

The Impact of Screen Time on Social-emotional Reciprocity and Sensory Regulation in Children with Autism Spectrum Disorder (ASD)

Ms. Nadia Thahreen

Student, Psychology, JAIN University

ABSTRACT

The increasing use of digital screens among children has raised concerns regarding their potential influence on behavioural, social, emotional, and sensory functioning. These concerns may be particularly relevant for children with Autism Spectrum Disorder (ASD), who may experience differences in social-emotional reciprocity, attention, emotional regulation, and sensory processing. The present study, titled “The Impact of Screen Time on Social-Emotional Reciprocity and Sensory Regulation in Children with Autism Spectrum Disorder (ASD),” was undertaken to examine the relationship between children's daily screen exposure and selected areas of social-emotional and sensory functioning.

The study employed a quantitative, cross-sectional research design and collected responses from 103 parents/caregivers. Data were obtained using a structured questionnaire comprising demographic information, patterns of screen exposure, and items assessing areas of focus and learning, social reciprocity, and sensory and emotional regulation. Information regarding the child's age, gender, Autism Spectrum Disorder diagnosis, daily screen exposure, and primary screen-use patterns was also collected. The study focused particularly on caregiver-reported observations of children's behaviour in relation to their screen exposure. Descriptive analysis indicated that 40.8% of the participants reported 1–2 hours of daily screen exposure, while 39.8% reported 2–4 hours, 16.5% reported 4–6 hours, and 2.9% reported less than one hour of daily screen use. The mean reported daily screen exposure was 2.57 hours in the ASD group and 2.78 hours in the non-ASD group. The difference in screen exposure between the two groups was not significant, $t(72.1) = -0.788, p = .4335$.

Pearson correlation analysis indicated a moderate positive relationship between daily screen exposure and attention deficits, with $r = .552$ and $p < .001$. This finding indicates that higher reported screen exposure was associated with higher attention-deficit scores within the study sample. A comparatively weaker positive relationship was observed between daily screen exposure and social reciprocity, with $r = .236$ and $p = .053$. Although the relationship was positive, it did not reach the conventional level of statistical significance. Daily screen exposure also demonstrated a positive and significant relationship with sensory/emotional dysregulation, with $r = .329$ and $p = .0061$.

Comparison of the ASD and non-ASD groups showed that the mean attention-deficit scores were 2.70 and 2.51, respectively. The corresponding mean scores for social reciprocity were 2.86 and 2.60, while the mean scores for sensory/emotional dysregulation were 2.83 and 2.51, respectively. The difference between the ASD and non-ASD groups for sensory/emotional dysregulation was significant, with $p = .0092$ and an effect size of Cohen's $d = .57$.

The study suggest that, within the present sample, greater daily screen exposure was associated with higher levels of reported attention difficulties and sensory/emotional dysregulation. The relationship between screen exposure and social reciprocity was positive but comparatively weaker and did not reach statistical significance. The study also demonstrated differences between the ASD and non-ASD groups across the assessed domains, with the clearest group difference observed for sensory/emotional dy-regulation.

The study highlights the importance of examining children's screen-use patterns in relation to their social-emotional and sensory functioning. At the same time, because the study used a cross-sectional design and caregiver-reported data, the study demonstrate associations rather than establishing that screen exposure directly causes changes in social-emotional reciprocity or sensory regulation. Further research using larger samples, longitudinal designs, and objective measures of screen exposure may provide greater understanding of the relationship between digital media exposure and functioning among children with ASD.

Keywords: Autism Spectrum Disorder, screen time, screen exposure, social-emotional reciprocity, sensory regulation, emotional regulation, attention, children, caregiver report.

CHAPTER 1

INTRODUCTION

1.1 Chapter Summary

This chapter introduced the relationship between screen exposure and selected neuro-behavioural characteristics in children with Autism Spectrum Disorder. The chapter established that digital media has become an important part of children's everyday environments and that its developmental significance may depend on duration, content, purpose, routine, and social context.

Autism Spectrum Disorder was discussed as a heterogeneous neurodevelopmental condition involving differences in social communication and interaction, restricted or repetitive behaviours, and potentially significant sensory differences. Within this context, attention, social reciprocity, emotional regulation, and sensory regulation represent important areas of everyday functioning.

The chapter also established the conceptual basis for examining screen exposure through the domains of Attention and Focus, Social Reciprocity, and Sensory/Emotional Regulation. These domains correspond to the SENA subscales used in the study. The SENA incorporates demographic information, screen-use patterns, behavioural observations, and caregiver perspectives within a 22-item parent-report format. The rationale for the study arises from the need to understand screen exposure within the broader developmental context of autistic children rather than considering screen duration in isolation. Particular gaps identified include the limited integration of multiple neurobehavioural domains, the need to examine screen-use context and routine, questions concerning parent-reported joint attention during digital activities, and the relative scarcity of Indian contextual research.

The research problem, questions, objectives, hypotheses, conceptual definitions, operational definitions, significance, scope, delimitations, and limitations were subsequently presented. The coming work builds upon this foundation by examining the theoretical and empirical literature relevant to screen exposure, autism, attention, social reciprocity, sensory processing, emotional regulation, and digital media use.

1.2 Background

The rapid expansion of digital technology has transformed the everyday environments in which children

learn, communicate, play, and regulate their emotions. Television, smartphones, tablets, computers, gaming devices, and online platforms have become increasingly integrated into family routines and educational environments. Digital media can provide opportunities for learning, communication, entertainment, creativity, and social connection. At the same time, increasing exposure to screen-based media has generated concerns regarding the ways in which digital engagement may interact with children's attention, behaviour, emotional regulation, sensory experiences, sleep, physical activity, and social development.

The developmental significance of screen exposure cannot be understood solely in terms of the number of hours a child spends in front of a screen. The nature of the exposure may also be important. Screen-use patterns may differ according to the type of content accessed, whether the activity is educational or recreational, whether the child uses the device independently or with a caregiver, the degree of parental monitoring, the timing of exposure, and whether screen use occurs within a predictable routine. This therefore approaches screen exposure as a behavioural and environmental phenomenon rather than simply as a numerical measure of hours.

These considerations may be particularly relevant for children with Autism Spectrum Disorder (ASD). Autism is a neurodevelopmental condition associated with differences in social communication and interaction, restricted or repetitive patterns of behaviour and interests, and differences in sensory processing. The behavioural profile of autism is heterogeneous, meaning that children may differ considerably in their patterns of attention, communication, sensory responsiveness, emotional regulation, and social engagement.

Digital media may interact with these developmental characteristics in several ways. Highly stimulating digital environments may provide predictable and immediately rewarding forms of engagement for some children. However, prolonged or poorly structured exposure may also displace opportunities for face-to-face interaction, physical activity, sensory-motor exploration, independent play, and developmentally appropriate social learning. The existing thesis conceptualises this possibility through the Displacement Hypothesis, which proposes that time spent engaging with media may replace time that would otherwise be devoted to activities supporting development. The present research focuses specifically on three neurobehavioural domains: attention and focus, social reciprocity, and sensory/emotional regulation. These domains were selected because they represent important areas of everyday functioning for children with ASD and can be observed by parents and primary caregivers in home and community environments.

The study uses the Screen Exposure Neurobehavioral Assessment (SENA), a 22-item parent-report questionnaire developed for the present research. The instrument combines questions regarding demographic characteristics and screen-use patterns with behavioural items addressing attention, social reciprocity, sensory and emotional regulation, and caregiver perspectives. The questionnaire asks caregivers to report on the child's screen exposure and observed behaviour over a two-week recall period. The study therefore seeks to examine the relationship between daily screen exposure and selected aspects of children's functioning, with particular attention to children diagnosed with ASD. The research also incorporates a non-ASD comparison group, allowing the study to examine whether patterns observed among children with ASD differ from those reported for children without an ASD diagnosis.

1.3 Autism Spectrum Disorder

Autism Spectrum Disorder is a neurodevelopmental condition characterised by persistent differences in social communication and social interaction together with restricted or repetitive patterns of behaviour,

interests, or activities. Differences in sensory responsiveness may also be present. The existing thesis defines ASD in terms of reciprocal social interaction and communication difficulties alongside restricted, repetitive behavioural patterns and sensory sensitivities.

Autism is described as a spectrum because its presentation varies substantially between individuals. Two children with the same diagnostic classification may demonstrate very different strengths and support needs. One child may experience substantial difficulty sustaining attention and shifting between activities, whereas another may demonstrate prolonged concentration on highly preferred interests. Similarly, social difficulties may range from limited reciprocal conversation and reduced social initiation to difficulty interpreting subtle social cues or participating flexibly in peer interaction.

Sensory processing differences are also frequently relevant to the everyday experiences of autistic children. Some children may be unusually sensitive to particular sounds, lights, textures, movements, or visual stimuli, while others may actively seek particular sensory experiences. Such differences may influence behaviour and emotional regulation in everyday situations. The relationship between autism and screen exposure is consequently complex. Digital media may be attractive because it can provide predictable visual and auditory stimulation, repetitive patterns, immediate feedback, and a high degree of control over the environment. These characteristics may make digital activities highly engaging for some autistic children. At the same time, extensive engagement with digital media may reduce opportunities to practise skills that develop through naturalistic social interaction and physical exploration. It is therefore important not to conceptualise screen exposure as inherently beneficial or harmful. Instead, the developmental context in which screen use occurs requires consideration. The current study examines this context by assessing not only screen duration but also screen-use patterns and associated neurobehavioural observations.

1.4 Screen Exposure in Childhood

Screen exposure refers to the time children spend interacting with digital visual media. Within the present study, screen exposure includes interaction with televisions, smartphones, tablets, computers, gaming devices, and other digital media used for entertainment, education, or communication. Digital technology occupies multiple roles in children's lives. Educational platforms may support academic learning, while video content can provide entertainment and exposure to information. Video calls and messaging applications can facilitate communication, particularly when direct interaction is difficult. Digital games may provide opportunities for problem-solving and engagement. Consequently, the developmental meaning of screen exposure depends partly upon what the child is doing during that time. However, screen exposure can also become embedded in daily routines in ways that make reduction or transition difficult. Children may use digital devices during meals, before bedtime, during travel, while waiting, or when caregivers need to manage competing responsibilities. In some families, screens may also be used to calm a distressed child or facilitate transitions between activities. The SENA questionnaire therefore distinguishes screen exposure from the broader concept of screen-use patterns. The instrument records daily screen duration as categories ranging from less than one hour to more than six hours and also asks about the purpose of screen use and the structure of the child's screen routine. This distinction is important because the same number of screen hours may represent very different experiences. For example, two hours of supervised educational content may involve a different pattern of interaction from two hours of highly stimulating entertainment content. Similarly, screen use within a consistent routine may differ from screen access that is unpredictable or primarily used in response to behavioural distress. The present research therefore treats duration as the primary measurable exposure

variable while recognising that screen use occurs within a broader behavioural and family context.

1.5 Screen-Use Patterns

Screen-use patterns refer to the characteristics surrounding a child's interaction with digital media, including duration, purpose, routine, and manner of use.

The SENA instrument captures three major dimensions of screen exposure. First, caregivers report the child's average daily screen duration using five categories: less than one hour, one to two hours, two to four hours, four to six hours, and more than six hours. Second, caregivers identify the purposes for which screens are used, including watching videos, playing games, online learning or schoolwork, video calls, messaging or social applications, and other activities. Third, caregivers describe the structure of the child's screen routine. The inclusion of routine structure is particularly relevant to children with ASD. Predictability and consistency can be important components of everyday functioning for many autistic children. Sudden termination of a preferred activity, unexpected transitions, or inconsistent access to a highly preferred activity may be associated with distress in some children. A structured screen routine may therefore differ from unrestricted access even when the total duration is similar. A child who knows when screen use begins and ends may experience a different transition from a child whose access is unpredictable. Similarly, caregiver involvement may influence whether screen use becomes an isolated activity or an opportunity for shared engagement. This study does not assume that structured screen use eliminates potential difficulties or that unstructured use automatically produces behavioural problems. Instead, routine structure is considered a contextual variable that may help explain differences in children's reported behaviour. This approach is consistent with the conceptual framework of the study, which identifies daily screen duration and primary screen-use purpose as independent variables and screen routine status as a contextual or potentially moderating factor.

1.6 Attention and Learning

Attention is a fundamental component of learning and everyday functioning. Children require the ability to maintain attention on relevant information, shift attention when required, resist distractions, follow instructions, complete activities, and retain information long enough to act upon it. Within this study, attention and focus are defined as the capacity to sustain mental focus, complete structured activities, retain multi-step instructions, and filter irrelevant environmental distractions. The relationship between digital media and attention is an important area of developmental research. Digital environments are often characterised by rapid visual changes, immediate feedback, sounds, rewards, and continuous availability of new stimuli. Such environments may be highly engaging. However, concerns have been raised about whether extensive exposure to highly stimulating digital content may be associated with difficulty maintaining attention during less stimulating tasks. The Displacement Hypothesis provides one possible explanation. According to this perspective, the concern is not necessarily that screen exposure directly damages attention but that substantial screen use may displace activities requiring sustained self-directed attention. Reading, drawing, construction play, puzzles, conversation, outdoor activities, and classroom tasks may require children to maintain attention without continuous external stimulation. The existing theoretical framework of the thesis describes screens as providing relatively externalised attention orientation, whereas many non-screen activities require greater self-directed attentional control. This issue may be particularly relevant in children with ASD because attentional profiles can already be characterised by variability in shifting, sustaining, or directing attention. Some autistic children may demonstrate intense concentration on preferred activities while experiencing difficulty redirecting attention toward less preferred tasks. In the present research, attention is not assessed through an

independent neuropsychological performance test. Instead, it is examined through caregiver observation using four SENA items addressing sustained attention, task completion or activity shifting, repeated instructions, and forgetfulness or distractibility. These four items constitute the Attention and Focus subscale. Consequently, study relating to attention should be interpreted as parent-reported behavioural indicators of attention difficulty, rather than as a direct clinical measure of cognitive attention capacity.

1.7 Social Reciprocity

Social reciprocity refers to the back-and-forth nature of interpersonal interaction. It includes the ability to initiate and respond to social interaction, share experiences, respond to social cues, participate in reciprocal communication, and engage jointly with other people. The present thesis defines social reciprocity as the dynamic exchange involved in social interaction, including joint attention, shared emotional experiences, understanding social cues, and active engagement in peer or family play. Social reciprocity is central to the clinical understanding of ASD. Difficulties in reciprocal interaction may affect peer relationships, family interactions, classroom participation, and everyday communication. Digital media introduces a distinctive issue in this area because some screen activities are socially interactive while others are relatively solitary. Video calls, cooperative games, shared viewing, and caregiver-guided educational activities may involve social interaction. In contrast, solitary viewing or gaming may provide fewer opportunities for natural reciprocal communication. The Displacement Hypothesis suggests that substantial screen exposure may reduce opportunities for direct face-to-face interaction. Real-world interaction involves multiple simultaneous social signals, including facial expression, gesture, tone of voice, body language, timing, and emotional feedback. The existing thesis specifically identifies these interpersonal exchanges as important forms of social scaffolding. However, the relationship between screen exposure and social reciprocity cannot be reduced to a simple assumption that more screen time necessarily produces poorer social functioning. Children with ASD may have pre-existing differences in social communication that influence both their social behaviour and their preference for particular forms of digital engagement. We therefore understand the association empirically rather than assuming causation. The SENA Social Reciprocity subscale consists of Items 13–16. These address group-play avoidance, difficulties responding to social cues, resistance to engagement, and a joint-attention item relating to shared screen experiences. The inclusion of joint attention is particularly important because sharing a digital experience with a caregiver may not necessarily represent the same social process as spontaneous joint attention during naturalistic interaction. This measurement issue is recognised in the thesis as an important area requiring further investigation.

1.8 Emotional Regulation

Emotional regulation refers to the processes through which individuals manage emotional responses, recover from distress, tolerate frustration, and adapt their emotional responses to changing circumstances. For children, emotional regulation develops gradually through interaction between individual characteristics and environmental support. Caregivers contribute to this development through co-regulation, predictable routines, emotional modelling, communication, and assistance during transitions. Digital media may intersect with emotional regulation in several ways. A screen may be used to calm a distressed child, provide distraction, occupy attention during difficult situations, or facilitate transitions. At the same time, terminating access to a highly preferred activity may sometimes result in protest, irritability, crying, anger, or other observable distress.

Under this research we understand post-screen emotional responses rather than treating emotional dysregulation as a general characteristic unrelated to screen use. The SENA sensory/emotional domain includes items addressing outbursts following screen termination, mood changes or meltdowns after screen exposure, agitation when access is restricted, and sensory-motor behaviours. This distinction is important because emotional reactions following screen termination may have multiple possible explanations. They may reflect frustration associated with ending a preferred activity, difficulty with transitions, reinforcement history surrounding screen access, baseline emotional regulation difficulties, or the stimulating characteristics of particular digital content. Accordingly, our study understands these behaviours as observed associations within caregiver reports, rather than interpreting them as evidence that screen exposure alone causes emotional dysregulation.

1.9 Sensory Regulation

Sensory processing refers to the way individuals detect, organise, interpret, and respond to sensory information from their environment and their own bodies.

Sensory differences are relevant to autism because some autistic children demonstrate heightened or reduced responses to sensory stimuli. Behavioural manifestations may include sensory seeking, avoidance, repetitive motor behaviour, intense visual attention, sensitivity to sound, or a strong preference for particular forms of sensory stimulation. Digital environments can provide concentrated and controllable sensory experiences. Bright colours, rapid visual movement, repetitive sounds, music, vibration, animation, and immediate responses may provide powerful sensory input. For some children this may be engaging or regulating, while for others it may contribute to overstimulation. The thesis incorporates Dunn's Sensory Processing Framework as one of its theoretical foundations. The framework is used to understand differences in neurological thresholds and behavioural responses to sensory input. Within the SENA instrument, sensory and emotional regulation is assessed through four items concerning post-screen outbursts, emotional reactions, agitation following screen deprivation, and sensory-motor behaviours such as flapping, rocking, and intense gazing. The combined sensory/emotional domain used in this research reflects the practical overlap between sensory responsiveness and observable emotional behaviour. However, the two constructs should not be regarded as identical. Sensory behaviours and emotional dysregulation may have different mechanisms and may require different forms of clinical assessment. The combined SENA domain should therefore be understood as a study-specific behavioural construct rather than a substitute for a comprehensive occupational-therapy or psychological sensory assessment.

1.10 Rationale of the Study

The rationale for research arises from the increasing integration of digital media into children's everyday lives and the need to understand how screen exposure may relate to specific areas of functioning in children with ASD. Existing discussions of screen time often focus primarily on duration. However, the developmental significance of screen exposure may depend upon several interacting factors, including content, routine, context, and the child's individual characteristics. Children with ASD represent an important population for investigation because of the heterogeneity of their attentional, social, sensory, and emotional profiles. Digital media may be particularly engaging for some autistic children, while transitions away from preferred digital activities may present challenges.

Research here therefore examines screen exposure in relation to three interconnected domains:

1. Attention and Focus
2. Social Reciprocity

3. Sensory and Emotional Regulation

The study also includes a non-ASD comparison group, enabling examination of differences in reported neurobehavioural functioning between children with and without an ASD diagnosis. The SENA instrument was developed specifically for this research to integrate screen exposure patterns with these behavioural domains. The questionnaire contains demographic questions, screen-use questions, behavioural items, and caregiver-perspective questions. The research is consequently intended not merely to determine whether children use screens for a particular number of hours, but to investigate whether variation in reported screen exposure is associated with measurable differences in selected aspects of daily functioning.

1.11 Problem Statement

The increasing presence of digital screens in children's daily lives raises important questions regarding their relationship with children's behavioural and developmental functioning. These questions may be particularly relevant for children with Autism Spectrum Disorder, whose developmental profiles may include differences in attention, social reciprocity, sensory processing, and emotional regulation. Although screen exposure may serve educational, recreational, and communicative functions, prolonged or poorly structured exposure may coexist with difficulties in attention, social engagement, transitions, and emotional regulation. At the same time, children who already experience difficulties in these areas may also be more likely to seek or prefer screen-based activities. A cross-sectional study cannot determine which process occurs first. Therefore, the central problem addressed by the present research is the need to examine whether daily screen exposure is associated with parent-reported differences in attention and focus, social reciprocity, and sensory/emotional regulation among children with ASD, while also examining differences between ASD and non-ASD groups.

Statement of the Problem

“A study to examine the relationship between screen exposure and selected neurobehavioural domains, attention and focus, social reciprocity, and sensory/emotional regulation in children with Autism Spectrum Disorder, using the Screen Exposure Neurobehavioral Assessment (SENA).”

1.12 Research Questions

The study addresses the following research questions:

1. Is there a relationship between daily screen exposure and attention-related difficulties among children with ASD?
2. Is daily screen exposure associated with social reciprocity difficulties among children with ASD?
3. Is daily screen exposure associated with sensory and emotional dysregulation among children with ASD?
4. Are there differences in attention, social reciprocity, and sensory/emotional regulation between children with ASD and children without an ASD diagnosis across varying levels of screen exposure?

1.13 Research Objectives

The objectives of the study are:

1. To examine the relationship between daily screen exposure duration and attention/focus difficulties among children diagnosed with ASD.
2. To examine the relationship between daily screen exposure duration and social reciprocity difficulties among children diagnosed with ASD.
3. To examine the relationship between daily screen exposure duration and sensory/emotional dysregulation among children diagnosed with ASD.

4. To find and compare selected neurobehavioural outcomes between children with ASD and children without an ASD diagnosis.
5. To understand screen-use patterns, including screen duration, primary purpose of screen use, and routine structure.
6. To explore the utility and measurement characteristics of the Screen Exposure Neurobehavioral Assessment (SENA) as a parent-report instrument for examining screen-related neurobehavioural observations.

1.14 Research Hypotheses

Based on the theoretical framework and objectives of the study, the following hypotheses were formulated:

H₁- There will be a positive relationship between daily screen exposure duration and attention-deficit scores among children diagnosed with ASD.

H₂- There will be a positive relationship between daily screen exposure duration and social-reciprocity deficit scores among children diagnosed with ASD.

H₃- There will be a positive relationship between daily screen exposure duration and sensory/emotional dysregulation scores among children diagnosed with ASD.

H₄- Children diagnosed with ASD will demonstrate significantly higher sensory/emotional dysregulation and social-reciprocity deficit scores than children without an ASD diagnosis under comparable screen-exposure conditions.

These hypotheses correspond to the hypotheses specified in the existing thesis.

1.15 Conceptual Definitions

1.15.1 Autism Spectrum Disorder

Autism Spectrum Disorder refers to a neurodevelopmental condition involving persistent differences in social communication and social interaction together with restricted or repetitive patterns of behaviour, interests, or activities. Sensory differences may also form part of the individual's behavioural presentation.

1.15.2 Screen Exposure

Screen exposure refers to the cumulative daily duration spent interacting with digital visual media, including television, smartphones, tablets, computers, and gaming devices, for purposes such as entertainment, learning, and communication.

1.15.3 Attention and Focus

Attention and focus refer to the capacity to sustain concentration on relevant activities, complete structured tasks, retain instructions, and resist irrelevant distractions.

1.15.4 Social Reciprocity

Social reciprocity refers to the reciprocal and dynamic exchange involved in social interaction, including responding to social cues, sharing experiences, participating in joint attention, and engaging in social play.

1.15.5 Sensory Seeking

Sensory seeking refers to behavioural attempts to obtain particular forms of sensory stimulation, such as repetitive movement, intense visual attention, or seeking particular sounds or other sensory experiences.

1.15.6 Emotional Dysregulation

Emotional dysregulation refers to observable difficulty managing emotional responses, including intense

agitation, anger, outbursts, or distress. In the context of this study, particular attention is given to emotional responses associated with screen termination or restricted access.

1.16 Operational Definitions

The variables in this study were operationalised through the Screen Exposure Neurobehavioral Assessment.

Daily Screen Exposure Duration

Daily screen exposure was assessed through the SENA screen-time item, with caregivers selecting one of the following categories:

- Less than 1 hour
- 1–2 hours
- 2–4 hours
- 4–6 hours
- More than 6 hours

The existing analytical procedure converted the first four categories into approximate continuous values for correlational analysis: 0.5, 1.5, 3.0, and 5.0 hours respectively. The “more than 6 hours” category was retained as a categorical response rather than assigning an unsupported exact value. The original questionnaire confirms the five response categories.

