressive scores have a mean score of around less than 60 minutes on weekdays and approximately 70 minutes on weekends. In contrast, those children who have language ages below their chronological age have an exposure of more than 120 minutes or two hours. This, along with further research, can be used to develop a norm, or guidelines in our country to say how much time and what kind of content is advisable for children to watch at in this day and age. It is also to be brought into light the importance of parent-child interaction when the child is being exposed to screens is a significant factor and should always be considered (Kirkorian et al., 2009; Mendelson et al., 2008, 2010).

5.4 Performance of SASTE in Relation to Demographic Details of Typically Developing Children

The significant difference across the group was seen for the number of minutes the child spends watching screens on weekdays and weekends, subdomain child positive child factors, and combined parent-child positive factors. In the first pair that was between children whose onset of screen exposure started at 0-<6 months when compared

to the group II >6- < 12 months, only the number of minutes the child is exposed to screen during the weekdays and weekends were found to be significant this could be as the onset in both these groups are at a much younger age before the parents or child starts positively using the screen. It can also be contributed to the fact that children in the younger group, as discussed in under the age group does not have the cognitive capacity to associate all that is seen or heard on the various screens. The fast transitions of the visual and auditory modality can harm the child's cognitive development.

In Pair 2, all domains except subdomain negative parental factors and combined negative scores were found to be significant. This can be attributed to the fact that children of the older age group can understand and comprehend better when compared to the younger group. This could be as in Group III, and the parent might start to use screens to teach children the early school concepts to a greater extent than Group I, where they are too young to use screen, etc. In Pair 3, only the number of minutes the child was exposed on weekdays and weekends and subdomain child positive factors were found to be significant. This finding can be supported that with repeated exposure for infants who are above 17 months could pick up new vocabulary when compared to infants who were younger than 16 months. (Krcmar,2011,2014). Therefore, the older groups would benefit more from the screen when compared to the younger groups. Screen exposure beyond 18 months would be beneficial for the child. This might have caused a significant difference between the age range.

It was noted that there was no significant difference between the two groups consisting children belonging to nuclear families and joint families for all the domain of SASTE except child negative factor total which when compared along with the raw

scores that the amount of exposure and child negatively using the screen was higher in the nuclear family group when compared to joint families. International studies show that children who were in families of single parents had higher screen time when compared to families in which both parents were there. No Indian studies to our knowledge have been done to study the effects of the same. This finding can be related to the fact that children in a nuclear household have higher exposure to screen as parents might use it as a tool to keep the child occupied to complete work, factors such as no one else being available to take care of the child, no interaction between the child during exposure to screen, and also children having limited social interactions when compared to joint families can all be contributing factors to the increase in exposure to screen.

Chapter VI

Summary and Conclusion

Walking into the 21st era, the spike of technology has increased drastically over the last 100 years. From devices that had long cords and antennas to simple portable handheld devices, ease of internet access has made technology so accessible and at everyone's fingertips. Increasing studies show an association with screen time and various factors with an individual. How much effect does it have on a developing child is of utmost importance? The increased exposure can have detrimental effects on to rapidly changing and developing brain.

The main aim and objective of this study were to develop a scale that could assess screen time exposure in typically developing children and find the contributing factors of screen time that can be beneficial or harmful to the child.

The study was done on 51 children in the age range of 0-4; where each age year was divided into 4 sub-groups respectively 0->1 was Group I(n=9), >1-<2 was Group II (n= 15) >2-<3 was Group III (n=14) and finally Group IV which consisted of children of the age range >3-<4 (n= 13). The children were selected randomly from preschools, colonies, and vicinities in Mysuru.

The Scale for Assessment of Screen Time Exposure (SASTE) was developed after careful consolidation from the review of the literature. The Scale consisted of qualitative information that included parent and child demographics, which was inclusive of age, gender, birth order, amount of time child watched screens on weekdays, and

weekends. Parental demographics included parental education, employment, parental screen time on weekdays, and weekends were also assessed. It also consisted of a quantitative section, which was further divided into 5 sub-sections. The subsections assessed neutral variables, parental positive and negative factors, and child positive and negative factors. The quantitative information was marked on a 5 point Likert scale ranging from 0-4 where 0 was absent, 1 was rarely seen; 2 was sometimes seen ; 3 was frequently seen, and 4 was always. The SASTE scale was administered via a parental interview, and the language scores were also assessed for children using the Assessment Checklist for Speech and Language Skills (ACSL). A Speech-Language Pathologist administered both ACSL and SASTE.

The study mainly focused on studying the SASTE scores and child demographics across age groups, between genders and language age. Due to the availability of data, the onset of screen exposure, and the structure of the family were also assessed.

The study revealed children spend more time watching screens on weekends than compared to weekdays. The older age group (>3-<4) had a higher screen duration than the younger age groups for an average duration of 117 minutes on weekdays and 130 minutes on weekends. In SASTE, positive child factors were highest, followed by the parental negative variable, neutral variables, child negative, and finally parental positive variables. When combined scores were taken into consideration, it was seen that combined positive factors were higher than the combined parent and child negative factors.

The present study with reference to the variable 'age' showed that there is a linear growth in the amount of screen exposure as the age of the child increased. Overall screen time exposure was seen more in Group III and IV, the age range from 2- 4 years. Significant differences across all SASTE domains and the number of minutes of exposure on weekdays and weekends were seen across all the different age groups. And also when compared between the older and younger age groups. Across the first age groups (Group I and Group II; Group I and Group III; Group I and Group IV), significant differences were seen for all the subdomains of SASTE. In between Group II and Group III, it was noticed that parental positive, child positive, and the combined parent and child positive showed significant difference. The significant difference seen between Group II and Group IV was observed only for the positive factor of both parent and child, the combined positive factors, and the amount of exposure the child has on the weekends. There was no significant difference seen between Group III and IV.