Attention and Focus

The Attention and Focus score was operationalised as the mean score of SENA Items 9–12. Each item uses a four-point response format:

- 1 = Never
- 2 = Rarely
- 3 = Sometimes
- 4 = Always

Higher scores represent greater reported difficulty with sustained attention, task completion, instruction retention, and distractibility.

Social Reciprocity

The Social Reciprocity score was operationalised using Items 13–16. The items address social participation, response to social cues, engagement resistance, and joint attention within screen-sharing contexts. The existing thesis specifically identifies Item 16 as requiring additional psychometric consideration because of its conceptual direction.

Sensory and Emotional Regulation

The Sensory/Emotional Regulation score was operationalised using Items 17–20. These items address behavioural and emotional responses following screen exposure or screen restriction and sensory-motor behaviours such as flapping, rocking, and intense gazing.

ASD Group

For the purposes of the research, the ASD group consists of caregivers reporting that the child had received a formal clinical diagnosis of ASD. The methodology specifies that the diagnosis was expected to have been provided by an appropriately qualified professional.

Non-ASD Comparison Group

The comparison group consists of caregivers of children aged 4–15 years who were reported to have no clinical diagnosis of ASD or neurodevelopmental delay.

1.17 Significance of the Study

The significance of this research can be considered at several levels.

1.17.1 Significance for Clinical Psychology

For clinical psychologists working with children and families, understanding the relationship between screen exposure and behavioural functioning can contribute to more comprehensive assessment and psychoeducation. Screen use may become relevant during assessment when caregivers report difficulties with attention, transitions, emotional outbursts, social engagement, or sensory behaviours. Rather than treating screen time as an isolated lifestyle variable, clinicians may consider it alongside broader developmental and environmental factors. The study's focus on specific domains attention, social reciprocity, and sensory/emotional regulation may therefore provide a framework for discussing screen-related behaviour during clinical interviews.

1.17.2 Significance for Parents and Caregivers

Caregivers frequently have to balance children's digital interests with educational, behavioural, social, and family needs. The study may help caregivers think beyond the simple question of whether a child uses a screen and instead consider:

- How long the child uses screens;
- What the child uses them for;
- Whether screen use follows a predictable routine;
- Whether the child becomes distressed when access ends;
- Whether screen use displaces social or physical activities; and
- Whether digital activities are shared with caregivers.

The thesis specifically identifies caregiver empowerment as an important contribution of the research, particularly in relation to establishing structured digital routines rather than relying exclusively on complete restriction.

1.17.3 Significance for Special Educators

Teachers and special educators may encounter attention shifting, task abandonment, difficulty following instructions, social withdrawal, and behavioural distress in children with ASD. Understanding the child's digital environment can therefore provide useful contextual information when planning behavioural and educational interventions. Screen exposure should not be viewed as the sole explanation for classroom difficulties. Rather, information regarding screen routines may complement broader educational and developmental assessment.

1.17.4 Significance for Allied Health Professionals

Occupational therapists, speech-language professionals, developmental specialists, and other allied health professionals may benefit from considering children's digital environments when discussing attention, sensory processing, social participation, and emotional regulation. The thesis identifies the potential relevance of screen structure, content, and sensory characteristics for multidisciplinary intervention planning.

1.17.5 Significance for Research

A major contribution of the study is the attempt to examine several behavioural domains within a single framework. Rather than examining screen exposure only in relation to one outcome, the SENA integrates attention, social reciprocity, and sensory/emotional regulation. The study also provides preliminary information regarding the functioning of a newly developed parent-report instrument. In particular, the treatment of the joint-attention item demonstrates the importance of evaluating not only

reliability statistics but also the conceptual meaning of individual items. The existing thesis identifies this psychometric component as a potential contribution to future development of screening and assessment tools.

1.17.6 Significance in the Indian Context

Research conducted within Indian families is valuable because children's digital experiences are shaped by family structure, educational expectations, living environments, access to technology, and caregiver practices. The research includes participants from Indian urban and semi-urban contexts and therefore provides context-specific observations rather than relying entirely on study generated in Western populations. The thesis specifically identifies the relative scarcity of research integrating screen exposure with neurobehavioural domains in Indian autistic children.

1.18 Scope of the Study

The study focuses on children between **4 and 15 years of age** and obtains behavioural information from parents, guardians, or primary caregivers.

The research examines:

1. Daily screen exposure duration;
2. Primary purposes of screen use;
3. Screen routine structure;
4. Attention and focus;
5. Social reciprocity; and
6. Sensory/emotional regulation.

The methodology describes the target population as caregivers/parents of children aged 4–15 years residing primarily in urban and semi-urban Indian settings, with recruitment through digital parent-support groups, special-education networks, early-intervention centres, and online caregiver forums. The study does not attempt to establish a clinical diagnosis of ASD. Instead, diagnostic status is based on caregiver-reported formal clinical diagnosis as recorded through the study questionnaire. Similarly, the study does not claim that screen exposure causes autism, attention difficulties, social difficulties, or sensory/emotional dysregulation. Because the research uses a cross-sectional correlational design and caregiver reports, relationships identified in the data should be interpreted as associations rather than causal effects.

1.19 Delimitations of the Study

The study is delimited to:

- Children aged 4–15 years;
- Parent or primary-caregiver reports;
- Participants recruited through purposive sampling;
- Indian urban and semi-urban contexts;
- Screen exposure measured primarily through caregiver-reported categories;
- Selected behavioural domains represented in the SENA;
- Cross-sectional assessment of screen exposure and neurobehavioural functioning.

These delimitations allow the study to maintain a focused investigation while recognising that its study may not be generalisable to all children with ASD.

1.20 Limitations of the Study

Several limitations should be acknowledged at the outset.

First, the study uses a **cross-sectional design**. Therefore, even if screen exposure is statistically associa-

ted with behavioural outcomes, the direction of the relationship cannot be established. It is possible that higher screen exposure contributes to certain difficulties, but it is also possible that children who already experience greater attention, sensory, emotional, or social difficulties are more likely to engage extensively with screens. The existing thesis explicitly recognises this limitation. Second, screen exposure is based on caregiver report rather than automated device tracking. Caregivers may estimate screen duration differently, particularly when children use multiple devices or when screen use occurs intermittently throughout the day. Third, the SENA is a newly developed instrument for the purposes of this study. Although its internal consistency and item-level behaviour are examined, it should not be interpreted as a replacement for established diagnostic or neuropsychological assessments. Fourth, the sample was obtained through purposive recruitment and was concentrated in urban and semi-urban contexts. Consequently, the study may not generalise to children from rural areas or substantially different socioeconomic and cultural environments. Finally, the study combines sensory and emotional indicators into a single study-specific domain. Although this reflects the structure of the SENA, sensory processing and emotional regulation are conceptually distinct constructs and may require separate assessment in future research.

1.21 Organisation of the Dissertation

The dissertation is organised into chapters that progressively develop the theoretical, empirical, methodological, and clinical dimensions of the research.

Chapter 1 – Introduction presents the background of the study, autism spectrum disorder, childhood screen exposure, screen-use patterns, attention and learning, social reciprocity, emotional and sensory regulation, rationale, research gap, research problem, objectives, hypotheses, operational definitions, significance, scope, and limitations.

Chapter 2 – Review of Literature examines theoretical perspectives and empirical research concerning screen exposure, child development, autism, executive functioning, sensory processing, social reciprocity, emotional regulation, parental mediation, and digital media use. The chapter also develops the conceptual framework underlying the present investigation.

Chapter 3 – Research Methodology describes the research design, participants, sampling method, inclusion and exclusion criteria, SENA instrument, procedure, ethical considerations, scoring system, and statistical analysis.

Chapter 4 – Analysis, study and Conclusions presents the statistical analysis of the collected data, including demographic characteristics, screen-use patterns, SENA subscale study, relationships between screen exposure and neurobehavioural variables, and comparisons between ASD and non-ASD participants.

Chapter 5 – Summary provides a concise synthesis of the study, major study, conclusions, implications, limitations, and recommendations for future research.

The final sections contain the **References** and **Annexures**, including the research instrument, consent material, and supporting statistical or documentary material.

CHAPTER 2

REVIEW OF LITERATURE

2.1 Introduction

The increasing integration of digital technology into children's everyday lives has generated substantial interest within developmental psychology, clinical psychology, education, occupational therapy, and

child psychiatry. Television, smartphones, tablets, computers, gaming devices, and internet-based platforms now occupy multiple roles in children's lives, including entertainment, education, communication, social interaction, and behavioural regulation.

The developmental significance of screen exposure, however, cannot be understood solely by considering the number of hours a child spends using a device. The meaning of screen exposure is influenced by the child's developmental characteristics, the content being viewed, the purpose of use, the social context in which the device is used, parental mediation, timing, and the activities displaced by screen use. The American Academy of Pediatrics has similarly emphasised that media guidance for school-aged children should consider balance, content, context, and the individual child rather than applying a single universal time limit. [David Hill, MD; Nusheen Ameenuddin, MD; Yolanda (Linda) Reid Chassiakos, MD; Corinn Cross, MD; Jenny Radesky, MD; Jeffrey Hutchinson, MD; Alanna Levine, MD; Rhea Boyd, MD; Robert Mendelson, MD; Megan Moreno, MD; Wendy Sue Swanson, MD; MBE (paediatrics 2106)] These considerations become particularly important when understanding children with Autism Spectrum Disorder (ASD). Autism is characterised by persistent differences in social communication and interaction and restricted or repetitive patterns of behaviour, interests, or activities. Many autistic children also experience differences in sensory processing, attention, executive functioning, emotional regulation, and social participation. Consequently, digital media may have a different functional meaning for an autistic child than it does for a typically developing child.

The existing thesis identifies four theoretical perspectives as the foundation for the present research: the Displacement Hypothesis, Dunn's Sensory Processing Framework, the Goldilocks Model, and the Differential Susceptibility to Media Effects Model (DSMM).

The present chapter reviews these theoretical perspectives and examines empirical literature concerning screen exposure, autism, attention, social reciprocity, emotional regulation, sensory processing, parent-reported behaviour, and the Indian sociocultural context. The chapter concludes by identifying the research gap and presenting the conceptual framework guiding the current study.

2.2 Theoretical Background

2.2.1 The Displacement Hypothesis

The Displacement Hypothesis provides one of the most intuitive explanations for why excessive screen exposure might be associated with developmental outcomes. The central proposition is that time is finite. Consequently, when children spend increasing amounts of time with screens, that time may replace other activities that contribute to development.

The existing thesis adopts this perspective and proposes that screen exposure may displace face-to-face interaction, physical play, sensory-motor experiences, and activities requiring self-directed attention.

For children, development occurs through repeated engagement with the physical and social environment. Face-to-face interaction provides opportunities to interpret facial expressions, gestures, vocal tone, emotional states, and social intentions. Play provides opportunities for negotiation, turn-taking, problem-solving, motor coordination, and flexible behaviour. Similarly, reading, drawing, construction activities, and classroom tasks require children to sustain attention without continuous digital stimulation.

From a displacement perspective, therefore, the potential concern associated with screen exposure is not necessarily that the screen itself produces impairment. Rather, excessive use may reduce opportunities to participate in experiences that support development.

This distinction is important for the current study because a cross-sectional association between screen exposure and behavioural difficulties cannot establish that screens caused the difficulties. Children who already have attention, social, sensory, or emotional difficulties may themselves be more likely to use screens extensively. Thus, the displacement hypothesis provides a theoretical explanation rather than proof of causal direction.

The hypothesis is particularly relevant to autism because social communication and executive functioning are already areas of developmental difference for many autistic children. If screen-based activities replace opportunities for reciprocal interaction or self-directed tasks, there may be fewer opportunities to practise those skills in everyday settings.

The existing thesis describes three potentially displaced developmental experiences:

1. **Face-to-face social scaffolding**, which provides opportunities for reciprocal communication;
2. **Sensory-motor play**, which provides physical and sensory experiences; and
3. **Executive-function practice**, which requires sustained attention, flexibility, planning, and self-regulation.

2.2.2 Dunn's Sensory Processing Framework

Dunn's Sensory Processing Framework provides a theoretical basis for understanding individual differences in responses to sensory stimulation. Dunn's model conceptualises sensory processing through two dimensions: neurological threshold and behavioural response strategy.

Children may differ in the amount of sensory stimulation required before they respond. Some individuals may have relatively low thresholds and become overwhelmed by relatively small amounts of stimulation, while others may seek additional stimulation because their thresholds are relatively high. Behavioural strategies can also differ, ranging from passive responses to active attempts to regulate sensory input.

Dunn's work provided the basis for the Sensory Profile, an instrument developed to characterise sensory processing patterns in children. [Dunn W, Westman K. 1997 Jan] The framework is particularly relevant to autism. Tomchek and Dunn's comparative study of 281 children with ASD aged 3–6 years found that 95% of the autistic sample demonstrated some degree of sensory processing dysfunction on the Short Sensory Profile, with particularly notable differences in underresponsiveness/seeking sensation, auditory filtering, and tactile sensitivity. [Tomchek SD, Dunn W. 2007 Mar-Apr]

A later systematic review examining studies that specifically used Dunn's framework concluded that sensory processing differences were significantly related to participation in daily occupations among children with ASD. [Ismael N, Lawson LM, Hartwell J. 2018 May/Jun] The relevance of digital media arises because screens can provide concentrated visual and auditory stimulation. Animated videos, games, rapidly changing images, music, sound effects, vibration, and interactive feedback can create an environment with a high density of sensory information.

For some children, such stimulation may be attractive and regulating. For others, it may be overwhelming. This means that the same screen activity may have different effects depending on the child's sensory characteristics.

The existing thesis applies Dunn's framework to the possibility that high-intensity digital stimulation may interact with sensory-seeking or sensory-avoidant patterns.

Importantly, however, the current study does not directly measure sensory processing using a validated occupational-therapy instrument such as the Sensory Profile. Its sensory study are based on the SENA's

behavioural items. Therefore, Dunn's framework should be regarded as a theoretical interpretive model rather than evidence that the SENA directly measures Dunn's sensory-processing constructs.

2.2.3 The Goldilocks Model of Digital Exposure

The Goldilocks perspective challenges a simple assumption that digital technology is either beneficial or harmful. Przybylski and Weinstein examined digital-screen use and adolescent mental well-being using a preregistered analysis of a representative sample of 120,115 English adolescents. They reported quadratic associations, suggesting that the relationship between digital technology use and well-being was not adequately represented by a simple linear model. They argued that moderate use was not inherently harmful and that the timing and context of technology use also mattered. [Patti M. Valkenburg, Jochen Peter, 07 March 2013]

This perspective is important because it cautions against treating every minute of screen use as equivalent.

For example, a child may use a tablet for:

- an educational activity,
- a video call with a family member,
- watching an educational programme,
- playing a highly stimulating game,
- communicating with peers, or
- watching entertainment videos.

The developmental implications of these activities may differ.

The Goldilocks perspective therefore supports examining screen exposure across categories rather than assuming a uniformly harmful effect. It also supports the inclusion of screen-use purpose and routine structure in. The existing thesis applies this perspective to the SENA's screen-duration categories, including less than one hour, one to two hours, two to four hours, and four to six or more hours. At the same time, the original Goldilocks research focused primarily on adolescents and mental well-being. Its application to autistic children and to specific neurobehavioural domains such as attention and sensory regulation should therefore be regarded as an extension of the theoretical idea rather than a direct empirical validation of the model in ASD.

2.2.4 Differential Susceptibility to Media Effects Model

The Differential Susceptibility to Media Effects Model (DSMM) was proposed by Valkenburg and Peter as an integrative model explaining why media exposure may affect individuals differently. The model identifies three forms of susceptibility: dispositional, developmental, and social susceptibility. It also proposes cognitive, emotional, and excitative response states through which media effects may operate. [Patti M. Valkenburg, Jochen Peter, 07 March 2013]

This model is particularly relevant to the present research because children do not respond uniformly to digital media.

A child's response may depend on:

- neurodevelopmental characteristics,
- age,
- temperament,
- pre-existing attention characteristics,
- sensory processing,

- emotional regulation,
- family environment,
- parental mediation, and
- the type of content consumed.

Within an ASD population, individual susceptibility may be especially important because autism is highly heterogeneous. One child may become intensely engaged with a particular digital interest, another may use screens as a predictable calming activity, while another may become overstimulated by rapid audiovisual content.

The DSMM therefore provides a useful framework for avoiding a deterministic interpretation of screen exposure. Rather than asking whether screens are "good" or "bad," the model encourages examination of who is using the media, what media they are using, how they are using it, and under what social and developmental conditions.

The research's inclusion of ASD and non-ASD groups, screen-use purpose, screen routine, and three neurobehavioural domains is consistent with this broader susceptibility perspective.

2.3 Screen-Time Research

2.3.1 Developmental Importance of Screen Exposure

Screen exposure has become a major component of childhood environments. Digital technology can provide educational resources, entertainment, social communication, and opportunities for creative expression. Consequently, the research literature increasingly recognises that screen use cannot be understood exclusively through a simple "more versus less" framework. The World Health Organization's guidelines for children under five integrate sedentary screen time with physical activity and sleep rather than treating screen exposure as an isolated behaviour. For example, the WHO recommends no sedentary screen time for one-year-olds and no more than one hour for children aged two years, with less being preferable; for children aged three and four, the recommendation is also no more than one hour. [WHO 24 April 2019; News release] These recommendations are designed for children under five and therefore should not be mechanically applied to the entire 4–15-year-old sample in research. Nevertheless, they demonstrate the broader developmental principle that sedentary screen exposure should be considered alongside sleep, physical activity, and other activities. A systematic review of reviews examining screen time and child health found evidence across several domains, including mental health, sleep, fitness, diet, and body composition, although the strength and quality of evidence varied substantially between outcomes. [Stiglic N, Viner RM. 2019 Jan 3] This variability is important. It suggests that screen exposure may not have a single uniform effect across all developmental outcomes.

2.3.2 Duration Versus Context

A major issue in screen-time research is whether duration alone adequately captures the developmental significance of digital media.

The American Academy of Pediatrics has argued that healthy media use should be individualised rather than based solely on a universal number of hours. Its guidance for school-aged children and adolescents emphasises the need to consider developmental stage, content, context, balance, family communication, and consistent rules. [David Hill, MD; Nusheen Ameenuddin, MD; Yolanda (Linda) Reid Chassiakos, MD; Corinn Cross, MD; Jenny Radesky, MD; Jeffrey Hutchinson, MD; Alanna Levine, MD; Rhea

Boyd, MD; Robert Mendelson, MD; Megan Moreno, MD; Wendy Sue Swanson, MD; MBE (paediatrics 2016)]

The SENA records:

- daily screen duration,
- purpose of screen use,
- routine structure, and caregiver observations of behaviour.

Thus, the research here incorporates a broader view of screen exposure than duration alone.

2.4 ASD and Digital Media

2.4.1 Digital Media Use Among Autistic Children

Children with ASD may interact with digital media in distinctive ways. Digital environments can provide predictable rules, repetitive patterns, highly focused interests, controllable sensory stimulation, and immediate feedback. These characteristics may be especially appealing to some autistic children. At the same time, extensive digital engagement may coexist with social communication difficulties, restricted interests, sedentary behaviour, sleep disruption, or behavioural distress during transitions. The relationship is therefore potentially bidirectional. Children with ASD may spend more time using screens because digital environments are particularly engaging or because screens can reduce the demands associated with face-to-face interaction. Conversely, extensive screen exposure may displace opportunities for social and physical engagement. A major 2023 systematic review and meta-analysis examined this issue across 46 observational studies involving 562,131 participants. The review found a positive overall association between screen time and ASD, but the authors emphasised substantial heterogeneity and publication bias. After a trim-and-fill correction for publication bias, the association became nonsignificant. [Ophir Y, Rosenberg H, Tikochinski R, Dalyot S, Lipshits-Braziler Y. 2023] The methodological implications are particularly important. Of the 46 studies, 41 were cross-sectional and only five were longitudinal. Consequently, the literature cannot establish that screen exposure causes ASD. [Ophir Y, Rosenberg H, Tikochinski R, Dalyot S, Lipshits-Braziler Y. 2023] This finding supports the approach adopted in the research: screen exposure and neurobehavioural characteristics should be investigated as associated variables, without making causal claims.

2.4.2 Screen Use as a Potentially Preferred Activity

The relationship between autism and screen exposure may also operate in the opposite direction. Digital environments may be attractive to autistic children because they offer predictable stimulation and allow the child to control aspects of the interaction.

The 2023 systematic review notes that earlier literature had considered the possibility that children with ASD may be more attracted to screen activities because digital activities can reduce some of the challenges involved in real-life social communication. [Ophir Y, Rosenberg H, Tikochinski R, Dalyot S, Lipshits-Braziler Y. 2023] This creates an important interpretive issue.

If a child with significant social or emotional difficulties is given a tablet because it reliably calms the child, a correlation between screen exposure and behavioural difficulty could arise even if the screen did not create the underlying difficulty.

This possibility is highly relevant to the present cross-sectional study and will be revisited in the Discussion chapter.

2.5 Screen Exposure and Attention

2.5.1 Attention and Executive Function

Attention is closely connected to executive functioning. Executive functions include processes such as inhibition, working memory, cognitive flexibility, planning, and goal-directed behaviour. Executive-function differences are well documented in ASD. A large meta-analysis of 235 studies involving more than 14,000 participants found a moderate overall effect for reduced executive functioning in ASD, with the authors describing executive dysfunction as relatively stable across development. [Demetriou EA, Lampit A, Quintana DS, Naismith SL, Song YJC, Pye JE, Hickie I, Guastella AJ. 2018 May] A systematic review of preschool executive-function profiles similarly found that children with ASD frequently demonstrated differences in shifting and, in many studies, inhibition. [Christoforou M, Jones EJH, White P, Charman T. 2023 Jan 7] This study provides a developmental basis for investigating attention as one of the major outcomes of the current research.

2.5.2 Screen Exposure and Attention in Typically Developing Children

Research examining screen exposure and attention has produced a pattern of concern but also methodological uncertainty.

A systematic review published in *Developmental Neuropsychology* identified 11 studies examining screen time and attention in children. Most of the studies reported an association between greater screen exposure and attention problems, although the authors noted the need for further research. [Santos RMS, Mendes CG, Marques Miranda D, Romano-Silva MA. 2022 Jul] Another systematic review examining screen exposure and attentional functioning in young children included five cross-sectional and ten longitudinal studies. All five cross-sectional studies reported significant associations between high screen exposure and attention difficulties. Among longitudinal studies, six reported significant effects and four did not. Importantly, several studies suggested that the relationship may be bidirectional. [Jourden M, Bucaille A, Ropars J. 2023 May] A systematic review of sedentary behaviour and executive function in children and adolescents similarly found mixed results overall, although screen-based sedentary behaviour showed negative associations with executive function in several studies. [Li S, Guo J, Zheng K, Shi M, Huang T. 2022 Feb 2]; The overall literature therefore suggests an association worth investigating while simultaneously demonstrating why causal conclusions should be avoided.

2.5.3 Attention in ASD and Screen Exposure

The relevance of screen exposure may be greater in children who already have executive-function differences. Digital environments frequently provide rapid changes in stimuli, immediate rewards, and strong external attentional cues.

For some children, this may support engagement. For others, extensive exposure may make slower-paced activities feel comparatively less stimulating.

However, there is insufficient evidence to conclude that screen exposure directly produces executive dysfunction in autistic children. The relationship may instead involve multiple interacting processes, including child preference, parental practices, content characteristics, sleep, physical activity, and baseline executive functioning.

This study addresses this issue through four SENA items concerning:

- sustained attention,
- task completion and shifting,
- retention of repeated instructions, and
- distractibility or forgetfulness.

These items are combined to create the Attention and Focus domain.

2.6 Screen Exposure and Social Reciprocity

2.6.1 Social Reciprocity in Autism

Social reciprocity refers to the reciprocal exchange that occurs during social interaction. It includes initiating and responding to interaction, sharing experiences, interpreting social cues, and participating in joint activities. Social reciprocity is particularly important in ASD because difficulties in reciprocal social interaction are central to the condition. Joint attention represents one important component of social reciprocity. It involves coordinating attention between people and an object or event. A review of the literature describes joint attention as an important early developmental skill that is frequently impaired in autism and associated with later language development. [Bruinsma Y, Koegel RL, Koegel LK; 2004] A systematic review and meta-analysis of joint-attention interventions involving children with ASD found evidence supporting interventions designed to improve joint-attention skills. [Murza KA, Schwartz JB, Hahs-Vaughn DL, Nye C. 2016 May]

A more recent meta-analysis of 18 randomised controlled trials involving 1,165 children under five also found improvements in joint-attention skills following intervention, although heterogeneity and methodological limitations required cautious interpretation. [Song J, Reichow B, Chow J, Bruder MB, Simonsen B. 2026 Jan 6]

This study demonstrates why joint attention is clinically relevant when understanding social reciprocity.

2.6.2 Screen Use and Social Interaction

Digital media can have both socially isolating and socially facilitating functions.

A child watching videos alone may have relatively little direct social interaction during that period. In contrast, video calling, cooperative gaming, shared viewing, and caregiver-guided digital activities can involve communication and social engagement.

The displacement perspective suggests that extensive solitary screen use may reduce opportunities for face-to-face interaction. However, this does not mean that every form of screen use reduces social functioning. The distinction between socially mediated screen use and solitary screen use is therefore important. The present SENA includes questions concerning the purpose of screen use and incorporates a Social Reciprocity subscale consisting of Items 13–16. The existing thesis specifically identifies a psychometric concern regarding the interpretation of Item 16, which involves shared screen attention. This is an important methodological issue because a child inviting a parent to look at a favourite video may demonstrate a form of shared attention, but the behaviour may not necessarily represent the same type of spontaneous social reciprocity observed during face-to-face play.

2.6.3 Joint Attention and Digital Media

Joint attention should be distinguished from simply looking at the same screen.

Traditional joint attention includes social coordination: one person directs another person's attention toward an object, checks the other person's attention, shares affect, and maintains a common attentional focus. The literature indicates that joint attention is closely connected with language and social development in autism. A meta-regression involving 71 reports or datasets and more than 3,600 participants found that joint attention was associated with language outcomes and that the relationship was particularly relevant in ASD. [Bottema-Beutel K. 2016 Oct] Therefore, screen sharing should not automatically be interpreted as equivalent to developmental joint attention. This distinction becomes

important for the current study because the SENA was designed as a parent-report screening instrument rather than as a direct observational measure of joint attention.

2.7 Screen Exposure and Emotional Regulation

2.7.1 Emotional Regulation in ASD

Emotional regulation refers to the ability to modulate emotional responses, tolerate frustration, recover from distress, and adjust behaviour according to situational demands. Emotional regulation can be challenging for autistic children. A 2024 meta-analysis examining emotion regulation and emotion dysregulation in children and adolescents with ASD included 55 studies and examined relationships with internalising and externalising symptoms, cognitive functioning, social skills, and interventions. [Restoy D, Oriol-Escudé M, Alonzo-Castillo T, Magán-Maganto M, Canal-Bedia R, Díez-Villoria E, Gisbert-Gustemps L, Setién-Ramos I, Martínez-Ramírez M, Ramos-Quiroga JA, Lugo-Marín J. 2024 Apr]

Emotional dysregulation can manifest through:

- irritability,
- tantrums,
- crying,
- aggression,
- withdrawal,
- difficulty recovering after frustration,
- difficulty transitioning between activities, and
- intense reactions to changes in routine.

These behaviours are not specific to screen exposure. However, screen use may become one context in which such behaviours are particularly visible.

2.7.2 Screen Removal and Emotional Responses

One behavioural pattern frequently discussed by caregivers is distress when screen access ends.

There are several possible explanations.

First, the child may have difficulty transitioning from a preferred activity.

Second, the child may have learned that emotional protest sometimes results in continued screen access. Third, the child may use the screen as a self-regulation strategy, meaning that removing the device removes a preferred method of managing stimulation or distress. Fourth, highly stimulating content may make the transition to a less stimulating environment subjectively difficult. Therefore, a post-screen tantrum should not automatically be interpreted as evidence of neurological damage caused by screen exposure. The research appropriately frames these behaviours as screen-associated behavioural observations rather than proof of causation. The SENA sensory/emotional domain includes items concerning outbursts following screen removal, mood changes, agitation when access is restricted, and sensory-motor behaviours.

2.8 Screen Exposure and Sensory Processing

2.8.1 Sensory Differences in ASD

Sensory processing differences are common among autistic children.

Tomchek and Dunn's comparative study found substantial differences in sensory processing among young children with ASD compared with typically developing peers. [Tomchek SD, Dunn W. 2007 Mar-Apr] The systematic review of Dunn-framework studies found that sensory processing differences

were significantly related to participation in daily occupations among children with ASD. [Ismael N, Lawson LM, Hartwell J. 2018 May/Jun]

Sensory processing therefore has consequences beyond isolated sensory preferences. It can affect:

- eating,
- dressing,
- sleeping,
- school participation,
- play,
- community activities,
- social interaction, and
- emotional regulation.

2.8.2 Digital Media as Sensory Stimulation

Screens can provide highly controllable sensory stimulation.

Children can select:

- brightness,
- volume,
- speed,
- content,
- repetition,
- visual themes,
- music,
- game difficulty, and
- interaction frequency.

For a child with sensory-seeking tendencies, this predictability and intensity may be particularly attractive. For a child with sensory sensitivity, the same characteristics may produce overstimulation. This provides another explanation for individual variation in screen-related behaviour, therefore the study understands sensory/emotional behaviour rather than assuming that all autistic children will respond to screens in the same way.

2.9 Parent-Reported Behaviour

2.9.1 Importance of Caregiver Observation

Parent-report measures are particularly valuable in developmental and clinical psychology because caregivers observe children across multiple environments and over extended periods.

A clinician may observe a child for one or two hours, whereas parents may observe:

- morning routines,
- meals,
- school preparation,
- homework,
- leisure,
- screen use,
- transitions,
- bedtime,

- sibling interactions, and
- community activities.

Caregiver reports can therefore provide ecologically relevant information.

2.9.2 Limitations of Parent Report

Parent-report data also introduce several sources of possible bias.

Recall bias

Caregivers may have difficulty accurately estimating average daily screen duration, particularly when several devices are used.

Interpretation bias

Different caregivers may interpret terms such as "meltdown," "tantrum," "agitation," or "difficulty concentrating" differently.

Social desirability

Parents may underreport behaviours they believe will be judged negatively.

Attribution bias

Parents may attribute behaviour to screen use because screen exposure occurs immediately before the behaviour.

Informant differences

Parents, teachers, therapists, and clinicians may observe different aspects of a child's functioning. Here we acknowledge recall bias, social desirability, and differences in caregiver interpretation as limitations of the parent-report design.

Consequently, SENA study should be regarded as screen-associated caregiver observations, not objective measurements of neurocognitive functioning.

2.10 Parent-Mediated Screen Use

Parental mediation is another important component of the digital environment.

Parents can influence children's media use through:

1. Restrictive mediation - establishing rules concerning duration or content;
2. Active mediation - discussing or explaining content;
3. Co-viewing - using media together; and
4. Technical mediation - using device-level controls.

A meta-analysis of 57 studies found small associations between certain parental mediation strategies and child outcomes, although effects differed according to mediation type and outcome. [Collier KM, Coyne SM, Rasmussen EE, Hawkins AJ, Padilla-Walker LM, Erickson SE, Memmott-Elison MK. 2016 May]

A systematic review of parental mediation and problematic internet or gaming use among adolescents similarly found that no single mediation strategy consistently produced the same outcome across all contexts. Active mediation showed some potentially protective associations, whereas restrictive mediation produced mixed study. [Nielsen P, Favez N, Liddle H, Rigter H. 2019 Dec 1]

An idea that how parents manage screen exposure may be as important as the amount of screen exposure. Screen use may sometimes serve practical functions for caregivers, including:

- calming a child,
- occupying the child during meals,
- facilitating transitions,
- providing predictable entertainment,
- supporting educational activities, or

- giving caregivers temporary respite.

The present research therefore includes screen routine as a contextual variable.

2.11 Screen Exposure and Social-Emotional Development

Beyond ASD-specific research, broader developmental literature provides evidence for associations between screen exposure and social-emotional functioning.

A 2025 meta-analysis synthesising 124 effect sizes from 30 studies and 39,620 children and adolescents found a small negative correlation between screen exposure and social-emotional competence and a small positive correlation with problem behaviours. Age and screen type contributed to heterogeneity. [Jia W, Deng X, Zeng H. 2025 Nov] A systematic review and meta-analysis focused specifically on children under five included 12 studies from seven countries and found that screen time was generally associated with poorer social-emotional development. The meta-analysis reported an overall odds ratio of 1.24 for social-emotional difficulties, although the underlying studies differed substantially. [Ahmer A, Raza M, Azhar M, Rahman A, das JK, Jafri SK. 2025 Mar], relevant because they suggest that social-emotional outcomes may be one pathway through which screen exposure and child behaviour are related.

2.12 Screen Exposure and Executive Function

Executive functioning includes the ability to maintain goals, inhibit responses, shift attention, hold information in working memory, and regulate behaviour.

A recent rapid systematic review of information and communication technology exposure and executive function in children and adolescents included ten studies involving more than 231,000 children. Most included studies reported negative associations between excessive ICT exposure and executive functions such as working memory, inhibitory control, cognitive flexibility, and attention, although contextual factors including parental mediation and content type appeared important. [Maeneja R, Rato J, Ferreira IS. 2025 Apr 25] evidence remains heterogeneous. The distinction between screen time and screen activity is therefore essential. A passive video, interactive game, educational application, video call, and creative digital activity may place very different demands on executive functioning. The distinction in this supports the current work's inclusion of screen-use purpose rather than measuring duration alone.

2.13 Indian and Contextual Literature

2.13.1 Indian Digital Environment

India provides an important context for examining childhood screen exposure because digital technology has become increasingly integrated into family and educational environments. The existing thesis highlights several contextual characteristics relevant to Indian households, including multigenerational living, urban space limitations, and widespread smartphone availability. These contextual factors should not be treated as universal characteristics of all Indian families. India contains substantial variation in socioeconomic status, family structure, geography, language, education, access to technology, and parenting practices.

Nevertheless, the Indian context is important because study generated entirely in Western settings may not automatically generalise to Indian families.

2.13.2 Screen Exposure in Indian Children

A population-based Indian study by Varadarajan and colleagues examined excessive screen time and developmental delay among children younger than five years. The study was designed specifically to address the absence of population-based evidence on screen exposure and child development in India. [Varadarajan S, Govindarajan Venguidesvarane A, Ramaswamy KN, Rajamohan M, Krupa M, Winfred

Christadoss SB. 2021 Jul 6] this is relevant because it demonstrates the importance of examining screen exposure in relation to developmental outcomes within the Indian context rather than assuming that international evidence is directly transferable. At the same time, the participants in that research were younger than the majority of children represented in the current 4–15-year study. Therefore, its study provide contextual evidence rather than a direct comparison with the present sample.

2.13.3 Autism in India

The epidemiological evidence concerning ASD in India has historically been limited.

A systematic review and meta-analysis of Indian studies identified only a small number of community-based prevalence studies and highlighted the scarcity of high-quality population-level epidemiological evidence. [Chauhan A, Sahu JK, Jaiswal N, Kumar K, Agarwal A, Kaur J, Singh S, Singh M. 2019 Jan-Feb] The review reported differences between urban and rural estimates and emphasised the need for better population-based data. This limitation extends beyond prevalence. Research examining the interaction between autism, screen exposure, family routines, and neurobehavioural functioning in Indian settings is comparatively limited. Consequently, studies examining Indian caregiver experiences can contribute contextual information even when their samples are not nationally representative.

2.14 International Literature Relevant to the Present Study

The major empirical literature organised according to the principal variables examined in the current research.

Table 2.1
Selected Literature Relevant to Screen Exposure and ASD

Study	Population/Design	Major contribution
Przybylski & Weinstein (2017)	120,115 English adolescents	Found quadratic rather than simply linear associations between digital-screen use and well-being, supporting contextual and non-linear approaches. [Andrew K. Przybylski, Netta Weinstein Volume 28, Issue 2, February 2017]
Tomchek & Dunn (2007)	281 children with ASD, age 3–6	Demonstrated substantial sensory-processing differences in ASD. [Tomchek SD, Dunn W. 2007 Mar-Apr]
Ophir et al. (2023)	46 studies; 562,131 participants	Found an overall screen-time/ASD association, but publication bias and observational designs substantially limited causal interpretation. [Ophir Y, Rosenberg H, Tikochinski R, Dalyot S, Lipshits-Braziler Y. 2023;6(12)]
Santos et al. (2022)	Systematic review of 11 studies	Most reviewed studies reported associations between screen exposure and attention problems. [Santos RMS, Mendes CG, Marques Miranda D, Romano-Silva MA. 2022 Jul]
systematic review of preschool attention (2023)	15 studies	Found associations between high exposure and attention difficulties, with evidence of possible bidirectionality. [Jourden M, Bucaille A, Ropars J. 2023 May]
Li et al. (2022)	16 studies	Found mixed evidence between sedentary behaviour and executive function, with more consistent concern for

		screen-based sedentary behaviour. [Li S, Guo J, Zheng K, Shi M, Huang T. 2022 Feb 2]
Murza et al. (2016)	15 intervention studies	Supported the relevance of joint-attention interventions for children with ASD. [Murza KA, Schwartz JB, Hahs-Vaughn DL, Nye C. 2016 May]
Bottema-Beutel (2016)	71 reports/datasets	Found meaningful relationships between joint attention and language, particularly in ASD. [Bottema-Beutel K. 2016 Oct]
Ismael et al. (2018)	Systematic review	Found sensory processing to be significantly related to participation in daily occupations in ASD. [Ismael N, Lawson LM, Hartwell J. 2018 May/Jun]
ASD emotion-regulation meta-analysis (2024)	55 studies	Demonstrated the importance of emotion regulation and dysregulation in autistic children and adolescents. [Restoy D, Oriol-Escudé M, Alonzo-Castillo T, Magán-Maganto M, Canal-Bedia R, Díez-Villoria E, Gisbert-Gustemps L, Setién-Ramos I, Martínez-Ramírez M, Ramos-Quiroga JA, Lugo-Marín J. 2024 Apr]
Collier et al. (2016)	57 studies	Examined parental mediation and showed that effects varied according to mediation strategy and outcome. [Collier KM, Coyne SM, Rasmussen EE, Hawkins AJ, Padilla-Walker LM, Erickson SE, Memmott-Elison MK. 2016 May]
Parental mediation systematic review (2020)	27 publications	Found inconsistent effects of different parental mediation approaches on problematic screen use. [Nielsen P, Favez N, Liddle H, Rigter H. 2019 Dec 1]
Varadarajan et al. (2021)	Indian population-based study	Examined excessive screen exposure and developmental delay in young Indian children. [Varadarajan S, Govindarajan Venguidesvarane A, Ramaswamy KN, Rajamohan M, Krupa M, Winfred Christadoss SB. 2021 Jul 6]
Chauhan et al. (2019)	Indian systematic review/meta-analysis	Highlighted the scarcity of high-quality population-based ASD prevalence evidence in India. [Chauhan A, Sahu JK, Jaiswal N, Kumar K, Agarwal A, Kaur J, Singh S, Singh M. 2019 Jan-Feb]
Screen/social-emotional meta-analysis (2025)	30 studies; 39,620 participants	Found small associations between screen exposure, social-emotional competence and problem behaviours. [Jia W, Deng X, Zeng H. 2025 Nov]

2.15 Synthesis of Literature by Study Variable

2.15.1 Screen Exposure and Attention

The literature provides a relatively consistent rationale for examining screen exposure in relation to attention, although it does not establish a simple causal relationship.

Systematic reviews have generally found associations between greater screen exposure and attention difficulties. However, longitudinal studies produce more mixed results, and several studies suggest bidirectional relationships. [Santos RMS, Mendes CG, Marques Miranda D, Romano-Silva MA. 2022 Jul]

In ASD, executive-function differences are already documented. [Demetriou EA, Lampit A, Quintana DS, Naismith SL, Song YJC, Pye JE, Hickie I, Guastella AJ. 2018 May]

2.15.2 Screen Exposure and Social Reciprocity

The literature suggests that social outcomes depend strongly on the nature of screen use. Solitary screen use may displace direct social interaction, whereas socially mediated digital activity may provide communication opportunities.

Joint attention is particularly important because it forms a bridge between attention and social reciprocity. Research demonstrates its relationship with language and social functioning in ASD. [Bruinsma Y, Koegel RL, Koegel LK. 2004;10(3)]

2.15.3 Screen Exposure and Emotional Regulation

The literature establishes emotional regulation as an important developmental domain in ASD. [Restoy D, Oriol-Escudé M, Alonzo-Castillo T, Magán-Maganto M, Canal-Bedia R, Díez-Villoria E, Gisbert-Gustemps L, Setién-Ramos I, Martínez-Ramírez M, Ramos-Quiroga JA, Lugo-Marín J. 2024 Apr]

Screen use may interact with emotional regulation through several pathways:

- screens may be used as a calming strategy;
- children may become distressed when a preferred activity ends;
- digital content may provide intense stimulation;
- screens may become incorporated into behavioural reinforcement patterns; and, extensive screen use may displace sleep, physical activity, and social engagement.

Consequently, the relationship is likely to be multifactorial.

2.15.4 Screen Exposure and Sensory Processing

The literature clearly establishes sensory-processing differences as relevant to ASD. [Tomchek SD, Dunn W. 2007 Mar-Apr]

Digital media can provide concentrated visual and auditory stimulation, but the current literature does not justify assuming that this stimulation is universally dysregulating. Instead, individual sensory thresholds and behavioural response strategies are likely to influence children's experiences.

2.16 Parent-Reported Behaviour and the SENA Framework

The present research uses the Screen Exposure Neurobehavioral Assessment (SENA) as its principal study instrument.

The existing thesis describes SENA as a 22-item parent-report questionnaire incorporating demographic information, screen exposure, behavioural domains, and caregiver perspectives. The behavioural section uses a four-point response scale from "Never" to "Always."

The instrument operationalises three study domains:

Attention and Focus;

Items 9–12 assess sustained attention, task completion, instruction retention, and distractibility.

Social Reciprocity;

Items 13–16 address social engagement, social-cue response, engagement resistance, and joint attention.

Sensory and Emotional Regulation;

Items 17–20 address post-screen emotional reactions, agitation, and sensory-motor behaviours. The use of a single instrument allows the study to examine these domains within the same participant rather than combining unrelated instruments administered at different times. However, because SENA is newly developed for the study, its study should be interpreted as preliminary. Its psychometric properties require further validation in larger samples and against established clinical measures.

This issue is especially important for Item 16. existing work here identifies a psychometric ambiguity concerning whether parent-reported sharing of screen content represents social reciprocity or reflects a child's intense interest in digital material.

This represents a valuable measurement issue for discussion in the present research.

2.17 Research Gap

The literature reviewed above reveals several gaps that provide the rationale for the current study.

2.17.1 Integration of Multiple Neurobehavioural Domains

Much of the existing research examines individual outcomes such as attention, language, sleep, or social behaviour. The current study attempts to understand attention/focus, social reciprocity, **and sensory/emotional regulation simultaneously**. The existing thesis explicitly identifies this lack of subscale integration as a principal research gap.

2.17.2 Limited ASD-Specific Screen Research

The relationship between screen exposure and ASD itself has been extensively debated, but the direction of the relationship remains unclear.

The large 2023 meta-analysis found that although an overall association was observed, publication bias substantially reduced the strength of the finding and the authors concluded that the existing evidence was insufficient for causal conclusions. [Ophir Y, Rosenberg H, Tikochinski R, Dalyot S, Lipshits-Braziler Y.2023;6(12)]

This indicates the need to shift attention from the simplistic question of whether screens "cause autism" toward more specific questions concerning how screen exposure relates to functioning among children who already have ASD.

The current study adopts precisely this approach.

2.17.3 Insufficient Attention to Screen Routine

Screen duration alone does not describe how a child uses technology.

The current study therefore considers routine structure alongside duration and purpose.

This allows the research to explore whether structured digital routines may provide a different behavioural context from irregular or unstructured screen access.

2.17.4 Psychometric Ambiguity of Digital Joint Attention

The use of a joint-attention item within a screen-exposure questionnaire creates a unique measurement problem.

A child who shows a parent a favourite video may be engaging socially, but this may not represent the same construct as spontaneous joint attention during naturalistic interaction.

The existing thesis explicitly identifies this as a psychometric gap.

2.17.5 Indian Context

Indian research on child screen exposure exists, but comparatively less research integrates:

- ASD,
- screen exposure,

- attention,
- social reciprocity,
- sensory/emotional regulation, and
- parent-reported behavioural observations within one framework.

The Indian literature also faces broader limitations in population-based ASD research. [Chauhan A, Sahu JK, Jaiswal N, Kumar K, Agarwal A, Kaur J, Singh S, Singh M.2019 Jan-Feb]; The research here therefore contributes contextual evidence from Indian caregivers, while recognising that the purposive and digitally recruited sample cannot be considered representative of all Indian families.

2.18 Conceptual Framework of the Study

The conceptual framework integrates the theoretical perspectives and empirical literature reviewed above.

The existing thesis defines the framework around screen exposure dynamics as independent variables, neurobehavioural outcomes as dependent variables, and routine structure and sociocultural context as contextual factors.

Independent Variables

Screen Exposure Dynamics

1. Daily screen duration
2. Primary screen-use purpose
3. Type of screen activity

Contextual Variables

1. Screen routine structure
2. Caregiver involvement
3. Family environment
4. Sociocultural context

Dependent Variables

SENA Neurobehavioural Domains

Attention and Focus

1. sustained attention
2. task completion
3. distractibility
4. instruction retention

Social Reciprocity

1. social engagement
2. social-cue response
3. engagement resistance
4. joint attention

Sensory and Emotional Regulation

1. post-screen outbursts
2. emotional reactions
3. screen-deprivation agitation
4. sensory-motor behaviours

2.18.1 Conceptual Relationship

The proposed conceptual relationship can be represented as follows:

Screen Exposure

Duration + Purpose + Routine

Potential developmental/contextual pathways

- ✧ displacement of face-to-face interaction
- ✧ displacement of physical/sensory-motor play
- ✧ externalised attentional stimulation
- ✧ sensory stimulation
- ✧ reinforcement of preferred digital activities
- ✧ transition demands following screen termination

Neurobehavioural Outcomes:

Attention & Focus

Social Reciprocity

Sensory & Emotional Regulation

The relationship is expected to be influenced by individual and contextual factors rather than functioning as a simple direct pathway.

This framework is consistent with the DSMM, which emphasises differential susceptibility, and with the Goldilocks perspective, which cautions against assuming a simple linear relationship between digital exposure and outcomes. [Patti M. Valkenburg, Jochen Peter Journal of Communication, Volume 63, Issue 2, April 2013, Pages 221–243]

2.19 Theoretical Integration

The four theoretical perspectives provide complementary rather than competing explanations.

Theory	Central proposition	Relevance to present study
Displacement Hypothesis	Screen use may replace developmentally important activities	Explains potential relationships with attention and social reciprocity
Dunn's Sensory Processing Framework	Individuals differ in sensory thresholds and response strategies	Provides a framework for sensory-related differences
Goldilocks Model	Digital use may have non-linear relationships with well-being	Supports examination of different screen-duration categories
DSMM	Individuals differ in susceptibility to media effects	Explains heterogeneity among children with ASD

The Displacement Hypothesis primarily addresses what screen exposure may replace.

Dunn's framework addresses how individual sensory characteristics may shape responses to stimulation.

The Goldilocks model addresses the possibility that effects may vary according to amount and context.

The DSMM addresses why different children may respond differently to similar media exposure.

Together, these perspectives support a multidimensional investigation of screen exposure rather than a simplistic assumption that duration alone determines developmental outcomes.

2.20 Critical Evaluation of Existing Literature

Although the literature provides a strong rationale for this research, several methodological weaknesses must be considered.

Cross-sectional designs

Much of the screen-time literature is cross-sectional. The major 2023 screen-time/ASD meta-analysis in

cluded 41 cross-sectional studies and only five longitudinal studies. [Ophir Y, Rosenberg H, Tikochinski R, Dalyot S, Lipshits-Braziler Y.2023;6(12)]

Measurement heterogeneity

Studies differ in how screen exposure is measured. Some assess total hours, while others distinguish television, gaming, smartphones, or social media.