Across the gender, it was seen that there was no significant difference, but females had a higher amount of screen exposure when compared to girls. This could pertain to the fact that girls are not easily involved or engaged in physical, outdoor, or extracurricular activities, which could be due to safety issues.

The results of the SASTE scores across language levels, children who were below chronological age and those at the level of their chronological age showed that in receptive skills significant difference between both the groups was seen for the amount of exposure the child has to screens on the weekend and the child negative factors. In expressive skills, the significant difference between both the groups was seen for the amount of exposure the child has on weekdays and weekends and the negative child

factors. This increase in screen exposure during the weekdays and weekends can cause attentional deficits, or child throwing tantrums, limited parent-child interaction, especially on weekends as parents also engage in screen time leading to a risk of having a language delay.

When the onset of exposure was considered with the association to SASTE scores, it was seen that significant differences were seen for the number of minutes the child had exposure on weekend and weekdays, child positive variables, and the combined positive variables. Significant differences were observed for infants and toddlers who were exposed to screens from >6-<12 months and >12-19 months. At this age, it could be contributed to the child's cognition; attention, language, and behavior are better developed than younger infants.

The significant difference seen across family structures of joint and nuclear families was seen only for the child's negative factors. This was because of the family structure, for example, the nuclear family with fewer people to interact with the child and poor socializing environment, only caused the child to use more screen time.

Implications of the Study

- This study compiles all major factors that play a role in the child's experience with the screen.
- This tool provides extensive knowledge into both the good and the bad that lead to screen exposure in typically developing children.

- It can be used to not only assess but also provide baselines and guidelines in parental counselling in moderating the screen time in typical children and compare the same with children with communication disorders.

Limitations of the Study

- Larger samples could have been collected to standardize the tool.
- Detailed demographic studies could have been carried out with the available data.
- The children taken for the study represented a wide variety of Indian cultures as there was no control for language and state ethnicity.
- This assessment was carried out pre-COVID 19 times as in today's present condition; lockdown would have increased the exposure to screens.
- Appropriate guidelines could not be established as a larger sample was required to develop a standardized norm with parametric statistical analysis.

Future Directions of the Study

- The present study was initiated to develop a norm and to standardize the tool which needs to be validated on the clinical population of children with communication disorders.
- Once norms are developed, the tool can be used to monitor increased exposure to screens in children leading to communication disorders such as autism, spoken language disorders and thus use the same as a diagnostic indicator and also monitor the treatment plan.
- Cultural norms can be developed by doing studies of particular populations.

- The scale can be further developed to keep up with the ever-changing trends of the high technology world.

References

- Anderson, D. R., & Hanson, K. G. (2010). From blooming, buzzing confusion to media literacy: The early development of television viewing. *Developmental Review, 30*(2), 239-255. <https://doi.org/10.1016/j.dr.2010.03.004>
- Anderson, D. R., &Subrahmanyam, K. (2017). Digital screen media and cognitive development. *Pediatrics, 140*(Supplement 2), S57-S61. <https://doi.org/10.1542/peds.2016-1758C>
- Arya, K. (2004). Time spent on television viewing and its effect on changing values of school-going children. *The Anthropologist, 6*(4), 269-271. <https://doi.org/10.1080/09720073.2004.11890866>
- Asplund, K. M., Kair, L. R., Arain, Y. H., Cervantes, M., Oreskovic, N. M., & Zuckerman, K. E. (2015). Early childhood screen time and parental attitudes toward child television viewing in a low-income Latino population attending the special supplemental nutrition program for women, infants, and children. *Childhood obesity, 11*(5), 590-599. <https://doi.org/10.1089/chi.2015.0001>
- Ayu, I. M., Titik, R., & Yuli, S. (2020). Preschoolers' mental health status based on their mobile gadget usage. *JPhCS, 1469*(1), 012054. <https://doi.org/10.1088/1742-6596/1469/1/012054>
- Bapat, R., Van Geel, M., & Vedder, P. (2017). Socio-economic status, time spending, and sleep duration in Indian children and adolescents. *Journal of child and family studies, 26*(1), 80-87. <https://doi.org/10.1007/s10826-016-0557-8>

- Barber, S. E., Kelly, B., Collings, P. J., Nagy, L., Bywater, T., & Wright, J. (2017). Prevalence, trajectories, and determinants of television viewing time in an ethnically diverse sample of young children from the UK. *International Journal of Behavioral Nutrition and Physical Activity*, *14*(1), 88. <https://doi.org/10.1186/s12966-017-0541-8>
- Barr, R., & Lerner, C. (2014). Screen Sense: Setting the Record Straight. *Research-Based Guidelines for Screen Use for Children Under, 3*.
- Barr, R., Lauricella, A., Zack, E., & Calvert, S. L. (2010). Infant and early childhood exposure to adult-directed and child-directed television programming: Relations with cognitive skills at age four. *Merrill-Palmer Quarterly*, *56*(1), 21-48.
- Beatty, C., & Egan, S. M. (2018). Screen-Time and Vocabulary Development: Evidence from the Growing Up in Ireland Study. *ChildLinks-Children and the Digital Environment*, *3*, 18-22.
- Bentley, G. F., Turner, K. M., & Jago, R. (2016). Mothers' views of their preschool child's screen-viewing behaviour: a qualitative study. *BMC Public Health*, *16*(1), 1-11. <https://doi.org/10.1186/s12889-016-3440-z>
- Bickham, D. S., & Rich, M. (2006). Is television viewing associated with social isolation?: roles of exposure time, viewing context, and violent content. *Archives of pediatrics & adolescent medicine*, *160*(4), 387-392. <https://doi.org/doi:10.1001/archpedi.160.4.387>
- Britain, G. (2013). *Children and parents: Media use and attitudes report*. Ofcom.
- Bronfenbrenner, U. (1979). Contexts of child rearing: Problems and prospects. *American Psychologist*, *34*(10), 844. <http://dx.doi.org/10.1037/0003-066X.34.10.844>