Parent-report dependence

Many child screen studies rely on caregiver estimates rather than objective device tracking.

Confounding

- Screen exposure may be related to:
- socioeconomic status,
- sleep,
- physical activity,
- parental stress,
- child temperament,
- developmental level,
- educational demands,
- behavioural difficulties, and
- pre-existing clinical characteristics.

Bidirectionality

Children with behavioural difficulties may be given screens more frequently because screens are effective at occupying or calming them.

Content differences

Educational, social, recreational, passive, and interactive screen activities should not automatically be considered equivalent.

Developmental differences

The meaning of screen exposure changes with age. Evidence from toddlers should not automatically be generalised to adolescents.

These limitations strengthen the rationale for the current study while also defining the limits of interpretation.

2.21 Implications of the Literature for the Present Study

The literature suggests five principles that directly inform the present research.

First, screen exposure should be treated as multidimensional.

Duration is important, but purpose and routine provide additional information.

Second, ASD should be treated as heterogeneous.

Not every autistic child will respond to digital media in the same way.

Third, behavioural associations should not automatically be interpreted causally.

The direction between screen exposure and behavioural difficulty may be bidirectional.

Fourth, attention, social reciprocity, and sensory/emotional regulation should be examined together.

These domains are interconnected but conceptually distinct.

Fifth, caregiver reports are valuable but require cautious interpretation.

Parent reports provide ecologically relevant observations but can be affected by recall, interpretation, and attribution.

2.22 Summary of Previous Literature

The literature reviewed in this chapter demonstrates that screen exposure has become an important developmental and clinical issue. Digital media can provide educational, recreational, communicative, and social opportunities, but excessive or poorly structured use may also be associated with displacement of developmentally relevant activities.

Research examining screen exposure and attention generally identifies associations between greater exposure and attention difficulties, although longitudinal study remain mixed and bidirectional relationships are plausible. [Santos RMS, Mendes CG, Marques Miranda D, Romano-Silva MA.2022 Jul]

Research on ASD and digital media indicates that autistic children may differ from their peers in patterns of screen use, but the direction of the relationship between ASD and screen exposure remains unresolved. The most comprehensive recent meta-analysis found that publication bias and the predominantly observational nature of existing research limit causal conclusions. [Ophir Y, Rosenberg H, Tikochinski R, Dalyot S, Lipshits-Braziler Y. Screen Time and Autism Spectrum Disorder:2023;6(12)]

Social reciprocity and joint attention remain important domains within autism research. Evidence demonstrates the relationship between joint attention and language and supports the relevance of joint-attention interventions. [Murza KA, Schwartz JB, Hahs-Vaughn DL, Nye C. 2016 May]

Sensory processing differences are well documented among autistic children and are associated with participation in everyday occupations. [Tomchek SD, Dunn W.2007 Mar-Apr]

Emotional regulation is also an important area of difficulty for some autistic children, with recent meta-analytic evidence demonstrating substantial research attention to emotion regulation and dysregulation. [Restoy D, Oriol-Escudé M, Alonzo-Castillo T, Magán-Maganto M, Canal-Bedia R, Díez-Villoria E, Gisbert-Gustemps L, Setién-Ramos I, Martínez-Ramírez M, Ramos-Quiroga JA, Lugo-Marín J. 2024 Apr]

Research on parental mediation says that the relationship between parenting practices and screen outcomes is complex and cannot be reduced to a single universally effective strategy. [Collier KM, Coyne SM, Rasmussen EE, Hawkins AJ, Padilla-Walker LM, Erickson SE, Memmott-Elison MK.2016 May]

Indian evidence highlights the importance of investigating digital exposure within local developmental and family contexts. Indian studies have documented concerns surrounding excessive screen exposure and developmental outcomes, while systematic reviews have also highlighted limitations in the country's population-level ASD evidence. [Varadarajan S, Govindarajan Venguidesvarane A, Ramaswamy KN, Rajamohan M, Krupa M, Winfred Christadoss SB.2021 Jul 6]

Overall, the literature supports the need for a multidimensional examination of screen exposure in autistic children while simultaneously demonstrating that causal conclusions should be avoided.

2.23 Research Gap Addressed by the Present Study

Based on the reviewed literature, the present research addresses the following specific gaps:

Integration gap: Limited research simultaneously examines attention, social reciprocity, and sensory/emotional regulation within one ASD-focused screen-exposure framework.

Contextual gap: Screen duration is frequently studied without sufficient consideration of screen routine and purpose.

Measurement gap: Parent-reported digital joint attention requires careful conceptual and psychometric consideration.

Population gap: Indian children and caregivers remain comparatively underrepresented in the international literature concerning the relationship between screen exposure and specific neurobehavioural domains.

Interpretive gap: There is a need to distinguish association from causation and recognise the possibility that pre-existing behavioural characteristics may influence children's screen exposure.

The current research attempts to address these gaps using the SENA parent-report framework and an ASD/non-ASD comparative design. The existing thesis identifies these three principal gaps - subscale integration, digital joint-attention measurement, and Indian sociocultural representation as central to the study.

2.24 Chapter Conclusion

This chapter reviewed the theoretical and empirical foundations of the relationship between screen exposure and neurobehavioural functioning in children, with particular emphasis on ASD.

The Displacement Hypothesis suggests that extensive screen exposure may replace opportunities for face-to-face interaction, physical play, sensory exploration, and self-directed activities. Dunn's Sensory Processing Framework provides a basis for understanding individual differences in responses to sensory stimulation. The Goldilocks Model highlights the possibility that digital exposure may have non-linear relationships with developmental outcomes, while the DSM explains why individuals may differ in their susceptibility to media effects. [Patti M. Valkenburg ,

Jochen Peter Journal of Communication, Volume 63, Issue 2, April 2013, Pages 221–243] The empirical literature provides evidence of relationships between screen exposure and attention, social-emotional functioning, and developmental outcomes, but also demonstrates substantial methodological limitations. In particular, the predominance of cross-sectional designs, reliance on caregiver reports, variation in screen measurement, confounding factors, and potential bidirectionality limit causal interpretation. Within ASD, sensory processing differences, executive-function differences, social reciprocity difficulties, joint-attention differences, and emotional-regulation challenges provide important developmental contexts in which screen exposure may operate. The Indian literature further indicates the importance of studying screen exposure within local family and developmental environments rather than assuming that study from other populations will automatically generalise. Here it consequently adopts a multidimensional framework in which screen duration, screen purpose, and routine structure are examined in relation to attention and focus, social reciprocity, and sensory/emotional regulation. The study does not assume that screen exposure causes these outcomes; instead, it examines their empirical association within a cross-sectional parent-report design. The conceptual framework developed from this review provides the theoretical basis for the methodology and statistical analyses presented in the following chapter.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Summary of the Chapter

This chapter described the methodology adopted for investigating the relationship between screen exposure and selected neurobehavioural domains among children, with particular emphasis on children with Autism Spectrum Disorder.

The study adopted a quantitative, cross-sectional, correlational, and comparative research design. The final dataset consisted of 103 caregiver responses, including 68 children with ASD, 34 children in the

non-ASD comparison group, and one uncertain diagnostic response. Participants were recruited through purposive, non-probability sampling. The study included caregivers/parents of children between 4 and 15 years of age.

The principal independent variable was daily screen exposure, while the primary dependent variables were Attention and Focus, Social Reciprocity, and Sensory and Emotional Regulation.

Data were collected using the 22-item Screen Exposure Neurobehavioral Assessment (SENA). The SENA collected demographic information, screen-use information, screen-time routine information, and caregiver-reported behavioural observations.

The behavioural items used a four-point frequency scale ranging from Never to Always.

Three composite domain scores were generated:

- Attention and Focus
- Social Reciprocity
- Sensory and Emotional Regulation

Data were collected online through Google Forms following informed consent.

The data were subsequently cleaned, coded, and prepared for statistical analysis.

The planned statistical analyses included descriptive statistics, Pearson correlation, Welch's independent-samples t-test, Cohen's d effect sizes, and Cronbach's alpha reliability analysis. The methodology provides a structured framework for examining associations between children's screen exposure and neurobehavioural characteristics. Nevertheless, the study must be interpreted cautiously because of the cross-sectional design, non-probability sampling, reliance on caregiver report, approximation involved in screen-time coding, and preliminary psychometric status of the SENA questionnaire. The following chapter presents the statistical results obtained from the prepared dataset and interprets the study in relation to the research questions and hypotheses.

3.2 Introduction

The present chapter describes the methodology adopted for investigating the relationship between screen exposure and selected neurobehavioural domains among children, with particular emphasis on children diagnosed with Autism Spectrum Disorder (ASD). The methodology was developed to examine children's everyday screen-use patterns and their relationship with attention and focus, social reciprocity, and sensory and emotional regulation. The study employed a quantitative, cross-sectional, correlational, and comparative research design. Data were collected through a structured parent-report questionnaire titled the Screen Exposure Neurobehavioral Assessment (SENA). The questionnaire was designed specifically for the data collection and research purpose to obtain information regarding children's demographic characteristics, daily screen exposure, purpose of screen use, screen-time routines, and selected behavioural characteristics.

The methodology was designed around the understanding that screen exposure is a multidimensional construct. The amount of time spent using screens is important, but the purpose of screen use, the structure of screen use, and the child's behavioural characteristics may also influence how screen exposure is experienced. Therefore, the research did not understand screen duration in isolation. Instead, it considered screen duration alongside screen-use purpose and the presence or absence of a structured screen-time routine. The study further focused on three neurobehavioural domains: Attention and Focus, Social Reciprocity, and Sensory and Emotional Regulation. These domains were selected because they represent areas of functioning that are particularly relevant when examining the everyday behaviour of children with ASD.

The chapter presents the research design, participant characteristics, sampling procedure, inclusion and exclusion criteria, study variables, details of the SENA questionnaire, data-collection procedure, ethical considerations, data preparation, statistical analysis, methodological strengths and limitations, and a summary of the methodology.

3.3 Research Design

The present study adopted a quantitative, cross-sectional, correlational, and comparative research design. A quantitative approach was selected because the study involved collecting structured information that could be converted into numerical values and analysed statistically. The behavioural responses obtained through the SENA questionnaire were coded numerically, allowing the researcher to calculate domain scores and examine relationships between screen exposure and behavioural characteristics. The study was cross-sectional because the data were collected at one point in time rather than following the same participants over an extended period. Although the questionnaire asked caregivers to consider the child's behaviour during the preceding two weeks, the information was collected during a single survey administration. The study was also correlational because one of its primary objectives was to examine whether daily screen exposure was statistically associated with the three SENA neurobehavioural domains among children with ASD. The correlational component therefore examined whether differences in reported screen exposure were accompanied by differences in reported attention and focus, social reciprocity, and sensory and emotional regulation. The study was additionally comparative because children with ASD were compared with children in a non-ASD comparison group. The purpose of this comparison was to examine whether the two groups differed in their reported screen-use patterns and neurobehavioural scores. The study was non-experimental because the researcher did not manipulate screen exposure, assign children to different levels of screen use, or control the participants' daily digital-media environment. The children continued their usual routines, and caregivers reported their observations. This design was considered appropriate because the research sought to investigate naturally occurring relationships rather than determine the effect of an experimentally controlled intervention. However, the design also imposes an important limitation. Because the study is cross-sectional and observational, an association between screen exposure and behavioural characteristics cannot be interpreted as evidence that screen exposure causes the observed behaviour. The relationship may potentially operate in either direction. For example, extensive screen use could be associated with behavioural characteristics, while children who already experience attention, sensory, emotional, or social difficulties may also be more likely to engage in greater screen use.

3.4 Participants

The participants in the study were parents, legal guardians, and primary caregivers of children between 4 and 15 years of age.

The final dataset consisted of 103 caregiver responses. Of these, 68 responses represented children with a formal ASD diagnosis, while 34 responses represented children in the non-ASD comparison group. One response indicated an uncertain diagnostic status ("Maybe"). This response was retained in the overall dataset but was not included in the formal ASD-versus-non-ASD group comparison.

Therefore, while the overall dataset contained 103 responses, the formal two-group comparative analysis was based on 102 participants, consisting of 68 participants in the ASD group and 34 participants in the non-ASD group.

The respondents included mothers, fathers, and guardians. Mothers represented approximately 58.3% of the respondents, fathers approximately 40.8%, and guardians approximately 1.0%.

The child gender distribution consisted of approximately 58.3% male children and 41.7% female children.

Within the ASD group, 40 children were male and 28 were female. Within the non-ASD comparison group, 20 children were male and 14 were female.

The most frequently represented age category in the study was 10–12 years.

The participants were recruited from accessible caregiver populations rather than through probability-based population sampling. Therefore, the sample represents caregivers who were accessible through the recruitment channels used in the study and should not be interpreted as a nationally representative sample of children with ASD.

3.5 Sampling

The study used a purposive sampling technique.

Purposive sampling was considered appropriate because the study required participants who met specific characteristics. In particular, the study required caregivers of children within a predetermined age range and, for the ASD group, caregivers of children who had received a formal clinical diagnosis of Autism Spectrum Disorder. Participants were recruited through accessible sources such as parent-support groups, special-education networks, early-intervention settings, and online caregiver communities. The use of online recruitment provided several practical advantages. It enabled the researcher to reach caregivers from different locations without requiring participants to attend a physical research centre. It also allowed the questionnaire to be administered in a standardised format.

However, purposive sampling has limitations. Because participants were not randomly selected from the general population, the study cannot automatically be generalised to all children with ASD or all Indian families. Caregivers who participate in online support groups may differ from caregivers who do not participate in such groups.

There may also be differences in socioeconomic status, education, access to technology, awareness of ASD, access to healthcare, and willingness to participate in research. Consequently, the sampling approach should be understood as appropriate for an exploratory academic study but as a limitation when considering generalisability.

3.6 Inclusion Criteria

3.6.1 Inclusion Criteria for the ASD Group

1. Participants were included in the ASD group when the following criteria were satisfied:
2. The respondent was the child's primary caregiver.
3. The child was between 4 and 15 years of age.
4. The child had received a formal clinical diagnosis of Autism Spectrum Disorder.
5. The child had regular exposure to screen-based digital devices such as television, smartphones, tablets, computers, or similar devices.
6. The parent/caregiver voluntarily consented to participate in the study.
7. The requirement for a formal diagnosis was intended to ensure that the ASD group was based on reported clinical diagnostic status rather than caregiver suspicion alone.

3.7 Inclusion Criteria for the Non-ASD Group

1. Participants in the comparison group were required to meet the following criteria:
2. The respondent was the child's primary caregiver.
3. The child was between 4 and 15 years of age.
4. The child did not have a reported clinical diagnosis of ASD.

5. The child did not have a reported neurodevelopmental delay according to the study's comparison criteria.
6. The caregiver voluntarily consented to participate.
7. The inclusion of a comparison group allowed the study to examine whether patterns observed in the ASD group were also present in children without a reported ASD diagnosis.

3.8 Exclusion Criteria

The study excluded participants who did not satisfy the required eligibility criteria.

The exclusion criteria included:

1. Children outside the specified age range of 4–15 years.
2. Children without sufficient caregiver information to complete the questionnaire.
3. Participants who did not provide informed consent.
4. Incomplete questionnaire responses that could not be used for analysis.
5. Children with uncorrected severe visual or auditory impairments where such impairments could substantially affect interpretation of sensory or screen-related behavioural items.
6. Children with progressive neurodegenerative conditions or an active medical crisis that could substantially influence behaviour independently of ordinary screen exposure.
7. These exclusion criteria were established to reduce potential sources of major confounding and to ensure that the information collected was relevant to the research questions.

The exclusion criteria do not imply that children with additional clinical conditions are inappropriate subjects for research. Rather, they define the specific population to which the study of the research here are applicable.

3.9 Variables of the Study

The study included independent, dependent, and contextual variables.

3.9.1 Independent Variable

The primary independent variable was **daily screen exposure**.

Daily screen exposure was measured by asking caregivers to estimate the average amount of time the child spent using screens on a typical day.

The response categories included:

- Less than 1 hour
- 1–2 hours
- 2–4 hours
- 4–6 hours
- More than 6 hours

For quantitative analysis, the categorical responses were converted into representative numerical values where appropriate.

3.10 Dependent Variables

The primary dependent variables were the three neurobehavioural domains measured through the SENA questionnaire.

These were:

3.10.1 Attention and Focus

- This domain assessed behaviours relating to:
- Sustained attention
- Task completion

- Distractibility
- Forgetfulness
- Requirement for repeated instructions
- Difficulty maintaining engagement with structured activities

3.10.2 Social Reciprocity

This domain assessed behaviours relating to:

Social engagement

Participation in group or peer activities

Response to social cues

Resistance to social interaction

Sharing excitement or interest with caregivers

3.10.3 Sensory and Emotional Regulation

This domain assessed behaviours relating to:

- Emotional responses following screen termination
- Frustration when screen access ended
- Mood changes or emotional meltdowns
- Agitation when screens were unavailable
- Sensory-motor behaviours associated with screen use

3.11 Contextual Variables

Several additional variables were collected to describe the context in which screen exposure occurred. These included:

- Child's age
- Child's gender
- Caregiver relationship
- Caregiver age
- ASD diagnostic status
- Primary purpose of screen use
- Presence of a structured screen-time routine

The inclusion of these contextual variables was important because screen exposure cannot necessarily be interpreted independently of the child's environment.

For example, two children may each use screens for three hours per day, but one may use the screen primarily for schoolwork while another may use it primarily for entertainment. Similarly, one child may use screens according to a predictable family routine while another may have unrestricted access throughout the day.

3.12 Screen Exposure Neurobehavioral Assessment (SENA)

The primary instrument used in the study was the **Screen Exposure Neurobehavioral Assessment (SENA)**.

SENA was developed specifically for data collection and research purpose as a parent-report questionnaire intended to examine children's screen exposure and selected behavioural characteristics.

The questionnaire consisted of **22 items** and included sections covering demographic information, screen exposure, behavioural domains, and caregiver perspectives.

The instrument was designed to be completed by the child's parent or primary caregiver.

The questionnaire used a combination of categorical and four-point frequency responses.

The behavioural response scale was:

Response	Score
Never	1
Rarely	2
Sometimes	3
Always	4

The questionnaire instructed caregivers to consider the child's behaviour over the preceding two weeks when responding to the behavioural items.

3.13 Demographic Section of SENA

The demographic section collected information concerning:

- Relationship to the child
- Caregiver age
- Child age
- Child gender
- ASD diagnostic status

These variables were used to describe the sample and establish the grouping variable for subsequent analyses.

The questionnaire specifically asked whether the child had received a formal clinical diagnosis of ASD.

The response options allowed caregivers to indicate:

- Yes
- No
- Maybe

The "Maybe" response was retained as a descriptive category but was not treated as equivalent to a confirmed ASD diagnosis in the formal comparative analysis.

3.14 Screen Exposure Section

The screen-exposure component of SENA examined the amount and nature of children's digital-media use.

Caregivers were asked to estimate the average amount of time the child spent using screens each day.

The questionnaire included five categories:

1. Less than 1 hour
2. 1–2 hours
3. 2–4 hours
4. 4–6 hours
5. More than 6 hours

The questionnaire also asked about the primary purposes of screen use.

These included activities such as:

- Watching videos
- Playing games
- Online learning or schoolwork
- Video calls
- Messaging or social applications

- Other activities

Because caregivers could report more than one purpose, screen-use purpose was treated as a multiple-response variable.

3.15 Screen-Time Routine

The questionnaire also examined whether children had a structured screen-time routine.

Caregivers were asked whether screen use was:

- Consistently structured
- Irregularly structured
- Unstructured

This variable was included because the developmental context of screen exposure may differ depending on how access is managed.

For example, a child who receives a fixed period of screen use after completing homework may experience screen exposure differently from a child who has unrestricted access throughout the day.

The inclusion of this variable therefore allowed the study to move beyond a simple measure of total screen hours.

3.16 Focus and Learning Domain

The Focus and Learning section consisted of four behavioural items.

The items assessed:

1. Difficulty maintaining attention during activities.
2. Moving between activities or leaving tasks incomplete.
3. Requiring repeated instructions to complete tasks.
4. Appearing forgetful or easily distracted during learning or structured play.
5. The questionnaire encouraged caregivers to consider examples such as homework and daily chores when answering.
6. Each item was scored from 1 to 4 according to the frequency of the behaviour.
7. The four item scores were combined to generate the **Attention and Focus** composite score.

3.17 Social Reciprocity Domain

The Social Reciprocity section consisted of four items.

The items examined:

1. Avoidance or withdrawal from group play or peer interaction.
2. Difficulty understanding or responding to social cues.
3. Resistance or discomfort when asked to engage with others.
4. Sharing excitement or showing a caregiver something the child was looking at on the screen.
5. The fourth item was identified in the questionnaire as relating to joint attention.
6. The inclusion of this item was intended to capture an observable social-sharing behaviour associated with screen use.

However, it is important to interpret this item cautiously. Sharing something viewed on a screen is not necessarily identical to clinical joint attention as defined within autism research. Therefore, the item should be interpreted as a caregiver-reported screen-related social-sharing behaviour rather than as a standalone clinical measure of joint attention.

The four items were combined to create the Social Reciprocity score.

3.18 Sensory and Emotional Regulation Domain

The Sensory and Emotional Regulation section consisted of four items.

These assessed:

1. Intense frustration or outbursts when screen time ended.
2. Mood changes or emotional meltdowns following screen exposure.
3. Restlessness or agitation when access to screens was unavailable.
4. Sensory-motor behaviours such as hand flapping, rocking, or intense gazing during or immediately following screen use.
5. The items were intended to capture caregiver observations concerning emotional responses and sensory-related behaviours associated with screen exposure.
6. The four items were combined to generate the Sensory and Emotional Regulation score.

3.19 SENA Scoring

The three primary SENA domains were calculated using the four-point frequency responses.

The coding system was:

Never = 1

Rarely = 2

Sometimes = 3

Always = 4

The domain scores were calculated using the mean of the four items belonging to each domain.

Therefore:

Attention and Focus

Mean of Items 9–12.

Social Reciprocity

Mean of Items 13–16.

Sensory and Emotional Regulation

Mean of Items 17–20.

A higher composite score represented greater frequency of the behaviours represented by the items.

The composite-score approach allowed the three domains to remain on a comparable 1–4 scale.

3.20 Psychometric Considerations of SENA

Because SENA was developed specifically for the present research, its psychometric properties require careful consideration.

Internal consistency was examined using **Cronbach's alpha**.

Cronbach's alpha provides information regarding the degree to which items within a subscale demonstrate internal consistency.

The study examined reliability for:

- Attention and Focus
- Social Reciprocity
- Sensory and Emotional Regulation

Item-level relationships were also considered, particularly for the joint-attention item.

However, internal consistency alone cannot establish that an instrument is valid.

A questionnaire can demonstrate internal consistency while still requiring further evidence concerning construct validity, criterion validity, convergent validity, and test-retest reliability.

Therefore, SENA should be considered a **study-specific research questionnaire** rather than a diagnostic instrument for ASD, ADHD, sensory-processing disorders, or emotional disorders.

Further validation using larger independent samples and established clinical measures would be required before SENA could be considered a fully validated clinical assessment instrument.

3.21 Procedure

Data were collected using an online questionnaire administered through **Google Forms**. Before beginning the questionnaire, parents/caregivers were presented with information about the purpose of the research and the nature of their participation. The information explained that the study aimed to examine children's screen exposure and its relationship with everyday functioning, particularly focus, behaviour, emotions, and social interaction.

Caregivers were informed that participation was voluntary.

The questionnaire required participants to provide consent before proceeding.

Following consent, caregivers completed the demographic section.

They then answered questions regarding:

- Daily screen duration
- Purpose of screen use
- Screen-time routine
- Child behaviour

The behavioural questions required caregivers to consider the child's behaviour during the preceding two weeks.

The questionnaire was designed to take approximately **10–15 minutes** to complete.

After completion, responses were exported from Google Forms into a spreadsheet for data cleaning, coding, and statistical analysis.

3.22 Data Collection Procedure

The data-collection process followed several stages.