- Brown, A. (2011). Media use by children younger than 2 years. *Pediatrics*.
<https://doi.org/10.1542/peds.2011-1753>
- Byeon, H., & Hong, S. (2015). Relationship between television viewing and language delay in toddlers: evidence from a Korea national cross-sectional survey. *PLoS one*, *10*(3), e0120663. <https://doi.org/10.1371/journal.pone.0120663>
- Carson, V., Spence, J. C., Cutumisu, N., & Cargill, L. (2010). Association between neighborhood socioeconomic status and screen time among pre-school children: a cross-sectional study. *BMC Public Health*, *10*(1), 1-8. <https://doi.org/10.1186/1471-2458-10-367>
- Carson, V., Kuhle, S., Spence, J. C., & Veugelers, P. J. (2010). Parents' perception of neighbourhood environment as a determinant of screen time, physical activity and active transport. *Canadian Journal of Public Health*, *101*(2), 124-127.
<https://doi.org/10.1007/BF03404356>
- Carson, V., & Janssen, I. (2012). Associations between factors within the home setting and screen time among children aged 0–5 years: a cross-sectional study. *BMC Public Health*, *12*(1), 539. <https://doi.org/10.1186/1471-2458-12-539>
- Carson, V., Rosu, A., & Janssen, I. (2014). A cross-sectional study of the environment, physical activity, and screen time among young children and their parents. *BMC public health*, *14*(1), 61. <https://doi.org/10.1186/1471-2458-14-61>
- Carson, V., & Kuzik, N. (2017). Demographic correlates of screen time and objectively measured sedentary time and physical activity among toddlers: a cross-sectional study. *BMC Public Health*, *17*(1), 187. <https://doi.org/10.1186/s12889-017-4125-y>

- Chang, H. Y., Park, E. J., Yoo, H. J., won Lee, J., & Shin, Y. (2018). Electronic media exposure and use among toddlers. *Psychiatry investigation*, *15*(6), 568.
<https://doi.org/10.30773/pi.2017.11.30.2>
- Cheng, S., Maeda, T., Yoichi, S., Yamagata, Z., Tomiwa, K., & Japan Children's Study Group. (2010). Early television exposure and children's behavioral and social outcomes at age 30 months. *Journal of epidemiology*, 1002160147-1002160147.
<https://doi.org/10.2188/jea.JE20090179>
- Chonchaiya, W., & Pruksananonda, C. (2008). Television viewing associates with delayed language development. *Acta Paediatrica*, *97*(7), 977-982.
<https://doi.org/10.1111/j.1651-2227.2008.00831.x>
- Chonchaiya, W., Nuntnarumit, P., & Pruksananonda, C. (2011). Comparison of television viewing between children with autism spectrum disorder and controls. *Acta Paediatrica*, *100*(7), 1033-1037. <https://doi.org/10.1111/j.1651-2227.2011.02166.x>
- Christakis, D. A., & Garrison, M. M. (2009). Preschool-aged children's television viewing in child care settings. *Pediatrics*, *124*(6), 1627-1632. <https://doi.org/10.1542/peds.2009-0862>
- Christakis, D. A. (2009). The effects of infant media usage: what do we know and what should we learn?. *Acta Paediatrica*, *98*(1), 8-16. <https://doi.org/10.1111/j.1651-2227.2008.01027.x>
- Common Sense Media, & Rideout, V. (2011). *Zero to eight: Children's media use in America*. Common Sense Media.
- Common Sense Media. (2013). *Zero to Eight: Children's Media Use in America, 2013*.

- Cost, K. T., Korczak, D., Charach, A., Birken, C., Maguire, J. L., Parkin, P. C., & Szatmari, P. (2020). Association of Parental and Contextual Stressors With Child Screen Exposure and Child Screen Exposure Combined With Feeding. *JAMA Network Open*, 3(2), e1920557-e1920557.
- Courage, M. L., & Howe, M. L. (2010). To watch or not to watch: Infants and toddlers in a brave new electronic world. *Developmental Review*, 30(2), 101-115.
<https://doi.org/10.1016/j.dr.2010.03.002>
- Dauw, J. M. (2016). Screen Time and the Effects on Development for Children Ages Birth to Five Years.
- Domingues-Montanari, S. (2017). Clinical and psychological effects of excessive screen time on children. *Journal of paediatrics and child health*, 53(4), 333-338.
<https://doi.org/10.1111/jpc.13462>
- Downing, K. L., Hnatiuk, J., & Hesketh, K. D. (2015). Prevalence of sedentary behavior in children under 2 years: a systematic review. *Preventive medicine*, 78, 105-114.
<https://doi.org/10.1016/j.ypmed.2015.07.019>
- Dubey, M., Nongkynrih, B., Gupta, S. K., Kalaivani, M., Goswami, A. K., & Salve, H. R. (2018). Screen-based media use and screen time assessment among adolescents residing in an Urban Resettlement Colony in New Delhi, India. *Journal of family medicine and primary care*, 7(6), 1236. https://doi.org/10.4103/jfmprc.jfmprc_190_18
- Duch, H., Fisher, E. M., Ensari, I., & Harrington, A. (2013). Screen time use in children under 3 years old: a systematic review of correlates. *International journal of behavioral nutrition and physical activity*, 10(1), 102. <https://doi.org/10.1021>
<http://www.ijbnpa.org/content/10/1/102>