Stage 1: Participant Recruitment

Potential participants were approached through relevant caregiver and educational networks.

Stage 2: Participant Information

Caregivers received information regarding the purpose of the research and their role as respondents.

Stage 3: Informed Consent

Participants were asked to provide informed consent.

Stage 4: Questionnaire Administration

Participants completed the online SENA questionnaire.

Stage 5: Data Export

Completed responses were exported from Google Forms into a structured dataset.

Stage 6: Data Cleaning

The dataset was examined for incomplete responses, inconsistent entries, formatting issues, and coding requirements.

Stage 7: Statistical Coding

Categorical and Likert-type responses were converted into numerical values where required for analysis.

Stage 8: Statistical Analysis

The prepared dataset was analysed using descriptive and inferential statistical procedures.

3.23 Ethical Considerations

Ethical principles were incorporated throughout the research process because the study involved collecting information concerning children.

3.23.1 Informed Consent

Informed consent was obtained from caregivers before questionnaire completion.

Participants were provided with information regarding:

The purpose of the study

Their role in the research

The voluntary nature of participation

Confidentiality

Intended academic use of the information

Participants were required to indicate their consent before continuing with the questionnaire.

3.24 Voluntary Participation

Participation in the research was voluntary.

Caregivers were not required to participate and were not subjected to any penalty for declining participation.

Participants could choose not to answer questions or discontinue their participation.

No experimental manipulation of screen use was required.

3.25 Confidentiality

The questionnaire was designed to protect participant confidentiality.

The research did not require direct identifying information such as the child's name or home address.

Responses were used for academic research purposes.

The data were handled as research data and were not intended to be used to identify individual children or families.

3.26 Minimisation of Risk

The study involved a questionnaire-based assessment rather than an intervention.

Participants were not instructed to increase or decrease their children's screen exposure.

They were not asked to modify medication, education, treatment, or other clinical care.

The study therefore presented minimal anticipated physical risk.

Some questions concerned children's behavioural difficulties and emotional responses, which could potentially be personally sensitive to caregivers. Participants were therefore informed of the voluntary nature of participation.

3.27 Ethics Approval

The available study materials contain the participant information and consent procedure used for the survey.

3.28 Data Preparation

The collected responses were exported from Google Forms into a spreadsheet format for preparation and analysis.

The initial dataset contained 103 responses.

Data preparation involved several stages.

3.28.1 Data Cleaning

The first stage involved checking the dataset for formatting inconsistencies.

Spreadsheet headers and response labels were examined to ensure that variables could be identified consistently.

Unnecessary spaces, quotation marks, and formatting artefacts were removed where necessary.

3.28.2 Consent Verification

Responses were examined to ensure that the consent requirement had been satisfied.
Responses without appropriate consent were not included in the final analytical dataset.

3.28.3 Diagnostic Group Coding

The diagnostic-status variable was used to classify participants into:

- ASD
- Non-ASD
- Uncertain/Maybe

The confirmed ASD group consisted of **68 participants**.

The non-ASD group consisted of **34 participants**.

The uncertain "Maybe" response was not included in the formal ASD-versus-non-ASD comparison.

3.29 Screen-Time Coding

The questionnaire used categorical screen-time responses.

For quantitative analysis, representative numerical values were assigned to several categories.

Screen-time category	Numerical value
Less than 1 hour	0.5
1–2 hours	1.5
2–4 hours	3.0
4–6 hours	5.0
More than 6 hours	To be specified based on final analysis decision

The documented coding was:

The midpoint approach allowed categorical screen-time responses to be represented numerically for correlation analysis.

However, the More than 6 hours category is open-ended.

Therefore, the final analysis should document exactly how this category was treated.

An arbitrary value should not be introduced without methodological justification.

3.30 Likert-Scale Coding

Response	Numerical code
Never	1
Rarely	2
Sometimes	3
Always	4

The SENA behavioural items were coded using the following numerical system:

This coding was applied consistently across the behavioural domains.

The scores were then used to calculate mean composite scores.

3.31 Composite Score Calculation

For each participant, the three domain scores were calculated as follows.

Attention and Focus

$$\text{[Attention\ Score = } \frac{\text{Item9} + \text{Item10} + \text{Item11} + \text{Item12}}{4} \text{]}$$

Social Reciprocity

$$\text{[Social\ Reciprocity\ Score = } \frac{\text{Item13} + \text{Item14} + \text{Item15} + \text{Item16}}{4} \text{]}$$

Sensory and Emotional Regulation

$$\text{[Sensory/Emotional\ Score = \frac{\text{Item17} + \text{Item18} + \text{Item19} + \text{Item20}}{4} \text{ \}]}$$

The use of mean scores ensured that all three domains remained within the original 1–4 response scale.

3.32 Statistical Analysis

The statistical analysis was designed to answer the research questions through descriptive, correlational, comparative, and reliability analyses.

The analysis was conducted using statistical programming tools, including **Python**, with libraries such as **pandas** and **scipy.stats**.

The analysis consisted of the following major components:

1. Descriptive statistics
2. Pearson correlation
3. Welch's independent-samples t-test
4. Cohen's d effect size
5. Cronbach's alpha reliability analysis

3.33 Descriptive Statistics

Descriptive statistics were used to summarise the characteristics of the sample.

For categorical variables, frequencies and percentages were calculated.

These included:

- Child gender
- Caregiver relationship
- ASD diagnostic status
- Screen-duration category
- Screen-use purpose
- Screen-time routine

For the SENA domain scores, descriptive statistics included:

- Mean
- Standard deviation
- Minimum
- Maximum

Descriptive statistics provide an initial understanding of the data before inferential statistical procedures are conducted.

3.34 Pearson Correlation

Pearson's correlation coefficient was used to examine relationships between daily screen exposure and the three SENA neurobehavioural domains within the ASD group.

The ASD group consisted of **68 participants**.

Three principal correlations were examined:

Hypothesis 1

Daily screen exposure and Attention and Focus.

Hypothesis 2

Daily screen exposure and Social Reciprocity.

Hypothesis 3

Daily screen exposure and Sensory and Emotional Regulation.

Pearson's correlation coefficient, represented by **r**, ranges from -1 to +1.

A positive value indicates that higher values of one variable tend to occur alongside higher values of the other variable.

A negative value indicates an inverse relationship.

The absolute magnitude of the coefficient provides information regarding the strength of the linear association.

However, correlation does not establish causation.

Therefore, even if a relationship is found, it cannot be concluded that screen exposure caused the behavioural outcome.

3.35 Welch's Independent-Samples t-Test

Welch's independent-samples t-test was used to compare the ASD and non-ASD groups.

The test was selected because it does not require the assumption that the two groups have equal population variances.

The following comparisons were examined:

1. ASD versus non-ASD on Attention and Focus.
2. ASD versus non-ASD on Social Reciprocity.
3. ASD versus non-ASD on Sensory and Emotional Regulation.

The comparison consisted of:

ASD group: $n = 68$

Non-ASD group: $n = 34$

The uncertain "Maybe" diagnostic response was excluded from the formal comparison.

The Welch t-test evaluates whether the observed difference between group means is sufficiently large relative to the variability within the groups.

As with the correlation analysis, statistical significance does not establish causality.

3.36 Effect Size: Cohen's d

In addition to statistical significance, the study considered the magnitude of group differences using Cohen's d.

Effect-size analysis is important because statistical significance alone does not indicate how large or practically meaningful an observed difference may be.

Cohen's d describes the difference between two group means relative to their variability.

The effect size should be interpreted alongside:

- Group means
- Standard deviations
- Sample size
- Confidence intervals
- Clinical context

An effect size should not automatically be interpreted as evidence of clinical significance.

3.37 Reliability Analysis

Reliability analysis was conducted to examine the internal consistency of the SENA domains.

Cronbach's alpha was calculated for:

- Attention and Focus
- Social Reciprocity
- Sensory and Emotional Regulation

Cronbach's alpha evaluates the degree to which items within a scale are related to one another. Because each SENA domain contains only four items, the value of alpha should be interpreted carefully.

A lower alpha does not necessarily mean that the construct is invalid, particularly when a scale contains a small number of items. Similarly, a high alpha does not by itself demonstrate validity.

The reliability study should therefore be interpreted as evidence concerning internal consistency within the present sample.

3.38 Item-Level Analysis

Item-level analysis was also considered, particularly for the Social Reciprocity domain.

The joint-attention item was examined separately because its conceptual meaning requires particular consideration.

The item asks whether the child shares excitement or shows the caregiver something that the child is looking at on the screen.

This behaviour may represent social sharing.

However, it does not necessarily correspond directly to the clinical construct of joint attention.

Therefore, interpretation of this item should remain cautious.

The item should not be presented as a validated diagnostic measure of joint attention.

3.39 Statistical Assumptions

Before interpreting inferential analyses, relevant assumptions should be considered.

For Pearson correlation, the following issues should be examined:

- Approximate linearity
- Distribution of the variables
- Presence of extreme observations
- Relationship between screen exposure and each outcome

For Welch's t-test, the following should be considered:

- Distribution of the outcome variables
- Presence of extreme observations
- Group sample sizes
- General appropriateness of the comparison

Welch's t-test is less dependent on equal variances than the traditional Student's t-test, but the distribution of the outcome variables should still be inspected.

3.40 Interpretation of the Statistical Results

The statistical results should be interpreted in relation to the research questions rather than as isolated numerical study.

A correlation would indicate evidence of an association within the study sample.

It would not demonstrate that screen exposure causes the behavioural outcome.

Similarly, a difference between ASD and non-ASD groups would indicate that the groups differed on the measured domain within this sample.

It would not establish that ASD status alone explains the difference.

Potential alternative explanations include:

- Age
- Sleep
- Family routines

- Educational demands
- Parental stress
- Developmental characteristics
- Baseline behavioural differences
- Type of screen content
- Amount of physical activity
- Existing clinical characteristics

These factors should be acknowledged when interpreting the results.

3.41 Methodological Strengths

Several strengths can be identified within the methodology.

3.41.1 Multidimensional Measurement

The study did not focus exclusively on screen duration.

It also examined screen purpose and screen-time routine.

This provides a more contextual understanding of children's digital-media exposure.

3.41.2 Multiple Neurobehavioural Domains

The study examined three domains simultaneously:

- Attention and Focus
- Social Reciprocity
- Sensory and Emotional Regulation

This provides a broader behavioural perspective than studies examining only one outcome.

3.41.3 ASD Comparison Group

The inclusion of a non-ASD comparison group provides a basis for examining whether the observed behavioural patterns differ according to diagnostic status.

3.41.4 Caregiver Perspective

Caregivers observe children across everyday settings and therefore provide ecologically relevant information concerning behaviour outside a clinical environment.

3.41.5 Structured Instrument

SENA provides a standardised format for collecting information from caregivers.

3.41.6 Reliability Assessment

The study does not simply assume that the newly developed questionnaire is reliable. Internal-consistency analysis was included as part of the methodology.

3.42 Methodological Limitations

Despite its strengths, several limitations should be recognised. First, the use of purposive sampling limits the generalisability of the study. Second, the sample size is relatively modest. Third, the study uses caregiver-reported estimates of screen exposure rather than objective device-use records. Fourth, screen duration was collected categorically and subsequently converted into representative numerical values. This introduces approximation. Fifth, the "More than 6 hours" category is open-ended and requires a clearly documented coding decision. Sixth, parent-report measures can be influenced by recall bias. Seventh, caregivers may interpret behavioural terms differently. Eighth, caregivers may attribute behaviour occurring after screen use to screen exposure even when other factors may have contributed. Ninth, the cross-sectional design prevents causal conclusions. Tenth, SENA is a newly developed study-specific questionnaire and therefore requires further psychometric validation. Finally, the uncertain

diagnostic response creates a distinction between the total response count and the formal comparison sample.

CHAPTER 4

ANALYSIS, RESULTS AND study

4.1 Chapter Summary

In summary, Chapter 4 presented the descriptive and inferential analysis of the study data.

The principal study were:

N = 103 total respondents.

ASD n = 68.

Non-ASD n = 34.

One uncertain diagnostic response.

Mean screen exposure of 2.57 hours in the ASD group and 2.78 hours in the non-ASD group.

No significant difference in screen exposure between the two groups.

Significant positive association between screen exposure and Attention Deficits, $r = .552$, $p < .001$.

Borderline association between screen exposure and Social Reciprocity, $r = .236$, $p = .053$.

Significant positive association between screen exposure and Sensory/Emotional Dysregulation, $r = .329$, $p = .0061$.

Significant ASD-versus-non-ASD difference in Sensory/Emotional Dysregulation, $p = .0092$, $d = .57$.

Strong internal consistency for Attention Deficits, $\alpha = .839$.

Strong internal consistency for Sensory/Emotional Dysregulation, $\alpha = .808$.

Four-item Social Reciprocity reliability of $\alpha = .771$.

Important psychometric concerns surrounding Item 16 and digital screen-sharing behaviour.

These study provide the empirical foundation for Chapter 5 – Discussion, where the statistical results can be interpreted in relation to the theoretical frameworks, previous research, clinical psychology, the Indian context, and the research questions

4.2 Introduction

The present chapter presents the analysis and study of the study examining the relationship between children's screen exposure and selected neurobehavioural domains, with particular emphasis on children diagnosed with Autism Spectrum Disorder (ASD).

The analysis was conducted using data obtained through the Screen Exposure Neurobehavioral Assessment (SENA) questionnaire. The dataset consisted of responses from parents and primary caregivers of children between the intended age range of 4 and 15 years. The total dataset contained 103 responses. Of these, 68 respondents reported that their child had a formal diagnosis of ASD, 34 reported that their child did not have ASD, and one respondent selected an uncertain/"Maybe" diagnostic status. The uncertain response was retained in the overall sample description but excluded from the formal ASD-versus-non-ASD comparison.

The analysis focused on children's daily screen exposure and three principal neurobehavioural domains measured through SENA:

1. Attention and Focus
2. Social Reciprocity
3. Sensory and Emotional Regulation

The statistical analysis included descriptive statistics, Pearson correlation analyses, Welch's independent-samples t-tests, effect-size analysis using Cohen's d, and internal-consistency analysis using Cronbach's alpha.

The purpose of this chapter is to present the empirical study in a systematic manner before interpreting their broader theoretical and clinical implications in the subsequent discussion chapter.

4.3 Participant Characteristics

4.3.1 Overall Sample

The final dataset consisted of 103 parent and primary caregiver responses.

The diagnostic distribution was as follows:

Diagnostic status	n	Percentage
ASD	68	66.0%
Non-ASD	34	33.0%
Maybe/uncertain	1	1.0%
Total	103	100%

Thus, approximately two-thirds of the respondents belonged to the ASD group.

The one uncertain response was not classified as either ASD or non-ASD for inferential group comparison. Consequently, comparative analyses were based on 102 participants.

4.3.2 Caregiver Characteristics

The majority of respondents were mothers.

Caregiver relationship	Total n	Percentage
Mother	60	58.3%
Father	42	40.8%
Guardian	1	1.0%
Total	103	100%

Among the ASD group, 39 respondents were mothers, 28 were fathers, and one was a guardian. Within the non-ASD group, 21 respondents were mothers and 13 were fathers.

The predominance of mothers as respondents is relevant because mothers may occupy a substantial caregiving and monitoring role in children's daily routines. However, the study does not permit conclusions regarding whether mothers and fathers systematically differ in their perceptions of children's screen use or behaviour.

4.4 Child Gender Characteristics

The overall sample consisted of 60 male children and 43 female children.

Child gender	Total n	Percentage
Male	60	58.3%
Female	43	41.7%
Total	103	100%

Within the ASD group:

- Male: **40 (58.8%)**
- Female: **28 (41.2%)**

Within the non-ASD group:

- Male: **20 (58.8%)**
- Female: **14 (41.2%)**

Thus, the proportion of male and female children was remarkably similar across the ASD and non-ASD groups in the reported dataset's.

Interpretation

The relatively balanced male-to-female distribution within the two groups is noteworthy because ASD research frequently contains a higher proportion of male participants. However, the present sample was not population-based, and therefore the gender distribution should not be interpreted as representative of the prevalence of ASD by gender.

4.5 Child Age Characteristics

The reported age distribution was divided into several categories.

Age category	Total n	Percentage	ASD n	ASD %	Non-ASD n	Non-ASD %
4–6 years	9	8.7%	5	7.4%	4	11.8%
7–9 years	30	29.1%	20	29.4%	10	29.4%
10–12 years	43	41.7%	29	42.6%	14	41.2%
13–15 years	19	18.4%	12	17.6%	6	17.6%
>15 years	2	1.9%	2	2.9%	0	0%

The largest age category was **10–12 years**, representing 41.7% of the overall sample.

Within the ASD group, 42.6% belonged to the 10–12-year category, while 41.2% of the non-ASD group belonged to the same category.

Data-quality observation

The original methodology defined the intended participant age range as 4–15 years. However, the reported demographic table contains two responses in the ">15 years" category. This discrepancy should be checked against the original dataset before the final thesis is submitted. The figures have been retained here exactly as reported rather than being altered retrospectively.

4.6 Screen-Time Exposure Patterns

Daily screen exposure was measured using SENA Item 6.

The reported distribution was:

Daily screen exposure	Total n	Percentage	ASD n	ASD %	Non-ASD n	Non-ASD %
Less than 1 hour	3	2.9%	2	2.9%	1	2.9%
1–2 hours	42	40.8%	28	41.2%	14	41.2%
2–4 hours	41	39.8%	27	39.7%	13	38.2%
4–6 hours	17	16.5%	11	16.2%	6	17.6%

The largest proportion of children reported screen exposure of **1–2 hours per day**, accounting for 40.8% of the total sample.

A very similar proportion, 39.8%, reported **2–4 hours per day**.

Therefore, approximately four-fifths of the sample fell within the 1–4-hour daily screen exposure range.

Only 2.9% of the total sample were reported to have less than one hour of daily screen exposure.

The 4–6-hour category represented 16.5% of the sample.

The distribution was broadly similar between the ASD and non-ASD groups.

4.6.1 Screen-Time Pattern by Diagnostic Group

The mean daily screen exposure was:

- ASD group: M = 2.57 hours, SD = 1.34
- Non-ASD group: M = 2.78 hours, SD = 1.19

The difference between the two groups was not :

Welch's $t(72.1) = -0.788$, $p = .4335$, Cohen's $d = -0.16$.

This indicates that the ASD group did not demonstrate a difference in average reported daily screen exposure compared with the non-ASD group.

This finding is important because the subsequent differences in certain neurobehavioural outcomes cannot simply be attributed to one group spending substantially more time using screens.

4.7 Screen-Time Routine Structure

Participants were also asked about the structure of their child's screen use.

Screen routine	Total n	Percentage	ASD n	ASD %	Non-ASD n	Non-ASD %
Consistently followed	45	43.7%	29	42.6%	16	47.1%
Irregular structure	44	42.7%	30	44.1%	13	38.2%
Unstructured	14	13.6%	9	13.2%	5	14.7%

The reported responses were:

Approximately 43.7% of caregivers reported that screen routines were consistently followed. A similar proportion, 42.7%, reported an irregular screen routine.

Only 13.6% reported completely unstructured screen use.

The ASD and non-ASD groups showed broadly similar distributions.

Interpretation

The study suggest that screen exposure in the sample was not uniformly unregulated. A considerable proportion of caregivers reported either consistent or irregularly structured screen use. This is relevant because the psychological effects of screen exposure may depend not only on duration but also on the context in which screens are used.

4.8 Purpose of Screen Use

The study also examined the activities for which children used digital screens.

The reported activities were:

Screen-use activity	Percentage of sample
Watching videos	98.1%
Online learning/schoolwork	81.6%
Digital games	78.6%
Social/messaging applications	65.0%
Video calls	58.3%

Watching videos was the most frequently reported screen activity, with 98.1% of participants reporting this activity.

Online learning and schoolwork were reported by 81.6%.

Digital gaming was reported by 78.6%.

Social or messaging applications were reported by 65.0%.

Video calls were reported by 58.3%.

These study demonstrate that screen exposure in the sample was multidimensional.

Children were not using screens exclusively for entertainment. Educational activities, communication, gaming, and video consumption all formed part of children's digital environments.

Consequently, screen duration should not automatically be interpreted as equivalent to passive entertainment exposure.

4.9 Descriptive Statistics of SENA Domains

Descriptive statistics were calculated for the SENA neurobehavioural domains within the ASD group.

Table 4.2

Descriptive Statistics and Internal Consistency of SENA Domains

SENA domain	Items	Mean	SD	Minimum	Maximum	Cronbach's α
Attention Deficits	9–12	2.70	0.67	1.00	4.00	.839
Social Reciprocity – 3 item	13–15	2.86	0.60	1.33	4.00	.692
Social Reciprocity – 4 item	13–16	2.90	0.57	1.75	4.00	.771
Sensory & Emotional Dysregulation	17–20	2.83	0.55	1.75	4.00	.808
Total SENA composite	9–20	2.81	0.48	1.83	4.00	.786

The Attention Deficits domain had a mean of 2.70 and a standard deviation of 0.67.

The Social Reciprocity three-item score had a mean of 2.86, while the four-item direct Social Reciprocity score had a mean of 2.90.

The Sensory and Emotional Dysregulation domain had a mean of 2.83 with a standard deviation of 0.55.

The total SENA composite had a mean of 2.81 and a standard deviation of 0.48.

4.10 Attention and Focus study

Attention and Focus was one of the principal domains investigated in the study.

The domain consisted of four SENA items examining difficulties such as distractibility, incomplete tasks, repeated instructions, and difficulty maintaining attention.

The mean Attention Deficits score among the ASD participants was:

$M = 2.70$, $SD = 0.67$.

The observed range extended from 1.00 to 4.00.

The internal consistency of the four-item Attention Deficits scale was strong:

Cronbach's $\alpha = .839$.

This indicates a relatively high level of internal consistency among the four items in the present ASD sample.

4.11 Relationship Between Screen Exposure and Attention

The first hypothesis examined whether daily screen exposure was associated with attention difficulties among children with ASD.

The hypothesis proposed that:

Higher daily screen exposure would be significantly associated with greater attention difficulties among children with ASD.

Pearson's correlation analysis produced:

$r(66) = .552$, $p < .001$.

The more precise reported value was approximately:

$r = .5520$, $p = .000002$.

This represents a positive relationship.

In the context of the present scoring system, higher Attention Deficits scores represented more frequent attention-related difficulties. Therefore, higher reported screen exposure was associated with higher reported attention difficulties within the ASD group.

The first hypothesis was therefore supported by the statistical analysis.

Interpretation

The finding suggests that, within the ASD sample, children with greater reported daily screen exposure also tended to receive higher caregiver-reported attention difficulty scores.

The correlation does not demonstrate causality.

It is not possible from this cross-sectional analysis to determine whether increased screen exposure contributes to attention difficulties, whether children with attention difficulties are more likely to engage in greater screen use, or whether both are influenced by other variables.

Nevertheless, the magnitude and statistical significance of the observed relationship make attention one of the most prominent relationships identified in the study.

4.12 Social Reciprocity study

Social Reciprocity was examined using items relating to:

- Group-play avoidance
- Social-cue difficulty
- Resistance to social engagement
- Sharing interest in screen content

The three-item Social Reciprocity scale had:

$M = 2.86$, $SD = 0.60$, $\alpha = .692$.

When Item 16 was included directly, the four-item Social Reciprocity scale had:

$M = 2.90$, $SD = 0.57$, $\alpha = .771$.

The difference between the three-item and four-item versions was particularly important for the psychometric analysis.

4.13 Relationship Between Screen Exposure and Social Reciprocity

The second hypothesis proposed that increased screen exposure would be significantly associated with decreased social reciprocity among children with ASD.

Two versions of the analysis were reported.

For the three-item Social Reciprocity scale:

$r(66) = .2195$, $p = .0721$.

For the four-item direct Social Reciprocity scale:

$r(66) = .2357$, $p = .0530$.

The relationship was positive in both analyses, meaning that greater screen exposure was associated with higher reported social difficulty scores.

However, the result did not reach the conventional .05 significance threshold in either analysis.

The four-item analysis came close to conventional statistical significance, while the three-item analysis remained above the threshold.

Therefore, the second hypothesis is best described as showing a borderline or marginal statistical trend rather than definitive statistical support.

Interpretation

The results suggest that greater screen exposure may be related to increased social reciprocity difficulties, but the evidence in this sample was not sufficiently strong to conclude that the association was at the conventional .05 level.

This distinction is important.

The results should not be reported as demonstrating that screen time significantly caused social reciprocity difficulties.

Instead, the data indicate a positive association that warrants further investigation.

4.14 Sensory and Emotional Regulation study

The Sensory and Emotional Regulation domain examined behaviours including:

- Frustration when screen time ended
- Emotional meltdowns
- Irritability when screen access was unavailable
- Sensory-motor behaviours such as rocking or hand flapping

The ASD group demonstrated:

$M = 2.83$, $SD = 0.55$.

The minimum reported score was 1.75 and the maximum was 4.00.

The internal consistency of this domain was:

Cronbach's $\alpha = .808$.

The alpha value indicates strong internal consistency for the four-item domain within the ASD sample.

4.15 Relationship Between Screen Exposure and Sensory/Emotional Regulation

The third hypothesis examined whether greater daily screen exposure was associated with increased sensory and emotional dysregulation.

Pearson's correlation analysis produced:

$r(66) = .3294$, $p = .0061$.

This represents a positive correlation.

Therefore, within the ASD group, higher daily screen exposure was associated with higher caregiver-reported sensory and emotional dysregulation.

The third hypothesis was therefore supported by the statistical study.

Interpretation

The result indicates that children with greater reported screen exposure tended to show more frequent behaviours associated with emotional dysregulation and sensory responses.

These included behaviours such as:

- Post-screen tantrums
- Meltdowns
- Irritability when screens were unavailable
- Sensory-motor behaviours

However, as with the attention finding, the correlation cannot establish that screen exposure caused these behaviours.

The relationship may also reflect the possibility that children with greater sensory or emotional regulation difficulties are more likely to use screens intensively as a coping or self-regulation mechanism.

4.16 ASD and Non-ASD Group Comparison

The fourth hypothesis examined whether children with ASD demonstrated greater neurobehavioural difficulties than children in the non-ASD comparison group.

Welch's independent-samples t-tests were used to compare the groups.

Table 4.3
Welch's t-Test Comparison of ASD and Non-ASD Groups

Variable	ASD M (SD)	Non-ASD M (SD)	Welch's t	df	p	Cohen's d
Daily screen exposure	2.57 (1.34)	2.78 (1.19)	-0.788	72.1	.4335	-.16
Attention Deficits	2.70 (.67)	2.51 (.65)	1.383	66.8	.1711	.29
Social Reciprocity – 3 item	2.86 (.60)	2.60 (.70)	1.893	58.1	.0633	.40
Sensory & Emotional Dysregulation	2.83 (.55)	2.51 (.59)	2.690	64.2	.0092	.57

4.17 Comparison of Daily Screen Exposure

The ASD group reported an average of:

2.57 hours per day

while the non-ASD group reported:

2.78 hours per day.

The difference was not :

Welch's $t(72.1) = -0.788$, $p = .4335$.

The effect size was small:

Cohen's $d = -.16$.

Therefore, the study did not find evidence of a difference in average daily screen exposure between the two diagnostic groups.

This is an important finding because it indicates that the observed group difference in sensory and emotional dysregulation cannot simply be attributed to a difference in average screen duration.

4.18 Comparison of Attention Deficits

The ASD group had a mean Attention Deficits score of:

$M = 2.70$, $SD = .67$

compared with:

$M = 2.51$, $SD = .65$

for the non-ASD group.

The Welch test produced:

$t(66.8) = 1.383$, $p = .1711$.

The effect size was:

Cohen's $d = .29$.

Therefore, although the ASD group had a numerically higher mean attention-difficulty score, the difference was not .

The result suggests that the study did not provide sufficient statistical evidence for a group difference in the Attention Deficits score.

4.19 Comparison of Social Reciprocity

The three-item Social Reciprocity score was:

- ASD: $M = 2.86$, $SD = .60$
- Non-ASD: $M = 2.60$, $SD = .70$

The Welch test produced:

$t(58.1) = 1.893$, $p = .0633$.

The effect size was:

Cohen's $d = .40$.

This represents a trend toward higher social reciprocity difficulty scores in the ASD group, but the result did not reach the conventional .05 significance threshold.

Therefore, the group difference should be described as a statistical trend, rather than as a difference.

4.20 Comparison of Sensory and Emotional Dysregulation

The ASD group had a mean Sensory and Emotional Dysregulation score of:

$M = 2.83$, $SD = .55$.

The non-ASD group had:

$M = 2.51$, $SD = .59$.

The Welch test produced:

$t(64.2) = 2.690$, $p = .0092$.

The corresponding Cohen's d was:

$d = .57$.

This was the only reported neurobehavioural group comparison that reached conventional statistical significance.

The result indicates that the ASD group had higher caregiver-reported sensory and emotional dysregulation scores than the non-ASD group in this sample.

The effect size of .57 represents a moderate difference.

Thus, the fourth hypothesis received support specifically for the Sensory and Emotional Dysregulation domain.

4.21 Summary of Hypothesis Testing

Table 4.4

Summary of Hypothesis Testing

Hypothesis	Statistical result	Interpretation	Outcome
H1: Screen exposure and Attention Deficits	$r(66) = .552$, $p < .001$	Significant relationship positive	Supported
H2: Screen exposure and Social Reciprocity	$r(66) = .236$, $p = .053$	Borderline relationship positive	Partially supported / trend
H3: Screen exposure and Sensory/Emotional Dysregulation	$r(66) = .329$, $p = .0061$	Significant relationship positive	Supported
H4: ASD vs Non-ASD	Sensory/emotional: $t(64.2) = 2.690$, $p = .0092$, $d = .57$	Significant difference group in sensory/emotional domain	Supported for this domain

4.22 Psychometric Analysis of SENA

The internal consistency of the SENA subscales was examined using Cronbach's alpha.

The Attention Deficits subscale demonstrated:

$\alpha = .839$

The Sensory and Emotional Dysregulation subscale demonstrated:

$\alpha = .808$

The four-item Social Reciprocity scale demonstrated:

$\alpha = .771$

The three-item Social Reciprocity scale demonstrated:

$\alpha = .692$.

These study indicate generally satisfactory to strong internal consistency within the present ASD sample.

The strongest internal consistency was observed for Attention Deficits.

The Sensory and Emotional Dysregulation scale also demonstrated strong internal consistency.

The three-item Social Reciprocity scale had a lower alpha than the four-item version.

4.23 Item 16 and the Joint-Attention Finding

An important psychometric finding emerged from the analysis of Item 16.

The item asked:

"How often does your child share excitement or show you something they are looking at on the screen?"

The item was initially considered in relation to the Social Reciprocity domain.

Unexpectedly, Item 16 showed positive correlations with the other social difficulty items.

The reported correlations were:

- Item 16 with Item 13: $r = .465$, $p < .001$
- Item 16 with Item 14: $r = .489$, $p < .001$
- Item 16 with Item 15: $r = .525$, $p < .001$

This is important because the item could intuitively be interpreted as a positive social behaviour. However, its statistical relationship with the other social difficulty items suggests that caregivers may have interpreted screen-sharing differently within the context of ASD.

4.24 Reliability Analysis of Item 16

The treatment of Item 16 produced substantially different reliability results.

When Item 16 was reverse-coded, the reported Cronbach's alpha fell to:

$\alpha = -.018$.

When Item 16 was retained in its direct scoring direction, internal consistency increased to:

$\alpha = .771$.

This finding indicates that reverse-coding the item was not psychometrically supported in this dataset.

The result is important because it demonstrates that an apparently positive behaviour does not necessarily function as a straightforward reverse-coded item when embedded in a screen-related social behaviour scale.

4.25 Interpretation of the Item 16 Finding

One possible interpretation is that screen-sharing behaviour among children with ASD may sometimes represent a child's intense interest in digital content rather than conventional social reciprocity.

For example, a child may repeatedly show a parent a preferred video, game, character, image, or other digital stimulus.

The behaviour may involve social interaction, but the primary motivation may remain centred on the child's interest in the media content.

The present data cannot independently establish the motivation underlying this behaviour. Therefore, this should not be interpreted as proving that children with ASD lack genuine joint attention. Instead, it indicates that screen-related sharing behaviour may have a different psychometric meaning from conventional joint-attention behaviours and deserves further investigation.

4.26 Parent-Reported Qualitative study

Although the primary study was quantitative, caregiver responses to the open-ended question concerning their views on children's screen time provided additional contextual information.

Three major themes were identified in the source analysis:

1. The "Digital Pacifier" phenomenon
2. Transition-related irritability and meltdowns
3. Academic versus social trade-offs

4.27 Theme 1: The "Digital Pacifier" Phenomenon

Some caregivers reported using screens to manage children's behaviour in situations such as:

- Mealtimes
- Travel
- Periods of behavioural distress
- Situations requiring the child to remain calm

Caregivers simultaneously described concerns about increasing dependence on screens.

This theme is relevant to the quantitative study because it illustrates that screen use may sometimes be a **response to behavioural difficulty rather than its cause**.

For example, a caregiver may offer a screen to a child who is already dysregulated because the screen appears to calm the child.

If that child subsequently demonstrates high screen exposure and high dysregulation scores, a simple correlation cannot determine the direction of the relationship.

4.28 Theme 2: Transition Irritability and Meltdowns

Caregivers described emotional difficulties occurring when screen use ended.

Reported behaviours included:

- Tantrums
- Crying
- Irritability
- Emotional outbursts
- Resistance to stopping screen use

In some accounts, destructive behaviour

This qualitative theme corresponds closely with the Sensory and Emotional Regulation domain.

The quantitative analysis also demonstrated a significant relationship between screen exposure and sensory/emotional dysregulation:

$$r(66) = .3294, p = .0061.$$

The qualitative and quantitative study therefore point toward the importance of screen transitions as an area requiring further investigation.

4.29 Theme 3: Academic Versus Social Trade-Off

Caregivers also described both positive and negative aspects of children's screen use.

Educational applications were reported to provide benefits in specific learning situations.

At the same time, some caregivers perceived that unstructured screen use reduced opportunities for:

- Family conversation
- Face-to-face interaction
- Spontaneous play
- Social engagement

This finding reinforces the importance of examining screen **quality and context**, rather than treating all screen exposure as identical.

A child using an educational program with parental involvement is not necessarily engaging with screens in the same manner as a child consuming highly stimulating entertainment content for several uninterrupted hours.

4.30 Overall Pattern of study

When the study are considered together, several patterns emerge.

First, screen exposure was common across both diagnostic groups.

Second, the average screen exposure of the ASD group was not statistically different from that of the non-ASD group.

Third, within the ASD group, greater screen exposure was significantly associated with greater attention difficulties.

Fourth, screen exposure was significantly associated with sensory and emotional dysregulation.

Fifth, the association between screen exposure and social reciprocity was weaker and did not cross the conventional significance threshold.

Sixth, the ASD group demonstrated significantly higher sensory and emotional dysregulation than the non-ASD group.

Seventh, the psychometric analysis suggested that the Social Reciprocity domain requires careful interpretation, particularly regarding Item 16.

These study collectively suggest that the relationship between screen exposure and child behaviour is multidimensional.

4.31 Summary Table of Major study

Table 4.5
Summary of Principal study

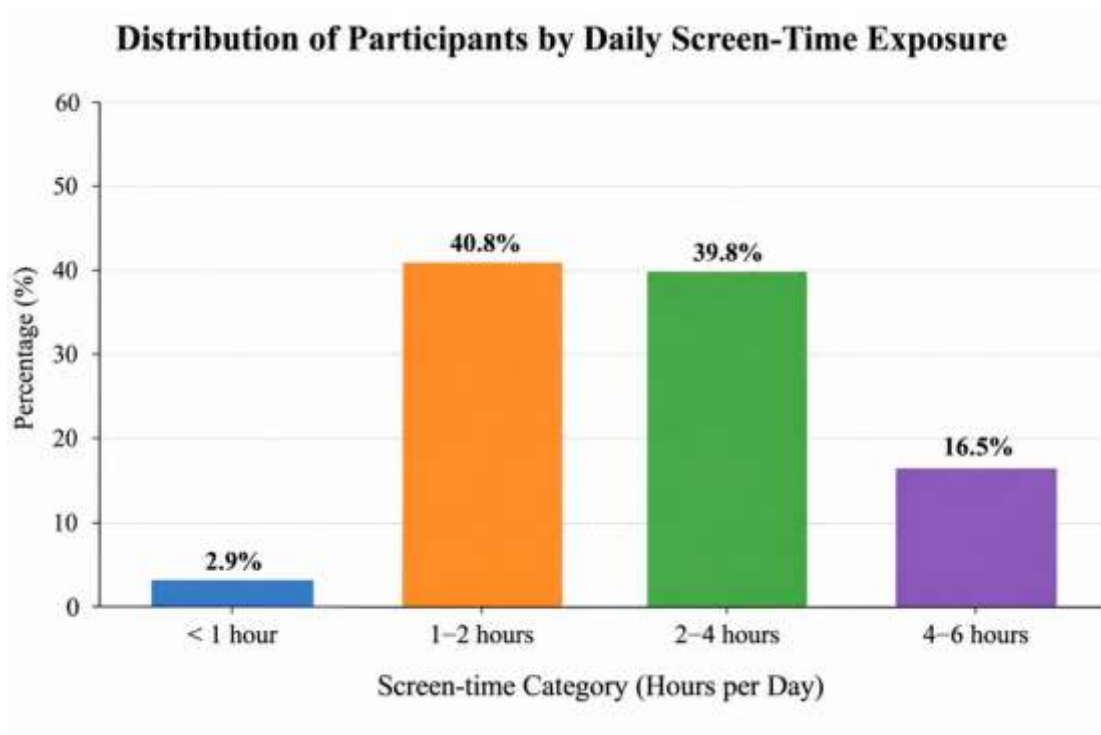
Domain	Major finding
Sample	N = 103
ASD group	n = 68
Non-ASD group	n = 34
Uncertain diagnosis	n = 1
Mean screen exposure – ASD	2.57 hours
Mean screen exposure – Non-ASD	2.78 hours
Screen exposure group difference	Not significant, $p = .4335$
Attention mean – ASD	2.70
Social Reciprocity mean – ASD	2.86–2.90
Sensory/Emotional mean – ASD	2.83

Screen–Attention correlation	$r = .552, p < .001$
Screen–Social correlation	$r = .236, p = .053$
Screen–Sensory/Emotional correlation	$r = .329, p = .0061$
ASD vs Non-ASD Attention	$p = .1711$
ASD vs Non-ASD Social Reciprocity	$p = .0633$
ASD vs Non-ASD Sensory/Emotional	$p = .0092$
Sensory/Emotional effect size	$d = .57$
Attention reliability	$\alpha = .839$
Social Reciprocity reliability	$\alpha = .771$
Sensory/Emotional reliability	$\alpha = .808$

4.32 Graphical Presentation of study

Figure 4.1
Distribution of Daily Screen Exposure

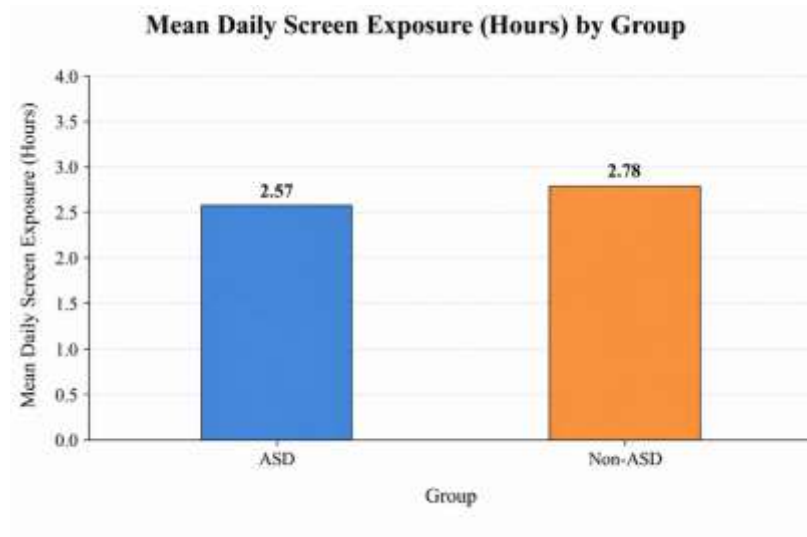
Screen-time category	Percentage
<1 hour	2.9%
1–2 hours	40.8%
2–4 hours	39.8%
4–6 hours	16.5%



Interpretation: The distribution demonstrates that the majority of children were reported to use screens between one and four hours per day.

Figure 4.2
Mean Daily Screen Exposure by Diagnostic Group

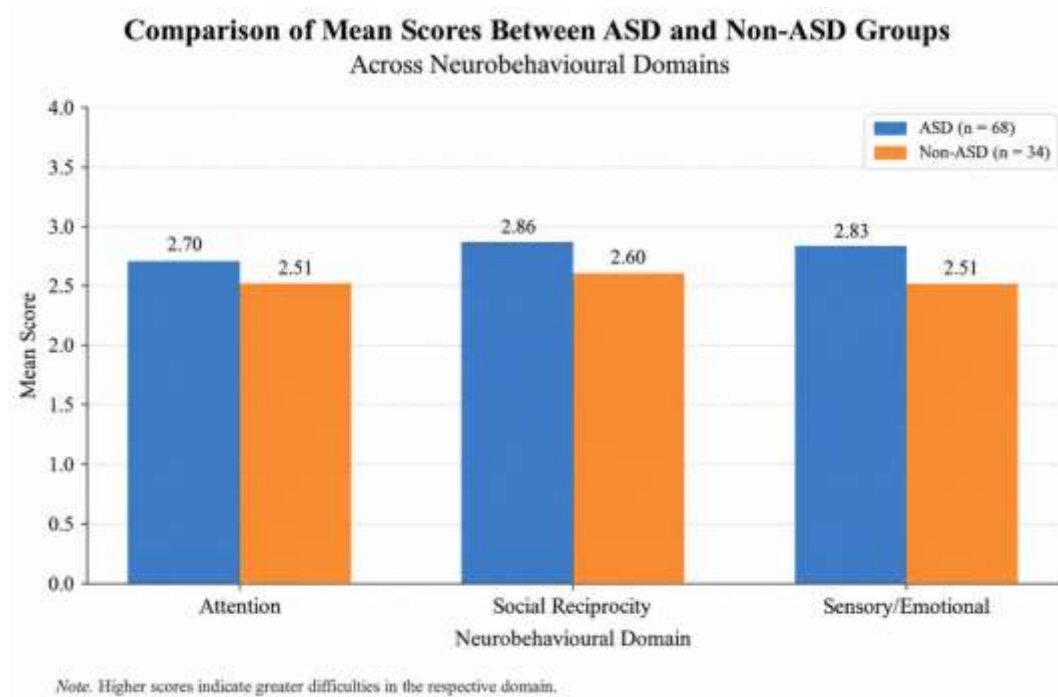
Group	Mean hours
ASD	2.57
Non-ASD	2.78



Interpretation: The non-ASD group had a slightly higher numerical mean screen exposure, but the difference was not ($p = .4335$).

Figure 4.3
Mean SENA Scores by Diagnostic Group

Domain	ASD	Non-ASD
Attention	2.70	2.51
Social Reciprocity	2.86	2.60
Sensory/Emotional	2.83	2.51



Interpretation: The largest reported difference between groups occurred in the Sensory and Emotional Dysregulation domain.

4.33 Suggested Scatterplots

Figure 4.4

Daily Screen Exposure and Attention Deficits

The scatterplot should display:

- X-axis: Daily screen exposure in hours
- Y-axis: Attention Deficits score
- Correlation: $r = .552$
- $p < .001$

Figure 4.5

Daily Screen Exposure and Social Reciprocity

- X-axis: Daily screen exposure
- Y-axis: Social Reciprocity score
- $r = .236$
- $p = .053$

Figure 4.6

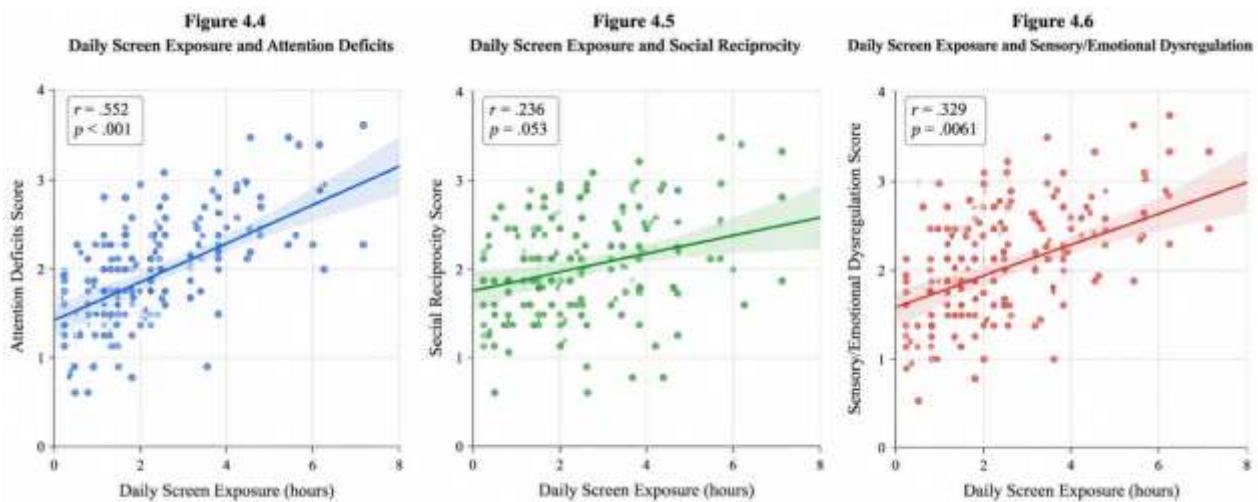
Daily Screen Exposure and Sensory/Emotional Dysregulation

X-axis: Daily screen exposure

Y-axis: Sensory/Emotional Dysregulation

$r = .329$

$p = .0061$



4.34 Interpretation of the Attention Finding

The attention finding represents the strongest correlation identified in the study.

The correlation coefficient of **.552** indicates a relatively substantial positive association between reported daily screen exposure and reported attention difficulties among children with ASD.

This finding is important because attention is essential for:

- Learning
- Task completion
- Following instructions
- Academic participation
- Daily routines
- Executive functioning

The cross-sectional design means that several explanations remain possible. One explanation is that greater screen exposure may contribute to difficulties with sustained attention. Another possibility is that children who already experience attention difficulties may be more likely to engage in prolonged screen use because digital environments can provide highly stimulating and immediately rewarding activities. A third possibility is that both screen exposure and attention difficulties are influenced by other factors. Therefore, the appropriate conclusion is that the study identified a strong statistical association, not a causal relationship.

4.35 Interpretation of the Social Reciprocity Finding

The social reciprocity finding was comparatively weaker.

The correlation of **.236** had a p-value of **.053**, placing it just above the conventional significance threshold.

This finding suggests that screen exposure may be associated with social reciprocity difficulties, but the evidence from this sample was insufficient to establish a relationship at $\alpha = .05$.

This may indicate that social reciprocity is influenced by a wider range of developmental and environmental factors than screen exposure alone.

Within ASD, social communication characteristics are multidimensional and cannot necessarily be reduced to the amount of time spent using screens.

The result therefore supports a cautious interpretation.

4.36 Interpretation of Sensory and Emotional Regulation

The relationship between screen exposure and sensory/emotional dysregulation was :
 $r = .3294$, $p = .0061$.

This finding indicates that higher screen exposure was associated with higher caregiver-reported dysregulation.

The group comparison further demonstrated that the ASD group had significantly higher sensory/emotional scores than the non-ASD group:

$t(64.2) = 2.690$, $p = .0092$, $d = .57$.

The convergence of the correlational and comparative results makes sensory/emotional regulation an important finding within the study.

However, again, the relationship should not be interpreted as proof that screen exposure causes dysregulation.

Children who experience sensory or emotional dysregulation may themselves seek screens as a form of self-soothing or behavioural regulation.

4.37 Integrated Analysis of Screen Exposure

An important observation from the results is that screen exposure itself was not significantly different between the ASD and non-ASD groups.

The ASD group averaged 2.57 hours per day, while the non-ASD group averaged 2.78 hours. This difference was not .