- Duch, H., Fisher, E. M., Ensari, I., Font, M., Harrington, A., Taromino, C., ... & Rodriguez, C. (2013). Association of screen time use and language development in Hispanic toddlers: a cross-sectional and longitudinal study. *Clinical Pediatrics*, 52(9), 857-865. <https://doi.org/10.1177/0009922813492881>
- Elias, N., & Sulkin, I. (2019). Screen-assisted parenting: The relationship between toddlers' screen time and parents' use of media as a parenting tool. *Journal of Family Issues*, 40(18), 2801-2822. <https://doi.org/10.1177/0192513X19864983>
- Emond, J. A., Tantum, L. K., Gilbert-Diamond, D., Kim, S. J., Lansigan, R. K., & Neelon, S. B. (2018). Household chaos and screen media use among preschool-aged children: a cross-sectional study. *BMC public health*, 18(1), 1210. <https://doi.org/10.1186/s12889-018-6113-2>
- Fenson, L. (2007). *MacArthur-Bates communicative development inventories*. Baltimore, MD: Paul H. Brookes Publishing Company.
- Genc, Z. (2014). Parents' perceptions about the mobile technology use of preschool-aged children. *Procedia-Social and Behavioral Sciences*, 146, 55-60. <https://doi.org/10.1016/j.sbspro.2014.08.086>
- Goncalves, W. S. F., Byrne, R., Viana, M. T., & Trost, S. G. (2019). Parental influences on screen time and weight status among preschool children from Brazil: a cross-sectional study. *International Journal of Behavioral Nutrition and Physical Activity*, 16(1), 1-8. <https://doi.org/10.1186/s12966-019-0788-3>
- Hamilton, K., Spinks, T., White, K. M., Kavanagh, D. J., & Walsh, A. M. (2016). A psychosocial analysis of parents' decisions for limiting their young child's screen time:

- An examination of attitudes, social norms and roles, and control perceptions. *British Journal of Health Psychology*, 21(2), 285-301. <https://doi.org/10.1111/bjhp.12168>
- Hendry, R. S. (2017). *Investigating relationships between screen time and young children's social-emotional development* (Doctoral dissertation, University of British Columbia).<https://doi.org/10.14288/1.0348154>
- Hermawati, D., Rahmadi, F. A., Sumekar, T. A., & Winarni, T. I. (2018). Early electronic screen exposure and autistic-like symptoms. *Intractable & rare diseases research*, 7(1), 69-71. <https://doi.org/10.5582/irdr.2018.01007>
- Hiniker, A., Suh, H., Cao, S., & Kientz, J. A. (2016, May). Screen time tantrums: how families manage screen media experiences for toddlers and preschoolers. In *Proceedings of the 2016 CHI conference on human factors in computing systems* (pp. 648-660).<http://dx.doi.org/10.1145/2858036.2858278>
- Hinkley, T., & McCann, J. R. (2018). Mothers' and father's perceptions of the risks and benefits of screen time and physical activity during early childhood: a qualitative study. *BMC public health*, 18(1), 1271. <https://doi.org/10.1186/s12889-018-6199-6>
- Jago, R., Stamatakis, E., Gama, A., Carvalhal, I. M., Nogueira, H., Rosado, V., & Padez, C. (2012). Parent and child screen-viewing time and home media environment. *American journal of preventive medicine*, 43(2), 150-158.
- Kaur, N., Gupta, M., Malhi, P., & Grover, S. (2019). Screen Time in Under-five Children. *Indian pediatrics*, 56(9), 773-788. [https://doi.org/10.1007/s13312-019-1638-](https://doi.org/10.1007/s13312-019-1638-8)

- Kirkorian, H. L., Pempek, T. A., Murphy, L. A., Schmidt, M. E., & Anderson, D. R. (2009). The impact of background television on parent–child interaction. *Child development, 80*(5), 1350-1359. <https://doi.org/10.1111/j.1467-8624.2009.01337.x>
- Kirkorian, H. L., Choi, K., & Pempek, T. A. (2016). Toddlers' word learning from contingent and noncontingent video on touch screens. *Child development, 87*(2), 405-413. <https://doi.org/10.1111/cdev.12508>
- Kostyrka-Allchorne, K., Cooper, N. R., & Simpson, A. (2017). The relationship between television exposure and children's cognition and behavior: A systematic review. *Developmental Review, 44*, 19-58. <http://dx.doi.org/10.1016/j.dr.2016.12.002>
- Kourlaba, G., Kondaki, K., Liarigkovinos, T., & Manios, Y. (2009). Factors associated with television viewing time in toddlers and preschoolers in Greece: the GENESIS study. *Journal of public health, 31*(2), 222-230.
- Krcmar, M., Grela, B., & Lin, K. (2007). Can toddlers learn vocabulary from television? An experimental approach. *Media Psychology, 10*(1), 41-63.
- Krcmar, M. (2011). Word learning in very young children from infant-directed DVDs. *Journal of Communication, 61*(4), 780-794. <https://doi.org/10.1111/j.1460-2466.2011.01561.x>
- Krcmar, M. (2014). Can infants and toddlers learn words from repeat exposure to an infant directed DVD?. *Journal of Broadcasting & Electronic Media, 58*(2), 196-214. <https://doi.org/10.1080/08838151.2014.906429>

- Kuriyan, R., Bhat, S., Thomas, T., Vaz, M., & Kurpad, A. V. (2007). Television viewing and sleep are associated with overweight among urban and semi-urban South Indian children. *Nutrition Journal*, *6*(1), 25.
- Kuta, C. (2017). The Negative Impact of Excessive Screen Time on Language Development in Children Under 6-Years-Old: An Integrative Review with Screen Time Reduction Toolkit and Presentation for Outpatient Pediatric and Family Health Providers.
- Langøy, A., Smith, O. R., Wold, B., Samdal, O., & Haug, E. M. (2019). Associations between family structure and young people's physical activity and screen time behaviors. *BMC public health*, *19*(1), 433. <https://doi.org/10.1186/s12889-019-6740-2>
- Lauricella, A. R., Wartella, E., & Rideout, V. J. (2015). Young children's screen time: The complex role of parent and child factors. *Journal of Applied Developmental Psychology*, *36*, 11-17. <https://doi.org/10.1016/j.appdev.2014.12.001>
- Laurie, M. H., Warreyn, P., Uriarte, B. V., Boonen, C., & Fletcher-Watson, S. (2019). An international survey of parental attitudes to technology use by their autistic children at home. *Journal of autism and developmental disorders*, *49*(4), 1517-1530. <https://doi.org/10.1007/s10803-018-3798-0>
- Lavigne, H. J., Hanson, K. G., & Anderson, D. R. (2015). The influence of television coviewing on parent language directed at toddlers. *Journal of Applied Developmental Psychology*, *36*, 1-10. <https://doi.org/10.1016/j.appdev.2014.11.004>
- Lerner, C., & Barr, R. (2014). *Screen Sense: Setting the Record Straight. Research-Based Guidelines for Screen Use for Children Under 3 Years*. Washington,