However, the ASD group demonstrated significantly greater sensory and emotional dysregulation. This suggests that the relationship between screen exposure and behaviour may not simply depend on the number of hours of exposure.

Individual characteristics may influence how children respond to digital environments.

This is particularly relevant when considering ASD, where sensory processing, emotional regulation, restricted interests, and behavioural rigidity can vary considerably between individuals.

4.38 study in Relation to Screen-Use Purpose

The very high prevalence of video consumption and the substantial use of screens for online learning demonstrate that the sample's digital exposure was heterogeneous.

Watching videos was reported by 98.1% of participants.

Online learning was reported by 81.6%.

Gaming was reported by 78.6%.

Therefore, the study cannot assume that all screen exposure involved passive entertainment.

This distinction is important for interpretation.

The quantitative screen-time variable measured duration, not necessarily the cognitive or social quality of the content.

Consequently, future studies should consider:

- l Content type
- l Educational versus entertainment use
- l Interactive versus passive use
- l Co-viewing
- l Time of day
- l Screen transitions
- l Device type
- l Use before bedtime

4.39 study in Relation to Screen-Time Structure

The majority of caregivers reported either consistent or irregular screen routines.

Only 13.6% reported completely unstructured screen use.

This finding indicates that the relationship between screen exposure and behaviour occurs within a broader family-management context.

A structured routine may involve predictable screen periods, whereas irregular use may vary according to the child's behaviour, caregiver availability, school requirements, or family circumstances. Future analyses could therefore understand whether screen-time structure moderates the relationship between screen duration and behavioural outcomes.

The study here did not provide sufficient evidence to establish such a moderating effect.

4.40 Overall study

The major study of the study can be summarised as follows:

Finding 1 - Screen use was widespread among children in the study, with the largest proportion reporting 1–2 hours or 2–4 hours of daily screen exposure.

Finding 2 - The ASD and non-ASD groups did not differ significantly in average daily screen exposure.

Finding 3 - Greater screen exposure was significantly associated with greater attention difficulties within the ASD group.

Finding 4 - Greater screen exposure demonstrated a association with sensory and emotional dysregulation.

Finding 5 - The relationship between screen exposure and social reciprocity was positive but borderline and did not reach the conventional .05 threshold.

Finding 6 - The ASD group demonstrated significantly greater sensory and emotional dysregulation than the non-ASD comparison group.

Finding 7 - The Attention and Sensory/Emotional SENA domains demonstrated strong internal consistency.

Finding 8 - Item 16 demonstrated an unusual psychometric pattern, suggesting that screen-related sharing behaviour may not operate as a conventional reverse-coded social item.

Finding 9 - Caregiver narratives highlighted the practical complexity of screen use, including its use for behavioural management, transition difficulties, learning, and potential displacement of face-to-face interaction.

4.41 Chapter Conclusion

The present chapter analysed the empirical study obtained from the SENA dataset.

The study included 103 caregiver responses, of which 68 represented children with ASD and 34 represented children in the non-ASD comparison group. One uncertain diagnostic response was excluded from the formal group comparison.

Screen exposure was common in both groups, with most children reported to spend between one and four hours per day using screens.

The ASD and non-ASD groups did not differ significantly in average daily screen exposure.

Within the ASD group, however, screen exposure demonstrated a strong positive relationship with attention difficulties. The correlation between screen exposure and Attention Deficits was $r = .552$, $p < .001$.

Screen exposure also demonstrated a positive relationship with Sensory and Emotional Dysregulation, with $r = .3294$, $p = .0061$.

The relationship between screen exposure and Social Reciprocity was weaker. The four-item analysis produced $r = .2357$, $p = .053$, indicating a borderline statistical trend rather than conventional statistical significance.

The comparative analysis demonstrated that the ASD group had significantly higher Sensory and Emotional Dysregulation scores than the non-ASD group, with $t(64.2) = 2.690$, $p = .0092$, Cohen's $d = .57$.

The analysis therefore identified sensory and emotional regulation as an important area of difference between the two groups.

The psychometric study also provided an important insight into the SENA instrument. Attention Deficits and Sensory/Emotional Dysregulation demonstrated strong internal consistency, while the Social Reciprocity scale demonstrated improved reliability when Item 16 was retained in its direct rather than reverse-coded form.

The study from the quantitative and qualitative components together suggest that children's relationship with screen media is complex. Screen exposure may be associated with attention and sensory/emotional outcomes, but the direction and mechanisms of these relationships cannot be determined from a cross-sectional design.

The study therefore provide empirical evidence of associations within the study sample while also highlighting the need for longitudinal, objective, and clinically validated research.

CHAPTER 5

DISCUSSION, CONCLUSION AND SUMMARY

5.20 Final Summary

The major conclusions of the study can be summarised as follows:

1. Screen exposure was widespread among the children included in the study.
2. Most children were reported to have approximately 1–4 hours of daily screen exposure.
1. 3. There was no difference in average screen exposure between the ASD and non-ASD groups.
3. Higher screen exposure was significantly associated with greater Attention Deficits among children with ASD.
4. Higher screen exposure was significantly associated with Sensory and Emotional Dysregulation among children with ASD.
5. The relationship between screen exposure and Social Reciprocity was positive but did not reach conventional statistical significance.
6. Children with ASD demonstrated significantly higher Sensory and Emotional Dysregulation scores than children in the non-ASD group.
7. Attention and Sensory/Emotional Dysregulation domains demonstrated satisfactory to strong internal consistency.
8. The analysis of Item 16 demonstrated the complexity of measuring social behaviour in screen-related contexts.
9. Caregiver responses indicated that screens may function as educational tools, entertainment sources, communication tools, and behavioural regulation strategies.
10. The study support further investigation of screen exposure in ASD using longitudinal designs and objective measures.

11. The study demonstrates associations between screen exposure and selected neurobehavioural outcomes but does not establish causal relationships.

5.1 Introduction

The present study understands the relationship between screen exposure and selected neurobehavioural characteristics among children, with particular focus on children with Autism Spectrum Disorder (ASD). The study specifically explored the relationship between daily screen exposure and three domains assessed through the Screen Exposure Neurobehavioral Assessment (SENA): Attention and Focus, Social Reciprocity, and Sensory and Emotional Regulation.

The study was undertaken in the context of the increasing integration of digital media into children's everyday lives. Screens are now used for education, entertainment, communication, gaming, and behavioural management. For children with ASD, digital media may have particular relevance because of differences in attention, sensory processing, social communication, behavioural flexibility, and emotional regulation.

5.2 Summary of the Study

The study investigated screen exposure and selected behavioural characteristics among children, with a particular emphasis on children with ASD.

A total of 103 caregiver responses were included in the dataset. Of these, 68 respondents reported that their child had ASD, while 34 reported that their child did not have ASD. One respondent selected an uncertain/"Maybe" diagnostic category and was not included in the formal ASD-versus-non-ASD comparison.

The study assessed daily screen exposure and examined its relationship with:

1. Attention Deficits
2. Social Reciprocity
3. Sensory and Emotional Dysregulation

The study also compared the ASD and non-ASD groups across these domains.

Pearson correlation was used to examine relationships between screen exposure and SENA domains. Welch's independent-samples t-test was used to compare the ASD and non-ASD groups. Internal consistency of the SENA domains was examined using Cronbach's alpha.

Daily screen exposure was significantly associated with Attention Deficits and Sensory and Emotional Dysregulation among children with ASD. The relationship between screen exposure and Social Reciprocity was positive but did not reach conventional statistical significance.

The ASD group also demonstrated significantly greater Sensory and Emotional Dysregulation than the non-ASD comparison group.

5.3 Discussion of the Major study

5.3.1 Pattern of Screen Exposure

The study demonstrated that screen exposure was common among the children represented in the study. The largest proportion of children reported screen exposure between 1 and 2 hours per day (40.8%), followed closely by 2–4 hours per day (39.8%). A further 16.5% were reported to spend approximately 4–6 hours per day using screens.

Therefore, the majority of children in the sample had regular exposure to digital devices.

An important finding was that the ASD and non-ASD groups did not differ significantly in average daily screen exposure. The ASD group reported a mean of 2.57 hours, while the non-ASD group reported a mean of 2.78 hours.

The difference was not :

Welch's $t(72.1) = -0.788$, $p = .4335$.

5.4 Screen Exposure and Attention

One of the most important study of the study concerned the relationship between screen exposure and attention.

The analysis produced a significant positive correlation between daily screen exposure and Attention Deficits among children with ASD:

$r(66) = .552$, $p < .001$.

This was the strongest correlation observed in the study.

The finding indicates that higher reported screen exposure was associated with greater caregiver-reported attention difficulties.

Attention is particularly important for children's academic, social, and adaptive functioning. Difficulties in maintaining attention may affect children's ability to:

- Follow instructions
- Complete tasks
- Participate in classroom activities
- Maintain engagement in learning
- Shift attention between activities
- Participate in social interactions

The present finding therefore has potential clinical relevance.

However, the direction of the relationship cannot be established from the present study.

It is possible that prolonged exposure to highly stimulating digital environments contributes to difficulties with sustained attention. It is also possible that children who already have attention difficulties are more likely to seek or be provided with digital stimulation.

A third possibility is that both screen exposure and attention difficulties are influenced by other factors, such as parenting practices, sleep, developmental characteristics, environmental stimulation, educational demands, or the child's individual behavioural profile.

5.5 Screen Exposure and Social Reciprocity

The second major area examined was Social Reciprocity.

The relationship between screen exposure and Social Reciprocity was positive but weaker than the relationship observed for attention.

The three-item analysis produced:

$r(66) = .2195$, $p = .0721$.

The four-item analysis produced:

$r(66) = .2357$, $p = .0530$.

Thus, the relationship approached but did not cross the conventional significance threshold of .05.

The direction of the relationship suggests that greater screen exposure was associated with higher reported social difficulty scores. However, the statistical evidence was insufficient to conclude that there was a significant association within the present sample.

This finding is important because social reciprocity in ASD is a complex construct that involves several aspects of social functioning, including responding to others, sharing attention, interpreting social cues, and engaging in reciprocal interaction.

Screen exposure represents only one potential environmental influence.

The relatively weak association observed in the present research may indicate that social reciprocity is influenced by multiple developmental, interpersonal, and environmental factors.

It is also possible that the relationship between digital media and social functioning depends heavily on what children are doing on screens, rather than simply how long they are using them.

For example, video calls, interactive educational activities, and shared media use with caregivers involve different forms of social engagement compared with solitary viewing.

5.6 Screen Exposure and Sensory and Emotional Regulation

A relationship was observed between screen exposure and Sensory and Emotional Dysregulation.

The correlation was:

$$r(66) = .3294, p = .0061.$$

This indicates that greater reported screen exposure was associated with greater caregiver-reported sensory and emotional dysregulation.

The Sensory and Emotional Dysregulation domain included behaviours relating to frustration, emotional reactions when screen use ended, irritability, and sensory-motor behaviours.

The finding is particularly relevant because children with ASD may experience differences in sensory processing and emotional regulation.

Caregiver responses in the qualitative portion of the study also described difficulties surrounding the ending of screen use. Some caregivers reported tantrums, irritability, and emotional outbursts when screen access was removed.

The convergence between the quantitative and caregiver-reported study provides useful contextual information.

However, the relationship must again be interpreted cautiously.

One possible explanation is that prolonged screen use may make transitions away from highly engaging digital activities more difficult for some children.

Another explanation is the reverse direction: children who already experience emotional or sensory dysregulation may be given screens because digital activities appear to calm or occupy them. The "digital pacifier" theme identified in caregiver responses is particularly relevant to this issue. Thus, the relationship may potentially be bidirectional.

5.7 ASD and Non-ASD Group Differences

The study also examined whether children with ASD differed from children in the non-ASD group on the neurobehavioural domains.

The study were mixed.

For Attention Deficits, the ASD group had a higher mean score:

- ASD: $M = 2.70$

- Non-ASD: $M = 2.51$

However, the difference was not :

$$t(66.8) = 1.383, p = .1711.$$

Similarly, the ASD group had a higher Social Reciprocity score:

- ASD: $M = 2.86$

- Non-ASD: $M = 2.60$

but the difference was not :

$t(58.1) = 1.893, p = .0633$.

The Sensory and Emotional Dysregulation domain produced a different result.

The ASD group had a mean of:

$M = 2.83$

compared with:

$M = 2.51$

in the non-ASD group.

The difference was :

$t(64.2) = 2.690, p = .0092$.

The effect size was:

Cohen's $d = .57$.

This represents a moderate difference between the groups.

5.8 Relationship Between Group Differences and Screen Exposure

An important observation is that the ASD group did not have significantly greater screen exposure than the non-ASD group, yet it demonstrated significantly greater sensory and emotional dysregulation.

This suggests that the relationship between screen exposure and neurobehavioural functioning may involve more than simple exposure duration.

Children may differ in how they respond to the same amount of screen exposure.

For example, two children may spend two hours using a digital device, but one may use the device for educational activities while another may engage primarily in highly stimulating games or videos.

Similarly, one child may use a screen independently, while another may use it together with a parent.

These differences cannot be captured through duration alone.

5.9 Discussion of Screen-Use Patterns

The study found that video viewing was the most common screen activity, reported by 98.1% of participants.

Online learning or schoolwork was reported by 81.6%, gaming by 78.6%, social or messaging applications by 65.0%, and video calls by 58.3%.

These study demonstrate that children's digital exposure was heterogeneous.

Screens were used for both potentially constructive activities and entertainment.

This distinction is important in clinical psychology because the psychological impact of screen exposure may depend upon the quality and context of the experience.

A blanket interpretation of all screen use as harmful would therefore not be supported by the present data.

5.10 Screen Routine and Behaviour

Approximately 43.7% of caregivers reported a consistently followed screen routine, while 42.7% reported an irregular routine.

A smaller proportion, 13.6%, reported completely unstructured screen use.

The relatively high proportion of irregular routines is clinically relevant.

Children with ASD may benefit from predictable routines, and sudden changes in access to preferred activities may sometimes produce behavioural distress.

The caregiver reports concerning screen transitions are consistent with this possibility.

Nevertheless, the current study did not statistically test whether routine consistency moderated the relationship between screen exposure and dysregulation.

5.11 Discussion of SENA Reliability

The psychometric study provided useful information regarding the SENA domains used in the study.

The Attention Deficits scale demonstrated:

Cronbach's $\alpha = .839$.

The Sensory and Emotional Dysregulation scale demonstrated:

$\alpha = .808$. The four-item Social Reciprocity scale demonstrated:

$\alpha = .771$. These values indicate generally satisfactory internal consistency within the present dataset. The three-item Social Reciprocity version produced a lower reliability estimate of:

$\alpha = .692$. This suggests that the reliability of the Social Reciprocity domain may be somewhat sensitive to item selection.

5.12 Significance of Item 16

One of the most interesting study concerned Item 16.

The item examined whether the child shared excitement or showed another person something they were viewing on a screen.

Initially, this could appear to represent a positive social behaviour and might therefore be expected to require reverse scoring.

However, reverse-coding Item 16 resulted in a very low or negative reliability estimate:

$\alpha = -.018$.

When retained in the direct scoring direction, reliability increased to:

$\alpha = .771$.

This suggests that the behaviour measured by Item 16 may not function as a straightforward indicator of positive social reciprocity within a screen-related context.

A child may show a parent something on a screen because the child is strongly interested in the digital content.

Therefore, the behaviour may represent a mixture of social sharing and interest-driven behaviour.

This finding illustrates an important methodological consideration for psychological assessment: behavioural items can change meaning depending on context.

A behaviour that appears socially positive in one setting may have a more complex interpretation in another.

5.13 Clinical Implications

The study have several potential implications for clinical psychology.

First, clinicians working with children with ASD may benefit from assessing not only whether a child uses screens, but how screens are integrated into the child's daily routine.

Assessment may consider:

- Duration of use
- Purpose of use
- Type of content
- Whether use is solitary or shared
- Emotional response to stopping
- Use during meals
- Use during transitions

- Use before sleep
- Educational versus recreational use

Second, caregivers may benefit from guidance on creating predictable screen routines.

Third, clinicians may consider helping caregivers distinguish between screen use that supports learning or communication and screen use that primarily functions as behavioural avoidance or regulation.

Fourth, where children demonstrate significant distress when screen use ends, behavioural strategies could focus on predictable transitions and alternative activities.

5.14 Implications for Parents and Caregivers

The study also have implications for parents and caregivers.

The study demonstrates that screens may serve several different purposes in children's lives.

Caregivers reported using screens during situations in which they needed children to remain calm or occupied.

This may be understandable from a practical perspective, particularly when caregivers are managing difficult behaviour.

However, repeated reliance on screens as the primary strategy for regulating behaviour may potentially make transitions away from screen use more challenging.

Therefore, caregivers may consider developing predictable routines around screen access and providing children with alternative activities.

The emphasis should not necessarily be on eliminating screens entirely.

Instead, the study support a more structured and context-sensitive approach to screen use.

5.15 Implications for Educational Settings

Schools and educational professionals also have a role in understanding children's digital exposure.

Because online learning was reported by a substantial proportion of participants, screen exposure cannot be treated solely as recreational behaviour.

Educational institutions may consider balancing digital learning with:

- Face-to-face interaction
- Physical activities
- Sensory breaks
- Collaborative activities
- Hands-on learning
- Opportunities for spontaneous social interaction

For children with ASD, educational planning may also consider individual sensory and attention needs.

The present study suggest that attention and sensory/emotional regulation are relevant domains when considering children's digital environments.

5.16 Strengths of the Study

Several strengths can be identified in the present research.

5.16.1 Inclusion of an ASD and Comparison Group

The study included both ASD and non-ASD participants.

This allowed the research to examine not only relationships between screen exposure and behaviour but also group differences.

5.16.2 Examination of Multiple Domains

The study did not restrict the investigation to a single behavioural outcome.

Attention, Social Reciprocity, and Sensory/Emotional Regulation were examined separately. This provided a broader understanding of the relationship between screen exposure and neurobehavioural functioning.

5.16.3 Caregiver Perspective

Parents and primary caregivers provided information regarding children's everyday behaviour. This is particularly useful because caregivers observe children across multiple real-world contexts.

5.16.4 Quantitative Analysis

The study employed Pearson correlations, group comparisons, effect sizes, and reliability analysis. This provided a structured statistical examination of the research questions.

5.16.5 Inclusion of Qualitative Context

The open-ended caregiver responses added contextual information to the quantitative results. The themes surrounding digital pacifier use, transition difficulties, and academic/social trade-offs helped illustrate the complexity of children's screen experiences.

5.17 Limitations of the Study

Despite its strengths, several limitations should be considered.

5.17.1 Cross-Sectional Design

The study used a cross-sectional approach.

Consequently, temporal relationships cannot be established.

The study cannot determine whether screen exposure precedes behavioural difficulties or whether behavioural difficulties lead to increased screen exposure.

Longitudinal studies would be better suited to examining directionality.

5.17.2 Reliance on Parent-Reported Data

The study relied substantially on caregiver reports.

Parent reports are valuable but may be influenced by:

- Recall
- Interpretation
- Expectations
- Perceptions of behaviour
- Awareness of screen use

Future studies could combine caregiver reports with direct behavioural observation and objective digital-use data.

5.17.3 Self-Reported Screen Duration

Screen exposure was based on reported duration rather than objective device-recorded usage.

Actual exposure may therefore differ from reported exposure.

Future research could use:

- Device usage logs
- Screen-time monitoring applications
- Digital wellbeing reports
- Direct observation

to improve measurement accuracy.

5.17.4 Heterogeneity of Screen Content

The study measured overall screen exposure but did not fully distinguish between types of digital content. Watching educational content, participating in video calls, gaming, and passive video viewing may have different behavioural implications.

Future studies should examine these categories separately.

5.17.5 Sample Characteristics

The sample was based on the available caregiver responses and should not automatically be assumed to represent all children with ASD.

The results therefore require cautious generalisation.

5.17.6 Measurement Considerations

The unusual behaviour of Item 16 demonstrates that screen-related social behaviours may be difficult to interpret using conventional assumptions about positive and negative behavioural indicators.

Further validation of the SENA questionnaire would therefore be beneficial.

5.17.7 Data Consistency

The dataset contains a small number of demographic inconsistencies that should be verified against the original raw data before final submission.

In particular, the reported methodology specifies an intended age range of 4–15 years, while two entries in the demographic table are categorised as above 15 years.

This should be reconciled before the thesis is submitted.

5.18 Recommendations for Future Research

Future research could build upon the present study in several ways.

1. Longitudinal research

Future studies should follow children over time to examine whether changes in screen exposure precede changes in attention, social functioning, or emotional regulation.

2. Objective screen-time measurement

Researchers should incorporate device-based measurements wherever possible.

3. Content-specific analysis

Future studies should distinguish:

- Educational content
- Gaming
- Social media
- Video consumption
- Video calls
- Creative digital activities

4. Larger samples

Larger samples would improve statistical power and allow subgroup analyses.

5. Examination of age differences

Future research could examine whether the relationship between screen exposure and behaviour changes across developmental stages.

6. Examination of sleep

Sleep should be considered because screen use, particularly at night, may interact with attention and emotional functioning.

7. Examination of sensory profiles

Children with different sensory-processing profiles may respond differently to digital media.

8. Parent-mediated screen use

Future research should examine whether co-viewing or parental involvement changes the relationship between screen exposure and neurobehavioural outcomes.

9. Intervention research

Experimental or intervention studies could investigate whether structured screen routines improve transition behaviour and emotional regulation.

10. Further SENA validation

The SENA questionnaire would benefit from additional psychometric validation, particularly for items involving digital social behaviour.

5.19 Conclusion

The present data understood the relationship between screen exposure and selected neurobehavioural domains among children, with particular emphasis on children with ASD. The study demonstrate that screen exposure was common among the participants and that most children were reported to spend between one and four hours per day using screens. The study did not identify a difference in average daily screen exposure between children with ASD and those in the non-ASD comparison group. However, within the ASD group, higher screen exposure was significantly associated with greater attention difficulties.

An association was also identified between screen exposure and sensory and emotional dysregulation. The relationship between screen exposure and Social Reciprocity was positive but did not reach conventional statistical significance.

The comparison between ASD and non-ASD groups demonstrated a difference in Sensory and Emotional Dysregulation, with the ASD group reporting higher scores. Taken together, the study suggest that screen exposure may be associated with particular neurobehavioural characteristics among children with ASD, especially attention and sensory/emotional regulation. However, the study should not be interpreted as demonstrating that screen exposure causes these difficulties. The relationship is likely to be influenced by multiple interacting factors, including the child's developmental characteristics, existing behavioural difficulties, family routines, purpose of screen use, and the context in which digital media are used. The caregiver study further demonstrate that screens may serve both beneficial and challenging functions. They may support education, entertainment, communication, and behavioural management, while transitions away from screens may sometimes be associated with emotional difficulties. The study therefore supports a balanced and context-sensitive understanding of screen use rather than a simple interpretation based solely on the number of hours spent using digital devices.

5.20 Final Summary

The major conclusions of the study can be summarised as follows:

1. Screen exposure was widespread among the children included in the study.
2. Most children were reported to have approximately 1–4 hours of daily screen exposure.
3. There was no difference in average screen exposure between the ASD and non-ASD groups.
4. Higher screen exposure was significantly associated with greater Attention Deficits among children with ASD.
5. Higher screen exposure was significantly associated with Sensory and Emotional Dysregulation among children with ASD.
6. The relationship between screen exposure and Social Reciprocity was positive but did not reach conventional statistical significance.

7. Children with ASD demonstrated significantly higher Sensory and Emotional Dysregulation scores than children in the non-ASD group.
8. Attention and Sensory/Emotional Dysregulation domains demonstrated satisfactory to strong internal consistency.
9. The analysis of Item 16 demonstrated the complexity of measuring social behaviour in screen-related contexts.
10. Caregiver responses indicated that screens may function as educational tools, entertainment sources, communication tools, and behavioural regulation strategies.
11. The study support further investigation of screen exposure in ASD using longitudinal designs and objective measures.
12. The study demonstrates associations between screen exposure and selected neurobehavioural outcomes but does not establish causal relationships.