- DC. Net source NOT given;
- Lin, L. Y., Cherng, R. J., Chen, Y. J., Chen, Y. J., & Yang, H. M. (2015). Effects of television exposure on developmental skills among young children. *Infant Behavior and Development*, 38, 20-26. <https://doi.org/10.1016/j.infbeh.2014.12.005>
- Linebarger, D. L., & Walker, D. (2005). Infants' and toddlers' television viewing and language outcomes. *American Behavioral Scientist*, 48(5), 624-645. <https://doi.org/10.1177/0002764204271505>
- Linebarger, D. L., & Vaala, S. E. (2010). Screen media and language development in infants and toddlers: An ecological perspective. *Developmental Review*, 30(2), 176-202. <http://dx.doi.org/10.1016/j.dr.2010.03.006>
- Livingstone, S., & Franklin, K. (2018). Families with young children and 'screen time'. *Journal of Health Visiting*, 6(9), 434-439.
- Lytle, S. R., Garcia-Sierra, A., & Kuhl, P. K. (2018). Two are better than one: Infant language learning from video improves in the presence of peers. *Proceedings of the National Academy of Sciences*, 115(40), 9859-9866.
- Masur, E. F., Flynn, V., & Olson, J. (2015). The Presence of Background Television During Young Children's Play in American Homes. *Journal of Children and Media*, 9(3), 349-367. <https://doi.org/10.1080/17482798.2015.1056818>
- McDaniel, B. T., & Radesky, J. S. (2018). Technoference: longitudinal associations between parent technology use, parenting stress, and child behavior problems. *Pediatric research*, 84(2), 210-218. <https://doi.org/10.1038/s41390-018-0052-6>

McCracken, L. M. (2019). Screen Time Effects on Pediatrics.

Mendelsohn, A. L., Berkule, S. B., Tomopoulos, S., Tamis-LeMonda, C. S., Huberman, H. S., Alvir, J., & Dreyer, B. P. (2008). Infant television and video exposure associated with limited parent-child verbal interactions in low socioeconomic status households. *Archives of pediatrics & adolescent medicine*, *162*(5), 411-417. <https://doi.org/10.1001/archpedi.162.5.411>

Mendelsohn, A. L., Brockmeyer, C. A., Dreyer, B. P., Fierman, A. H., Berkule-Silberman, S. B., & Tomopoulos, S. (2010). Do verbal interactions with infants during electronic media exposure mitigate adverse impacts on their language development as toddlers? *Infant and child development*, *19*(6), 577-593. <http://dx.doi.org/10.1016/j.dr.2010.03.006>

Stiller, A., & Mößle, T. (2018). Media use among children and adolescents with autism spectrum disorder: A systematic review. *Review Journal of Autism and Developmental Disorders*, *5*(3), 227-246. <https://doi.org/10.1007/s40489-018-0135-7>

Mowder, B. A., & Shamah, R. (2011). Parent behavior importance questionnaire-revised: Scale development and psychometric characteristics. *Journal of Child and Family Studies*, *20*(3), 295-302. <https://doi.org/10.1007/s10826-010-9392-5>

Ogbu, E., Tarnongo, O., & Alakali, T. (2013). Impact of television advertisement on children: A case study of Markurdi Town. *IOSR Journal of Humanities and Social Sciences*, *10*(3), 82-91.

- Pagani, L. S., Fitzpatrick, C., Barnett, T. A., & Dubow, E. (2010). Prospective associations between early childhood television exposure and academic, psychosocial, and physical well-being by middle childhood. *Archives of pediatrics & adolescent medicine*, *164*(5), 425-431. <https://doi.org/10.1001/archpediatrics.2010.50>
- Paudel, S., Jancey, J., Subedi, N., & Leavy, J. (2017). Correlates of mobile screen media use among children aged 0–8: a systematic review. *BMJ open*, *7*(10). <https://doi.org/10.1136/bmjopen-2016-014585>
- Pearson, N., Salmon, J., Crawford, D., Campbell, K., & Timperio, A. (2011). Are parental concerns for child TV viewing associated with child TV viewing and the home sedentary environment?. *International Journal of Behavioral Nutrition and Physical Activity*, *8*(1), 102. <https://doi.org/10.1186/1479-5868-8-102>
- Radesky, J. S., Kistin, C. J., Zuckerman, B., Nitzberg, K., Gross, J., Kaplan-Sanoff, M., ... & Silverstein, M. (2014). Patterns of mobile device use by caregivers and children during meals in fast food restaurants. *Pediatrics*, *133*(4), e843-e849. <https://doi.org/10.1542/peds.2013-3703>
- Radesky, J. S., Schumacher, J., & Zuckerman, B. (2015). Mobile and interactive media use by young children: the good, the bad, and the unknown. *Pediatrics*, *135*(1), 1-3. <https://doi.org/10.1542/peds.2014-2251>
- Radesky, J. S., & Christakis, D. A. (2016). Increased screen time: implications for early childhood development and behavior. *Pediatric Clinics*, *63*(5), 827-839. <https://doi.org/10.1016/j.pcl.2016.06.006>

- Ray, M., & Jat, K. R. (2010). Effect of electronic media on children. *Indian pediatrics*, 47(7), 561-568. <https://doi.org/10.1007/s13312-010-0128-9>
- Rideout, V. J., Vandewater, E. A., & Wartella, E. A. (2003). Zero to six: Electronic media in the lives of infants, toddlers and preschoolers.
- Rideout, V. (2017). The Common Sense census: Media use by kids age zero to eight. *San Francisco, CA: Common Sense Media*, 263-283.
- Robb, M. B., Richert, R. A., & Wartella, E. A. (2009). Just a talking book? Word learning from watching baby videos. *British journal of developmental psychology*, 27(1), 27-45. <https://doi.org/10.1348/026151008X320156>
- Roseberry, S., Hirsh-Pasek, K., Parish-Morris, J., & Golinkoff, R. M. (2009). Live-action: Can young children learn verbs from video? *Child Development*, 80(5), 1360-1375. <https://doi.org/10.1111/j.1467-8624.2009.01338.x>
- Ruangdaraganon, N., Chuthapisith, J., Mo-suwan, L., Kriweradechachai, S., Udomsubpayakul, U., & Choprapawon, C. (2009). Television viewing in Thai infants and toddlers: impacts to language development and parental perceptions. *BMC pediatrics*, 9(1), 1-6. <https://doi.org/10.1186/1471-2431-9-34>
- Russo-Johnson, C., Troseth, G., Duncan, C., & Mesghina, A. (2017). All tapped out: Touchscreen interactivity and young children's word learning. *Frontiers in Psychology*, 8, 578. <https://doi.org/10.3389/fpsyg.2017.00578>
- Sanders, T., Feng, X., Fahey, P. P., Lonsdale, C., & Astell-Burt, T. (2015). The influence of neighbourhood green space on children's physical activity and screen time: findings

- from the longitudinal study of Australian children. *International journal of behavioral nutrition and physical activity*, 12(1), 126. <https://doi.org/10.1186/s12966-015-0288-z>
- Stiller, A., Weber, J., Strube, F., & Mößle, T. (2019). Caregiver Reports of Screen Time Use of Children with Autism Spectrum Disorder: A Qualitative Study. *Behavioral Sciences*, 9(5), 56. <https://doi.org/10.3390/bs9050056>
- Sweetser, P., Johnson, D., Ozdowska, A., & Wyeth, P. (2012). Active versus passive screen time for young children. *Australasian Journal of Early Childhood*, 37(4), 94-98. DOI: <https://doi.org/10.1177/183693911203700413>
- Tandon, P. S., Zhou, C., Lozano, P., & Christakis, D. A. (2011). Preschoolers' total daily screen time at home and by type of childcare. *The Journal of pediatrics*, 158(2), 297-300. <https://doi.org/10.1016/j.jpeds.2010.08.005>
- Taylor, G., Monaghan, P., & Westermann, G. (2018). Investigating the association between children's screen media exposure and vocabulary size in the UK. *Journal of Children and Media*, 12(1), 51-65. <https://doi.org/10.1080/17482798.2017.1365737>
- Tomopoulos, S., Dreyer, B. P., Berkule, S., Fierman, A. H., Brockmeyer, C., & Mendelsohn, A. L. (2010). Infant media exposure and toddler development. *Archives of pediatrics & adolescent medicine*, 164(12), 1105-1111. <https://doi.org/10.1001/archpediatrics.2010.235>
- Vaala, S. E., Linebarger, D. L., Fenstermacher, S. K., Tedone, A., Brey, E., Barr, R., ... & Calvert, S. L. (2010). Content analysis of language-promoting teaching strategies used

- in infant-directed media. *Infant and Child Development*, 19(6),628-648.
<https://doi.org/10.1002/icd.715>
- Viner, R. M., & Cole, T. J. (2005). Television viewing in early childhood predicts adult body mass index. *The Journal of pediatrics*, 147(4), 429-435.
<https://doi.org/10.1016/j.jpeds.2005.05.005>
- Wartella, E. A., & Lauricella, A. R. (2012). Should babies be watching television and DVDs?. *Pediatric Clinics*, 59(3), 613-621. <https://doi.org/10.1016/j.pcl.2012.03.027>
- Wu, C. S. T., Fowler, C., Lam, W. Y. Y., Wong, H. T., Wong, C. H. M., & Loke, A. Y. (2014). Parenting approaches and digital technology use of preschool age children in a Chinese community. *Italian journal of pediatrics*, 40(1), 44. <https://doi.org/10.1186/1824-7288-40-44>
- Yang, Y., Jin, Z., Liu, S., Jin, X., Huang, H., & Tong, S. (2019). Children's social communication skills and electronic screen exposure, perinatal, and other risk factors. *Journal of Public Health*, 1-9. <https://doi.org/10.1007/s10389-019-01022-2>
- Zimmerman, F. J., & Christakis, D. A. (2005). Children's television viewing and cognitive outcomes: a longitudinal analysis of national data. *Archives of Pediatrics & Adolescent Medicine*, 159(7), 619-625. <https://doi.org/10.1001/archpedi.159.7.619>
- Zimmerman, F. J., Christakis, D. A., & Meltzoff, A. N. (2007). Associations between media viewing and language development in children under age 2 years. *The Journal of pediatrics*, 151(4), 364-368. <https://doi.org/10.1016/j.jpeds.2007.04.071>

Zimmerman, F. J., Christakis, D. A., & Meltzoff, A. N. (2007). Television and DVD/video viewing in children younger than 2 years. *Archives of pediatrics & adolescent medicine*, *161*(5), 473-479.