5.21 Concluding Statement

The increasing presence of digital technology in children's lives makes understanding its relationship with neurodevelopmental and behavioural functioning an important area of clinical psychological research. The research contributes to this area by examining screen exposure alongside attention, social reciprocity, and sensory and emotional regulation. The relationship between screen exposure and neurobehavioural functioning is neither uniform nor straightforward. Rather than viewing screen use as an isolated risk factor, it is important to consider the duration, purpose, content, structure, and behavioural context of digital-media use. For children with ASD, this contextual approach may be particularly important because individual differences in attention, sensory processing, social communication, and emotional regulation can influence both the child's interaction with digital media and the child's response when digital activities are introduced or discontinued.

REFERENCES

1. American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). American Psychiatric Publishing.
2. American Psychiatric Association. (2022). Diagnostic and statistical manual of mental disorders (5th ed., text rev.; DSM-5-TR). American Psychiatric Association Publishing.
3. Anderson, D. R., & Subrahmanyam, K. (2017). Digital screen media and cognitive development. *Pediatrics*, 140(Supplement 2), S57–S61.
4. Anderson, C. A., & Dill, K. E. (2000). Video games and aggressive thoughts, feelings, and behavior in the laboratory and in life. *Journal of Personality and Social Psychology*, 78(4), 772–790.
5. Anderson, D. R., Huston, A. C., Schmitt, K. L., Linebarger, D. L., & Wright, J. C. (2001). Early childhood television viewing and adolescent behavior: The recontact study. *Monographs of the Society for Research in Child Development*, 66(1), i–viii, 1–147.
6. Barkley, R. A. (2015). Attention-deficit hyperactivity disorder: A handbook for diagnosis and treatment (4th ed.). Guilford Press.
7. Baron-Cohen, S. (1995). *Mindblindness: An essay on autism and theory of mind*. MIT Press.
8. Baron-Cohen, S., Leslie, A. M., & Frith, U. (1985). Does the autistic child have a “theory of mind”? *Cognition*, 21(1), 37–46.

9. Baron-Cohen, S., Wheelwright, S., Skinner, R., Martin, J., & Clubley, E. (2001). The Autism-Spectrum Quotient (AQ): Evidence from Asperger syndrome/high-functioning autism, males and females, scientists and mathematicians. *Journal of Autism and Developmental Disorders*, 31, 5–17.
10. Bauminger, N., Shulman, C., & Agam, G. (2003). Peer interaction and loneliness in high-functioning children with autism. *Journal of Autism and Developmental Disorders*, 33, 489–507.
11. Bavin, E. L., Prior, M., Reilly, S., Williams, J., & Dalais, C. (2008). The early development of the attention of children with autism spectrum disorder. *Autism*, 12(2), 141–160.
12. Bettencourt, C., Anzalone, S., Chetouani, M., Cohen, D., & Grossard, C. (2024). Have information and communication technologies research for neurodevelopmental disorders improved overtime? A systematic meta-review. *Research in Autism Spectrum Disorders*, 118, 102483.
13. Beyens, I., Valkenburg, P. M., & Piotrowski, J. T. (2018). Screen media use and ADHD-related behaviors: Four decades of research. *Proceedings of the National Academy of Sciences*, 115(40), 9875–9881.
14. Bickham, D. S., & Rich, M. (2006). Is television viewing associated with social isolation? Roles of exposure time, viewing context, and violent content. *CyberPsychology & Behavior*, 9(2), 149–154.
15. Birch, S. A. J., & Bloom, P. (2007). The curse of knowledge in reasoning about false beliefs. *Psychological Science*, 18(5), 382–386.
16. Blumberg, F. C., & Brooks, P. J. (2017). Cognitive and affective development in the context of digital media. *Child Development Perspectives*, 11(4), 242–247.
17. Bölte, S., & Poustka, F. (2005). The recognition of facial expressions in autistic and schizophrenic subjects and their first-degree relatives. *International Journal of Neural Systems*, 15(4), 213–220.
18. Bonnot, O., Herrera, P., & Tordjman, S. (2014). Autism spectrum disorders and emotion regulation. *European Child & Adolescent Psychiatry*, 23, 1045–1050.
19. Bölte, S., & Poustka, F. (2006). The relationship between general cognitive functioning and restricted, repetitive behavior in individuals with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, 36, 845–854.
20. Brockmeyer, T., Holtforth, M. G., Bents, H., & Herzog, W. (2012). The relationship between emotion regulation and psychopathology in children and adolescents. *Journal of Child Psychology and Psychiatry*, 53, 1089–1099.
21. Brown, A., & Smolenaers, E. (2016). Parents' interpretations of screen time recommendations for children. *Journal of Children and Media*, 10(4), 386–402.
22. Caballero-Julia, D., Martín-Lucas, J., & Andrade-Silva, L. E. (2024). Unpacking the relationship between screen use and educational outcomes in childhood: A systematic literature review. *Computers & Education*, 215, 105049.
23. Carter, M., & Pelphrey, K. A. (2008). Understanding social cognition in autism spectrum disorder. *Child and Adolescent Psychiatric Clinics of North America*, 17, 205–221.
24. Case-Smith, J., Weaver, L. L., & Fristad, M. A. (2015). A systematic review of sensory processing interventions for children with autism spectrum disorders. *Autism*, 19(2), 133–148.
25. Christakis, D. A., Ramirez, J. S. B., & Ferguson, S. M. (2018). How early media exposure may affect cognitive development. *Pediatrics*, 142(Supplement 1), S18–S21.
26. Christakis, D. A., Zimmerman, F. J., DiGiuseppe, D. L., & McCarty, C. A. (2004). Early television exposure and subsequent attentional problems in children. *Pediatrics*, 113(4), 708–713.

27. Clements, D. H., & Sarama, J. (2014). Learning and teaching early math: The learning trajectories approach. Routledge.
28. Constantino, J. N., & Gruber, C. P. (2012). Social Responsiveness Scale (2nd ed.). Western Psychological Services.
29. Courchesne, E., Campbell, K., & Solso, S. (2011). Brain growth across the life span in autism: Age-specific structure. *Brain Research*, 1380, 138–145.
30. Craig, F., Margari, F., Legrottaglie, A. R., Palumbi, R., de Giambattista, C., & Margari, L. (2016). A review of executive function deficits in autism spectrum disorder and attention-deficit/hyperactivity disorder. *Neuropsychiatric Disease and Treatment*, 12, 1191–1202.
31. Dahl, R. E. (2004). Adolescent brain development: A period of vulnerabilities and opportunities. *Annals of the New York Academy of Sciences*, 1021, 1–22.
32. Dawson, G., Rogers, S., Munson, J., Smith, M., Winter, J., Greenson, J., Donaldson, A., & Varley, J. (2010). Randomized, controlled trial of an intervention for toddlers with autism: The Early Start Denver Model. *Pediatrics*, 125(1), e17–e23.
33. Dellapiazza, F., Vernhet, C., Blanc, N., Miot, S., Schmidt, R., & Baghdadli, A. (2018). Links between sensory processing, adaptive behaviours, and attention in children with autism spectrum disorder: A systematic review. *Psychiatry Research*, 270, 78–88.
34. Duch, H., Fisher, E. M., Ensari, I., & Harrington, A. (2013). Screen time use in children under 3 years old: A systematic review of prevalence and recommendations. *Archives of Disease in Childhood*, 98(12), 969–975.
35. Dunn, W. (1999). The sensory profile: User's manual. Psychological Corporation.
36. Dunn, W. (2001). The sensations of everyday life: Empirical, theoretical, and pragmatic considerations. *American Journal of Occupational Therapy*, 55(6), 608–620.
37. Dunn, W. (2007). Supporting children to participate successfully in everyday life by using sensory processing knowledge. *Infants & Young Children*, 20(2), 84–101.
38. Durkin, M. S., Maenner, M. J., Baio, J., Christensen, D., Daniels, J., Fitzgerald, R., Imm, P., Lee, L. C., Schieve, L. A., Van Naarden Braun, K., Wingate, M. S., & Yeargin-Allsopp, M. (2017). Autism spectrum disorder among US children: A review of surveillance study. *Pediatrics*, 140(Supplement 2), S41–S48.
39. Emerson, A., Dearden, J., & Bream, V. (2020). Screen use and children's emotional and behavioural functioning. *Journal of Child Health Care*, 24, 1–15.
40. Evans, M. A., & Shaw, D. (2008). Home literacy activities and their influence on children's language and literacy development. *Early Childhood Research Quarterly*, 23(2), 186–197.
41. Fombonne, E. (2009). Epidemiology of pervasive developmental disorders. *Pediatric Research*, 65, 591–598.
42. Fombonne, E. (2018). Editorial: The rising prevalence of autism. *Journal of Child Psychology and Psychiatry*, 59(7), 717–720.
43. Foss-Feig, J. H., Heacock, J. L., & Cascio, C. J. (2012). Tactile responsiveness patterns and their association with core features in autism spectrum disorders. *Research in Autism Spectrum Disorders*, 6(1), 337–344.
44. Frith, U. (2003). Autism: Explaining the enigma (2nd ed.). Blackwell Publishing.
45. Garon, N., Bryson, S. E., & Smith, I. M. (2008). Executive function in preschoolers: A review using an integrative framework. *Psychological Bulletin*, 134(1), 31–60.

46. Geurts, H. M., Corbett, B. A., & Solomon, M. (2009). The paradox of cognitive flexibility in autism. *Trends in Cognitive Sciences*, 13(2), 74–82.
47. Gillberg, C. (1990). Autism and pervasive developmental disorders. *Journal of Child Psychology and Psychiatry*, 31(1), 99–119.
48. Gomez, C. R., Baird, S., & Buck, C. (2003). Evaluating the cognitive, language, and social functioning of children with autism. *Journal of Autism and Developmental Disorders*, 33, 25–36.
49. Greenfield, P. M. (2014). *Mind and media: The effects of television, video games, and computers*. Psychology Press.
50. Happé, F., & Frith, U. (2006). The weak coherence account: Detail-focused cognitive style in autism spectrum disorders. *Journal of Autism and Developmental Disorders*, 36, 5–25.
51. Harris, P. L. (2000). *The work of the imagination*. Blackwell.
52. Hinkley, T., Verbestel, V., Ahrens, W., Lissner, L., Molnár, D., Moreno, L. A., Pigeot, I., Pohlabein, H., Reisch, L. A., Santaliestra-Pasías, A. M., & De Henauw, S. (2014). Early childhood electronic media use as a predictor of poorer well-being: A prospective cohort study. *JAMA Pediatrics*, 168(5), 485–492.
53. Hirsh-Pasek, K., Zosh, J. M., Golinkoff, R. M., Gray, J. H., Robb, M. B., & Kaufman, J. (2015). Putting education in “educational” apps: Lessons from the science of learning. *Psychological Science in the Public Interest*, 16(1), 3–34.
54. Hobson, R. P. (1993). *Autism and the development of mind*. Psychology Press.
55. Hutton, J. S., Dudley, J., Horowitz-Kraus, T., DeWitt, T., & Holland, S. K. (2020). Associations between screen-based media use and brain white matter integrity in preschool-aged children. *JAMA Pediatrics*, 174(1), e193869.
56. Hutton, J. S., Huang, G., Sahay, R. D., & Dudley, J. (2019). Role of digital media in early childhood development. *Pediatrics*, 143(Supplement 1), S40–S47.
57. Johnson, C. P., & Myers, S. M. (2007). Identification and evaluation of children with autism spectrum disorders. *Pediatrics*, 120(5), 1183–1215.
58. Johnson, G. M., & Puplampu, K. P. (2008). A conceptual framework for understanding the effect of internet use on child development. *Canadian Journal of Learning and Technology*, 34(1), 1–14.
59. Kanner, L. (1943). Autistic disturbances of affective contact. *Nervous Child*, 2, 217–250.
60. Kaye, L. K., & Johnson, D. (2020). Digital media use and children's social development. *Child Development Perspectives*, 14, 1–7.
61. Kim, J. W., Stewart, L., & Kim, J. H. (2018). Screen exposure and behavioural functioning in children with autism spectrum disorder. *Research in Autism Spectrum Disorders*, 52, 20–29.
62. 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.
63. Kochanska, G., Murray, K. T., & Harlan, E. T. (2000). Effortful control in early childhood: Continuity and change, antecedents, and implications for social development. *Developmental Psychology*, 36(2), 220–232.
64. Kuhl, P. K., Tsao, F. M., & Liu, H. M. (2003). Foreign-language experience in infancy: Effects of short-term exposure and social interaction on phonetic learning. *Proceedings of the National Academy of Sciences*, 100(15), 9096–9101.
65. 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.

66. Leekam, S. R., Prior, M. R., & Uljarevic, M. (2011). Restricted and repetitive behaviors in autism spectrum disorders: A review of research in the last decade. *Psychological Bulletin*, 137(4), 562–593.
67. Lissak, G. (2018). Adverse physiological and psychological effects of screen time on children and adolescents: Literature review and case study. *Environmental Research*, 164, 149–157.
68. Lord, C., Elsabbagh, M., Baird, G., & Veenstra-VanderWeele, J. (2018). Autism spectrum disorder. *The Lancet*, 392(10146), 508–520.
69. Lord, C., Rutter, M., & Le Couteur, A. (1994). Autism Diagnostic Interview-Revised: A revised version of a diagnostic interview for caregivers of individuals with possible pervasive developmental disorders. *Journal of Autism and Developmental Disorders*, 24, 659–685.
70. Lord, C., Rutter, M., Goode, S., Heemsbergen, J., Jordan, H., Mawhood, L., & Schopler, E. (1989). Autism Diagnostic Observation Schedule: A standardized observation of communicative and social behavior. *Journal of Autism and Developmental Disorders*, 19, 185–212.
71. MacMahan, C. R., & Carter, A. S. (2014). Social development in autism spectrum disorder. *Child and Adolescent Psychiatric Clinics of North America*, 23, 329–343.
72. Mazurek, M. O., Engelhardt, C. R., & Toth, K. (2016). Television, video game and social media use among children with ASD. *Journal of Autism and Developmental Disorders*, 46, 1755–1768.
73. McCleery, J. P., Elliott, N. A., Sampanis, D. S., & Stefanidou, C. A. (2013). Motor development and social communication in autism. *Research in Autism Spectrum Disorders*, 7, 133–142.
74. McDaniel, B. T., & Radesky, J. (2018). Technoference: Parent distraction with technology and associations with child behavior problems. *Child Development*, 89(1), 100–109.
75. Miller, L. J., Anzalone, M. E., Lane, S. J., Cermak, S. A., & Osten, E. T. (2007). Concept evolution in sensory integration: A proposed nosology for diagnosis. *American Journal of Occupational Therapy*, 61(2), 135–140.
76. Montag, C., Kannenberg, I., & Becker, B. (2016). Digital media use and psychological well-being. *International Journal of Environmental Research and Public Health*, 13, 1–13.
77. Mundy, P., Sigman, M., Ungerer, J., & Sherman, T. (1986). Defining the social deficits of autism: The contribution of non-verbal communication measures. *Journal of Child Psychology and Psychiatry*, 27(5), 657–669.
78. Mundy, P., Sigman, M., & Kasari, C. (1990). A longitudinal study of joint attention and language development in autistic children. *Journal of Autism and Developmental Disorders*, 20, 115–128.
79. Narzisi, A. (2019). Handle the autism spectrum condition during coronavirus (COVID-19) stay at home period: Ten tips for helping parents and caregivers of young children. *Brain Sciences*, 10(4), 207.
80. Nielsen, R. K., Schröder, K. C., & Tosun, J. (2021). The relationship between children's screen use and parental practices. *Media Psychology*, 24, 1–23.
81. Nikken, P., & Schols, M. (2015). How and why parents guide the media use of young children. *Journal of Child and Family Studies*, 24, 3423–3435.
82. Noble, K. G., Houston, S. M., Brito, N. H., Bartsch, H., Kan, E., Kuperman, J. M., Akshoomoff, N., Amaral, D. G., Bloss, C. S., Libiger, O., Schork, N. J., Murray, S. S., Casey, B. J., Chang, L., Ernst, T. M., Frazier, J. A., Gruen, J. R., Kennedy, D. N., Van Zijl, P., ... Sowell, E. R. (2015). Family income, parental education and brain structure in children and adolescents. *Nature Neuroscience*, 18, 773–778.

83. Ophir, Y., Rosenberg, H., Tikochinski, R., Dalyot, S., & Lipshits-Braziler, Y. (2023). Screen time and autism spectrum disorder: A systematic review and meta-analysis. *JAMA Network Open*, 6(12), e2346775.
84. Ozonoff, S., & Jensen, J. (1999). Brief report: Specific executive function profiles in three neurodevelopmental disorders. *Journal of Autism and Developmental Disorders*, 29, 171–177.
85. Papalia, D. E., & Martorell, G. (2021). *Experience human development* (14th ed.). McGraw-Hill.
86. Parsons, S., Yuill, N., Good, J., & Brosnan, M. (2015). Innovative technologies for autism: Critical reflections on digital technology. *Journal of Autism and Developmental Disorders*, 45, 1–6.
87. Pempek, T. A., Kirkorian, H. L., & Anderson, D. R. (2014). The effects of background television on the quantity and quality of child-directed speech by parents. *Journal of Children and Media*, 8(3), 278–295.
88. Piaget, J. (1952). *The origins of intelligence in children*. International Universities Press.
89. Posner, M. I., & Petersen, S. E. (1990). The attention system of the human brain. *Annual Review of Neuroscience*, 13, 25–42.
90. Prizant, B. M., Wetherby, A. M., Rubin, E., Laurent, A., & Rydell, P. (2006). *The SCERTS model: A comprehensive educational approach for children with autism spectrum disorders*. Brookes Publishing.
91. Radesky, J., 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.
92. Radesky, J., Kistin, C. J., Zuckerman, B., Nitzberg, K., Gross-Sable, C., Kaplan-Sanoff, M., Augustyn, M., & Silverstein, M. (2014). Patterns of mobile device use by caregivers and children during meals in fast food restaurants. *Pediatrics*, 133(4), e843–e849.
93. Radesky, J., Peacock-Chambers, E., Zuckerman, B., & Silverstein, M. (2016). Use of mobile technology to calm upset children: Associations with social-emotional development. *JAMA Pediatrics*, 170(4), 397–399.
94. Reichow, B., Volkmar, F. R., & Cicchetti, D. V. (2008). Development of the evaluative method for evaluating and determining evidence-based practices in autism. *Journal of Autism and Developmental Disorders*, 38, 1311–1319.
95. Reilly, C., & O'Connell, C. (2018). Digital technology and childhood development. *Child: Care, Health and Development*, 44, 1–8.
96. Rideout, V. (2017). *The Common Sense census: Media use by kids age zero to eight*. Common Sense Media.
97. Rutter, M. (1978). Diagnosis and definition of childhood autism. *Journal of Autism and Childhood Schizophrenia*, 8, 139–161.
98. Rutter, M., Bailey, A., & Lord, C. (2003). *The Social Communication Questionnaire*. Western Psychological Services.
99. Sasson, N. J., & Morrison, K. E. (2019). First impressions of adults with autism improve with diagnostic disclosure and increased autism knowledge of peers. *Autism*, 23(1), 50–59.
100. Schmidt, M. E., Pempek, T. A., Kirkorian, H. L., Lund, A. F., & Anderson, D. R. (2008). The effects of background television on the toy play behavior of very young children. *Child Development*, 79(4), 1137–1151.
101. Schreibman, L., Dawson, G., Stahmer, A. C., Landa, R., Rogers, S. J., McGee, G. G., Kasari, C., Ingersoll, B., Kaiser, A. P., Bruinsma, Y., McNerney, E., Wetherby, A., & Halladay, A. (2015).

- Naturalistic developmental behavioral interventions: Empirically validated treatments for autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 45, 2411–2428.
102. Shane, H. C., Laubscher, E., Schlosser, R. W., Flynn, S., Sorce, J., & Abramson, J. (2012). Applying technology to visually support individuals with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, 42, 1228–1235.
 103. Sigman, M., & Ruskin, E. (1999). Continuity and change in the social competence of children with autism, Down syndrome, and developmental delays. *Monographs of the Society for Research in Child Development*.
 104. Simpson, R. L. (2005). Evidence-based practices and students with autism spectrum disorders. *Focus on Autism and Other Developmental Disabilities*, 20(3), 140–149.
 105. Srinivasan, S. M., & Bhat, A. N. (2013). A review of “music and movement” therapies for children with autism. *Frontiers in Integrative Neuroscience*, 7, 1–15.
 106. Stevens, T., & Pivnick, L. (2019). Digital media and the development of social cognition. *Current Opinion in Psychology*, 36, 1–6.
 107. Stiegler, L. N., & Davis, R. (2010). Understanding the role of augmentative and alternative communication for individuals with autism spectrum disorders. *Perspectives on Augmentative and Alternative Communication*, 19, 1–10.
 108. Taylor, G., Sala, G., Kolak, J., Gerhardstein, P., & Lingwood, J. (2024). Does adult-child co-use during digital media use improve children's learning aged 0–6 years? A systematic review with meta-analysis. *Educational Research Review*, 44, 100614.
 109. Trembath, D., Balandin, S., & Togher, L. (2010). Vocabulary selection for Australian children who use augmentative and alternative communication. *Journal of Intellectual & Developmental Disability*, 35, 1–11.
 110. Tremolada, M., Taverna, L., & Bonichini, S. (2019). Which factors influence parents' use of digital media with young children? *Child & Youth Care Forum*, 48, 1–17.
 111. Tseng, M. H., Henderson, A., & Chow, S. M. (2018). Sensory processing and behavioural functioning in children with autism spectrum disorder. *American Journal of Occupational Therapy*, 72, 1–10.
 112. Valkenburg, P. M., & Peter, J. (2011). Online communication among adolescents: An integrated model of its attraction, opportunities, and risks. *Journal of Adolescent Health*, 48(2), 121–127.
 113. Vasa, R. A., Carroll, L. M., Nozzolillo, A. A., Mahajan, R., Mazurek, M. O., Bennett, A. E., Wink, L. K., & Bernal, M. P. (2014). A systematic review of treatments for anxiety in youth with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, 44, 321–337.
 114. Vernon, T. W., Miller, A. R., Ko, J. A., & McGinnis, S. (2019). Social and emotional development in autism spectrum disorder. *Child and Adolescent Psychiatric Clinics of North America*, 28, 1–15.
 115. Vismara, L. A., & Rogers, S. J. (2010). Behavioral treatments in autism spectrum disorder: What do we know? *Annual Review of Clinical Psychology*, 6, 447–468.
 116. Wang, B., Li, X., & Lu, J. (2022). Screen time and behavioral outcomes among children with autism spectrum disorder: A systematic review. *Research in Autism Spectrum Disorders*, 93, 101936.
 117. Warren, Z., McPheeters, M. L., Sathe, N., Foss-Feig, J. H., Glasser, A., & Veenstra-VanderWeele, J. (2011). A systematic review of early intensive intervention for autism spectrum disorders. *Pediatrics*, 127(5), e1092–e1101.

118. World Health Organization. (2019). International classification of diseases for mortality and morbidity statistics (11th Revision). World Health Organization.
119. World Health Organization. (2020). Guidelines on physical activity, sedentary behaviour and sleep for children under 5 years of age. World Health Organization.
120. World Health Organization. (2023). Autism. World Health Organization.
121. Yuan, G., Zhu, Z., Guo, H., Yang, H., Zhang, J., Zhang, K., Zhang, X., Lu, X., Du, J., Shi, H., Jin, G., Hao, J., Sun, Y., Su, P., & Zhang, Z. (2026). Screen time and autism spectrum disorder: A comprehensive systematic review of risk, usage, and addiction. *Journal of Autism and Developmental Disorders*, 56(4), 1573–1587.
122. Zablotsky, B., Black, L. I., Maenner, M. J., Schieve, L. A., & Blumberg, S. J. (2015). Estimated prevalence of autism and other developmental disabilities following questionnaire changes in the 2014 National Health Interview Survey. *National Health Statistics Reports*, 87, 1–20.
123. Zuckerman, B., & Augustyn, M. (2011). Autism spectrum disorder in the early childhood years. *Pediatrics in Review*, 32, 393–401.
124. Zwaigenbaum, L., Bauman, M. L., Choueiri, R., Kasari, C., Carter, A., Granpeesheh, D., Mailloux, Z., Smith Roley, S., Wagner, S., & Pierce, K. (2015). Early identification and interventions for autism spectrum disorder: Executive summary. *Pedi*