Appendix A



**All India Institute of Speech and Hearing, Naimisham
Campus, Manasagangothri, Mysore – 570006.**

CONSENT FORM

Dissertation on

**SCREEN TIME EXPOSURE AND ITS EFFECTS ON SPEECH AND
LANGUAGE DEVELOPMENT IN TYPICALLY DEVELOPING CHILDREN**

Information to the participants

I, Ms. Sarah working for a dissertation titled- “SCALE FOR ASSESSMENT OF SCREEN TIME EXPOSURE” under the guidance of Dr. Venkateshan. S Professor and Head- Department of Clinical Psychology and co-guidance of Dr. Hema N., Assistant Professor, Dept. of Speech-Language Sciences, AIISH, Mysore – 6. The research aims to investigate and compare the screen time exposure and the speech-language ability of typically developing children, and to study the correlation between screen time and speech-language skills. I need to collect data from 40 individuals in the age range of 0-4 years. Information will be collected through an interview and observation of a child’s behavior for 30 minutes each. I assure you that this data will be kept confidential. There is no influence or pressure of any kind by the investigating institute to your participation or us, and the research procedure is different from routine medical or therapeutic care activities. There is no risk involved with the participants. Still, your and your child’s cooperation in the study will go a long way in helping us in understanding speech-language development in typically developing children, and it will thus assist in the assessment and treatment of communication disorders.

Informed Consent

I have been informed about the aims, objectives, and the procedure of the study to the parents/guardian. I understand that I have a right to refuse participation as a participant or withdraw my consent at any time.

I, _____ (on behalf of my child), the undersigned, give my consent to be participant of this investigation/study/program.

Signature of participant

Signature of investigator

(Name and Address)

Date

Appendix B

**NIMH Socio-Economic Status Scale,
Revised Version**

(Venkateshan,
2011)

A.	Pooled Monthly Income		Score
	1.	Rs. 5000 or below	1
	2.	Rs. 5001 – Rs. 10000	2
	3.	Rs. 10001 – Rs. 15000	3
	4.	Rs. 15001 – Rs. 20000	4
	5.	Rs. 20001 & above	5
B.	Highest Education		Score
	1.	Illiterate	1
	2.	Primary/Secondary School	2
	3.	Matriculation	3
	4.	Graduation	4
	5.	Post Graduation & Above	5
C.	Occupation		Score
	1.	Unskilled labor/Unemployed/Daily Wager	1
	2.	Semi-skilled Worker/Class IV Service	2
	3.	Skilled/Technical/Class III Service	3
	4.	Professional/Class II Service/Blue Collared Jobs	4
	5.	Specialized/Class I Services/White Collared Jobs	5
D.	Family Properties (Immovable & Movable)		Score
	1.	Nil or Below Rs. 50000	1
	2.	Between Rs. 50000 to Rs. 1.5 Lakhs	2
	3.	Between Rs. 1.5 Lakhs to Rs. 2.5 Lakhs	3
	4.	Between Rs. 2.5 lakhs to Rs. 5.0 Lakhs	4
	5.	Above Rs. 5.0 Lakhs	5
	Total		

Note: Circle the appropriate score and enter sum into the cell against ‘Grand Total’;

Interpretative Norms for Obtaining Overall SES: 0-4 is SES I; 5-8 is SES II; 9-12 is

SES III; 13-16 is SES IV; 17-20 is SES V.

Appendix C**SCALE FOR ASSESSMENT OF SCREEN TIME EXPOSURE-SASTE****General Instructions:**

The scale comprises of various variables obtained from an extensive review article by Stiller and Moble (2018), this was named as “**Scale for Assessment of Screen Time Exposure (SASTE)**” to assess typically developing children with and without the exposure of screen time. SASTE is divided into two major sections;

Section I- Qualitative Information

Sub-SectionA- Individual Child’s Demographic Details

Sub-SectionB- Informant’s/ Family Demographic Details

Section II-Quantitative Information

Sub-section A- Neutral variables corresponding to screen time exposure of the child.

Sub-section B- Screen time exposure concerning positive parental factors/opinions.

Sub- Section C-Screen time exposure concerning negative parental factors/opinions.

Sub-Section D- Screen time exposure concerning positive child factors/opinions.

Sub-Section E- Screen time exposure concerning negative child factors/opinions.

Scoring Procedure:

The constructed SASTE is used to assess the children’s’ screen time usage (its intensity, duration, and frequency) by the Speech-Language Pathologist based on the parental interview and observational for 30-40 minutes. The participants (children) will be observed in their natural environment, home settings, and in their schools for older children.

This SASTE assessing screen time exposure uses a qualitative five-point perceptual rating scale for each factor under the sub-sections of qualitative information (A, B) and quantitative information (C, D, E, F, G). The five-point perceptual rating scale consists of a uniform rating of 0, 1, 2, 3, and 4 where **'Score 0'** is when the behavior (skill) or factor is **absent** for 0% of the time, or the child does not exhibit the behavior pattern. **'Score 1'** is when the behavior (skill) or factor is **rarely seen** for up to 25% of the time, or the child exhibit the behavior pattern for up to 25% of the time. **'Score 2'** is when the behavior (skill) or factor is **sometimes seen** for up to 26-50 % of the time, or the child exhibit the behavior pattern for up to 26-50 % of the time. **'Score 3'** is when the behavior (skill) or factor is **frequently seen** for up to 51-75% of the time, or the child exhibit the behavior pattern for up to 51-75% of the time. **'Score 4'** is when the behavior (skill) or factor is **very frequently seen** for up to 76-100% of the time, or the child exhibit the behavior pattern for up to 76-100% of the time.

SCALE FOR ASSESSMENT OF SCREEN TIME EXPOSURE-SASTE

S NO.	Section A- QUALITATIVE INFORMATION	
Sub Section-A	Individual Child's Demographic Details	
1.	Age	
2.	Date of birth	
3.	Gender	
4.	Number of Siblings	
5.	Birth Order	
6.	The onset age of screen usage	<6 months/6-12 months/13 to 18 months/19 to 24 months/25-30 months/31-36 months/36 to 42 months/43-48 months
7.	Number of hours spent in a day using screens on weekdays	
8.	Number of hours spent in a day using screens on weekends	
Sub Section-B	Informant's/ Family Demographic Details	
1.	Mother's age	
2.	Father's age	
3.	Educational Qualification Mother	10+/Diploma/UG/PG/ Professional course
	Father	10+/Diploma/UG/PG/ Professional course
4.	Professional employment Mother	Professional/Skilled worker/unemployed/home-maker
	Father	Professional/Skilled worker/unemployed/home-maker
5.	Family structure	Joint/nuclear/divorced/single (mother/father)/adopted parents
6.	Socioeconomic status of the family(SES Scale)	I/II/III/IV
7.	Residential Area Of Living	Rural/Urban/Semi-urban
8.	No. of hours' mother spends in a day using screen time on	

	weekdays.					
	Weekends					
9.	No. of hours father spends in a day using screen time on Weekdays					
	Weekends					
Section B- QUANTITATIVE INFORMATION						
	Variables related to screen time exposure	0	1	2	3	4
Sub-Section -A.	Neutral variables corresponding to screen time exposure of the child.					
1.	Accessibility and frequency of usage of different types of gadgets • Mobile					
2.	Accessibility and frequency of usage of different types of gadgets • TV					
3.	Accessibility and frequency of usage of different types of gadgets • Computer/Laptops					
4.	Accessibility and frequency of usage of different types of gadgets • Tabs					
5.	The child has access to these gadgets during various activities of the day such as meal times					
6.	The child has access to these gadgets during various activities of the day such as playtime					
7.	The child has access to these gadgets during various activities of the day such as sleep time					
8.	Screen time is given in the home environment					
9.	Screen time is given in the outdoor environment					
Sub-Section- B.	Screen time exposure concerning positive parental factors/opinions					
1.	An interactive way for education-based teaching					
2.	Improves a child's cognition and attention through memory games and videos.					

3.	Increases an opportunity for the child to interact with the content of the screen.					
4.	The child is capable of navigation, browsing and exploring through applications					
5.	Helps your child pick up new speech sounds					
6.	Helps your child pick up new language and vocabulary					
7.	Helps to monitor and facilitate speech and language development regularly					
Sub-Section- C.	Screen time exposure concerning negative parental factor/opinions					
1.	Cope (parent resting time) from their busy day					
2.	A strategy used by the caretaker/baby sitter to handle the child at home or daycare					
3.	Controls the temper tantrum or fussy behaviors of the child					
4.	Screen time is required for activities of daily living.					
5.	Adult-directed programs <ul style="list-style-type: none"> • Serials 					
6.	Adult-directed programs <ul style="list-style-type: none"> • Advertisement 					
7.	Adult-directed programs <ul style="list-style-type: none"> • Songs/music 					
8.	Environment and surrounding is not child-friendly <ul style="list-style-type: none"> • Apartment stay 					
9.	<ul style="list-style-type: none"> • Single house, unsafe neighborhood, no age-matched peers/neighbors 					
10.	Professional (work at home) work completion using screens with the child as a passive observer					
11.	Completion of household chores by engaging the child with a screen.					
12.	Poor parent-child verbal interaction during screen time					
13.	Poor parent-child non-verbal interaction during screen time					
14.	Inadequate supervision to facilitate joint interaction					

15.	Parental exposure to excessive screen time due to depression or distress, and the child is the passive observer.					
Sub-Section - D.	Screen time exposure concerning positive child factors/opinions					
1.	The child uses gadgets that are <ul style="list-style-type: none"> Borrowed from parents 					
2.	<ul style="list-style-type: none"> From friends and peer 					
3.	The child has acquired knowledge to access the gadgets and navigate through applications.					
4.	The child enjoys watching videos					
5.	<ul style="list-style-type: none"> With music 					
6.	<ul style="list-style-type: none"> With animation 					
7.	Child-directed program <ul style="list-style-type: none"> Cartoon and Animation 					
8.	Child-directed program <ul style="list-style-type: none"> Games 					
9.	Child-directed program <ul style="list-style-type: none"> Educational Content 					
10.	Child-directed age-appropriate content with colorful visuals					
11.	Child-directed age-appropriate content with black and white visuals					
12.	Child-directed age-appropriate content with only auditory listening					
13.	Does your child enjoy sharing with peer groups					
Sub-Section-E.	Screen time exposure concerning negative child factors/opinions					
1.	Insists on the use of a fixed gadget and program					
2.	Self-motivated, as the child finds it the best source of entertainment.					
3.	Reduction of infant/toddler/child crying episode					
4.	Acquired stereotypic knowledge to access the gadgets					
5.	The child spends most of the time watching various screens without being monitored (direct exposure)					

6.	Exposed to background running screen during the child's routine work (in-direct exposure)					
7.	Screen time exposure leading to poor verbal communication by the child					
8.	Screen time exposure leading to poor non-verbal communication					
9.	Screen time exposure leading to inadequate exposure to adapt to other activities					
10.	Screen time exposure leading to deprived sleep habit					
11.	Attachment to the family member who only facilitates screen time exposure leading to reduced socialization.					
12.	Hypersensitive to sounds which leads to watching videos without music					
13.	Hypersensitive to visual stimuli and likes watching still images without any animation					

SCALE FOR ASSESSMENT OF SCREEN TIME EXPOSURE-SASTE

Score sheet

SECTIONS					
Section I- Qualitative Information	Remarks				
<i>Sub-SectionA- Individual Child's Demographic Details</i>					
<i>Sub-SectionB- Informant's/ Family Demographic Details</i>					
Section II-Quantitative Information	Total no. of items of main sections	Total score in main sections	Obtained score	Cut off score	Remark
<i>Sub-section A- Neutral variables corresponding to screen time exposure of the child.</i>	9	36			
<i>Sub-section B- Screen time exposure concerning positive parental factors/opinions.</i>	7	28			
<i>Sub- Section C-Screen time exposure concerning negative parental factors/opinions.</i>	15	60			
<i>Sub-Section D- Screen time exposure concerning positive child factors/opinions.</i>	13	52			
<i>Sub-Section E- Screen time exposure concerning negative child factors/opinions.</i>	13	50			

Interpretation: