AN EVIDENCE-BASED APPROACH TO TECHNOLOGY FOR IDENTIFYING INTERESTS AND IMPROVING BEHAVIOR IN YOUNG CHILDREN

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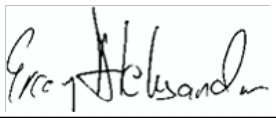
APPROVED BY 

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I am really grateful for everyone's contributions to the completion of this project and the study on the effects of technology on interest recognition and behavioral improvement in children.

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I acknowledge that this research could not have been accomplished without the collaborative efforts and contributions of all participants. I am sincerely grateful for their invaluable support. I hope this research will contribute to the understanding and advancement of using technology for interest recognition and behavior improvements in children.

ABSTRACT

AN EVIDENCE-BASED APPROACH TO TECHNOLOGY FOR IDENTIFYING INTERESTS AND IMPROVING BEHAVIOR IN YOUNG CHILDREN

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Growth refers to the progressive increase in a child's physical attributes (weight, height, etc.), while development involves the progressive acquisition of various skills. Children begin learning from birth, and their learning journey represents a developmental process throughout life. Growth and development are continuous processes. Kids respond to receptive vernacular and develop expressive language as per their ambiance. Technology has a vast and frequent impact on the growth of children. Consequently, understanding technology's role in these small kids' lives will help them develop interest recognition and morphed behavior. This surge in use has led to much attention on the consequences of technology utilization and how it impacts kids' brains and social, emotional, cognitive, and physical development.

This research dissertation studies the use of technology in ascertaining the interests of infants and children, as well as improving their behavior. The research advances in the provision of behavioral analytical techniques and acceptances of new-borns and children in different categories and subcategories with the aid of technology. The system would involve machine learning and analysis of data in order to understand the interest of infants and children and allow parents and other caregivers to engage them in activities or interventions around the areas of interest which are beneficial for their growth. The research also looks into the correlations between various primary and secondary categories in an attempt to identify the possibilities of cross-training that enhance cognition and psychomotor development of infants and young children.

Tied to the objectives of this study is the understanding of how children's lives are influenced through the use of scientific innovations. The increase in technology has raised concern with regards to the impact it has on the brain development of children and on their emotions, social and cognitive aspects, as well as physical development.

The technology use has to be easy and effective in interest identification. The results of this study may be useful for parents, guardians, and teachers, so they are able to make informed decisions regarding the introduction of technology to infants and preschool-aged children. By providing recommendations on the optimal use of technology, the project seeks to improve knowledge on infant health and parenting.

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CHAPTER I:
INTRODUCTION

1.1 Introduction

The introduction offers a summary of identifying the interests of new-borns and children and fostering their behavioral enhancement. It underscores the difficulties parents and caregivers have in understanding and addressing the preferences and needs of new-borns and children. The introduction delineates the prospective advantages of using technology to facilitate this procedure and establishes the study goals.

This study enhances our comprehension of research in domestic settings by highlighting the lack of studies that provide a comprehensive account of children's perceptions and experiences about technology in relation to their interests. The research paper addresses a significant gap in understanding children's perceptions and experiences within home environments, particularly about technology and interest recognition. The paper highlights technology as a tool that can effectively support children's learning, emphasizing the need for a comprehensive framework to acknowledge interest recognition and behavior improvement in early learners.

As a researcher, the focus is on exploring how children perceive and engage with technology in their home environments. The study examined how children between the ages of 1 and 10 interact with toys and technology, both for play and educational purposes, and revealed that technology can support effective learning. To nurture children's development in a positive way through technology, it is beneficial for parents to involve them in conversations on various subjects, encourage open expression of their thoughts, and challenge them to develop independent thinking and goal-setting skills. Additionally, recognizing their good decisions and providing guidance in reassessing less effective ones can contribute to their growth. The research methodology used in this study prioritized the selection of appropriate methods to gain a deeper understanding of family interactions and activities and their influence on children's learning. The framework employed in this research shaped the interpretation of data, enabling a comprehensive exploration of the complex interplay of practices, values, attitudes, and technology interventions.

These findings not only contribute to academic knowledge but also offer a practical foundation for the development of digital products, platforms, and services tailored to the early learning and parenting markets. Technology developers, EdTech companies, and entrepreneurs can leverage the study's insights to build intelligent applications, adaptive learning interfaces, and interest-matching tools for children. There is also scope for commercializing digital dashboards, behavior-monitoring toys, or parental guidance apps that embed this research into their functionality.

Methods that align with this approach are critical for making informed decisions about the data types that help us delve deeper into family interactions and activities and, thus, children's learning. The framework also shaped our data interpretations, allowing us to clarify the intricate practices, values, attitudes, and their interactions with technology.

Kids acquire many skills as they grow, such as controlling urine and stool, which rely mainly on the level of maturity of the children's nervous system and brain. Jean Piaget's theory of cognitive development suggested that children's life consists of four different stages of learning. His theory not only aims to comprehend how children gain knowledge but also seeks to understand the essence of intelligence. Further, behaving appropriately on-premises and in school results from a sophisticated interaction between the child's physical and intellectual (cognitive) development, health, temperament, and relationships with parents, teachers, and caregivers. It is a newer phenomenon emphasizing brain and body-based implications of technology use among children and adults.

Kids are born explorers and given the right ambiance to aspire, learn, and grow; their potential is limitless, and technology plays a vital role in their learning process. Children actively engaged in the learning process, resembling young scientists as they conducted experiments, observed, and discovered the world, facilitated by technological advancements. Children continuously acquire new knowledge, expand it, and revise their previous ideas to integrate fresh information as they engage with their surroundings. Learning occurs naturally when kids are having fun, and this is a playful learning method. Various activities and technologies are crucial in monitoring children's progress and outcomes in today's ever-evolving digital landscape. Practical communication skills encompassing verbal and non-

verbal expressions are essential for eliciting a child's interests and creating meaningful and lasting moments. Simple messages can be effectively conveyed through verbal and non-verbal suggestions, harnessing the power of interactive technology, mobile applications, websites in multiple languages, and parenting practices to promote positive behavioral development in children.

This landscape presents a unique opportunity for businesses and innovators to design age-appropriate content, responsive platforms, and intelligent feedback systems that align with children's developmental stages. Early intervention tools, personalized educational games, or even voice-based AI companions grounded in child psychology could be built based on this study. By embedding evidence-based frameworks into commercial offerings, companies can both improve outcomes for children and establish themselves in a growing global EdTech market.

Today, technological advancement also promotes learning and development, parenting practice, helping children acquire behavioral self-control, and enhancing the growth and wellbeing of children and their families.

Utilizing mobile applications, websites with multilingual support, interactive technologies, and positive parenting practices can significantly improve children's behavioral development. From a young age, children display a natural affinity for technology, making notable strides in preparing for their educational journey, future careers, and innovative thinking.

Just as globalization and the internet influence our daily lives, they also impact children's lives. To fully grasp the implications of technology on children, it is crucial to delve into available research to identify trends, gaps, and future directions for this field of study.

They effortlessly navigate digital platforms, making significant strides in preparing themselves for future endeavours, including school, careers, and innovative pursuits. The prevalence of globalization and the omnipresence of the internet further shape the lives of children, with news and influences from around the world impacting their daily experiences. To fully grasp the holistic implications of technology on children's lives, it becomes imperative to delve into existing research, uncover emerging trends, identify gaps, and chart future directions for further exploration in this field.

At an early age, children are tech-savvy; they make significant progress in preparing for school, future careers and innovations, and more. Just as in today's scenario, where globalization and the internet dominate the world and news from overseas impacts our daily lives, so do the kids' lives. To understand the implications of Technology on children more holistically, it is essential to explore the existing research to uncover trends, gaps, and future work. Parents and guardians, as well as education and child health professionals, may be uncertain as to how to structure kids' screen time, how this should affect their daily lives, and how to interpret the latest literature on these topics.

It is critical for guardians to comprehend the influence of technology on their children and rationalize the amount of time children spend in front of the screen. Guidelines for technology use may assist parents, guardians, as well as educational and child health professionals make informed decisions about children's screen time and its influence on their daily lives. In such a context, technology may boost almost every aspect of a growing and developing child, but only if it is regulated and used the right way.

It, therefore, supports the explanation of how the child's development should be enhanced, through education and development of the child. Where technology and education supports the child growth. However, there is a need to set rules in regard to technology and its use in order to ensure that the positives are harnessed and the negatives are avoided. This research highlights significant points as regards the technology flow in children whereby the children will be active and the behaviors shown will be constructive.

In the business landscape, this also opens the door for the development of responsible tech policies, ethical AI for children, and co-branded educational programs backed by research. Companies that offer products rooted in developmental science will have a competitive advantage with parents and schools seeking trusted solutions. Moreover, digital start-ups can use this evidence base to create differentiated platforms that align with global priorities in education equity, child health, and early learning innovation.

1.2 Research problems

The paper discusses insufficient research on how children perceive and experience technology in home environments. The study focuses on children from one year to 10 years of age playing with toys and learning with technology in family settings and how technology can improve children's interest, recognition, and behavior. The study also highlights the importance of suitable methods to collect data on family interactions and activities. Children acquire different skills as they grow up, and technology plays a crucial role in their cognitive development. Parents can encourage positive and healthy cognitive growth in their children by including them in discussions about various topics, fostering their independent thinking, and assisting them in setting goals. Children learn naturally when having fun; technology has allowed them to interact with the world and acquire new knowledge. However, there is a need for more research on the implications of technology on children and how it should be structured in their daily lives. Clear guidelines on technology can help parents, guardians, and professionals in education and child health to develop interest recognition and behavior improvement.

When conducting the research, the following problems related to kids were identified: Learning Activities for Kids:

- Selecting appropriate online activities for toddlers that supports their development and education becomes challenging.
- There is an apparent need for guidance to identify activities that are suitable for the child’s age and stimulating enough for growth.
- There is a lack of guidance in selecting activities that are appropriate to the child in consideration of his/her interests and developmental stage.

Sports Classes for Kids:

- It is particularly the case in certain regions where children encounter challenges in getting proper sports coaching services.
- Instructors also have difficulties in procuring places where appropriate classes are available for diverse age brackets and also are cost friendly.

- More indications on the advantages, the dangers and restrictions related to sporting activities for children are pertinent.

Reading Classes for Kids:

- There aren't quite enough hours in a day for all parents to read with their children, so someone has to help them.
- The task of finding reading lessons which are interesting to a child as well as promoting the child's total development is a task which is full of stresses.
- Parents do not have the resources required to help in developing their child's love for reading and gain literacy skills.

Cooking Classes for Kids:

- Engaging and participatory online professional courses in cooking for young people are rather deficient.
- There seems to be the challenge of locating age-appropriate geography safety and instructional cooking programs.
- Parents require assistance in promoting their child's interests in cooking and parenting skills.

These issues underscore the difficulties parents have in identifying appropriate and stimulating activities for their children's education, physical growth, and skill development. Resolving these difficulties necessitates offering accessible alternatives, information, and resources to assist parents in making educated choices about their children's growth and development.

1.3 Purpose of Research

This thesis presents the paper "Technology for Evidence Infants Interest Recognition and Behavior Improvement" in correlation with the play and learning activities of children aged from 1-10 years old, making use of toys and technology with a focus on the domestic context. The idea is to create a framework for observing and recognition of the child behaviour and interest when working with smaller devices that can be expected to develop their imagination. The study stresses the importance of considering what children regard and how they are

engaged with technology when it is in their home. The initiative attempts to look for effective ways of engaging children with devices that enhance their learning and development given their natural urge and exploration of their environment.

This study explores how technology is, in essence, development and interest recognition of the child, particularly interest identification and behavioral improvement of first learners. It attempts to deepen our understanding in relation to research conducted in the household context by emphasizing the lack of further work along those lines that would consider the child's view and experiences of using technology in their homes.

The study seeks to understand how technology can be employed optimally for equity in accessing education for all children and as tools that assist in cognitive development. The study examines the issues involved in using different family interaction approaches in a roundabout way of focusing children's brain development in the process. The goal is to offer guidelines to parents, caregivers, teachers, and children's health practitioners regarding screen time limitations for children, review available literature regarding the effect of technology on children, and develop appropriate parenting styles for proper behavioral development of children.

The study aims to provide practical guidelines for parents, guardians, educators, and child health professionals on structuring children's screen time, interpreting current literature on technology's impact on youth, and developing parenting strategies that promote positive behavioral development. The research highlights four essential principles for using technology in children's education and growth: fostering autonomous thinking, nurturing critical analysis, setting goals, and re-evaluating poor choices. This initiative aims to provide uniform guidelines for the integration of technology in children's education and to promote interest recognition and behavioral enhancement in early learners.

From a business standpoint, this research also opens a path for the development of child-focused digital products, mobile applications, and services rooted in behavioral science and interest recognition. It sets the foundation for EdTech start-ups, parenting platforms, paediatric tech solutions, and content creators to craft offerings that improve child development outcomes while addressing modern market demands. Companies building digital experiences for young

children can benefit from the insights and frameworks established here, ensuring that the products they develop are evidence-based, ethically grounded, and capable of driving both learning and engagement.

1.3.1 Aims

1. Understand Early Digital Engagement

- Investigate how often, why, and when children aged between 0 and 6 years utilize digital technologies.
- Examine the effects of digitization in early ages on cognitive as well as motor skills development of children.

2. Examine Longitudinal Effects

- Engage in long-term studies to assess the effects that early exposure of children to technology has on their cognitive as well as their gross motor skills.
- Research how early digital interaction might impact the trajectory of a child's development progressively over periods of time.

3. Balance Digital and Physical Play

- Examine the relationships among digital and physical play in the context of early childhood development.
- Provide ways that allow the integration of digital play and physical play for the consideration of multiple development.

4. Address Diverse Experiences

- Investigate how increased interaction with a particular culture or a particular socio-economic facet contributes to young children's consumption of digital media.
- Analyse how the effect of the same use of digital technology differs among various groups.

5. Enhance Parental Mediation

- Analyse the approaches that parents take in regulating the internet usage of their children.
- Investigate how children's usage of technological gadgets is influenced by their parents' proficiency in technology.
- Construct frameworks and materials to help parents in properly controlling the online behaviors of their children.

6. Improve Educational Policies

- Formulate and execute educational policies which incorporate computer literacy into preschool education.
- Turn attention to issues of bridging the digital divide to guarantee that no child goes without access to technology.
- Evaluate the results of such initiatives in the context of ensuring the right use of technology by very young children.

7. Develop Practical Recommendations

- Involve professionals, parents and policy makers in providing best practices that enable children to use technology positively.
- Highlight strategies to improve children's brain and physical development without over reliance on either digital or real world.

8. Promote Holistic Development

- Utilize information communication technologies to promote and enhance the comprehensive development of the young children's cognitive, motor, social as well as the emotional aspects.
- Support the creation and use of interesting and useful children's digital materials which aid children in expressing themselves, gaining knowledge and interacting socially.

This study will improve comprehension of young children's early digital engagement and provide valuable insights for promoting their cognitive and motor development in the digital

age. In addition, these aims align with business opportunities that focus on early learner analytics, interest-matching systems, and AI-powered parenting apps. By addressing these developmental themes with digital tools, businesses can introduce meaningful features into their products such as adaptive content delivery, behavior-based learning paths, and engagement dashboards thereby transforming theoretical goals into commercially viable innovations.

1.3.2 Objectives

1. Characterize Early Childhood Digital Interactions.

- Conduct thorough assessments of the digital devices and apps used by children aged 0-6.
- Analyse the contexts and environments where young children engage with digital gadgets.

2. Identify Developmental Outcomes.

- Examine the immediate and long-term cognitive, motor, and socio-emotional developmental effects of early digital device use.
- Evaluate the impact of different types of digital content (educational vs. entertainment) on children's developmental milestones.

3. Investigate Parental Roles and Strategies.

- Examine the roles of parents in regulating their children's digital engagements.
- Assess the effectiveness of various parenting strategies in fostering safe and positive digital interactions.

4. Address Digital Inequalities.

- Identify socioeconomic factors that influence access to and use of digital devices among young children.
- Devise strategies to reduce digital inequities and ensure equitable access to high-quality digital resources across diverse demographics.

5. Promote Digital Literacy in Early Education.

- Integrate digital literacy into early childhood education curricula to prepare children for a digital future.

- Guide educators on effective strategies for incorporating digital resources into early learning environments.

6. Understand the Impact on Physical Development

- Analyse the relationship between screen time and physical activity, focusing on its effects on motor skill development.
- Promote a balance between digital use and physical exercise to enhance overall health.

7. Enhance Digital Content for Development.

- Encourage the creation and dissemination of high-quality, developmentally appropriate digital content.
- Facilitate collaboration among content creators, educators, and child development experts to deliver beneficial digital materials.

8. Develop Parental Support Programs.

- Create educational programs and resources to improve parents' digital literacy and support their children's healthy digital engagement.
- Implement awareness campaigns to educate parents on the risks and benefits of digital devices for young children.

9. Policy Recommendations for Digital Integration.

- Formulate policies for the secure and effective integration of digital technology in early childhood settings.
- Promote the development of regulations that safeguard young children from online risks while encouraging beneficial digital engagement.

10. Foster Interdisciplinary Research.

- Encourage multidisciplinary collaboration among experts in child development, education, psychology, and digital media.
- Promote ongoing research to stay updated on the rapidly changing digital landscape and its effects on young children.

These objectives can guide companies developing early learning software, parental advisory platforms, and policy-aligned EdTech programs. Enterprises can use this structure to

ensure their solutions align with global educational standards and developmental health benchmarks while unlocking commercial potential through scalable digital services.

1.4. Significance of the Study

Technology has affected the modern child over the past few decades, and the child is growing to love so many things technology-related from early ages. Touchscreen devices alongside other interactive children learning tools can be argued to have positive impacts on a child's educational experience as well as their mental growth. However, it must be noted that technology should be used in a controlled manner in order to enforce its positive benefits in a child's growth. This research thesis claims the importance of understanding how a young child's interaction with the technology works in order to ensure its potential benefits would be used to the fullest.

Developmental research presents unique challenges, and most of the studies are observing improvements in infant behavior; therefore, researchers present appropriate approaches embracing suitable experimental designs to investigate how these characteristics were transformed.

The significance of this research is based on analysing how Infants develop interest recognition and behavior changes with the evidence of Technology. Moreover, what is the role of parents in guiding their Infants to use technology effectively for their Interest recognition?

This study is vital for understanding and improving infant behavior, which is essential for fostering their overall health and development. Earlier research has mainly concentrated on uncovering prevalent actions such as sleeping, sitting, hand motion, walking, running, and playing. However, the necessity to revise these action items has emerged due to challenges in accurately calculating calorie consumption.

To summarize, the use of technology enhanced approaches of evidence driven reconstruction of infants' and children's interests and behavior patterns may greatly improve our appreciation of the needs of these children and enhance their wellbeing.

Furthermore, the research holds commercial value for businesses seeking to build responsible digital ecosystems for early learners. By leveraging the insights of this study,

developers can create guided apps, educational toys, AI tutors, and wellness platforms that reflect the real behavioral and cognitive needs of young users. This not only supports children's development but also positions businesses at the forefront of innovation in the growing market for ethical, research-backed children's technology.

1.5 Business Context and Practical Implications

In today's evolving digital landscape, where early exposure to technology is inevitable, the findings from this study offer significant commercial relevance across multiple industries. The insights derived from research on infants' and children's behavior and interest recognition through technology have the potential to be applied far beyond academic settings. This research provides a foundation for the development of scalable, market-ready innovations in the domains of early childhood education, educational technology (EdTech), digital parenting platforms, child-focused health solutions, and smart device manufacturing.

One of the most direct business applications lies in the creation of intelligent systems for early childhood education. By utilizing behavior-tracking algorithms and interest recognition models as outlined in this thesis, companies can build adaptive learning platforms that personalize educational content in real time. These platforms can monitor a child's activity and engagement, detect patterns in their behavior, and adjust learning material accordingly to optimize attention, motivation, and developmental progress. The value proposition for schools and learning centers is clear: improved learning outcomes, reduced screen-time fatigue, and better child engagement, all measurable and reportable via analytics dashboards.

For parents and caregivers, mobile-based solutions can serve as everyday companions in child development. These tools, powered by behavioral data and AI recommendations, can support modern parenting by offering tailored advice, tracking progress across developmental milestones, and providing preventive feedback before behavioral issues escalate. Such apps can offer features like progress reports, alerts on excessive screen time, content filtering based on emotional impact, and custom learning paths aligned with a child's interests. These applications can operate under freemium, subscription, or licensing models, ensuring both accessibility and profitability.

In the healthcare sector, paediatricians and therapists can leverage these frameworks to develop digital behavioral screening tools. These tools can help diagnose developmental delays, suggest interventions, or serve as digital supplements to therapy. Clinics can integrate these systems into electronic health records (EHRs) and use real-time behavioral data to guide sessions with children and their parents. Early diagnosis and guided digital therapy are rising trends in child mental health care, and this research contributes foundational models and data-backed strategies for those emerging services.

The toy and gaming industry also stands to benefit significantly. Manufacturers can embed interest recognition sensors and feedback mechanisms in toys to create responsive, educational products. Smart toys built on these principles would not only entertain but also assess and guide a child's behavior through interactive storytelling, augmented reality-based adventures, or learning missions tailored to a child's preferences and developmental stage. These toys could collect non-sensitive usage data, with parental consent, to offer insights to parents and educators and become an extension of early learning environments.

Moreover, businesses that focus on corporate social responsibility (CSR) or social impact initiatives can use this research to design inclusive digital learning kits for underserved communities. By offering tailored digital resources that help children develop cognitively and emotionally, organizations can contribute to reducing educational inequality. NGOs and development agencies could collaborate with EdTech start-ups and use these frameworks to design interventions for children in rural or marginalized areas, where access to personalized education is limited.

Beyond direct consumer and institutional applications, this research opens new revenue channels through licensing. The behavioral models, cognitive markers, and AI logic described in this thesis can be packaged as APIs and licensed to third-party platforms including mobile apps, smart devices, e-learning content providers, and digital parenting ecosystems. Licensing these models allows for widespread integration while keeping ownership and control of the intellectual framework centralized with the product owner or company built around it.

From a business innovation standpoint, the study enables a hybrid product-service ecosystem. On one hand, companies can build tangible products like devices, dashboards, or

toys. On the other, they can offer services such as behavioral reporting, parental coaching subscriptions, or online assessments. The fusion of these offerings supports recurring revenue streams and cross-industry scalability.

Investors and entrepreneurs looking for high-impact, socially conscious ventures may find this research particularly compelling. As the demand for scientifically backed, ethically designed educational tools grows, startups can use these insights as a springboard to raise funding, partner with institutions, or enter niche global markets focused on early childhood wellness and education.

Finally, this research contributes to the growing conversation around ethical artificial intelligence and digital responsibility in childhood development. With increasing scrutiny on how technology affects the young brain, businesses that offer transparency, data safety, and developmental alignment will have a competitive edge. This study lays the foundation for a responsible innovation framework, where business value and child well-being are aligned.

In conclusion, this thesis is not just a theoretical exploration but a blueprint for multiple commercial pathways. It lays the groundwork for launching real-world products, platforms, and services that enhance how children grow, learn, and interact with technology, while also offering strong market potential. With the right partnerships and product strategies, the academic work presented here can transform into impactful business models with lasting educational, emotional, and developmental value.

1.6 Opportunities for Businesses that Implement the Research

This research yields not only academic knowledge regarding early childhood development, but it also provides important opportunities for businesses that are child-focused technology and education businesses. Based on the frameworks used in this research, organizations can develop new educational apps, interactive learning toys, and flexible digital environments based on developmental science. Organizations can tailor the digital experience to fit with the interests and behaviours of individual children by drawing from developmentally appropriate practices, resulting in better engagement, satisfaction, and developmental outcomes for children.

Also, with the global EdTech and parenting technology markets growing at a rapid pace, there is a high demand for ethical, research-backed solutions that prioritize children's well-being. Companies can distinguish themselves in the marketplace by offering products that go beyond entertainment and support the cognitive, social, and emotional development of young users. Using evidence-based child development models to better inform product offerings, improves a company's image of responsibility which builds trust with parents, educators, and medical professionals.

The convergence of behavioral tracking systems (BTS) and recognition of interest/investment algorithms as a result of the innovations suggested by this research opens up new paths for dynamic, responsive learning environments. The BTS and algorithms could easily be licensed to third parties, providing separate B2B revenue channels for startups in the educational or pediatric technology sectors. The social change aspect presents an opportunity for companies to participate in CSR structures with the development of tools that address digital inequalities and ensure the accessibility of quality educational resources for a variety of diverse and marginalized communities.

As globalization and technology continue to reshape society, leveraging developmental science will allow organizations to not only take advantage of new market opportunities but to also intentionally impact the holistic development and broad-scale well-being of children. This research serves as the scientific underpinning and strategic road map for organizations looking to embrace sustainable innovation, ethical impact, and competitive advantage in the developing digital childhood development ecosystem.

CHAPTER II:
LITERATURE REVIEW

2.1 Theoretical Framework

The purpose of this literature review is to explore the recent work done on child development across the uses of technology, interest in identifying, and work on the behavioral improvement in infants and toddlers. It looks into three aspects: the function of play and the instigation of an active desire as well as independent thinking, all of which are important components of cognition. The evaluation further gives attention to the risks that might be associated with the misuse or over use of technology instruments, thereby emphasizing the importance of management and supervision. Sufficient evidence has been found showing that, if harnessed correctly, technology can be an effective agent in enhancing creativity and innovative cognition in children. It highlights the ability of technology to provide rich environments that improved learning results. Children's visual activities are greatly dependent on the context, and provision of technical support can facilitate the development of biases in attention towards the learning stimulus' features and thus speed up learning.

The study stresses the importance of utilizing age-appropriate technology in a way which is consistent with traditional tools such as art and writing supplies, and toys. Research indicates that new tools and resources technologies offer unique opportunities for children, helps develop their critical thinking and assists the pre-schoolers in realizing their educational objectives.

The research places emphasis on the fact that when integrating technology into early learning environment's it is essential to take into consideration the different levels children are at in their development. The efficiency of technology is normally increased when it is applied in relation to other adults, other children or teachers. The study accentuates that technology makes the learning process more productive by strengthening the bond

2.1.1 Child Development Framework

By including the child development framework within the Literature Review section, the thesis has provided a theoretical foundation for understanding how technologies can potentially impact children's development. This framework will inform the subsequent sections

of this research thesis, such as the methodology and discussion of findings, where you can examine the child development outcomes.

“Infant mental health and the role of early interventions are pivotal in shaping the emotional and neurological foundations that influence a child's behavior and long-term development” (Balbernie 2013). This thesis explores how secure relationships and the use of technology can enhance interest recognition and behavior improvement in young children. Balbernie (2013) provides a complementary perspective by emphasizing the significance of secure attachment during the first three years of life. The paper explores how early caregiving relationships impact emotional regulation, social adaptability, and even the structural development of the brain. The study identifies disorganized attachment, often resulting from maltreatment or neglect, as a major risk factor for behavioral and emotional challenges.

The belief in one’s ability to accomplish tasks and overcome challenges, known as self-efficacy, plays a crucial role in shaping a child's behavior and their responses to developmental challenges. Self-efficacy not only influences a child’s willingness to try new things but also determines how they handle setbacks and persist through difficulties. In early childhood, fostering self-efficacy through tailored activities and supportive environments can lead to enhanced confidence, better problem-solving skills, and improved behavior regulation.

Bandura (1977) elaborates on the central role of self-efficacy in behavioral change, highlighting how it determines coping behaviors, effort, and persistence in the face of obstacles. The study identifies four key sources of self-efficacy: performance accomplishments, vicarious experiences, verbal persuasion, and physiological states. Figure 1 illustrates the distinction between efficacy expectations (belief in one's ability to execute a task) and outcome expectations (belief that a task will yield certain results), emphasizing their interconnected influence on behavior.

Figure 1 Diagrammatic representation of the difference between efficacy expectations and outcome expectations

(Source: Bandura, 1977, p.191).

Sleep is essential for children's behavioral, cognitive, and physical development. Adequate sleep not only supports growth and learning but also helps in regulating mood and social interactions. Conversely, sleep disturbances like dyssomnias can lead to a range of developmental issues, including attention deficits, emotional dysregulation, and even obesity.

Touchette et al. (2009) provide an integrative model exploring the risk factors and consequences of dyssomnias in early childhood. The paper highlights how parental behaviors, such as remaining present during sleep onset or transferring a child to the parent's bed after nocturnal awakenings, hinder the development of autonomous sleep habits.

The study reports that children with short nocturnal sleep are 2.5 times more likely to exhibit hyperactivity and impulsivity and are at increased risk of poor academic performance and obesity by age six. These findings emphasize the importance of promoting healthy sleep habits early to support optimal developmental outcomes.

Sleep is a crucial factor in a child's physical, emotional, and cognitive development, and disruptions caused by technology are increasingly concerning. “The presence of screens in children's bedrooms, such as televisions and small devices like smartphones, can significantly impact sleep duration and quality, influencing their overall well-being” (Falbe et al. 2015).

Falbe et al. (2015) study the association between the screen presence in sleep environments and the quality of sleep. This research, including 2048 youngsters, shows that those having small screen monitors in their bed areas had a reduction in hours of sleep by 20.6 minutes per night whereas those with televisions in their room reported a decrease of the time of 18 minutes. Sample characteristics are presented in Table 1 which shows that there is a high occurrence of insufficient rest on the part of the youngsters who are heavily exposed to screens.

	Grade 4 (n = 1194)	Grade 7 (n = 854)
Child characteristics, mean ± SD or %		
Female	51.4	51.4
Age, y	9.4 ± 0.6	12.3 ± 0.6
Race or ethnicity		
Hispanic	38.8	42.6
White, non-Hispanic	38.0	39.0
Black, non-Hispanic	10.8	8.5
Other, non-Hispanic[a]	5.4	3.2
Multiracial, non-Hispanic[b]	7.0	6.8
Overweight (BMI ≥85th to <95th percentile[c])	18.6	19.6
Obese (BMI ≥95th percentile[c])	27.2	30.1
Days in past week participated in ≥30 min of physical activity	3.3 ± 2.2	2.8 ± 2.2
Screens in child sleep environment, %		
Ever sleeps near a small screen[d]	45.9	64.5
TV in room in which child sleeps	74.1	75.6
Screen time[e]		
TV or DVDs (h/d)	2.4 ± 1.9	2.9 ± 2.1
Video or computer games (h/d)	1.8 ± 1.8	2.0 ± 2.0
Outcomes, mean ± SD or %		
Usual sleep duration per 24 h on a weekday in the past week, h	9.8 ± 1.4	8.8 ± 1.5
Perceived insufficient rest or sleep >3 d in past week	32.8	22.6
Usual bedtime in the past week, hh:mm PM	9:15 ± 2:34	10:12 ± 3:09

Table 1 Sample characteristics of 2048 children attending public school
(Source: Falbe et al., 2015, p.e367).

Table 2 quantitatively assesses the likelihood of inadequate rest, demonstrating that closeness to tiny screens increases the risk of insufficient sleep by 39%. These results underscore the need for laws and family behaviors that limit screen access in children's sleep environments to foster good sleep habits.

	Perceived Insufficient Rest or Sleep	
	Model 1 (partially adjusted)[a]	Model 2 (fully adjusted)[b]
	PR (95% CI)	PR (95% CI)
Presence of screen in sleep environment (n = 2048)		
Small screen[c]	1.38*** (1.19 to 1.61)	1.39*** (1.21 to 1.60)
TV[d]	1.13 (0.99 to 1.29)	1.07 (0.91 to 1.26)
Screen time, h/d (n = 1908)		
TV or DVDs	1.06*** (1.03 to 1.09)	1.05*** (1.02 to 1.08)
Video or computer games	1.07*** (1.03 to 1.11)	1.05** (1.01 to 1.09)

[a] Results from multivariate log binomial regression models using generalized estimating equations for estimation, adjusted for grade, gender, race or ethnicity (Hispanic, non-Hispanic white, non-Hispanic black, non-Hispanic other, non-Hispanic multiracial), and city.

[b] Additionally adjusted for days in past week participated in ≥30 min of physical activity, simultaneously included indicators for presence of a small screen and TV in the child's sleep environment for models examining screens in the sleep environment, and simultaneously included hours per day of TV or DVD viewing and video or computer game playing in models examining screen time.

[c] The reference group reported never sleeping near a small screen in the past week.

[d] The reference group reported there was not a TV in the room in which they sleep.

**$P < .01$, ***$P < .001$.

Table 2 Associations of screens in children's sleep environment and screen time with perceived insufficient rest or sleep

(Source: Falbe et al., 2015, p.e367).

"Physical exercise is crucial for the physical, mental, and social development of children" (Tremblay et al. 2003). Tremblay examines the recommended levels of physical exercise for children and their correlation with long-term health benefits. The publication provides evidence-based guidelines advocating for at least 60 minutes of moderate to vigorous physical activity daily for children and adolescents, emphasizing a mix of aerobic, muscle-strengthening, and bone strengthening activities.

The research reveals substantial barriers to achieving these activity levels, including sedentary habits like extended screen time and inadequate access to outdoor recreational areas. Table 3 demonstrates the relationship between reduced physical activity levels and increased chances of obesity, cardiovascular issues, and negative mental health consequences.

	BMI 25 kg/m²		BMI 30 kg/m²	
Age (y)[a]	Males	Females	Males	Females
7.5	18.2	18.0	21.1	21.0
8.5	18.8	18.7	22.2	22.2
9.5	19.5	19.4	23.4	23.5
10.5	20.2	20.3	24.6	24.8
11.5	20.9	21.2	25.6	26.0

Adapted from Cole *et al.*[10]
[a]When whole-year age groups (ie 7 = 7.00–7.99) are used as in the present study, it is appropriate to use the mid-point cutoffs (ie 7.5) presented here.

Table 3 Cutoffs of BMI for overweight and obesity by sex between 7 and 11 years of age (Source: Tremblay & Willms, 2003, p.1100).

This research highlights the urgency of necessity for treatments that encourage active lifestyles in children to reduce health risks linked to inactivity. It underscores the incorporation of physical activity into everyday routines via organized programs and spontaneous play, in accordance with comprehensive techniques to promote child development.

Engagement in physical activity during the preschool years is crucial for fostering good habits and facilitating physical, cognitive, and social development. Cardon et al. (2005) investigate the physical activity levels of pre-schoolers, highlighting the impact of both scheduled and unstructured activities on their total movement behavior. The research indicates that preschool children are inherently active; nevertheless, their activity levels are substantially influenced by the accessibility of play spaces and parental support. Table 4 delineates the average duration pre-schoolers engage in moderate to vigorous physical activity (MVPA) across various environments, indicating that children in preschools with organized physical education curricula exhibit 30% elevated activity levels compared to their counterparts in institutions lacking such programs.

	Cluster 1: 'positives' ($n = 223$, 41%)	Cluster 2: 'hindered' ($n = 186$, 35%)	Cluster 3: 'negatives' ($n = 127$, 24%)	F	P-value
Sports outside school (h week^{-1})	5.0 ± 3.4[a]	3.1 ± 2.6[b]	2.0 ± 2.7	30.7	<0.001
Sports at school (h week^{-1})	3.5 ± 1.6[a]	3.0 ± 1.8[b]	2.2 ± 1.8	15.0	<0.001
Frequency of 20 min vigorous PA (times week^{-1})	3.7 ± 2.8[a]	2.8 ± 2.1[b]	1.9 ± 1.9	23.1	<0.001
Frequency of 60 min moderate PA (times week^{-1})	2.8 ± 1.7[a]	2.1 ± 1.6[b]	1.6 ± 1.5	16.4	<0.001
Activity level during breaks at school	3.9 ± 0.7[a]	3.7 ± 0.6	3.7 ± 0.6	3.9	<0.05
Sedentary behaviour (h day^{-1})	3.5 ± 1.9	3.5 ± 1.9	3.5 ± 2.0	0.1	NS

NS – not significant.
[a] Significantly higher than clusters 2 and 3.
[b] Significantly higher than cluster 3.

Table 4 Frequency of moderate and vigorous physical activity
(Source: Cardon et al., 2005, p.896).

Furthermore, Figure 2 demonstrates the relationship between outdoor playtime and overall daily activity, highlighting the need of accessible and secure play areas.

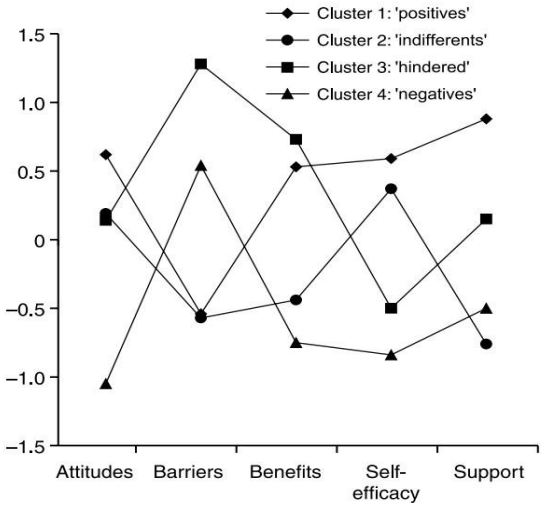


Figure 2 Standard scores of cluster centres on correlates in girls
(Source: Cardon et al., 2005, p.896).

The results support the integration of physical activity into preschool curricula and the promotion of active play at home, along with wider initiatives to enhance early health and developmental advantages through movement.

Comprehending children's behavior and development necessitates particular approaches adapted to their distinct cognitive and physical abilities. Research in developmental psychology provides insights into how early events and behaviors influence long-term results. (Lukowski and Milojevich, 2024) emphasize many research approaches for examining

new-borns and early children, encompassing involuntary reactions such as eye tracking and heart rate monitoring, voluntary responses like toy preferences, and psychophysiological measures including brain activity.

"Television viewing patterns in early childhood are crucial for understanding behavioral antecedents that influence long-term health and development" (Kahn 2002). This thesis emphasizes structured approaches to mitigate early negative influences, and this study by Certain and Kahn (2002) highlights critical insights into the prevalence and predictors of excessive television viewing among infants and toddlers.

The study analyses data from the National Longitudinal Survey of Youth (NLSY) from 1990 to 1998, focusing on children aged 0 to 35 months. The results show that a significant proportion of children exceed the American Academy of Paediatrics (AAP) guidelines for screen time. For example, 17% of infants aged 0–11 months, 48% of toddlers aged 12–23 months, and 41% of children aged 24–35 months watched more television than recommended. Notably, early viewing habits often persisted into later childhood, with children who watched more than two hours of television daily at age 2 being nearly three times as likely to watch excessive amounts at age 6 (Figure 3 illustrates these trajectories).

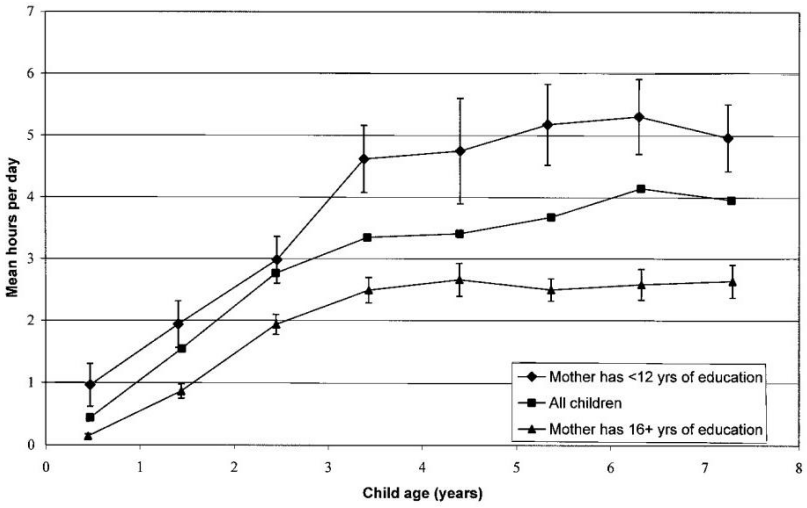


Figure 3 Trajectory of television viewing over time
(Source: Certain & Kahn, 2002, p.634).

Socioeconomic and parental factors significantly influenced viewing patterns. Children from households with lower maternal education levels or single-parent families were more likely to engage in excessive viewing. Additionally, neighbourhood quality and maternal perceptions of safety also correlated with viewing habits. The study underscores the importance of targeting early interventions to reduce screen time and promote alternative activities.

These findings align with the goals of this thesis by emphasizing the need for early, structured interventions that address family and environmental factors, aiming to foster healthier behavioral trajectories in children.

Understanding how media exposure influences early developmental outcomes is critical in framing interventions for young children. The study by Tomopoulos et al. (2010) provides valuable insights into the effects of media on infants' cognitive and language development, particularly within socioeconomically disadvantaged families. This aligns with the thesis's emphasis on using technology responsibly to enhance developmental outcomes.

The longitudinal study assessed 259 infants exposed to media at six months, analysing its impact on cognitive and language skills by 14 months. Key findings revealed that longer media exposure correlated with significantly lower scores on cognitive (Bayley-III) and language (PLS-4) scales, particularly with older child/adult-oriented content. For instance, a 50% increase in media exposure was associated with a 0.5-point decrease in PLS-4 language scores.

Educational content, however, showed no significant positive or negative effects on developmental outcomes.

Moreover, Figure 4 illustrated that infants with minimal media exposure (0 minutes/day) demonstrated higher predicted developmental scores compared to those with higher exposure levels (360 minutes/day). This reinforces the American Academy of Pediatrics' recommendations for no media exposure before age two, emphasizing that early developmental stages benefit more from direct parent-child interactions than from screen time.

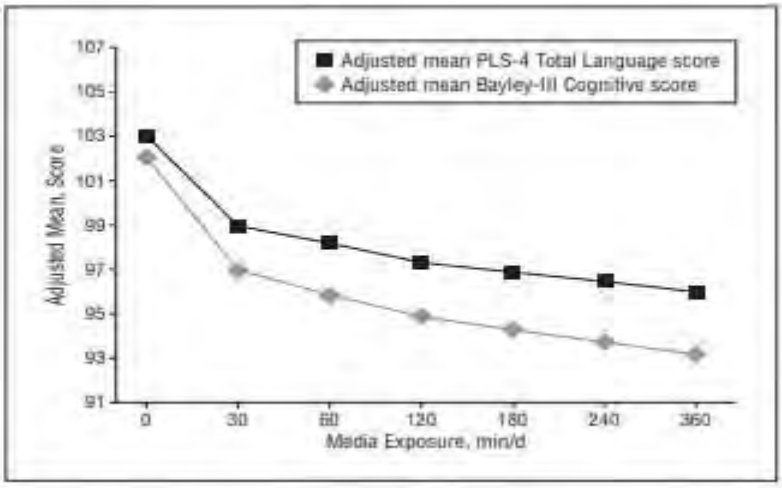


Figure 4 Relationship between total duration of media exposure at age 6 months and predicted development scores at age 14 months

(Source: Tomopoulos et al., 2010, p.164).

Tomopoulos et al. (2010) underscore the importance of content and duration in designing child-friendly media. By incorporating such insights, the thesis can guide the development of adaptive, interactive technologies that mitigate the adverse effects of excessive media exposure while promoting cognitive and language growth in early childhood.

(Haughton, Aiken, and Cheevers, 2015) explore these issues in depth, focusing on the developmental and cyber psychological implications of technology exposure in infants. They report that 28% of children aged 3 to 4 now use tablet computers, and over 14% of infants aged 6 to 23 months watch at least two hours of media daily. The study examines the "video deficit" concept, wherein toddlers under two experience difficulties in learning from screen media compared to direct encounters. Their results underscore the need for age-appropriate norms and parental awareness to mitigate possible developmental issues while fostering responsible digital media use.

The media's consumption during early infancy has become an integral aspect of family which possibly impacts developmental, cognitive and social outcomes within the family. Mostly parents consider television as a safe mate for their children especially those who are younger than two years of age but studies have always been sceptical about its benefits and rather emphasized the dangers associated with the exposure. Brown and the Council on

Communications and Media (2011) quote the American Academy of Paediatrics (AAP) express their continued focus on the ban of use of media by infants aged below 2 years and think with reason that there is a little to gain from it and a lot that could be lost in the process.

The findings explains the “video deficit”, implying to the fact that children aged below two scarcely learn from the information provided in the screes as compared to actual contact with others . The research further also sets out to explore what is referred to as background media and the role it plays in reduction of parent-child interactions as well as language development.

The increasing impact of television on children's everyday lives raises important questions about its effect on their engagement in developmentally advantageous activities. Research indicates that television may replace time devoted to activities such as creative play, reading, and family interactions, which are essential for a child's cognitive, social, and emotional growth.

Vandewater et al. (2006) explored the displacement hypothesis by analysing data from the Child Development Supplement (CDS-I) to evaluate the impact of television on children aged 0 to 12. The study found that television viewing negatively correlated with time spent in creative play, family interactions, and homework, as detailed in Stress on the caregiving relationship, which outlines the mean time children allocated to these activities. However, the study also reported no significant relationship between television time and active play or reading. Interestingly, Figure 5 illustrates the percentage reduction in family and creative activities due to an hour of television, emphasizing the displacement effect on specific developmental behaviors.

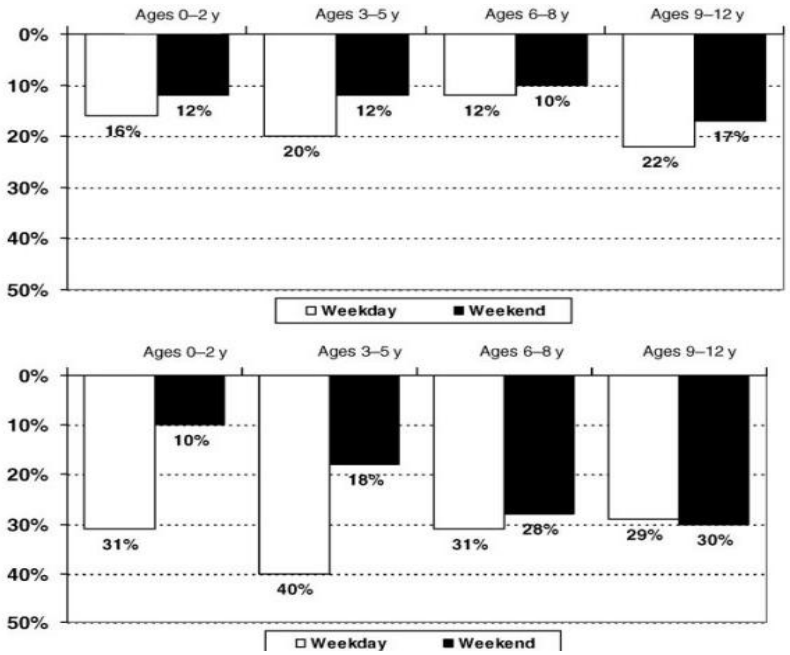


Figure 5 Percentage decrease in number of minutes spent in other activities
(Source: Vandewater, 2006, p.e181).

These findings support the need for balanced screen time policies that prioritize activities fostering holistic child development.

The impact of media and technology on early childhood behavior and development is a critical area of research, particularly as media use becomes increasingly embedded in children's daily routines. “Media exposure can influence developmental milestones, cognitive abilities, and social interactions, making it essential to understand patterns of media use and adherence to recommended guidelines” (Vandewater et al. 2007).

Vandewater presents an empirical study examining media access and usage among children aged 0–6 years, with a focus on adherence to the American Academy of Paediatrics (AAP) guidelines. The study highlights that while most children aged 3–6 fall within the recommended two-hour daily limit, 68% of children aged 0–2 exceed the guidelines, despite recommendations for no screen time at this age. Table 5 provides detailed descriptive statistics, revealing that television dominates media consumption, with younger children averaging 75 minutes per day and older children (3–6 years) averaging nearly 90 minutes.

Parameter	0- to 2-y-Olds ($n = 412$)	3- to 4-y-Olds ($n = 304$)	5- to 6-y-Olds ($n = 329$)
Watched television[a]	63	82	78
Minutes of television[b]	75.18 (67.30)	89.67 (57.97)	73.99 (53.45)
Watched video/DVD[a]	30	42	29
Minutes of video/DVD[b]	67.44 (47.70)	86.82 (49.47)	78.88 (43.08)
Played video game (console/hand-held video game)[a]	2	13	16
Minutes of video game (console/hand-held video game)[b]	51.21 (42.98)	60.50 (55.94)	51.59 (42.33)
Used computer[a]	4	20	27
Minutes of computer use[b]	60.76 (49.08)	45.81 (33.37)	50.50 (40.94)
Read electronic book[a]	12	20	10
Minutes of reading electronic book[b]	46.27 (49.68)	36.47(22.60)	47.20 (48.70)
Listening to music[a]	87	85	77
Minutes of music[b]	63.87 (60.65)	57.41 (54.65)	51.39 (64.05)

[a] Whether children did the activity yesterday/on the last day that was a typical day. Percentages are reported.
[b] Weighted means and SDs are reported; among those who used the respective media.

Table 5 Descriptive statistics of media and technology use
(Source: Vandewater et al., 2007, p.e1006).

The study also highlights concerning trends, such as a significant proportion of children having televisions in their bedrooms (Table 6), often used to keep children occupied or as a reward.

Parameter	0- to 2-y-Olds ($n = 412$)	3- to 4-y-Olds ($n = 304$)	5- to 6-y-Olds ($n = 329$)
Television in household, %	99.5	98.4	98
No. of televisions in household[a]	2.53 (1.12)	2.78 (1.14)	2.98 (1.29)
Cable or satellite television in household, %	79	79	84
TiVo/other digital video recorder on television, %	21	18	23
Surround sound on television, %	41	38	41
Portable DVD in household, %	30	36	32
No. of portable DVDs[a]	1.49 (0.85)	1.27 (0.59)	1.44 (0.73)
VCR or DVD in household, %	94	93	93
No. of VCRs or DVDs[a]	2.08 (1.09)	2.31 (1.24)	2.24 (1.29)
Video game console in household, %	45	49	52
No. of video game consoles[a]	1.41 (0.92)	1.36 (0.69)	1.53 (0.97)
Hand-held video game in household, %	21	29	33
No. of hand held video games[a]	1.53 (0.78)	1.75 (1.01)	1.66 (0.92)
Computer in household, %	80	79	82
No. of computers[a]	1.47 (0.88)	1.45 (0.78)	1.72 (0.99)
Internet access on home computer, %	73	71	73
High-speed internet access on home computer, %	45	42	50
Television in child's bedroom, %	18	43	37
Bedroom television has some cable or satellite channels, %[b]	9	19	20
Bedroom television has only regular channels, %[b]	5	7	6
Bedroom television only used for watching videos or play games, %[b]	5	12	9
Bedroom television not currently working or being used, %[b]	0	0.3	0.9
VCR/DVD in child's bedroom, %	14	30	25
Video game console in child's bedroom, %	2	10	18
Computer in child's bedroom, %	3	3	8
Internet access on bedroom computer, %	2	2	4

Table 6 Descriptive statistics of house media ownership and access
(Source: Vandewater et al., 2007, p.e1006).

Children's cognitive performance can be significantly influenced by environmental factors, including background distractions like television. This raises critical questions about the conditions under which television might enhance or inhibit intellectual

development. (Armstrong and Greenberg, 1990) propose that background television disrupts cognitive processing by exceeding attentional capacity, interfering with linguistic and problem-solving tasks. Their experimental study evaluates performance across conditions of no television, low-action/high-verbal television, and high-action/low-verbal television.

Language acquisition in early childhood is fundamentally shaped by the quality and quantity of adult-child interactions. While adult language input is often emphasized, the reciprocal nature of conversations plays a critical role in fostering robust linguistic and cognitive development. Zimmerman et al. (2009) investigate the importance of conversational interactions between adults and children, arguing that these exchanges are a more potent predictor of language development than mere exposure to adult speech or television.

The study used both cross-sectional and longitudinal approaches and expressed developmental outcomes using the Preschool Language Scale (PLS-4).

Also, from Table 7, it can be inferred that the amount of exposure to television has a negative impact on language outcomes which is due to reduced opportunities of achievement of conversational situations. The outcomes warrant encouraging active communicative interactions rather than mere language input to boost young children language development.

Dependent Variable	PLS-4 (Phase 1), Coefficient (95% CI)	PLS-4 (Phase 1), Coefficient (95% CI)	PLS-4 (Phase 1), Coefficient (95% CI)	PLS-4 (Phase 1), Coefficient (95% CI)	CT (Phase 1), Coefficient (95% CI)
Predictors					
Adult word count (1000 s/d)	0.44 (0.09 to 0.79)[a]			−0.16 (−0.63 to 0.30)	0.28 (0.24 to 0.32)[b]
Television exposure (foreground) (h/d)		−2.68 (−5.25 to 0.11)[a]		−1.4 (−3.97 to 1.14)	−0.51 (−0.79 to 0.23)[b]
Conversational turns (100 s/d)			1.92 (1.12 to 2.73)[a]	2.08 (0.97 to 3.19)[a]	
R^2	0.23	0.23	0.28	0.28	0.68

Results adjusted for child's age, gender, race/ethnicity, mother's and father's education, household income, and number of recording sessions ($N = 275$). CT indicates conversational turns.
[a] $P < .05$.

Table 7 Cross-sectional regression of PLS-4 scores on adult word count, conversational turns, television exposure, and conversational turns on adult word count

(Source: Zimmerman et al., 2009, p.342).

Regular exercise during childhood and teenage years is pivotal as it determines health in adulthood. It is also mentioned that involvement in exercises should begin at a tender age in order for the habits to persist over a long period of time bearing the mental and physical

wellbeing in mind. Given this, there must be consideration to the fact that how actions in early stages of life shape into adult behavior patterns.

Telama et al. (2005) are likely to be among the pioneers who try to use the data of the Cardiovascular Risk in Young Finns Study to understand how physical activity evolves from infancy to adulthood on a sample of Finns. The study program lasted for 72 months and includes participants aged from 9-18 years in the 1984 round. The Cadre of the authors followed over a period of time the patterns in duration of Physical Activity in the same people who were assessed by means of a Physical Activity Index (PAI).

The research suggests that encouraging continuous physical exercise during school years, facilitated by structured programs and organized sports, is essential for supporting lifetime engagement in physical activity. These results underscore the need for early interventions and policies that promote active lifestyles from a young age.

The impact of digital media on early childhood development is a growing concern, particularly as media consumption continues to rise. This thesis focuses on structured strategies to balance the benefits and risks of media exposure, aligning with the comprehensive recommendations of Hill et al. (2016) in their policy statement, Media and Young Minds.

The authors emphasize that excessive or inappropriate media use during the critical developmental years of birth to five can negatively impact cognitive, emotional, and physical health. They recommend no screen time for children under 18 months (except for video chatting) and limited, high-quality content for children aged 2–5 years. Parent-child co-viewing is highlighted as essential for reinforcing learning and social interaction.

Educational programs, such as Sesame Street, are shown to enhance language and social skills, whereas fast-paced or violent content may disrupt attention and behavior. The paper also links excessive media use to delayed language acquisition, poorer executive function, obesity, and sleep disturbances. The impacts are most significant when media consumption surpasses the advised one-hour daily limit for preschool-aged youngsters.

Hill et al. (2016) recommend media-use strategies that include screen-free areas, such as during meals and during bedtime, and emphasize interactive, instructional content over passive viewing. This method corresponds with the thesis's objectives of incorporating evidence-based

solutions to enhance developmental outcomes and promote healthier behavioral patterns in children.

The use of technology in preschool education is an emerging issue that closely correlates with the focal point of this study which involves the use of digital devices to enhance children's behavior and development. The NAEYC and Fred Rogers Center (2012) policy statement underscores the deliberate and developmentally suitable application of technology to facilitate cognitive, emotional, and social development in children from birth to age eight.

The authors emphasize that although interactive media, including apps, e-books, and interactive games, can improve learning and relationships when utilized correctly, passive media intake may be harmful, particularly for young children. The report emphasizes the necessity of structured, active involvement with technology to guarantee it enhances rather than supplants essential developmental activities such as creative play and social connections.

The statement also highlights essential problems, such as equal access, digital literacy among educators and parents, and the need for tailored approaches to accommodate children's distinct developmental stages. By promoting principles such as co-engagement, thoughtful planning, and moderation, the paper aligns with the thesis's intent to advocate for structured, evidence based approaches that maximize the benefits of technology while mitigating its risks for young learners.

2.1.2 Evolution of educational technology in early childhood

The technology education curricula for early childhood education (ECE) have been designed and implemented using various technology tools and pedagogical methods. These tools include automated mobile robots, robotic control interfaces, Lego, wooden rails, battens and ropes, cans and pipes, 4DFrame, and Duplo™. These tools serve multiple purposes, such as storytelling, teaching, and learning science and engineering.

Childhood development is deeply influenced by effective methods of education and communication, a theme central to this thesis on leveraging technology for behavior and interest recognition in children. (Glascoe and Trimm, 2014) examine strategies for developmental behavioral promotion during well-child visits in primary care. Their study

reviews 239 resources, proposing practical techniques such as "teachable moments," interactive multimedia, and tailored communication to support developmental milestones.

“Digital technologies have become integral to children’s daily lives, reshaping how they interact, learn, and play from a very young age” (Palaiologou 2014). This phenomenon underscores the need to re-examine traditional pedagogical approaches in early childhood education, where technology is often underutilized despite its pervasive presence in homes. Palaiologou investigates how children under five use digital technologies and the implications for early years’ pedagogy across four European countries.

The study reveals that children under three primarily engage with television, while those aged three to five increasingly use computers and the internet. Table 8 and Table 9 provide insights into the specific activities, such as playing games and educational applications, highlighting the gradual shift from passive to interactive media use. Interviews with parents reveal a consensus that digital literacy should be embraced as an essential skill in early education.

Sample	Television-based activities		Computer-based activities		Internet-based activities	
	Birth to three years	Three to five years	Birth to three years	Three to five years	Birth to three years	Three to five years
England (135)	86	82	42	72	38	62
Luxemburg (135)	88	84	38	68	36	61
Greece (135)	62	56	28	52	26	44
Malta (135)	66	58	32	62	28	46

Table 8 overview of overall percentage of families who participate in home digital technology activities

(Source: Palaiologou, 2014, p.5).

Activities	Percentage	
	Birth to three years	Three to five years
Television-based activities		
Sit and watch programmes and play with other toys when watching a programme on television	86	72
Interact with the programme by talking to the television	72	68
Watch something and then stop to engage in role play based on what they have watched	74	58
Play with Wii/Kinnect boxes	34	52
Computer-based activities		
Play computer games	22	68
Reading	14	46
Writing/drawing	16	56
Internet-based activities		
Play games	12	54
Watching programmes	15	62

Table 9 Overall percentages of common interactions with digital technologies

(Source: Palaiologou, 2014, p.5).

"Robotics education is increasingly recognized as an effective tool for fostering technological thinking and critical problem-solving skills in early childhood" (Zviel-Girshin et al. 2020). Zviel-Girshin examine a program that incorporates robotics as a compulsory component of kindergarten and elementary school curricula. This program involved hands-on activities, collaboration, and open-ended challenges, which encouraged students to explore and

innovate. Key findings include improved self-confidence and positive attitudes towards STEM subjects, with minimal gender differences observed in the desire to continue robotics studies.

Parents advocate for blending digital technologies with traditional learning methods to create flexible, innovative, and engaging learning environments. This research emphasizes the importance of aligning early childhood education with the realities of children's digital experiences to foster meaningful learning outcomes.

Digital technologies have transformed how children learn, play, and engage with their environment. However, understanding the nuanced ways in which children aged 0-8 interact with these technologies and the role of parental mediation is critical. Chaudron et al. (2015) present a comprehensive cross-national study that examines the digital habits of young children across seven countries. The research explores how children engage with devices like tablets, smartphones, and computers, their preferences, and how parents perceive and manage technology use.

Key findings include children's preference for tablets due to their portability and touchscreen functionality (Figure 6), and their use of smartphones, which often leads to unsupervised online activities like gaming or video streaming.

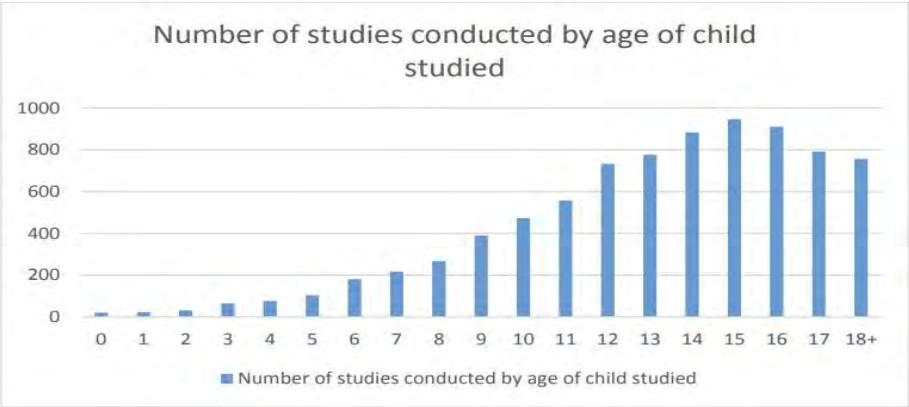


Figure 6 Number of studies conducted by age of child studies
(Source: Chaudron, 2015, p.1).

Mobile health (mHealth) interventions have shown significant promise in addressing the health challenges faced by mothers and children in low- and middle-income countries (LMICs). This is particularly relevant for improving maternal, new-born, and child health

(MNCH) outcomes through scalable and accessible technology. Lee et al. (2015) provide a systematic review and meta-analysis of mHealth interventions, focusing on their impact on health outcomes and utilization in LMICs.

The study identifies a variety of mHealth applications, including SMS-based interventions for health information delivery, reminders for care adherence, peer support, and test result turnaround.

However, the review highlights methodological limitations in many studies, such as small sample sizes and inconsistent intervention descriptions, which complicate replication and broader implementation. These insights underscore the potential of mHealth in transforming healthcare delivery for vulnerable populations, provided robust evaluation frameworks are developed.

Technology's integration into early education offers valuable opportunities to foster cognitive and social development, yet it also raises questions about gender dynamics in play and learning environments. This thesis explores structured strategies to optimize technology use for equitable developmental outcomes, aligning with the insights of (Hallström, Elvstrand, and Hellberg , 2014).

The study investigates the influence of gender on children's engagement with technology during unstructured play in Swedish preschools. Observations revealed that males mostly controlled access to technological devices, including building sets and digital gadgets, often taking on leadership roles during group play. Conversely, females engaged more in creative and cooperative play, often marked by verbal exchanges and social connections. The division of activities by gender mirrored traditional assumptions, suggesting that early engagement with technology can inadvertently perpetuate cultural norms unless aggressively challenged.

The authors underscore the significance of educators in enabling these processes. By deliberately promoting equal access and executing structured activities, educators may challenge traditional gender conventions and support balanced participation. Interventions such as rotating leadership roles and forming mixed-gender teams for collaborative tasks were effective in fostering inclusiveness and reducing gender disparities.

The need for intentional instructional methodologies to ensure that technology serves as a tool for empowerment rather than a catalyst for injustice was underscored by (Hallström, Elvstrand, and Hellberg ,2014). These results align with the thesis's aim of using structured interventions to reduce disparities and enhance the developmental potential of technology in early education.

2.1.3 Trends in Children's Media Usage and Online Activities

A significant number of children in the United Kingdom utilize television sets and tablets. Streaming platforms such as Amazon Prime and Netflix are experiencing increased popularity, although the duration of traditional television viewing is declining. YouTube has become the preferred viewing platform for children aged 8-11. YouTube is also highly popular among young children, surpassing popular gaming apps like Angry Birds and Temple Run.

PISA's findings on the online leisure activities of 15-year-olds across OECD countries revealed some interesting trends. Between 2012 and 2015, there was a four-percentage point increase, on average, in the share of students engaging daily in online activities. Specifically, 73% of students reported engaging in social networks daily, 61% reported chatting online every day, and 34% reported playing online games daily or almost every day. Additionally, across OECD countries, 88% of students reported that the Internet was a valuable resource for obtaining information, and 49% of students agreed that they used it to collaborate on problem-solving with others.

The popularity of social media platforms among children can change rapidly, influenced by trends and new developments in apps. For example, in the United States, the popularity of various platforms among teens shifted significantly over three years. In the United Kingdom, Facebook remains the most popular social media site among 12-15-year-olds, but the popularity of Instagram and WhatsApp increased between 2017 and 2018.

Media consumption, particularly screen time, plays a complex role in influencing child behavior and development. Screen use impacts critical areas such as sleep, social engagement, and emotional regulation, depending on the timing, content, and context of usage.

Ginsburg (2007) emphasizes the value of unstructured play in fostering children’s cognitive, emotional, and social well-being, highlighting its role as an essential counterbalance to passive

media consumption. The report points out that increasing screen use, coupled with reduced opportunities for child-driven play, can undermine developmental benefits. The paper advocates for paediatricians and educators to support a balance between academic, social, and recreational activities.

Garrison et al. (2011) build upon this by focusing on how media content, timing, and environment directly affect children's sleep patterns. Their study demonstrates that evening screen use and exposure to violent content significantly increase sleep problems, such as difficulty falling asleep and daytime tiredness (Table 10). The research underscores the need for parental mediation and strategic use of media, promoting non-violent and earlier-time content to mitigate these effects.

	Change in Sleep Score	95% CI	*P*
Each additional hour of nonviolent daytime media time	0.022	−0.186 to 0.229	.84
Each additional hour of violent daytime media time	0.398	0.121 to 0.676	<.01
Each additional hour of evening media time	0.743	0.373 to 1.114	<.001
Responding parent is mother	−0.399	−0.706 to −0.091	.01
Female	0.170	−0.037 to 0.377	.11
Low-income household	0.338	0.054 to 0.622	.02
Single-adult household	0.611	0.174 to 1.048	<.01
SCBE externalizing score	0.039	0.018 to 0.061	<.001
SCBE internalizing score	0.025	0.002 to 0.048	.04

Table 10 Final regression model

(Source: Garrison, Liekweg & Christakis, 2011, p.29).

Together, these studies highlight the need to balance media use with unstructured, creative play and adequate sleep, aligning with strategies to optimize child behavior and developmental outcomes.

Childhood development is profoundly influenced by lifestyle factors, with sedentary behaviors like television viewing and video game use increasingly scrutinized for their role in health outcomes. This thesis, which explores the intersection of technology use and behavioral patterns, ties into understanding how media impacts physical activity and body fatness in children.

Marshall et al. (2004) conducted a meta-analysis investigating the relationships between media use, physical activity, and body fatness in children and youth aged 3–18 years. The analysis of 52 independent samples revealed that:

- Television viewing showed a small but statistically significant positive correlation with body fatness, suggesting limited clinical relevance
- A negative correlation was observed between media use (TV and video games) and physical activity supporting the displacement hypothesis that media use reduces time spent in physical activities.
- The strongest correlations were found in younger children (0–6 years), highlighting early childhood as a critical period for interventions.

The study emphasizes the importance of addressing media habits early, integrating strategies to balance screen time with physical activities, which aligns with the broader objectives of this thesis to mitigate developmental risks while fostering positive behaviors in children.

Adolescence is a critical period for establishing lifelong physical activity habits, making it essential to accurately assess activity levels for research and interventions. This thesis explores the role of structured approaches in fostering healthy behaviors, including methods to measure and evaluate these behaviors effectively.

2.2 Cultural & Ecological Views on Early Childhood Tech Use

Studies focusing on technology use in homes often overlook the role of young children. A study framed by an ecological and cultural approach emphasized children's play and learning with toys and technologies, highlighting methodological challenges in researching young children's experiences.

Developmentally appropriate use of technology can benefit young children's growth and learning, especially when families and early educators are involved. Technology can help children explore new worlds, develop ideas, and engage in challenging and enjoyable activities. They can use technology to play, solve problems, role-play, and engage in critical and scientific thinking.

Early educators should consider children's developmental levels when using technology for early learning, prioritizing healthy child development over technology use. Technology should be integrated into learning programs alongside other materials like art supplies, books, and play materials, allowing children to express themselves without overshadowing other learning materials.

This study explains and analyses the mechanisms that affect peer-assisted learning (PAL) through the use of a conceptual framework. Processes are understood as actions such as modelling, and mechanisms are the means for such processes e.g. observation.

This investigation explores the dual role that digital technology can play, on the one hand, in assisting children's development while on the other hand also suffering from it in a child's environment. Hirsh-Pasek et al. (2015) propound ideas that are pertinent to this focus, providing a systematic approach to the assessment and improvement of educational apps' compliance with the science of learning.

This approach allows me to argue that good educational apps have to support the four pillars of learning: active learning, learning that is engaged, relevant and learning that is social in its interaction. All these aspects which are based on the tenets of developmental psychology dictate that such apps should be more than just 'fun', but should enhance growth both cognitively and socially. Active engagement in learning is different from passive where engagement is nominal, more than physical touch of tapping or swiping is anticipated. It is provided by applications that promote thinking and reasoning like solving puzzles. The connection of new information to existing schemas leads to better chance of remembering and applying the three shapes, which are essentially learning.

The paper complains about the uncontrolled market of 80,000 educational apps, most of which are worse than toys in promoting the learning process. The authors do not let go of the important principle of evidence-based design, insisting that new apps should help in purposeful learning, guided discovery, and improved social contacts, which are often negatively absent in previous generations of digital devices.

The thesis analyses the role of technology in fostering better performance of young children in interview, augmenting their cognitive, physical, and emotional development. Noorhidawati

et al. (2015) contribute to the body of knowledge in this area by investigating children's use of mobile applications through the lenses of cognition, psychomotor skills, and emotional involvement. This research focuses on the agreement of what 'happenings' and 'interventions' become relevant in the process and development of learning in informal spaces.

The research investigated 18 preschool students (aged between 4-6) using mobile applications, identifying their actions into three types of engagement: sensory motor, emotional and verbal interaction. For example, tactile and gestures turned out to be important in promoting active participation since children clearly preferred games and creativity applications rather than the e-storybooks (Figure 7). Positive engagement was also exhibited through emotional expressions such as smiles and applause. Other outbursts, including non-verbal communication such as speech directed towards the task while accomplishing it, indicated awareness and engagement.

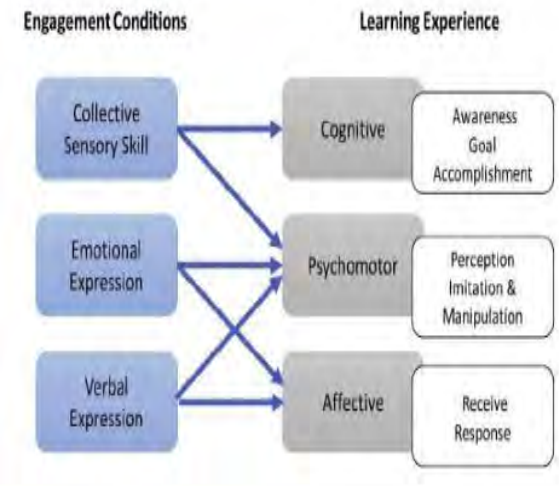


Figure 7 Engagement conditions of children's learning when interacting with mobile apps (Source: Noorhidawati, Ghalebandi & Roffeei, 2015, p.385).

Learning outcomes were mapped to three domains:

- Cognitive: Awareness and goal accomplishment, where children recognized inter active elements and completed tasks like puzzles and memory games.
- Psychomotor: Actions like dragging and tapping, which enhanced motor skills through gaming and drawing apps.

- Affective: Emotional responses and motivation influenced by app features and fe edback, shaping children’s interest and persistence.

This study emphasizes the importance of app design in fostering meaningful engagement, aligning with the thesis’s goal of leveraging technology to enhance behavioral and cognitive development. It supports creating apps that integrate sensory, emotional, and cognitive elements to optimize learning experiences for young children.

Mobility plays a vital role in early childhood development, particularly for children with disabilities. This thesis emphasizes the importance of innovative solutions to facilitate mobility and enhance motor skills for children with developmental challenges. The study by Jin (2015) aligns with this theme, focusing on designing a novel mobility interface that allows toddlers to drive a robotic walker using body motion, enabling both physical activity and environmental exploration.

The study addressed challenges faced by children with conditions like cerebral palsy or spina bifida, where mobility impairments delay motor, social, and cognitive development. The robotic walker integrates a harness system with rotary sensors to detect trunk movements, translating them into directional commands for the robot.

This research highlights the transformative potential of human-robot interfaces in enabling independent mobility for children, reinforcing the thesis's aim to integrate technology for developmental improvements. By adopting similar frameworks, interventions can be tailored to meet the diverse needs of children with mobility challenges, promoting both physical and cognitive growth.

Incorporating hands-on learning experiences into early education can foster curiosity, collaboration, and a foundational understanding of engineering principles. The study by (Kawada, Nagamatsu, and Yamamoto, 2013) aligns with this objective by introducing "Robo-iku," an educational program centered on designing and building rescue robots. This initiative, targeted at kindergarten and primary school children, emphasizes learning through play and structured activities.

Children's engagement peaked during the final session when they completed their robots and operated them in a simulated rescue field. This experiential learning not only enhanced

their understanding of mechanics but also encouraged empathy as they designed robots to deliver supplies to disaster victims. Parental feedback, summarized in, overwhelmingly supported the workshops, with over 90% affirming the value of manufacturing education in fostering creativity and technical skills.

The study highlights the potential of such interventions to inspire interest in science and technology at an early age. Integrating similar methodologies into broader educational frameworks can cultivate essential skills, aligning with the thesis's aim of leveraging technology to enhance developmental and social competencies in children.

Technology can strengthen relationships among parents, families, educators, and children. It is particularly effective when adults and peers interact, or parents and providers participate in children's activities together. Video chatting can enhance relationships between children and adults and among children, especially when distance or health barriers prevent in-person interaction.

This study aims to enhance understanding of peer learning mechanisms in kindergarten children, including verbal and non-verbal cues during peer learning tasks. The research will explore how kindergarten peers interact during learning tasks, considering the increasing incorporation of peer learning in classrooms.

2.2.1 Efficacy of educational tech tools in early learning

The transition from early childhood education to primary schooling marks a pivotal stage in child development. This thesis emphasizes structured strategies to bridge educational gaps and foster continuity in learning, closely aligning with the findings of Mawson (2003).

The study examines the role of technology education as a transitional bridge between early childhood settings and primary classrooms in New Zealand. Mawson highlights the pedagogical disjunction between these two educational stages, where early childhood emphasizes child-led, exploratory play, while primary schooling adopts more structured, curriculum-driven approaches. Technology education, with its focus on creative problem-solving, collaboration, and innovation, offers a medium to align these practices.

The research draws from classroom observations and video footage of children engaging in technological tasks, such as designing bird feeders and creating warning devices for

environmental hazards (Table 26). Mawson identifies common teaching practices, such as providing diverse materials, encouraging risk-taking, and fostering collaborative problemsolving. Teachers in both settings acted as facilitators, asking probing questions to guide children's learning while allowing autonomy in task completion.

Mawson (2003) argues that integrating technology education into early primary curricula can provide continuity, easing children's transition into formal schooling. This aligns with the thesis's focus on structured interventions to optimize learning experiences and address transitional challenges.

Television's pervasive role in children's lives presents both opportunities and challenges for their behavioral and developmental trajectories. This thesis emphasizes structured interventions to optimize media exposure and mitigate its adverse effects, aligning with the findings of Gupta et al. (1994).

The study, conducted in Jaipur, India, assessed the effects of television viewing on eating habits, physical health, physical activity, academic interest, sleep patterns, and overall wellbeing among 250 children aged 3–10 years. Results revealed an average weekly viewing time of 18.5 hours, with younger children watching more than older ones (Table 11). Significant behavioral changes were noted:

- Eating Habits: 52.4% of children showed changes in eating behaviors, with 34% eating less and 18.4% eating more while watching television. Additionally, 42.4% demanded foods advertised on TV, predominantly high-calorie, low-nutrient snacks.
- Physical Activity: A decrease in activity levels was observed in 30.4% of children, particularly those aged 5–7 years.
- Academic and Sleep Impacts: While 69.2% reported no change in academic interest, 18.4% showed decreased interest, and 10% reported a decline in school performance. Disturbed sleep patterns were noted in 18% of cases, often attributed to late-night

Age Groups (yr)	No of cases	Average duration of exposure (hours per week)
3-5	19	21.20
5-7	86	18
7-10	145	17.76
Total	250	18.58

Table 11 Duration of Television Exposure

(Source: Gupta, R. K., Saini, D. P., Acharya, U., & Miglani, N., 1994, p.153).

The study also highlighted medical issues, including headaches (10%) and rare cases of photic epilepsy. Gupta et al. concluded that excessive television viewing could predispose children to obesity, reduced physical activity, and disrupted sleep and academic routines, emphasizing the need for parental monitoring and structured media usage.

These findings align with the thesis's objectives by demonstrating the importance of evidence-based strategies to regulate media consumption and foster healthier behavioral patterns in children.

Understanding the interplay between sedentary behavior, physical activity, and childhood obesity is essential for designing effective interventions to promote healthier behaviors. This thesis highlights structured strategies to address behavioral challenges in children, reflecting the findings of Hernández et al. (1999).

Hernández et al. (1999) emphasize the importance of reducing television viewing and increasing physical activity as critical strategies to combat childhood obesity. These findings align with the thesis's goal of leveraging structured interventions to improve health outcomes in children by targeting behavioral and environmental factors.

Understanding how young children spend their time and the role of structured environments is central to promoting balanced developmental outcomes. This thesis focuses on integrating

technology to monitor and improve children's behavior and interest recognition, reflecting the findings of Huston et al. (1999).

The longitudinal study by Huston et al. (1999) examined time-use patterns among children aged 2–7 years in low-to-moderate income families, emphasizing how television viewing interacts with other daily activities. The study found that while educational TV programs did not displace activities like reading and play, entertainment TV viewing negatively correlated with time spent in educational and social activities.

Interestingly, the type of TV content played a crucial role in determining its impact. Informative programs aimed at children facilitated co-occurrence with play and had minimal negative effects on other activities. On the other hand, entertainment TV programs, particularly cartoons, were linked to reduced engagement in structured learning activities and social interactions, suggesting the influence of program content on developmental outcomes.

Home environment and parental education were significant predictors of children's viewing patterns. Children from stimulating environments or households with higher parental education levels spent more time watching educational programs and less on entertainment TV. This highlights the moderating role of environmental factors in shaping media's impact, aligning with the thesis's focus on leveraging adaptive technologies to cater to diverse family contexts.

Huston et al. (1999) emphasize the need for targeted interventions that account for the type of media content and its contextual effects on children's developmental trajectories. These findings resonate with the thesis's objective of designing technology-driven frameworks to encourage balanced behaviors, such as integrating content recommendations based on children's existing preferences and home settings. By aligning behavioral insights with technological tools, structured strategies can be devised to optimize early childhood development.

Early intervention and structured monitoring play a critical role in shaping children’s developmental behaviors, particularly in physical activity and fitness. The longitudinal Muscatine study by Janz, Dawson, and Mahoney (2000) provides compelling evidence on how early activity patterns, such as sedentary behaviors and vigorous physical activity, persist into adolescence. Through the use of extensive data collected over five years, the study

demonstrated that boys classified as sedentary (based on TV viewing and video game use) were 2.2 times more likely to remain sedentary, as illustrated in Table 12. Meanwhile, vigorous activity showed stronger tracking in girls, suggesting that early engagement in physical activity is crucial for long-term adherence.

	Year 4	Year 3	Year 2	Year 1
Peak $\dot{V}O_2$ ($mL \cdot min^{-1}$)				
Boys	0.86	0.78	0.67	0.48
Girls	0.74	0.59	0.59	0.43
Peak $\dot{V}O_2$ ($mL \cdot kg^{-1} \cdot min^{-1}$)				
Boys	0.74	0.70	0.69	0.44
Girls	0.75	0.69	0.60	0.39
Peak $\dot{V}O_2$ ($mL \cdot kgFFM \cdot min^{-1}$)				
Boys	0.66	0.38	0.52	0.24*
Girls	0.33	0.32	0.32	0.04*
Peak HR ($beats \cdot min^{-1}$)				
Boys	0.65	0.56	0.51	0.48
Girls	0.79	0.71	0.56	0.49
Peak O_2 pulse ($mL \cdot beat^{-1}$)				
Boys	0.67	0.64	0.59	0.43
Girls	0.65	0.54	0.50	0.41
Peak power (Watt)				
Boys	0.90	0.82	0.70	0.72
Girls	0.70	0.56	0.52	0.61
Peak grip (kg)				
Boys	0.89	0.70	0.68	0.75
Girls	0.80	0.72	0.64	0.62
3-Day Sweat (events)				
Boys	0.52	0.52	0.36	0.32
Girls	0.65	0.61	0.56	0.43
TV and Video Game ($min \cdot d^{-1}$)				
Boys	0.56	0.65	0.40	0.48
Girls	0.59	0.16*	0.26*	0.16*

Table 12 Spearman Correlation Coefficients Tracking Physical Fitness and Physical Activity Between Follow-Up (Year 5) and Preceding Years (4-1)

(Source: Janz, K. F., Dawson, J. D., & Mahoney, L. T., 2000, p.1250).

The data further demonstrated relevant gender variation, especially between boys and girls, where it was noted that during the age of mid-puberty, boys had superior changes with respect to aerobic fitness. This is further substantiated from the trends found in Table 13 where for males there is a steady increase in peak oxygen uptake (VO2) over the five years but for females there is a rise followed by a plateau then a decline by Year five.

	Year 1	Year 2	Year 3	Year 4	Year 5
Peak $\dot{V}O_2$ (mL·min^{-1})					
Boys	1860 ± 299	2026 ± 352	2183 ± 429	2577 ± 531	2729 ± 490
Girls	1479 ± 343	1672 ± 336	1807 ± 341	2024 ± 371	1907 ± 293*
Peak $\dot{V}O_2$ (mL·kg^{-1}·min^{-1})					
Boys	49 ± 8	47 ± 8*	44 ± 7	47 ± 7	46 ± 7*
Girls	40 ± 7	39 ± 6*	37 ± 7	38 ± 7*	33 ± 5
Peak $\dot{V}O_2$ (mL·kgFFM·min^{-1})					
Boys	86 ± 10	85 ± 10*	80 ± 9	83 ± 8	81 ± 9*
Girls	83 ± 12	84 ± 9*	82 ± 10	84 ± 10*	76 ± 8
Peak HR (beats·min^{-1})					
Boys	196 ± 9	192 ± 8	195 ± 8	198 ± 8	195 ± 9
Girls	198 ± 8	195 ± 8	198 ± 8	203 ± 8	201 ± 9
Peak O_2 pulse (mL·beat^{-1})					
Boys	9.5 ± 1.5	10.5 ± 1.9	11.2 ± 2*	12.9 ± 2.7	13.9 ± 2.9
Girls	7.5 ± 1.7	8.6 ± 1.8	9.2 ± 1.9	10.0 ± 2.0	9.7 ± 1.8*
Peak power (Watt)					
Boys	119 ± 19	132 ± 18	146 ± 23	178 ± 32	210 ± 42
Girls	95 ± 23	105 ± 23	120 ± 19	142 ± 23	150 ± 23
Peak grip (kg)					
Boys	33 ± 6	36 ± 8	54 ± 11	66 ± 13	76 ± 16
Girls	26 ± 6	30 ± 7	46 ± 11	56 ± 9	58 ± 8
3-Day Sweat Recall (events)†					
Boys	3.5 (2.0, 4.5)	3.5 (2.0, 5.4)*	3.8 (2.5, 5.0)*	4.5 (3.1, 6.4)	5.0 (3.0, 6.5)*
Girls	2.5 (1.5, 3.7)	2.0 (1.8, 3.3)*	2.8 (1.5, 3.7)*	3.3 (2.4, 4.5)	3.0 (1.5, 5.0)*
TV/Video Recall (min·d^{-1})†					
Boys	100.0 (67.5, 172.5)	86.3 (60.0, 128.8)	97.5* (52.5, 142.5)	68.8* (54.4, 140.0)	82.5* (45.0, 135.0)
Girls	101.7 (63.8, 131.0)	75.0 (47.5, 97.5)	75.0* (45.0, 108.8)	60.0* (37.5, 80.0)	60.0* (37.5, 90.0)

Table 13 Description of Physical Activity Variables by Gender, Years 1 Through 5 (Mean ± SD)

(Source: Janz, K. F., Dawson, J. D., & Mahoney, L. T., 2000, p.1250).

Another primary takeaway was the reduction of sedentary behavior, such as watching television and playing video games, over the studied period particularly for males as evidenced by the estimation of daily usage of the screen represented in Figure 8. This particularly highlights the role of well-organized practices and changes in surroundings in changing behavior.

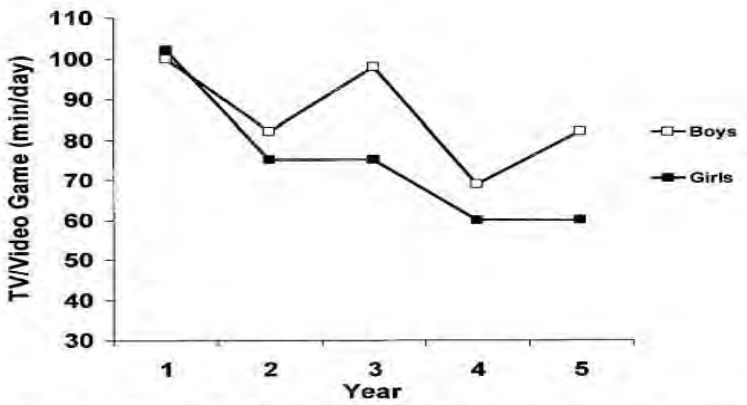


Figure 3—Changes in TV viewing and video game recall by study year (median).

Figure 8 Changes in TV Viewing and Video Game Recall by Study Year (Median)

(Source: Janz, K. F., Dawson, J. D., & Mahoney, L. T., 2000, p.1250).

According to Janz et al. (2000), It may be possible to alter children's later levels of physical activity if interventions are directed toward behaviors shaped early in life. Interventions which in practice make use of technology can figure out a way to revolutionize the way at-risk children are dealt with by using input based scientific evidence such as the tables and figures in the study to suggest appropriate action to dissuade them from sedentary behavior and encourage active ones.

Early cognitive and motor skill development significantly influences children's ability to engage with advanced technology. (Tefft, Guerette, and Furumasu, 2007) identified spatial relations and problem-solving as critical predictors of powered mobility proficiency in children aged 20–36 months, accounting for 57% of performance variance. Activities like object retrieval using tools and spatial navigation exhibited significant connections with mobility success at developmental milestones of 19–36 months.

Working with infants that are behind in motor skills can make a difference especially in ambulation for the infants. Wu et al (2007) carried out a study that focused on how the use of treadmills helped with walking and walking patterns of Down syndrome (DS) infants. The implications of the study show how motor skills are enhanced through special designed therapies which is in line with changes that seek to improve children physically and mentally.

Adhikari (2023) claims that during the COVID-19 pandemic, cartoon characters had an impact on the social growth of children due to para-social relationships that they had formed. Such researches give insightful information concerning the role played by the media in people's behavior. We can place this research within the wider framework of trying to comprehend how interaction with technology and the media shapes the development of human beings, particularly in their early stages, and it includes both vices and virtues.

(Janz and Mahoney, 1997) analysed the relation between maturation, gender, video game play and the level of exertion during physical activity among adolescents which is important in explaining how behavior, and biological determinants or factors are related to a child's activity pattern. Such an investigation is important in understanding how technology use such as video gaming affects health which is in keeping with the wider objectives of promoting activity and reducing time spent in digital environments.

Using accelerometry, the study measured daily physical activity intensities in 102 adolescents over four days. Key findings indicated a negative correlation between video game playing and physical activity, with boys showing significant declines in average daily movement ($r = -0.38$) and vigorous activity ($r = -0.38$), while sedentary behavior increased ($r = 0.31$). Girls exhibited similar trends, albeit less pronounced, with a notable correlation between video gaming and reduced movement ($r = -0.55$).

The findings highlight the need to incorporate organized physical activity programs as certain counterbalancing measures aimed at reducing the negative effects of prolonged screen time Consequently contributing to the debate on how technology should be controlled at the adolescent stage which is the formative stage.

This also goes a long way in understanding the role interaction plays in the development of children's social and cognitive capabilities to fully appreciate effective strategies in early childhood education. The aim of this thesis is to utilize advances in technology to develop an understanding of interest and activity patterns in young children within specific and group contexts. Peer learning forms the core of early childhood education and provides a natural context to explore how children influence one another. This is research by Mlawski in 2014, which falls within the scope of this topic as it gives insight into successful peer learning among kindergarten-aged children.

Mlawski (2014) describes the various verbal and non-verbal strategies that children use in peer dyads to accomplish proximal learning activities, but also accounts for the larger cooperative effort among the children. Some of the key strategies reported include observation, modelling, and feedback that are summarized in Table 14 on observation and Table 15 on feedback.

Processes	Totals	Dyad 1	Dyad 2	Dyad 3	Dyad 4	Dyad 5	Dyad 6
Modeling non-verbal	**1**	0	0	0	1	0	0
Modeling + verbal	**4**	2	1	0	0	0	1
Imitation	**7**	0	1	0	1	0	5
Prompting-verbal	**31**	1	3	8	7	6	6
Prompting-non-verbal	**14**	0	1	2	5	4	2

Table 14 Processes Associated with Observation
(Source: Mlawski, E. A., 2014, p. 2055).

Processes	Totals	Dyad 1	Dyad 2	Dyad 3	Dyad 4	Dyad 5	Dyad 6
Self-reinforce-ment	**63**	11	7	18	13	12	2
Feedback positive	**6**	1	0	3	2	0	0
Feedback negative	**9**	0	0	1	0	8	0

Table 15 Processes Associated with Feedback
(Source: Mlawski, E. A., 2014, p. 2055).

One notable observation is the prevalence of parallel play over direct cooperative engagement in some interactions, suggesting that developmental stages can influence the nature of collaboration. This insight complements the thesis's emphasis on adapting strategies to individual developmental needs, as effective peer learning may require varying levels of structure depending on children's readiness. The conceptual framework (Figure 9) highlights how processes like scaffolding and error management can foster engagement, ensuring peers learn effectively together.

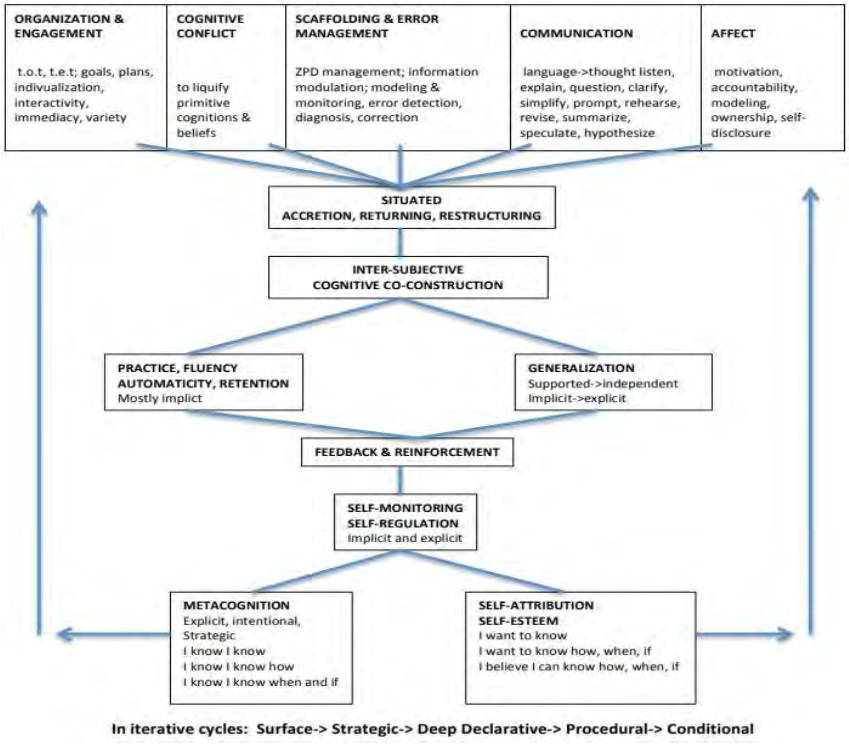


Figure 9 Conceptual Framework for Peer Learning

(Source: Mlawski, E. A., 2014, p. 2055).

The dissertation may consider approaches similar to those outlined in Mlawski's study on technology-based interventions within the educational settings to improve behavior and peer interaction. Such findings add onto the larger debate on how to improve the preschool education using procedural and structural approaches.

This dissertation emphasizes the effectiveness of mobile technologies in enabling children to identify their interests and promote appropriate behavior changes, particularly through engaging and flexible teaching methods.

This supports the work Ewais et al. (2019) did whereby they sought to test and evaluate a mobile learning app called ChemApp, designed for eighth grade Palestinian students learning chemistry. The study emphasizes the importance of integrating digital technologies in order to improve the interactivity and engagement levels of learners in the learning process, particularly in less or more difficult learning contexts.

Such features include whiteboard animations, interactive periodic table, and quizzes that foster learning in complex chemistry issues of molecular structures and interaction chemistry. In Table 16, for instance, 87 percent of students said they had a better understanding of certain chemical principles.

Questions	Min	Max	Avg.	Std.
1. When I use ChemApp, my skills are enhanced.	3	5	4.33	0.31
2. I am sure that ChemApp increased my understanding of the chemistry.	2	5	4.36	0.34
3. Using ChemApp would enable me to perform learning tasks more quickly.	3	5	4.53	0.29
4. Using ChemApp will not help me to achieve my desired grade in the chemistry course.	1	5	1.70	0.69

Table 16 Learner's Performance Evaluation Result
(Source: Ewais, A., Jaradat, S., Rabaya, K., & De Troyer, O., 2019, p. 2339-2347).

The research also examined the gender aspects with a particular focus on female students who tend to be more passive in terms of STEM field applications. It can be noted from Table 17 that such mobile applications as ChemApp have contributed to improving students' academic engagement and positively affected them in regard to technology-based learning, which is in line with the objectives set out in the thesis to reduce behavioral disparities with the help of technological solutions.

Questions	> 3 times	2-3 times	Once	Never
How many times do you use mobile phones or tablets every day?	24%	40%	26%	10%
How often do you use educational applications in a day?	10%	16%	66%	8%

Table 17 Participants Demographic Data

(Source: Ewais, A., Jaradat, S., Rabaya, K., & De Troyer, O., 2019, p. 2339-2347).

This thesis demonstrates the importance of usability and user-centered design in technological solutions targeted to meet diverse learning needs, based on the research that Ewais et al.(2019) have conducted. Such technologies have potential to enhance engagement and performance, making them inevitable elements within educational frameworks focusing on a holistic development of children.

2.2.2 Ethical guidelines on the use of technology in early education.

The impact of technology on children rarely has been the focus of contemporary research. Children's resources concerning language, cognition, and development on the adjustable parameters in the design and implementation of moral conversational artificial intelligence (Alexa, Cortana, Google Home, Siri) were researched. However, while these conversational agents (CAIs) are wide in safety, security and access, they are poorly designed in respect of morality. Children-oriented mobile apps sometimes have such verbal and non-verbal components as hyper- or sub-verbalisation, when children are viewed as vulnerable mildly or not at all.

The issue of digital technology in the context of early age education is becoming more and more social relevant as we look at the context of within which the child thinks learns and behaves. This dissertation addresses systematic methods of improving behavioral modification of children which closely relates and expands this paper in respect of strategies on how technology can be applied in constructive ways with less harmful consequences.

According to OECD (2023), the involvement of digital tools in early education has various advantages and disadvantages. Online resources present customized learning facilities and entertaining activities directed to enhance the cognitive and social skills. Conversely, extensive display time and limited accessibility would exacerbate developmental and social inequalities. The report identifies that inclusion of digital competencies into curricula would help children think critically when using online safety while learning it.

This work aligns with the goals of this thesis by underscoring the need for structured, evidence based interventions that harness the potential of technology to enhance behavioral and developmental outcomes for young children.

2.2.3 Socioeconomic factors influencing tech accessibility

The influence of socioeconomic status (SES) on child development offers profound insigh ts into behavioral and developmental disparities across populations. This investigation emphasizes coordinated efforts directed toward alleviating the negative effects of both environmental and societal stressors, besides the conclusions drawn by (Bradley and Corwyn, 2002).

This research highlights coordinated efforts directed toward reducing the adverse impacts of both environmental and societal stressors, in addition to the findings that (Bradley and Corwyn, 2002).

This present research focuses on the strong link between socioeconomic status and child outcomes in the three areas of health, cognitive and academic performance, and socioemotional development. The authors conclude that stress reactions, access to resources, and health-related behaviors explain how class influences children's wellbeing. To the authors, children from poor backgrounds face higher risks than their counterparts in the community, poor health, unsafe environment and poor learning environments all of which contribute to poor growth. Children from the low-socioeconomic-status families suffer from growth deficits and neurobehavioral disorders, early deliveries, and poor mental and emotional development. Bradley and Corwyn (2002) applied moderator variables, including parental expectations, availability of enrichment experiences, and socioeconomic level of neighbourhoods, in order to show how these variables affect developmental paths. However, Baker et al. point out that social determinants of health BE detrimental if resilience features like support from family environment and outside help counteract them.

One of the major disadvantages in SES research is the lack of study of various interrelated processes when assessing the effect of a particular factor on developmental outcomes. Nutritionally disadvantaged children often face supplementary problems, such as exposure to environmental risks and suboptimal parenting, which may exacerbate cognitive deficiencies.

Thus, to get a better understanding of the link between socioeconomic position and cognitive performance, researchers need to dig deeper into these interrelated processes.

Although most research deals with mediators of the SES-child outcome link, study of moderators, those aspects that affect mediation processes, also is important. Such factors as belief in human agency, social support, and coping mechanisms may mediate the relationship between socioeconomic status and child outcomes.

Additionally, disparities in these processes often occur based on race, with minority groups facing discrimination that limits access to resources and increases stress.

Media exposure plays a critical role in shaping early childhood behavior and development. This thesis explores how technology can influence interest recognition and behavior improvement, with a particular focus on the balance between constructive and passive media use. Understanding patterns of media consumption among children provides valuable insights into designing interventions that promote healthy engagement with technology.

Christakis et al. (2004) investigated media usage patterns in children under 11 years, shedding light on factors that contribute to excessive screen time. The study revealed that children with a television in their bedroom consumed significantly more media across all forms television, videos, and computer games (Table 18). Moreover, habits such as eating meals in front of the television were associated with additional daily screen time (0.61 hours). These behaviors were more prevalent among older children and those from families with lower parental education levels.

Variable	Television	Video	Computer games	Total media time
Eat breakfast or dinner in front of television	**0.38 (0.21, 0.54)**	**0.19 (0.04, 0.34)**	0.04 (−0.06, 0.15)	**0.61 (0.14, 1.08)**
Television in bedroom	**0.25 (0.07, 0.43)**	**0.31 (0.16, .47)**	**0.21 (0.10, .32)**	**1.06 (0.55, 1.57)**
Male	−0.07 (−0.22, 0.08)	−0.07 (−0.20, 0.06)	**0.19 (0.09, 0.28)**	0.27 (−0.15, 0.70)
Age (y)				
<3	Referent	Referent	Referent	Referent
3–6	**0.91 (0.60, 1.21)**	**0.82 (0.65, 1.00)**	**0.38 (0.25, 0.50)**	**2.15 (1.6, 2.73)**
>6	**0.78 (0.50, 1.05)**	**0.35 (0.19, 0.52)**	**0.72 (0.60, 0.84)**	**1.95 (1.42, 2.48)**
Education				
Less than high school	**0.37 (0.02, 0.72)**	0.09 (−0.21, 0.06)	0.03 (−0.18, 0.25)	−0.11 (−1.08, 0.88)
High school	Referent	Referent	Referent	Referent
Some college	−0.06 (−0.28, 0.16)	0.05 (−0.15, 0.24)	−0.02 (−0.16, 0.11)	−0.16 (−0.78, 0.46)
College degree	**−0.33 (−0.55, −0.11)**	−0.15 (−0.34, 0.05)	−0.05 (−0.18, 0.09)	**−0.83 (−1.45, −0.20)**
Higher college degree	**−0.70 (−0.98, −0.42)**	**−0.24 (−0.48, −0.01)**	**−0.11 (−0.28, 0.06)**	**−1.5 (−2.3, −0.73)**

Table 18 Linear Regression Predicting Hours of Television, Video, and Computer Usage on a Typical Day in the Past Week

(Source: Christakis et al., 2004, p. XX).

(Robinson and Killen, 1995) underscore the significance of cultural and environmental influences in moderating the impact of television use, stressing the need for tailored treatments that account for ethnic and gender-specific vulnerabilities.

Adolescent physical exercise is a complex behaviour that is affected by several psychological, social, and environmental factors. This thesis emphasises the importance of systematic, evidence-based approaches to enhance physical activity in children and adolescents, which promotes their holistic development. Sallis et al. (2000) provide essential insights into these connections by carefully analyzing 108 research to discern patterns and determinants of physical activity in children aged 3–12 and teenagers aged 13–18.

The analysis uncovers notable disparities between children and teenagers. For youngsters, variables such as liking for physical exercise, goals, and accessibility to facilities were consistently correlated with elevated activity levels. Parental physical activity shown just an erratic impact. For teenagers, psychological elements such as perceived competence and goals, in conjunction with social support from friends and family, were identified as significant predictors. Significantly, sedentary activities such as television watching had an unfavourable correlation with physical activity, especially throughout adolescence.

Sallis et al. (2000) emphasize the need for focused interventions that address changeable variables, including access to facilities and the cultivation of supportive social contexts.

A list of many factors that could help children cope with low socioeconomic distress includes personality traits, family interactions, and external support systems. These may either improve access to essential resources or provide emotional support.

Understanding the interaction of individual, familial, and community-level socioeconomic status determinants is crucial for understanding the effects on child development. Bystander effects, shared socialization, competitive theories, and relative deprivation theories suggest links between neighbourhood poverty and maladaptive behaviors: each provides a facet of insight into the influence of social environment on child outcomes.

2.2.4 Impact of early exposure to technology on long-term development

It has become more urgent to understand the influence of technology on children's development as it becomes an integral part of everyday life. The modern child spends almost an incomprehensible amount of time with digital media, which has caused concerns regarding the pros and cons of being exposed to it. The study classifies contemporary research into two major categories: those about negative impacts of technology use, such as cognitive problems, concern about body image, and unhealthy eating practices, and the positive outcomes of enhanced cognitive function and socialization. This study seeks to elucidate the complicated relation between technology and child development by synthesizing evidence from several studies; it provides parents, schools, and health professionals with a backdrop against which to navigate such digital waters.

(Grøntved and Hu, 2011) performed a meta-analysis investigating the correlation between extended television watching and the risk of type 2 diabetes, cardiovascular disease, and overall mortality. The examination of eight prospective cohort studies identified a dose-response correlation, indicating that each additional two hours of daily television watching elevates the relative risk of type 2 diabetes by 20%, cardiovascular disease by 15%, and all-cause death by 13%.

The outcomes of the study indicate that it would be beneficial to promote active lifestyles, instead of keeping children exposed to screens for long periods. The epidemiology of childhood obesity has emerged as one of the important issues regarding the provision of public health.

Recognizing the pattern and identifying factors of risk requires prompt intervention. This dissertation examines how systematic approaches may counter the behavioral and environmental contributors that cause childhood obesity, along with (Chinn and Rona, 2001).

The study was done on the basis of information drawn from three cross-sectional surveys conducted among children aged between 4 to 11 years during the years 1974 to 1994 with more than 20,000 children. Using internationally agreed BMI cut-off points, the researchers reported a substantial increase in the prevalence of overweight and obesity among children, particularly between 1984 and 1994. For instance, overweight prevalence rose from 5.4% to 9.0% in

English boys and from 9.3% to 13.5% in English girls during this period. Obesity prevalence, though lower, also showed significant growth, with Scottish girls reaching a peak of 3.2% in 1994.

The study highlights age-related differences, with older children showing the most significant increases in overweight and obesity. The authors emphasize that these trends are likely to lead to higher rates of adult obesity and associated morbidities, underscoring the need for early interventions. This study establishes a solid foundation for tracking trends, aligning with the thesis's objectives of formulating evidence-based methods to reduce childhood obesity via behavioral and environmental changes.

2.2.5 Exploring Technology's Impact on Infant Development

The thesis explores the transformative impact of technology on young children's behavior, cognition, and social interactions. The article by (Anderson and Hanson, 2013) complements this by examining how television and other media influence infants and toddlers, highlighting distinctions between foreground and background TV and their developmental impacts.

Background TV, which refers to programs not directed at children, disrupts sustained attention, play, and parent-child interactions. Studies referenced in the article show that background TV reduces the richness of language parents direct toward their children and is associated with delayed language and cognitive skills. For example, research by Schmidt et al. (2008) found that children engaged in shorter, less-focused play episodes when a TV was on in the background.

In contrast, Foreground TV, which is designed for children, has more nuanced effects. Programs like Sesame Street can positively influence cognitive and social development if the content is age-appropriate and interactive. However, children under 2½ years struggle to comprehend and learn from video due to the "video deficit," where they learn less from video compared to real-life interactions.

These findings align with the thesis's focus on leveraging technology responsibly to enhance development. They underscore the need for interactive and contextually relevant digital tools that engage children meaningfully, support language acquisition, and encourage active participation, bridging gaps seen in passive media consumption.

The summary emphasizes that electronic media, such as television and interactive material, may either facilitate or obstruct growth based on the nature of the content, its length, and the context in which it is used. Educational television, shown by Sesame Street, has demonstrated the capacity to improve school preparation and cognitive abilities. In contrast, extended exposure to violent or inappropriate material correlates with heightened aggressiveness and anxiety, as shown by research using Social Learning Theory.

This study emphasizes the need for deliberate media tactics in early infancy, along with the thesis's aim to include technology into organized interventions. Utilizing insights on content design and parental engagement, forthcoming media products may more effectively facilitate comprehensive kid development.

The research purpose is to investigate and delineate the many research methodologies applicable to the study of Infant Interest Recognition and Behavior Enhancement via Technology. The study seeks to elucidate the beneficial and detrimental effects of Technology in this context and to instruct Infants on the proficient use of Technology to foster imaginative and creative results. Furthermore, the study seeks to encourage infants

to express ideas and concepts pertaining to technology, perhaps facilitating the development of logical reasoning in infants. Ultimately, the study seeks to elucidate how technology might enhance the structuring of new-borns.

2.2.6 Young Children, Early Childhood Education, and Care

This section considers the use of digital technology, by young children (aged 0-6), in their family settings, and thus highlights the particular attributes and consequences of their experiences, relative to older children. Recent studies conducted in OECD nations reveal that young children are increasingly using digital devices with parental guidance. This counters the oversimplified notion of the "digital native," stressing the differential experience made by children with technology and the requirement for instruction or assistance in accessing it safely and productively.

Some studies note that a good proportion of children start to explore digital technology even before they reach the age of 3 and consume it rather actively by ages 3 and 4. Data indicates that, on average, almost 40% of 15-year-olds encountered their first digital gadget by the age

of 6. In 2018, a survey revealed that 83% of 5-year-olds in the participating nations used digital gadgets on a weekly basis, with a significant number engagi ng with them everyday. Parental surveys indicate that engagement in digital activities begins at increasingly younger ages, with significant use documented in several countries.

Young children use digital technology for many reasons, mostly for enjoyment, such as viewing cartoons, listening to music, and participating in creative activities. Communication with family members is crucial, often under parental supervision. Although young children are less inclined to engage with social media, several own accounts or are indirectly depicted via their parents' postings. Their digital engagements often intertwine with offline play and social interactions, providing avenues for learning, creativity, and familial connection while also exposing children to potential threats.

Digital inequality is conceptualized as inequality in access to digital tools and competencies. Research studies suggest that children from poorer backgrounds have

limited access to technology. Where they are available, the devices and connectivity available may be of poor quality. The digital skill itself is influenced by social class; those who come from wealthy families will tend to have better skills.

Child outcomes depend on socioeconomic factors such as family income, parental education, and parenting styles. For example, mostly children from wealthy homes play fewer games, although maternal working hours do slightly reduce the time children spend socializing. Notwithstanding apprehensions of "over programming," the research reveals no indication of youngsters being unduly engaged in organized activities throughout the examined timeframe.

These results corroborate the concept by emphasizing the necessary equilibrium between organized and unstructured activities to facilitate whole infant development.

Television's influence on young children remains a pivotal topic in understanding developmental and behavioral outcomes, particularly as modern technologies dominate early childhood environments. This thesis delves into structured strategies to manage and optimize such behavioral interactions, drawing from empirical studies like Anderson et al. (1985).

This study meticulously compares parent-reported data on children's television viewing habits with time-lapse video observations in a sample of 334 middle-class families. By employing innovative observational techniques, including automated video setups, the study revealed critical discrepancies between parent diaries and actual viewing patterns. Parent-maintained diaries showed significant overestimations, averaging 16.6 hours per week compared to observed data indicating 13.4 hours (Table 19). However, the diary method was still considered moderately reliable, with correlations reaching up to 0.86, demonstrating its utility when direct observation is infeasible.

	Group				
Diary	C-NE	C-EP	E-E	C-ER	All
With uncertainty:					
1	16.6	17.3	16.3	16.9	16.6
SD	9.8	9.2	8.7	10.0	9.4
N	102	41	104	85	330[a]
2	16.4	14.4	16.6	16.1	16.1
SD	10.0	7.3	9.0	10.2	9.4
N	100	41	105	85	330
Without uncertainty:					
1	15.4	15.8	15.9	15.9	15.6
SD	9.4	8.4	8.8	9.8	9.1
N	102	41	104	85	330
2	15.2	12.9	14.2	14.8	14.8
SD	9.1	6.9	8.0	9.5	8.6
N	100	41	105	85	330

Table 19 Focus Child's Mean Number of Hours per Week with Television, Recorded on Diaries with and Without Hours of Uncertainty

(Source: Anderson et al., 1985, p. XX).

Early exposure to television plays a critical role in shaping cognitive and behavioral outcomes in young children, a concept that aligns with the focus of this thesis on leveraging technology for developmental improvement. Barr et al. (2010) examine the relationship between media exposure (in particular, television) and cognitive and executive function by evaluating the amount of time children aged 1 and 4 spent watching TV.

This study categorizes television programs into two: children-oriented, such as Sesame Street and Blue's Clues, while the adult-oriented programs entail news and sitcoms. As argued in this paper, the executive function that was reduced from children who mainly watch the adult-oriented programming is not having inhibitory control over their thoughts and metacognition. In that developmental age, children's cognitive skills, like vocabulary build up

and preparedness for school, were not hampered by viewing television programs designed for children.

This dissertation is concerned with the intentional engagement with digital technologies with the intention of promoting concentration in children and reducing undesired behaviors. Tamana and co-workers have researched the relationship between screen time and attention and externalizing behaviors in pre-schoolers in the context of the Canadian CHILD project, putting forth important findings. The researchers collected data on 2,438 five-year-olds' screen usage and behavior scores on the Child Behavior Checklists, or CBC. Those whose screen time usage went beyond two hours in a day experienced an increase in the externalizing behavior Tscores at 2.2 and were five times more likely to be seriously facing behavioral problems.

Inattention assessments showed a strong correlation with high screen time, which increased the chances of difficulties related to attention in children by 5.9 times. On the other hand, screen time has a weak correlation with violent behavior; hence, this shows its unique impact on the attention issues. The study showed that organized physical activities decreased externalizing behavior ratings by 1.3 points. Socioeconomic status combined with parental stress was another important predictor of behavioral outcomes. Tamana et al. (2019) considered the importance of following guidelines on screen time and activities promoting physical activity as well as social engagement. This evidence is consistent with the position of the thesis, a judicious use of technology towards development and reduction in problems created by excessive exposure to screen time. In addition, commercials on television also have profound impacts on what children consume. The present study focuses on the methods that aim to reduce advertising's impact by adopting healthy lifestyles and making well-informed decisions among children.

Clancy-Hepburn et al. (1974) performed two investigations regarding children's responses to television advertisements for food products. They facilitated interviews with both children and their mothers to discuss topics such as food preferences, snacking behaviors, perceptions of marketing, and engagement with commercials in the consumer environment.

This study highlights the importance of parental mediation and critical evaluation of advertising messages. It aligns with the thesis's objective of developing structured approaches to mitigate the influence of media and foster healthier, more informed behaviors in children.

Physical activity patterns in young children are critical to understanding their developmental and health trajectories. This thesis emphasizes structured strategies to promote behavioral improvements, aligning with Baranowski et al. (1993), who investigated how location, gender, ethnicity, and time influence physical activity in children aged 3–4 years.

The study utilized the Children's Activity Rating Scale (CARS) to assess physical activity levels across multiple settings, such as inside the home, school playgrounds, and public outdoor spaces, over a year. Results revealed that children were significantly more active outdoors than indoors, with boys consistently exhibiting higher activity levels than girls in all settings. Seasonal variations also influenced activity, with outside activity peaking in temperate months and declining during the hottest and coldest periods.

Interestingly, no significant differences in physical activity levels were observed across ethnic groups, challenging common assumptions about cultural influences on activity. However, the study did emphasize the potential of outdoor environments to encourage higher activity levels, suggesting that structured interventions promoting outdoor play could substantially enhance physical activity in young children.

These findings reinforce the thesis's focus on leveraging environmental and contextual factors to improve behavioral outcomes, underscoring the importance of integrating outdoor activities into early childhood routines to foster healthy development.

Children's food preferences and eating behaviors play a critical role in shaping their health outcomes, particularly in the context of obesity. This thesis explores structured strategies to influence behavioral patterns in children, aligning with the insights provided by Smith and Epstein (1991) in their study on food choice.

The study underscores that food choice in obese children is not solely based on preference but is influenced by environmental constraints and access. This suggests that interventions targeting dietary habits should focus on limiting access to high-calorie foods and creating environments where healthier options are more accessible and rewarding.

These results correspond with the thesis's aim to provide systematic methods for behavior modification, highlighting environmental tactics to promote healthy eating habits in kids.

2.3 Theory of Reasoned Action

The Theory of Reasoned Action (TRA) helps in understanding and explaining human behavior. For behavioral action, 'reasoned action' is approached in terms of intents, which depend on attitudes and subjective norms. This theory applies to analyzing Infant Interest Recognition and Behavior Enhancement via Technology by evaluating how parents' and caregivers' attitudes and norms dictate children's use of technology. The literature review will use TRA to examine factors affecting parents' and caregivers' decisions, such as beliefs about technology's effectiveness, risks, social norms, and appropriate usage.

A technology readiness assessment (TRA) may identify challenges in scholarly work on technology development. It could investigate how parents' and caregivers' behavioral intentions are influenced by subjective norms in different cultures and how attitudes toward technology evolve with advancements.

TRA postulates that behavior is determined by attitude, subjective norms, and perceived behavioral control. Children's behavior with technology in school depends on how parents, teachers, and classmates perceive it. The theory is useful in analyzing technology's role in education and how social contexts shape children's attitudes.

Applied to parents' and caregivers' behavior, TRA provides insights into assessing desirable technology use. The literature study focuses on behavioral changes through education, treating technology as a means, not an end. Key principles include using technology for creativity, age-appropriate use, curriculum integration, and bridging communication among parents, educators, and children.

Children's ages and development cycles should be considered in preschool technology use. Technology should be a means to education, not the goal. It can help set new boundaries, and teachers should integrate it with traditional materials like crayons, pens, toys, and books. Young children should express themselves freely without interfering with other educational tools.

2.4 Theory of Human Society

The technology and its effect on the growth of human society particularly in the sphere of education is the relevant social theory. This overview highlights the positive aspects of technology in enhancing children's behavior, thinking and even emotional aspects during the learning process. It highlights the importance of careful and integrated approaches in the involvement of children where such children are young, in relation to their developmental stage. The research findings point out that technology can improve the relationship between parents, families, and early childhood educators and children, and improve also educational achievement and readiness for school. Also, it underlines the importance of technology in providing diverse and rich experiences, advanced and creative thinking, as well as children's preferences. The literature review suggests that the inclusion of technology in the learning processes is necessary and has a great impact on people, especially since infancy.

The review shows that technology might increase children's chances of learning and developing positively. It makes several suggestions to parents and caregivers for instance in raising dialogue on various topics and letting kids think and create ideas on their own. The review underlines the need to create a conducive and nurturing educational environment for children for effective inquiry and hands on activities.

This literature review stresses on the appropriate and coherent use of technology across young children divided into developmental stages in launch of early learning projects. The analysis highlights the importance of continuing research in this field. It identifies other aspects of the problem which require investigation, such as the need for cohesive rules on the use of technology in the education of children.

2.5 Future of kids' cognitive and motor development

2.5.1 Cognitive Development

The cognitive development of children is influenced by their engagement with technology, educational settings, and media. Technological advancements and educational resources have created new options for enhancing cognitive development. This research examines how children learn, process, and use information via engagement with digital devices, interactive activities, and media consumption.

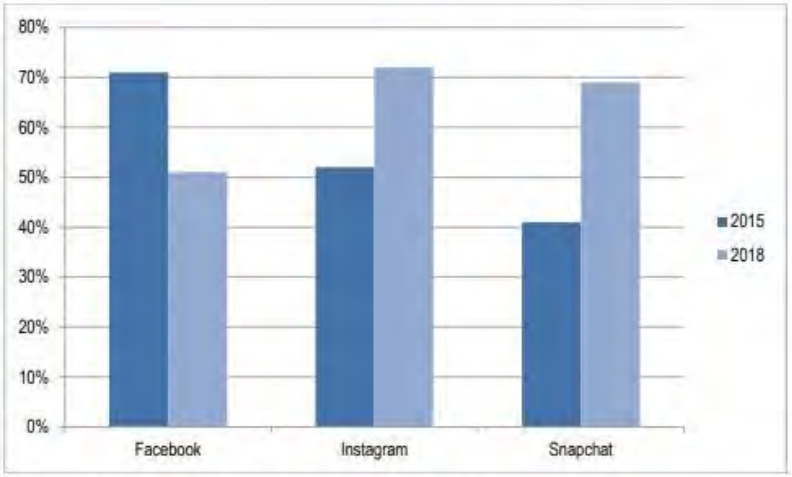
Technology plays a pivotal role in understanding and improving behavior and interest recognition among infants and toddlers, aligning with this thesis on leveraging technology for developmental interventions. Shic et al. (2020) explore how advanced tools like wearables, eye-tracking, and voice analysis systems can aid infants and toddlers at risk for Autism Spectrum Disorder (ASD). They emphasize critical developmental areas like sensory profiles, motor skills, and cognitive milestones. The paper includes Table 20, which outlines the physical growth metrics of infants and toddlers, highlighting the importance of accommodating variability in technology design. Such insights strongly support this thesis's goal of utilizing adaptive technologies for targeted developmental improvements.

	Head circumference (cm)		Weight (kg)		Height (cm)	
Age	Male	Female	Male	Female	Male	Female
6 months	41.1-46.2	40.1-44.9	6.3-9.9	5.7-9.0	62.2-72.6	60.2-70.4
12 months	44.1-48.6	42.8-47.3	8.5-12.6	7.9-11.6	70.4-81.2	68.4-79.1
24 months	46.3-51.0	45.1-49.8	10.6-15.3	10.1-14.7	81.1-93.5	79.6-92.0
36 months	48.6-52.3	46.0-51.2	12.0-17.5	11.5-17.4	89.3-102.9	88.0-101.7
Adult	54.4-58.4	52.7-56.4	57.4-106.0	47.9-92.3	167.1-186.3	154.7-171.1

Infant and toddler data are 5th to 95th percentile range ±2 weeks age in months (Adapted from Kuczmarski, 2000). Adult ranges are 10th to 90th percentiles at 18 years (height and weight: McDowell, Fryar, Ogden, & Flegal, 2008; head circumference: Rollins, Collins, & Holden, 2010).

Table 20 Physical Characteristics of Typically-Developing Infants and Toddlers
(Source: Shic et al., 2020, p. XX).

Gottschalk (2019) examines the diverse impacts of technology use on children's brains, cognition, and well-being, highlighting both opportunities and challenges. Figure 10 visualizes the shifting trends in social media platform usage among teens, showcasing the dynamic nature of technological engagement.



Source: Adapted from (Lenhart, 2015[30]; Pew Research Center, 2018[100]).

Figure 10 Change in Popular Social Media Platform Use Among US Teens
(Source: Gottschalk, 2019, p. XX).

The study emphasizes the "Goldilocks Effect," suggesting that moderate technology use can positively influence mental well-being, while excessive or minimal use might be detrimental. These findings reinforce the need for tailored, evidence-based approaches to integrate technology into children's developmental frameworks effectively.

Incorporating robots and interactive technology into early childhood education provides unique opportunities for cognitive and conceptual development. The study by Levy and Mioduser (2007) explores how kindergarten children perceive the adaptive functioning of self-regulated robots, emphasizing shifts between psychological and technological explanatory frameworks. These findings provide valuable insights into how children construct and refine their understanding of technology, aligning closely with this thesis's focus on fostering developmental growth through innovative educational tools.

(Levy and Mioduser, 2007) put forward contention for integrating computing devices in lower grades with the statement that through these devices children would develop more in terms of conceptual understanding and pathological reasoning. These results are consistent with the objectives of the thesis which aim at using advanced technology for children’s developmental enrichment, as they seem to provide an ingenious means for babies to explore

complex structures while satisfying their natural tendencies to attribute human qualities and relevance to situations.

Anastassea-Vlachou et al. (1996) conducted a large-scale study activities involving 4876 Greek pupils which aimed to determine the effects of television in watching habits on academic performance, prevalence of overweight and some health relevant practices. Based on their studies, children who are conditioned to watch TV at a lower age are likely to do better at school during the early stages of their life span probably because their cognitive potentials were stimulated. On the other hand, it was found that children who used the television excessively did not perform well in school particularly in reading and thinking activities. This contrast reveals the fact concerning relationships between exposure, the time of watching and cognitive development.

The study focused on socio-economic geography and found that children residing in cities and those belonging to lower economic groups had the highest television use, which sometimes exceeded 32 hours a week. Children who had a television set in their bedroom enjoyed more hours of watching television, and did not follow rules concerning what restrictions were meant to a great extent. Furthermore, consuming food while viewing television is associated with obesity, especially in teens, indicating that excessive screen time may supplant more beneficial activities such as physical exercise and social interaction.

Television exposure and its related risks must be regulated to preserve its beneficial impact. As, already explained in the opening section, the study corresponds to the general objectives of this thesis in the sense that it highlights the necessity of systematic measures aimed at increasing the benefits of technology for children and minimizing its adverse effects.

2.5.2 Behavioral and Emotional Impact

A child's emotional and behavioral growth are integral factors in their ability to socialize, learn as well as their mental health. To achieve holistic growth, the child's emotional growth, self-control and proper behavior patterns need to be developed. This segment focuses on the effects of television, parents and structured psychotherapy on the child’s emotions and mental health issues.

Child behavioral disorders can severely interfere in a child's emotional, social and cognitive growth. Sulkes (2023) covers the vast landscape of behavioral problems such as temper outbursts, poor sleep, reluctance to go to school and compulsive behaviors like thumb suckling and biting fingernails. It gives an insight into how parenting style and environment can affect how a child behaves. Circles which originate in the parent-child relationship are reported as largely causal. These circles are based on the fact that a child, due to some adverse reaction of the parent towards the child's wrong doing, is encouraged to repeat that behavior.

Harrison et al. (2006) implemented a 16-week program called "Switch OffGet Active," focusing on self-monitoring, budgeting time, and promoting alternative activities to screen use (Table 21). This paper investigates the impact of a school-based intervention aimed at reducing screen time and increasing physical activity in primary school children.

Lesson	Title	Focus
1	Healthy lifestyles	Explore meaning of health and its relationship with lifestyle
2	My time	Self-monitor leisure time with particular emphasis on physical activity and screen time
3	Intelligent television viewing	Explore TV viewing habits and encourage selective viewing
4	Switch Off—Get Active diaries	Explain the activity points system used to encourage the substitution of activity for screen pursuits
5	Television turnoff	Plan for a night without TV
6	Benefits of physical activity	Explore social, mental and physical benefits of being active
7	New games	Introduce fun, non-competitive street and playground games suitable for small and larger groups
8	Barriers to increased activity	Identify barriers to increased activity and ways of overcoming these barriers
9	Local activity opportunities	Identify local activity opportunities
10	Poster and slogan competitions	Advocacy of increased activity and decreased screen time by children

Table 21 "Switch Off- Get Active" Lesson content
(Source: Harrison et al., 2006)

The study highlights the potential of structured health education interventions in fostering healthier habits, though long-term strategies may be needed to achieve measurable impacts on weight and health.

Salmon et al. (2005) evaluated the "Switch-Play" intervention, a randomized controlled trial aimed at reducing sedentary behaviors (like television viewing and gaming) and increasing physical activity among 10-year-old children. The intervention used three strategies: behavioral modification (BM), fundamental motor skills (FMS) training, and a combined BM

and FMS approach. The study highlights that well-structured interventions incorporating self-monitoring, goal setting, and skill development can effectively influence sedentary behavior and promote physical activity. This aligns with broader objectives to foster healthier behavior patterns in children through targeted interventions.

Sedentary behaviors, particularly television viewing, are key contributors to the increasing rates of childhood obesity and associated health challenges. This thesis emphasizes understanding behavioral patterns to develop interventions that reduce sedentary activities and foster active, healthy lifestyles in children.

Gorely et al. (2004) reviewed empirical studies to identify correlates of television and video viewing among youth aged 2 to 18. The study underscores the importance of understanding sedentary behavior as distinct from physical inactivity. This aligns with this thesis by emphasizing the need for targeted interventions that address behavioral and environmental factors contributing to unhealthy habits in children.

Sedentary behaviors, such as excessive screen time, compete with physically active behaviors, impacting children's health and contributing to obesity. This thesis explores structured strategies to influence children's behaviors and enhance their engagement in healthier alternatives, aligning with the approach presented in this study.

Epstein et al. (1997) examine the effectiveness of three methods positive reinforcement, punishment, and restriction on reducing high-preference sedentary behaviors and their impact on activity choice in obese children aged 8–12. The study was conducted in a controlled laboratory setting where children were assigned to one of these intervention groups or a control group.

The findings reveal that children in the reinforcement and punishment groups were significantly more physically active during intervention days compared to the control group. Notably, the reinforcement group demonstrated a decrease in their liking for targeted sedentary activities over time, as depicted in Figure 26. By contrast, children in the restriction group did not show a significant increase in physical activity, suggesting that removing access to preferred sedentary behaviors may not be as effective as offering incentives or imposing penalties.

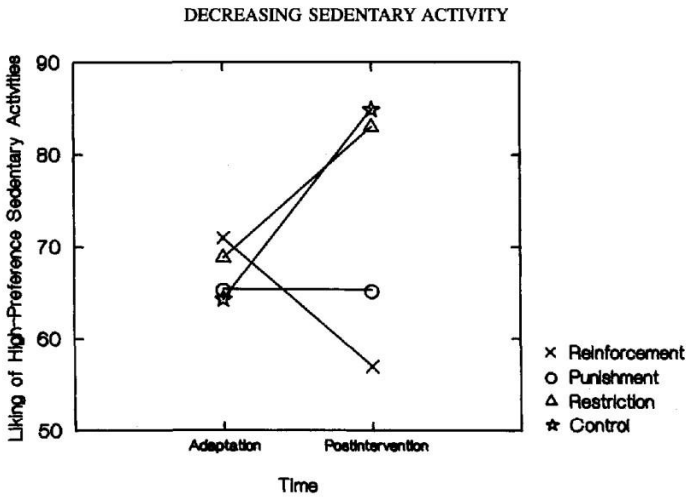


Figure 11 Liking ratings of the high-preference sedentary activities on the adaptation and post-intervention days in the reinforcement, punishment, restriction, and control groups

(Source: Epstein et al., 1997)

This study highlights the importance of behavioral strategies that enhance children's perception of choice and self-control in reducing sedentary habits. The results suggest that positively reinforcing reductions in sedentary behavior not only increases physical activity but also fosters a more sustainable decline in preference for those behaviors. These insights align with this thesis's goal of leveraging structured behavioral interventions to promote healthier lifestyles and mitigate the risks associated with sedentary behavior in children.

Andersen et al. (1998), in their analysis of NHANES III data, examined the relationships between vigorous physical activity, television viewing, and body fatness among children aged 8–16 years. The study found that excessive television viewing four or more hours daily was associated with higher BMI and skinfold thickness, a trend particularly pronounced among non-Hispanic Black children, 43% of whom reported such viewing habits. While 80% of children engaged in regular vigorous activity, rates were notably lower among non-Hispanic Black and Mexican American girls.

The findings highlight the independent impact of television viewing on adiposity, underscoring the importance of reducing screen time alongside promoting active behaviors. These results align with the thesis's goal of implementing structured interventions to mitigate sedentary behaviors and encourage healthier lifestyles in children.

The interplay between sedentary behaviors and physical activity is central to understanding health outcomes in children. This thesis emphasizes structured strategies to replace sedentary behaviors with physically active alternatives, which aligns with the behavioral economic approach proposed by (Epstein and Roemmich, 2001).

This paper highlights how reducing access to sedentary activities, such as television and video games, increases engagement in physical activities. The researchers used experimental settings to manipulate the accessibility of sedentary behaviors and observed that when access required more effort, children and adults were more likely to engage in physical activities. For instance, children increased physical activity when high-preference sedentary behaviors were contingent on performing physical tasks, as shown in Figure 12.

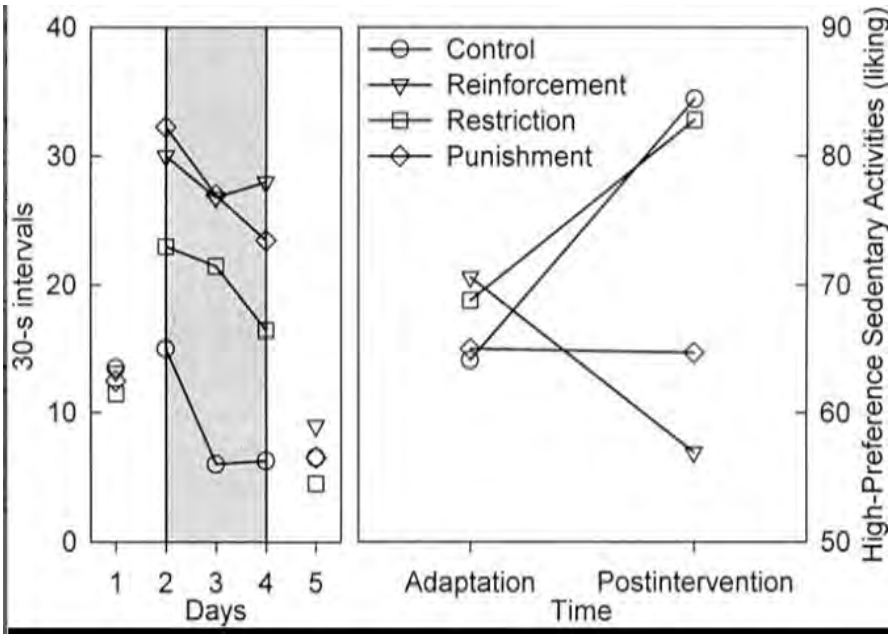


Figure 12 Time spent in physical activities and liking ratings of sedentary activities among obese children in control, reinforcement, restriction, and punishment groups during the intervention and post-intervention periods

(Source: Epstein & Roemmich, 2001

In both passive and dynamic activities, insights into behavioral patterns are essential for understanding their overarching role in children's growth and health. This dissertation seeks to explore polemic strategies aimed at reducing sedentary activities, and bolstering active participation which relates with the work of Marshall et al. (2002).

This cross-national research examined data from 2,494 children aged 11 to 15 years of the age range in that received respondents from USA and UK for the reasons that aimed to look into the clustering behavior of sedentary and active forms. Results illustrate the interrelation of some of the sedentary activities like watching television, gaming and socializing as weak, consequently highlighting the intricate nature of young age sedentariness (Table 22). The study also found out that sedentary leisure and physical activity are likely to be present together, and are not related in inverse fashion which weakens the argument that says if one is reduced, the other will be increased.

Variable	2	3	4	5	6	7	8
Computer/Internet use	0.13	0.26	0.15	0.16	0.14	0.15	0.17
Playing video games	1.00	0.08	0.06	0.08	0.05	0.23	0.23
Doing homework		1.00	0.28	0.34	0.25	0.27	0.27
Reading (non school)			1.00	0.17	0.09	0.10	0.16
Sitting & talking				1.00	0.49	0.33	0.27
Using the telephone					1.00	0.23	0.24
TV viewing						1.00	0.17
Physical activity							1.00

Table 22 Polychoric Correlation Matrix for the Sedentary Behaviours and Physical Activity (Source: Marshall et al., 2002)

Through the application of cluster analysis, the authors were able to identify three distinct profiles based upon the specific combination of sedentary and active behaviors. The research points to the importance of formulating strategies that are directed at specific clusters of behaviors instead of general approaches. Such findings support this thesis in that complex characteristics of behavior must be understood, to devise effective methods for promoting physical activity and healthy lifestyles among children and adolescents.

To properly address and understand the behavioral determinants of health in adolescents, it is pertinent to understand how physical activity interacts with TV watching and other sedentary

behaviors. The current thesis focuses on structured approaches to changing such behaviors which is consistent with McGuire et al. (2002) findings.

The research which included 4,746 teenagers of other races from different family backgrounds tried to determine the psycho-demographic factors of the use of physical activity and turning on the television. The results also suggested that there is people's concern for family and peers' fitness in addition to their concern for teens' own fitness and health that enhances the level of physical activity. The concern for fitness of the families accounted for 20.2% of boys' physical activity difference and 20.9% of girls' activity. On the other hand the television watching was found to be slightly negatively correlated to these characteristics but accounted for less variation explaining sedentary activities may require special interventions.

It has been reported that adolescents or teenagers and males in particular with girls and older adolescents in black teenagers saw the highest television consumption at 21.9 hours a week whereas black teenagers exercised less. The absence of any relationship between watching television and physical activity in the course of this investigation has therefore disproved the displacement theory.

The role of television in children's social interactions and entertainment activities is a vital area for understanding the development. The present thesis assesses structured methods for the management of net losses and the enhancement of net benefits in social involvement, in line with the findings of (Murray and Kippax, 1978).

The authors studied three Australian country communities, which differed in the amount of active television watching: a lot of TV – five years' access to two channels; little TV – one year access to one channel, no TV community.

The results showed that with the emergence of television, there were marked changes in the media use patterns and social behaviors of children. In the no-TV town, children engaged more in outdoor activities, listened to radio and read comic strips than their colleagues in the TV towns. On the other hand, the children in the high-TV town were able to take part in more common forms of sociability, for example, 'talks' and playing with friends, where television was a common topic of the talk (Table 23).

Activities	High-TV town	Low-TV town	No-TV town
Social			
Playing (Friends/Toys)	12.67	10.15	7.73
Indoor Games (e.g. cards)	2.71	1.94	3.24
Organized Social (e.g. Clubs)	1.69	1.18	1.73
Informal Social (e.g. parties)	0.89	0.75	1.34
Outdoor activities (e.g. BBQ)	0.97	1.35	2.64
Playing sport	4.62	4.20	6.72
Watching sport	1.21	1.59	1.74
Going for a drive	1.83	1.58	2.30
Alternative Media			
Radio listening	3.27	2.18	4.78
Record/Music playing	4.65	2.29	4.50
Reading (Books, Comics, etc.)	4.17	4.62	5.51
Cinema	1.58	1.34	2.69
Theatre	0.23	0.14	0.14
Talks/debates	0.68	0.39	0.27
Personal			
Animal care	2.89	2.23	2.74
Hobbies	2.92	1.59	1.92
Doing nothing	7.15	5.30	5.23

Table 23 Patterns of children's leisure activity (hours/week)
(Source: Murray & Kippax, 1978)

The role of television in shaping the behavior and development of children is a crucial topic of research. This thesis aims at the Mutz (1993) approach which contains wide analysis of the effects of television on children on the one hand and deals with structured methods of preventing its adverse effects on the other hand.

Mutz's meta-analysis synthesizes data from numerous studies, exploring how television exposure impacts children's cognitive, social, and emotional development. The findings reveal a dual impact: educational programs positively influence learning and pro-social behaviors, while excessive or inappropriate content such as violent or fast-paced shows correlates with aggression, reduced attention spans, and poorer academic performance (Table 24).

Activity		Year of change					
		1975-1976	1976-1977	1977-1978	1978-1979	1979-1980	1980-1981
Sports	r^2	.185	.032	.030	.021	.018	.006
	b	.007	.010†	.020†	.009	.002	.003
Lessons	r^2	.125	.018	.007	.004	.004	.000
	b	.005**	.003	.000	−.004	−.005	.000
Homework	r^2	.006	.002	.009	.008	.005	.001
	b	−.007	.015	−.012	.024	.039**	−.014
Clubs	r^2	.028	.008	.010	.002	.005	.003
	b	−.002	.001	.003	−.001	−.004	.004
Hobbies	r^2	.044	.026	.012	.013	.008	.008
	b	.000	.006	.008	−.002	.001	.009
Reading	r^2	.032	.011	.019	.018	.018	.008
	b	−.002	−.003	.005	.004	.000	.013***
Movies	r^2	.027	.014	.012	.001	.002	.000
	b	−.024†	−.009†	−.003	.005	−.006*	−.001
Radio	r^2	.032	.016	.008	.015	.008	.025
	b	−.019†	−.000	.004	.014***	.003	.005

Table 24 Prediction change in eight activities by change in hours of television viewing from one year to the next

(Source: Mutz, Roberts & van Vuuren, 1993)

These factors further compound the situation as children from low-income families have an increased likelihood of being exposed to material other than educational. Greater emphasis on such co-viewing was made by research in context of parent's benefits in terms of critical thought or enhancement of appropriate material.

According to the findings, the view of the thesis is based on further controlled activities and efforts; one of those is the focus of high quality, restriction of the time in front of the screen and provision of the conditions for co-use.

Myers et al. (1996) examine physical and sedentary activities in students from grades 5–8, highlighting key patterns and their health implications. The findings reveal that only 40% of students met the recommended guidelines for daily physical activity, with boys being more active than girls. Conversely, sedentary activities, particularly television viewing and video gaming, occupied a significant proportion of children's daily time, averaging 3.2 hours per day.

A reverse relationship is observed with regards to physical activity and sedentary behaviors indicating that students who spend more than three hours of screen time will find it twice easier to fall below the physical activity time guidelines. The study also identifies a lack of facilities and peer effects especially among girls as some of the physical activity constraints. Such competitions where structured sport and social support are included seem to be helpful in enhancing the participation rates.

Frazier et al. (2011) highlight the customization of the evidence-based treatment to that context population as being important to use of such program frameworks. This approach accounts for the focus of this thesis which regards organized and contextualized approaches to enhancing child behavioral outcomes and in particular those who come from disadvantaged backgrounds.

This research discusses the preliminary steps towards the implementation of the Summer Treatment Program (STP)within the framework of the Chicago Park District, 'Park Kids' after school program for children living in urban poverty. The intervention consisted of four main components which were the Group Discussion, Good Behavior Game, Peers as Leaders and Good News Notes, all of which are meant to leverage on the social-emotional development and positive behavior as well. These strategies take the advantage of what the programme already brings on board but addresses the issues of high child to adult ratios and lack of materials or options.

It is interesting that the relationship between structured nutrition programs and behavioral change is paramount in understanding developmental outcomes in children. This thesis focuses on interventional strategies aimed at enhancing children's behavior which is achieved through systematic approaches as advocated by Baker et al (2013).

In this paper, infant and young child feeding (IYCF) programs designed and implemented in Bangladesh, Ethiopia and Vietnam were described. Utilising behavior change design principles, formative research, stakeholder consultations and epidemiological data the authors constructed scalable customised interventions. The programs targeted critical two-year period of a child addressing stunting and malnutrition, and used a social-ecological model that considers individual, interpersonal and environmental factors (Figure 29).

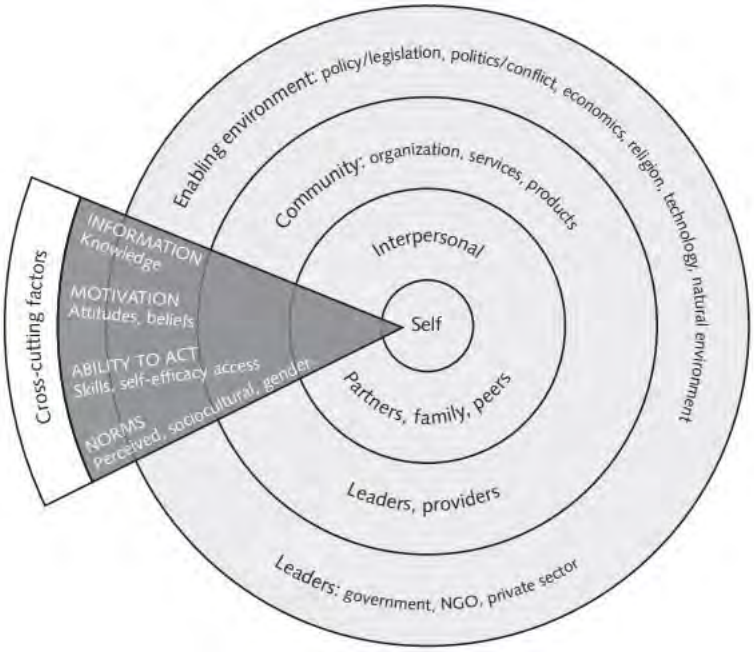


Figure 13 Socio-Ecological Model for Change

(Source: Baker et al., 2013)

The central aspects were focused advocacy, mass communication, interpersonal care, and caregiver support systems. For instance, in Vietnam, this program involved counselling out of the health centers, whereas Ethiopia employed community health volunteers for the same purpose. Such measures showed measurable results in terms of raising the rates of exclusive breastfeeding as well as improving the practices of feeding children with complementary foods.

Baker et al. (2013) note that it is important for program designs to be flexible enough to cater for the local needs and circumstances affected by the program. This is also in line with the thesis's aim of using systematic and socially responsible approaches to change behaviors and health of the children at focus.

2.5.3 Physical and Motor Development

Physical development refers to the growth of motor skills, body structure, and physical activity capacity in children. The development of motor skills such as running, jumping, and coordination plays a crucial role in children's overall health and physical well-being. This

section explores how structured activities and educational programs enhance physical growth, motor skills, and physical activity in children.

McMurray et al. (2004) compare two structured self-report physical activity surveys the Time-Based (TB) and Activity-Based (AB) approaches for their reliability, validity, and feasibility among adolescents. Key findings include:

- The TB approach showed slightly better reliability and validity for assessing moderate to-vigorous physical activity (MVPA) across multiple days (Table 25). It used time blocks to assist recall, which improved accuracy for recent activities but overestimated actual activity durations.
- The AB approach was more effective at capturing diverse activities, including short bouts of activity, but had lower reliability for recalling specific activities after two days.

Questionnaire	Overall	Monday	Sunday	Saturday
Moderate-Vigorous PA				
Activity-Based				
Girls ($N = 75$)	0.265†	0.371*	0.093	0.321#
Boys ($N = 32$)	0.340†	0.268	0.512#	0.218
Both ($N = 107$)	0.239#	0.307#	0.177	0.229†
Time-Based				
Girls ($N = 86$)	0.314#	0.529*	0.157	0.224†
Boys ($N = 44$)	0.277	0.419#	0.433#	−0.056
Both ($N = 130$)	0.279#	0.487*	0.264#	0.060
Vigorous PA				
Activity-Based				
Girls ($N = 75$)	0.312#	0.503*	0.030	0.366#
Boys ($N = 32$)	0.289	0.386†	0.309	0.163
Both ($N = 107$)	0.281#	0.441*	0.148	0.233†
Time-Based				
Girls ($N = 86$)	0.092	0.195	−0.005	0.084
Boys ($N = 32$)	0.265	0.525*	0.316	−0.094
Both ($N = 130$)	0.162	0.310#	0.147	0.023

* $P \leq 0.001$
# $P \leq 0.01$
† $P \leq 0.05$

Table 25 Overall and Day-by-Day Correlations Between Moderate to Vigorous Physical Activity

(Source: Gordon-Larsen, McMurray & Popkin, 1999)

Childhood obesity is a growing concern, with significant implications for long-term physical and psychological health. This thesis focuses on leveraging technology to improve behavioral outcomes in children, aligning with the need for structured interventions to combat obesity.

In a research paper, authored by Bar-Or et al. (1998), discusses how reduced physical activity and dietary factors contribute to obesity in children and adolescents. The study underscores the importance of early interventions combining activity promotion, behavioral modifications, and supportive policies to address juvenile obesity. This complements the thesis by emphasizing the potential of structured, technology-assisted approaches to foster healthier behaviors in children.

Cole et al. (2000) propose an internationally recognized definition for childhood overweight and obesity based on pooled data from six large, nationally representative surveys. Using Body Mass Index (BMI) as the primary metric, the study creates centile curves that align with adult obesity cut-offs of 25 kg/m² (overweight) and 30 kg/m² (obesity). Key findings include:

- Table 26 provides international BMI cut-off points for ages 2–18, allowing comparisons across diverse populations.
- Figure 14 illustrates the centile curves for overweight by age and sex.
- The study finds the highest BMI centiles in Singapore during puberty, emphasizing regional differences in obesity trends.

	Body mass index 25 kg/m²		Body mass index 30 kg/m²	
Age (years)	Males	Females	Males	Females
2	18.41	18.02	20.09	19.81
2.5	18.13	17.76	19.80	19.55
3	17.89	17.56	19.57	19.36
3.5	17.69	17.40	19.39	19.23
4	17.55	17.28	19.29	19.15
4.5	17.47	17.19	19.26	19.12
5	17.42	17.15	19.30	19.17
5.5	17.45	17.20	19.47	19.34
6	17.55	17.34	19.78	19.65
6.5	17.71	17.53	20.23	20.08
7	17.92	17.75	20.63	20.51
7.5	18.16	18.03	21.09	21.01
8	18.44	18.35	21.60	21.57
8.5	18.76	18.69	22.17	22.18
9	19.10	19.07	22.77	22.81
9.5	19.46	19.45	23.39	23.46
10	19.84	19.86	24.00	24.11
10.5	20.20	20.29	24.57	24.77
11	20.55	20.74	25.10	25.42
11.5	20.89	21.20	25.58	26.05
12	21.22	21.68	26.02	26.67
12.5	21.56	22.14	26.43	27.24
13	21.91	22.58	26.84	27.76
13.5	22.27	22.98	27.25	28.20
14	22.62	23.34	27.63	28.57
14.5	22.96	23.66	27.98	28.87
15	23.29	23.94	28.30	29.11
15.5	23.60	24.17	28.60	29.29
16	23.90	24.37	28.88	29.43
16.5	24.19	24.54	29.14	29.56
17	24.46	24.70	29.41	29.69
17.5	24.73	24.85	29.70	29.84
18	25	25	30	30

Table 26 International Cut-Off Points for BMI Overweight and Obesity by Sex Between 2 and 18 Years

(Source: Cole, 2000)

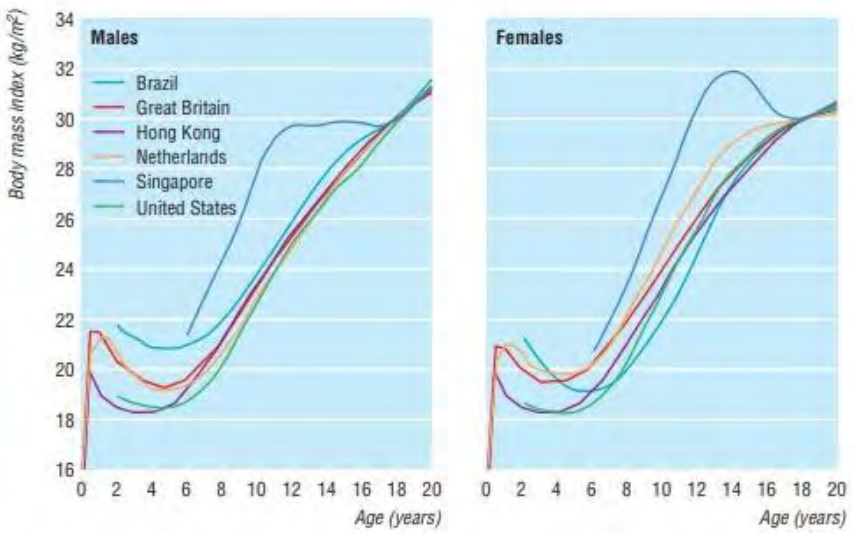


Figure 14 Centiles for overweight by sex for each dataset, passing through body mass index (Source: Cole, 2000)

This standardized method facilitates international comparisons of children obesity rates, establishing a basis for public health policies and actions to tackle this urgent concern. Please inform me if you want further detail or analysis on any particular area.

Childhood obesity is a significant public health issue, with enduring repercussions for both physical and mental well-being. This thesis analyzes strategies to promote behavioral enhancements and healthier habits in children, in accordance with the objectives of the Kiel Obesity Prevention Study (KOPS) by Müller et al. (2001), which assesses the efficacy of school- and family-oriented interventions for obesity prevention.

Key Findings from KOPS:

- Baseline Data: Among the initial cohort of 1,640 children aged 5–7, 20.7% were classified as overweight or obese, with a significant proportion of normal-weight children (21.1%) identified as at risk due to parental obesity or other factors (Figure 15 illustrates the social gradient in obesity prevalence).
- Intervention Strategies: The program included school-based nutrition education, health promotion, and family counselling. Behavioral goals included eating more fruits and vegetables, reducing high-fat food intake, engaging in daily physical activity, and limiting screen time to less than one hour per day.

- Effectiveness: After one year, children in intervention schools showed significantly smaller increases in triceps skinfold thickness and fat mass compared to those in control schools (Figure 16 and Figure 17). Daily physical activity increased, while TV viewing decreased by an average of 0.3 hours per day.

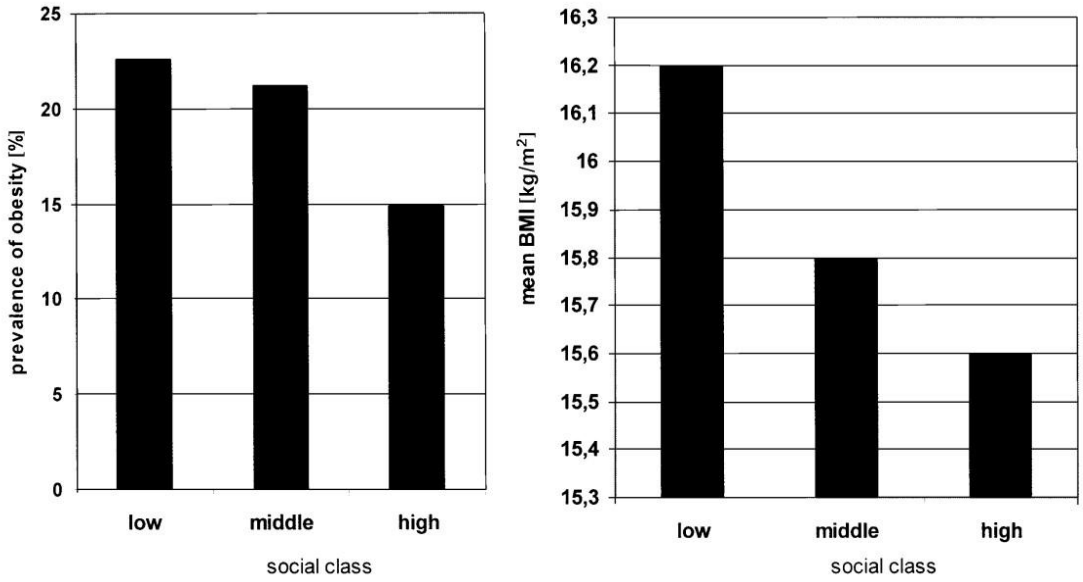


Figure 15 Social Gradient of the Prevalence of Obesity (Left Panel) and BMI (Right Panel) in 1350 to 7-Year-Old Children Investigated Between 1996 and 1998

(Source: Müller et al., 2001)

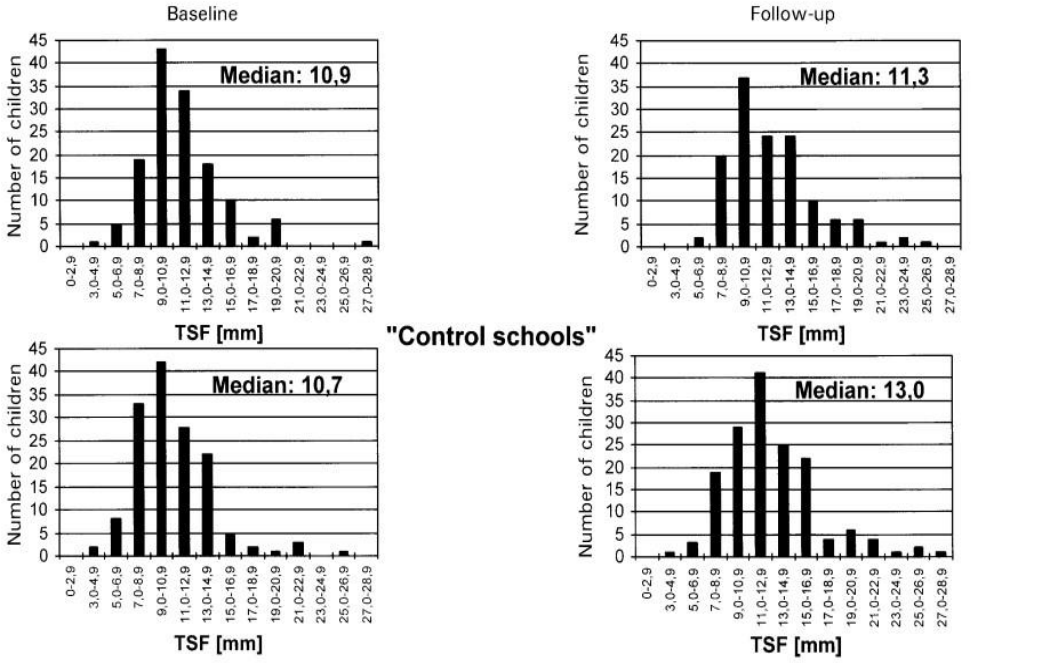


Figure 16 Distribution of triceps skinfold (TSF) in 297 children (136 in the intervention group and 161 in a socio demographically-matched control group) at baseline and after 1 yr. with or without school-based intervention

(Source: Müller et al., 2001)

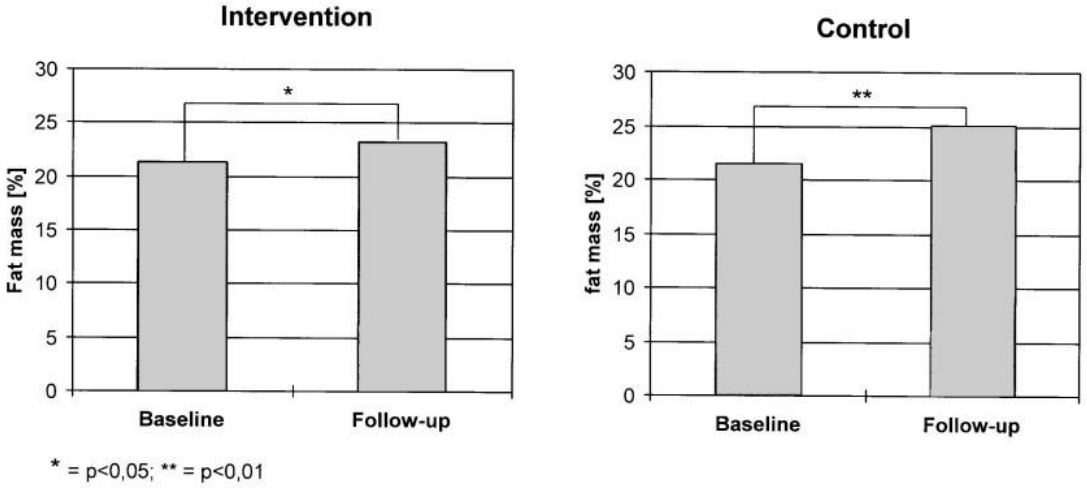


Figure 17 Anthropometrically derived percentage fat mass in overweight and obese children (n=25) before and 1 year after intervention

(Source: Müller et al., 2001)

Müller et al. (2001) emphasize that combining school and family interventions can effectively improve health-related behaviors and reduce obesity risk. This aligns with the thesis's focus on structured, multidimensional strategies to encourage behavioral improvements and mitigate childhood health risks.

Physical activity plays a vital role in children's physical and psychological development, and understanding its psychosocial determinants is critical to fostering lifelong healthy behaviors. This aligns with the thesis on utilizing structured approaches to influence and improve children's behavioral patterns.

Saunders et al. (1997) developed and validated three questionnaires to measure the psychosocial influences on physical activity in preadolescent children. These include:

- Social Influences Scale: Captures family and peer influences on children's activity levels, demonstrating a significant positive correlation with physical activity in both development and validation samples (Table 27).
- Self-Efficacy Scale: Comprises three factors support-seeking, overcoming barriers, and identifying positive alternatives. It highlights how children's confidence in their ability to engage in activity impacts their participation.
- Beliefs Scale: Explores the perceived physical and social outcomes of physical activity. The scale showed moderate correlations with intentions to be active but weaker correlations with actual physical activity levels (Table 28).

	Factor 1
A friend has offered to be physically active with me in the past 2 weeks.	**0.71**
A friend has been physically active with me in the past 2 weeks.	**0.70**
Someone in my family has been physically active with me in the past 2 weeks.	**0.63**
Someone in my family has offered to be physically active with me in the past 2 weeks.	**0.62**
A friend has encouraged me to be physically active in the past 2 weeks.	**0.62**
My friends think I should be physically active.	**0.57**
Someone in my family has encouraged me to be physically active in the past 2 weeks.	**0.56**
My family thinks I should be physically active.	**0.41**
Eigenvalue	2.97
Percentage variance explained	37.17%

Note. N = 160 males plus 159 females = 319.

Table 27 Principal Component Factor Analysis Using Varimax Rotation for the Social Influence Scale

(Source: Saunders et al., 1997)

If I were to be physically active most days . . .	Factor 1 physical outcomes	Factor 2 social outcomes
. . . it would get or keep me in shape.	**0.76**	0.08
. . . it would be boring. **No**"	**0.66**	0.06
. . . it would make me better in sports.	**0.63**	0.22
. . . it would be fun.	**0.62**	0.23
. . . it would help me be healthy.	**0.62**	−0.08
. . . it would make me get hurt. **No**"	**0.50**	0.02
. . . it would help me control my weight.	**0.50**	0.21
. . . it would make me embarrassed in front of others. **No**"	**0.48**	−0.17
. . . it would give me energy.	**0.45**	0.14
. . . it would make me tired. **No**"	**0.40**	0.13
. . . it would cause pain and muscle soreness. **No**"	**0.35**	0.13
. . . it would help me make new friends.	0.03	**0.76**
. . . it would help me spend more time with my friends.	0.01	**0.67**
. . . it would help me look good to others.	0.16	**0.61**
. . . it would make me more attractive to the opposite sex.	0.05	**0.52**
. . . it would help me work out my anger.	0.15	**0.37**
Eigenvalues	3.77	1.73
Percentage variance explained	23.57%	10.84%

Table 28 Principal Component Factor Analysis, Using Varimax Rotation with Belief Items

(Source: Saunders et al., 1997)

The study found significant correlations between these scales and children's intentions to be physically active. Notably, social influences and self-efficacy barriers showed the strongest correlations with actual activity. These insights provide a robust framework for designing interventions to increase physical activity by addressing psychosocial determinants, aligning with broader objectives to promote healthier behavioral patterns in children.

Accurately measuring physical activity in youth is critical for developing interventions that encourage active behaviors and improve health outcomes. This aligns with the thesis's focus on using structured methods to assess and enhance behavioral patterns in children.

(Weston, Petosa, and Pate, 1997) validated the Previous Day Physical Activity Recall (PDPAR), a self-report tool designed to measure physical activity among students in grades 7–12. The study aimed to establish the reliability and validity of this instrument for evaluating energy expenditure and participation in moderate-to-vigorous physical activity.

Key Findings:

- Reliability: The instrument demonstrated excellent test-retest reliability (r = 0.98) and interrater reliability (r = 0.99), indicating consistency in measuring relative energy expenditure across multiple administrations (Table 29).
- Validity: Correlations between the PDPAR's estimates of energy expenditure and objective measures like pedometers and Caltrac activity counts were strong (r = 0.88 and r = 0.77, respectively). The tool also effectively identified bouts of moderate-to vigorous physical activity, as evidenced by correlations with heart rate monitoring data (r = 0.63 for 20-minute intervals at ≥50% HRR).
- Flexibility: The PDPAR offers data on activity mode, intensity, and duration, making it suitable for evaluating both organized and unstructured activity patterns.

Correlation coefficient using $kcal \cdot kg^{-1} \cdot h^{-1}$ based on mode only	Correlation coefficient using $kcal \cdot kg^{-1} \cdot h^{-1}$ based on intensity only	Correlation coefficient using $kcal \cdot kg^{-1} \cdot h^{-1}$ based on mode and intensity
0.30 (P=0.14)	0.16 (P=0.42)	0.53 (P=0.006)

Table 29 Correlation Between Energy Expenditure and Heart Rate

(Source: Weston, Petosa & Pate, 1997)

The research indicates that the PDPAR system is reliable and accurate in the evaluation of the physical activity habits of adolescents, emphasizing the future application of such an instrument in behavioral modification research and treatment. The same corresponds to the objectives of the thesis, which intends to enhance the understanding and dissemination of healthy behavior among the youth by means of well-structured instruments.

Obesity in childhood is still a serious problem in the world and there is a need to find new ways to control its prevalence and the health impacts in the future. There is a great chance to make a difference about behavioral practices when children are in their school years by using obesity targeting school based interventions. In this respect, this thesis concurs with these goals by providing children with structured programs which teach them diets.

Gortmaker et al. (1999) offer a suitable example of this approach through their Planet Health intervention, which is an integrated school approach to the reduction of obesity among students in middle schools. The intervention targeted obesity promoting behaviors such as excessive video watching, poor food choices and less physical activities through the infusion of health education to various subjects like mathematics, science and physical training. This didactic strategy ensured that all learners received consistent and pertinent health and nutrition information.

The study's results were Said to be particularly striking for girls at intervention schools who had an observed decline in the obesity rate in relation to girls in control schools. A critical factor in this achievement was the drastic decrease in television watching time which served as a mediator to increased nutritional practices and decreased energy intake. It should be reinforced, however, that while boys in the intervention schools showed similar marks of decrease in their screen time, the effect on their rates of obesity was not significantly significant. All the same, the intervention suggested that school-centered interventions may be effective in changing the behavioral patterns that are relevant to obesity in some targeted subgroups of the population.

Planet Health is characterized by its cultural modification, evidenced by its success among African American girls with the greatest reduction in prevalence rates of obesity. This stresses

the importance of tailoring interventions to meet the specific needs of different populations so as to ensure equity in health outcomes. The study advocates for the integration of health education in schools as an integral part of education rather than an ancillary program. These findings are congruent with the intended objectives of this dissertation that seeks to study coordinated and multi factorial programs aimed at improving behavioral patterns and dealing with health problems among children.

Sahota et al. (2001) implemented a Randomized Controlled Trial known as APPLES. This research was conducted in ten primary schools in Leeds. This study used educational, environmental and, policy-based approaches in the intervention. This targeted the school-age children aged between 7 and 11 years, providing them with opportunities to change risk factors associated with obesity.

The intervention did provide a significant effect on the vegetable intake amongst the children, who increased servings from the baseline by 0.3 which was a 50% improvement. It also had an immense effect on the children psych which ensured the children had a positive self-image despite having a higher BMI Index. While over activity drastically decreased among the test children who were overweight, some low levels of obesity increase depression.

This has enabled the researchers to focus on the challenges of evaluating complex interventions alongside the importance of understanding the scale of changes at the school level.

APPLES is not able to report any startling behavioral modifications save for enhancing nutrition, but it did point to the somewhat greater potential that school based programs might provide as a foundation for more enlarged public health efforts. These findings also support the emphasis of the thesis on the need for more structured treatments and how this affects children's long term behavioral and health outcomes.

This thesis focuses on leveraging technology to improve behavioral patterns and outcomes in children, and this study provides important insights into the dual impact of television as both an educational tool and a risk factor for developmental challenges.

Physical activity interventions are essential for improving health outcomes, particularly in children. Baranowski et al. (1998) propose a mediating variable framework to assess how

interventions influence behavioral outcomes. Their review of intervention studies highlights that many programs achieve only modest success, often limited by insufficient focus on key mediating variables like self-efficacy, social support, and environment.

The study emphasizes that theoretical models used in interventions often explain less than 30% of behavior change, suggesting a need for greater precision in targeting mediating factors. Understanding the balance of physical activity required to foster health in children is integral to promoting behavioral improvements, which is a key focus of this thesis. Physical inactivity, a rising concern in modern lifestyles, has been associated with chronic diseases, obesity, and diminished functional health, issues this paper addresses comprehensively.

Blair et al. (1992) explore the relationship between physical activity, fitness, and health outcomes, focusing on dose-response relationships and public health implications. The study reviews clinical and epidemiological evidence, emphasizing that regular physical activity significantly reduces the risk of morbidity and mortality from cardiovascular diseases, diabetes, and certain cancers. Table 30 categorizes the strength of evidence linking physical activity to reduced disease rates, underscoring the robust connection to conditions like coronary artery disease and diabetes.

Disease	Number of studies	Trends across activity or fitness categories and strength of evidence
Obesity	***	↓ ↓ ↓
Coronary artery disease	***	↓ ↓ ↓
Hypertension	**	↓ ↓
Stroke	**	↓
Peripheral vascular disease	*	→
Cancer (all sites)	*	↓
colon	***	↓ ↓
rectum	***	→
breast	*	↓
prostate	*	↓
lung	*	↓
Non-insulin dependent diabetes	*	↓ ↓
Osteoarthritis	*	→
Osteoporosis	**	↓ ↓
Musculoskeletal disability	**	↓ ↓

Table 30 Physical Activity, Fitness, and Chronic Disease Incidence
(Source: Blair et al., 1992)

The authors advocate for moderate physical activity such as a brisk walk of 30 minutes daily highlighting its accessibility and significant health benefits for sedentary populations.

This aligns with the thesis's emphasis on structured, achievable strategies to improve children's behaviors, suggesting that integrating moderate activity into daily routines can foster long-term health improvements.

This study's insights support the broader goals of this thesis by demonstrating the transformative potential of physical activity in shaping healthier behavioral patterns and reducing health risks in populations, particularly children.

The influence of television watching on eating choices is essential in determining children's health outcomes. This thesis analyses behavioral patterns shaped by external stimuli, such as media exposure, and aims to design systematic solutions to tackle these issues.

(Borzekowski and Robinson, 2001) investigate the impact of television on children's food choices and consumption behaviors. The research indicates that elevated television watching correlates with increased intake of calorie-dense, nutrient-deficient meals, mostly influenced by marketing exposure. Children who saw over two hours of television everyday ingested far sugarier snacks and drinks than those with less screen time.

Table 31 presents a comprehensive analysis of dietary intake categorized by screen time, showing a clear relationship between watching duration and the consumption of harmful foods. The research indicates that youngsters regularly exposed to commercials are more inclined to seek and eat the promoted items, usually resulting in disputes when supermarket shopping.

Genre	Control group (n=19)		Treatment group (n=20)		Odds ratio
	n	(%)	n	(%)	
Juice[a]	11	48	17	74	3.1
Sandwich bread[a]	10	44	16	70	3.0
Doughnuts	4	17	7	30	2.1
Candy	9	39	13	57	2.0
Fast-food chicken entree	10	44	13	57	1.7
Snack cake	12	52	15	65	1.7
Breakfast cereal	8	35	8	35	1.0
Toy[b]	15	65	14	61	0.8
Peanut butter	8	35	9	39	1.2

[a]Commercials for these items appeared twice in the treatment videotape.
[b]Remote-control car.

Table 31 Preschoolers' Selection of Advertised Items With and Without Embedded Commercials

(Source: Borzekowski & Robinson, 2001)

These results highlight the need of regulating television consumption and closely evaluating the influence of commercials on children's dietary choices. This corresponds with the thesis's focus on cultivating better habits by mitigating adverse external impacts, indicating the feasibility of treatments that restrict exposure to harmful food advertising and enhance media literacy.

Television viewing and its impact on physical activity levels and body composition are critical in understanding early behavioral influences on children's health. This thesis explores structured strategies to mitigate sedentary behaviors and promote physical activity in young children, resonating with the findings of Durant et al. (1996).

Durant et al. analyzed observational data from 5- and 6-year-old children to assess how television watching affects physical activity and body composition. Using the Children's Activity Rating Scale (CARS), the study found that children were significantly less active

during television-watching periods compared to other times. However, contrary to common assumptions, the study reported no direct correlation between television watching and body composition metrics, such as BMI or skinfold thickness (Table 32). The lack of association suggests that television viewing's effect on adiposity may require longer-term observation to manifest.

	Females						Males					
	Inside			Outside			Inside			Outside		
Month	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*
Jan	23	1.85	0.21	17	2.51	0.49	21	1.83	0.16	18	2.48	0.26
Feb	31	1.83	0.15	26	2.40	0.35	20	1.82	0.19	13	2.42	0.25
Mar	22	1.85	0.15	22	2.30	0.20	23	1.86	0.16	20	2.46	0.24
Apr	26	1.77	0.16	26	2.31	0.22	25	1.83	0.17	25	2.39	0.24
May	25	1.80	0.16	22	2.26	0.21	12	1.84	0.10	10	2.37	0.22
Jun	18	1.83	0.16	17	2.24	0.16	22	1.85	0.13	19	2.36	0.29
Jul	20	1.86	0.19	16	2.19	0.37	16	1.95	0.16	16	2.16	0.33
Aug	18	1.97	0.11	18	2.44	0.23	14	1.96	0.17	12	2.32	0.16
Sep	16	1.91	0.11	14	2.44	0.30	18	2.02	0.18	14	2.45	0.30
Oct	27	1.99	0.15	26	2.46	0.31	17	1.99	0.21	13	2.59	0.25
Nov	18	1.97	0.14	12	2.48	0.23	16	1.97	0.20	13	2.69	0.30
Dec	17	1.80	0.11	8	2.40	0.22	21	1.92	0.14	12	2.69	0.27

Table 32 Mean CARS Activity Scores by Month, Gender, and Location
(Source: Baranowski et al., 1993)

Interestingly, the study observed variability in activity levels based on gender, with boys exhibiting higher levels of activity during and outside of television viewing compared to girls. Additionally, the longest bouts of television watching increased from earlier observations when the children were 3–4 years old, indicating a trend toward increased sedentary behavior as children age.

Durant et al. highlight that interventions aimed at reducing sedentary behaviors, particularly television viewing, could encourage physical activity by creating opportunities for outdoor play. These insights align with the goals of this thesis, underscoring the need for structured strategies that integrate environmental and behavioral interventions to foster healthier activity patterns in children.

The growing prevalence of obesity represents one of the most pressing public health challenges globally, with profound implications for both children and adults. This thesis

focuses on structured strategies to address behavioral and environmental factors contributing to obesity, resonating with the comprehensive analysis presented by Flegal (1999).

Flegal considers obesity a problem faced across the population and defines the term as an 'epidemic' experiencing shifts across history in 'weight of population'. The study uses national survey data in United States from 1960 and through to 1994 to show that there was an increase in the number of adults and children who were found to be overweight or obese. They further report that among children aged six to eleven, the prevalence of obesity went up from the four percent mark recorded in the early 1960's to eleven percent by the end of 1990's. Findings such as these point to broader social contexts like the availability of food, inactivity, and income among other factors as nabbed determinants.

This research notes that while obesity is viewed as a risk factor for hypertension other cardiovascular risks while tending to improve do not to quite correlate with the rates of obesity, indicating a complex and multi-faceted interplay.

Flegal calls for continued monitoring of obesity trends and interdisciplinary research to unravel the interplay between individual behaviors, societal influences, and environmental changes.

These insights support the thesis's aim to develop structured, evidence-based interventions targeting childhood behavioral patterns, addressing both individual and systemic contributors to obesity.

The interplay of environmental factors with eating habits and physical activity is central to understanding childhood behavioral and health outcomes. This thesis investigates structured strategies to modify these environmental influences to foster healthier behaviors, a theme extensively analyzed by (French, Story, and Jeffery, 2001).

This review identifies that the obesity epidemic in the United States stems largely from an environment that promotes high energy intake and discourages physical activity. The paper highlights the increasing prevalence of obesity among children, with 25% classified as overweight, attributing this trend to shifts in the food supply, rising restaurant and fast-food consumption, and sedentary activities such as television viewing. For instance, the availability

of soft drinks and larger portion sizes significantly increased calorie consumption, while television advertising amplified the preference for high-calorie, low-nutrient foods.

On physical activity, the study discusses societal shifts toward sedentary lifestyles due to urban planning, automobile dependency, and reduced occupational activity. Trends show limited increases in leisure-time physical activity, but these gains are insufficient to counterbalance rising sedentary behaviors.

The authors advocate for public health interventions that modify environmental factors, such as promoting accessibility to healthier food options, reducing the marketing of unhealthy foods to children, and creating infrastructure to support physical activities like walking and cycling.

These findings resonate with the thesis's objective to address the behavioral and environmental determinants of childhood health outcomes, offering a framework to implement systemic changes to support healthier lifestyles.

Behavioral patterns in physical activity and inactivity during adolescence significantly influence health outcomes and establish lifelong habits. This thesis emphasizes structured interventions targeting these behaviors, aligning with the findings of Gordon-Larsen et al. (1999).

The study analyzed data from over 14,000 U.S. adolescents as part of the National Longitudinal Study of Adolescent Health (Add Health). The results reveal substantial ethnic and gender disparities in physical activity and inactivity levels. For example, non-Hispanic Black adolescents reported the highest levels of weekly television viewing and inactivity, averaging 20.4 hours per week, compared to 13.1 hours for non-Hispanic White peers (Table 33). Physical activity levels were lowest among minority females, with only 12.5% of Asian females engaging in moderate-to-vigorous physical activity at recommended levels (Table 34).

	No.	Males	No.	Females	No.	Total
Ethnicity						
White	3,540	14.4 (.40)	3,665	11.9 (.43)	7,205	13.1 (.37)
Black	1,288	20.8 (.77)	1,482	20.0 (.89)	2,770	20.4 (.73)
Hispanic	1,139	16.6 (.64)	1,121	14.6 (.82)	2,260	15.6 (.55)
Asian	489	15.0 (1.02)	433	12.8 (1.09)	922	14.0 (.87)
Total	6,456	15.7 (.40)	6,701	13.5 (.47)	13,157	14.6 (.40)
Age category						
12-15 y	1,985	17.1 (0.49)	2,334	14.7 (0.63)	4,319	15.8 (0.48)
16-17 y	2,803	15.2 (0.55)	2,901	12.6 (0.57)	5,704	13.9 (0.51)
18-22 y	1,668	13.9 (0.56)	1,466	12.9 (0.74)	3,134	13.4 (0.54)

Table 33 Mean (SEM) Hours of Television Per Week

(Source: Gordon-Larsen et al., 1999)

	Non-Hispanic white		Non-Hispanic black		Hispanic		Asian	
Activity level	Males	Females	Males	Females	Males	Females	Males	Females
Low	27.2	39.5	22.8	48.9	26.1	43.3	25.3	44.5
Medium	35.0	34.9	35.1	33.1	33.7	38.5	36.8	43.0
High	42.1	25.6	42.2	18.1	40.1	18.1	37.9	12.5

Table 34 The adjusted proportion of adolescents participating in given tertiles of moderate vigorous physical activity

(Source: Gordon-Larsen et al., 1999)

The study found that inactivity tracked better into adulthood than physical activity, suggesting the need for early interventions to reduce sedentary behaviors and increase opportunities for active engagement. Ethnic and gender interactions further highlighted the disproportionate impact of inactivity on female and minority groups, emphasizing the role of tailored interventions to address cultural and social barriers.

These findings underscore the thesis's focus on developing targeted, evidence-based strategies to promote physical activity and reduce inactivity, particularly among vulnerable subpopulations.

Television viewing has long been a concern in understanding childhood obesity, with its impact on inactivity and dietary behaviors. The thesis is on systematic approaches to diminish sedentary behaviors and encourage healthy practices, strongly correlating with the conclusions of Gortmaker et al. (1996).

This research investigates the correlation between television use and the prevalence, incidence, and remission of obesity in children aged 10 to 15 years. Utilizing data from the National Longitudinal Survey of Youth, the researchers discerned a distinct dose-response relationship: youngsters who saw over five hours of television everyday exhibited 5.3 times greater chances of being overweight in comparison to those who watched two hours or less. Moreover, the research indicates that more than 60% of new obesity cases in this group may be ascribed to excessive television use.

Principal mechanisms include decreased physical activity and heightened energy consumption attributed to snacking and the impact of food promotion. The authors emphasize the need of environmental adjustments, including limiting screen time to the American Academy of Paediatrics' guideline of no more than two hours per day, as a preventative strategy.

This study highlights the importance of addressing sedentary habits in early life, along with the thesis's aim to develop treatments that combine behavior modification tactics with environmental alterations to successfully battle obesity.

The significance of physical exercise in influencing long-term health outcomes is crucial for comprehending childhood development and its progression into adulthood. This thesis explores structured interventions to encourage active lifestyles and mitigate the risks associated with inactivity, resonating with the findings of Raitakari et al. (1994).

The study, part of the Cardiovascular Risk in Young Finns Study, examines the tracking of physical activity and its association with coronary risk factors over six years. Participants, aged 12 to 18 at baseline, were assessed for activity levels using a physical activity index that incorporated intensity, duration, and frequency of leisure-time activities. Results reveal significant tracking of physical activity, with sedentary behaviors showing stronger persistence

than active behaviors; 57% of initially sedentary participants remained inactive compared to 44% of active individuals maintaining their activity levels.

The study identifies clear health benefits for consistently active individuals. Active boys exhibited lower serum insulin and triglyceride levels, a healthier HDL/total cholesterol ratio, and reduced truncal adiposity compared to their sedentary counterparts. Active girls demonstrated thinner subscapular skinfolds and lower triglyceride levels. Additionally, active individuals displayed healthier dietary patterns, consuming less saturated fat, and were less likely to start smoking, emphasizing the clustering of positive behaviors with physical activity.

Raitakari et al. (1994) further highlight the independent effects of activity change, finding inverse associations between increased physical activity and reductions in insulin and triglycerides, particularly in boys. These findings underscore the importance of promoting active lifestyles during adolescence to improve long-term health outcomes and reduce coronary risk factors.

This research aligns with the thesis's focus on integrating structured, evidence-based strategies to foster physical activity and combat sedentary behavior, highlighting the significant benefits of early and consistent engagement in active lifestyles.

2.6 Summary of Literature Review

The reviewed studies collectively highlight the complex and multifaceted impact of technology and media on early childhood development, underscoring both opportunities and challenges. A common thread across the research is the importance of content type, context, and interaction in shaping developmental outcomes.

- Cognitive Development: Multiple studies emphasized that age-appropriate and interactive media, such as educational apps (Ewais et al., 2019) and robotics workshops (Levy & Mioduser, 2007), foster cognitive growth, problem-solving, and early STEM engagement. Conversely, prolonged exposure to non-educational or adult-oriented media often hinders executive functioning and language development (Tomopoulos et al., 2010; Barr et al., 2010*).
- Behavioral and Emotional Impact: The role of screen time and media exposure in influencing attention, aggression, and emotional regulation was well-documented

(Tamana et al., 2019; Anderson & Hanson, 2013*). Positive behaviors are often associated with organized and monitored media use, whereas unsupervised or excessive screen time results in behavioral difficulties, such as inattention and externalizing concerns.

- Social Interaction and Peer Learning: Environments that facilitate peer-based learning (Mlawski, 2014) and co-viewing media with parents or peers augment social and collaborative competencies. Such environments enable youngsters to incorporate verbal and non-verbal signals into their education, establishing a basis for positive social relationships.
- Physical and Motor Advancement: Interactive technology, like robotic walkers (Jin, 2015) and adaptive treadmill training (Wu et al., 2007*), have shown considerable efficacy in enhancing motor abilities and fostering physical activity in children with developmental delays. These approaches underscore the essential function of customized technology in mitigating physical obstacles and promoting autonomy.
- Parental and Environmental Influences: Parental mediation has been identified as a crucial factor influencing the effects of media, where active direction amplifies advantages and mitigates hazards (Barr et al., 2010; Tomopoulos et al., 2010). Additionally, socioeconomic and environmental factors influenced access to and quality of media exposure, emphasizing the need for equitable intervention frameworks.

In conclusion, these findings align with the thesis's objective to leverage structured, interactive, and developmentally appropriate technology to enhance cognitive, behavioral, and social outcomes. By addressing the identified risks and focusing on personalized, supervised interventions, technology can be a transformative tool in early childhood development. This synthesis provides a robust foundation for integrating these insights into actionable frameworks for improving children's growth trajectories.

2.7 Research Gaps

1. Limited Focus on Young Children: Much of the current research on digital technology use concentrates on older children and adolescents, resulting in a lack of understanding of the unique experiences and needs of children aged 0-6.
2. Longitudinal Effects: There is a lack of longitudinal studies examining the long-term effects of early digital engagement on cognitive and motor development, particularly regarding how these experiences shape children's abilities as they grow.
3. Interplay Between Digital and Physical Play: Research does not fully explore the balance between digital and physical play and its implications for children's overall development, necessitating further investigation into how these forms of play can coexist and complement each other.
4. Diverse Experiences of Digital Media: The diverse experiences of young children with digital media, particularly about cultural and socioeconomic contexts, are not thoroughly addressed. Future research should consider how these factors influence children's interactions with technology.
5. Parental Roles and Strategies: More studies are needed to understand the various parenting strategies employed to mediate children's digital experiences and how parental digital literacy impacts children's engagement with technology.
6. Policy Implementation: Research is needed on the practical implementation of policies supporting digital literacy in early childhood education, emphasizing strategies to bridge the digital divide and guarantee equitable access to technology for all children.

CHAPTER III:

METHODOLOGY

The research problem is whether kids' technology use helps develop interest recognition and behavior improvement in education. The focus is on technology's positive impact, fostering critical thinking, creativity, and social, cognitive, and emotional development. The study emphasizes four principles: using technology effectively, ensuring developmental appropriateness, integrating it into learning, and strengthening relationships among parents, families, educators, and children.

Integrating technology enhances relationships, improves academic achievement and school readiness, and fosters curiosity. It influences children's behavior in social, cognitive, and emotional aspects. The assessment outlines four considerations: treating technology as a creative tool, ensuring appropriate learning outcomes with family and educator involvement, considering children's maturity levels, and integrating technology into curricula.

The study stresses technology's role in instructional tasks, aiding communication, task completion, academic updates, and interest exploration. Digital technologies outside class add value to learning. Watching stories or emotions on-screen may improve retention, interest development, and behavior. Technology facilitates interaction when in-person meetings are not possible. It should serve educational goals rather than be used for its own sake, alongside art, literature, and play materials. Early childhood teachers must determine its role in learning.

Findings highlight technology's role in widening learning and fostering child-adult interactions. The research assesses its impact on critical thinking, creativity, and behavior. It establishes four principles: appropriate technology use, stimulating inventive thinking, integrating technology in pedagogy, and improving relationships among parents, educators, and children. The article stresses technological devices' importance in education, peer connections, interest exploration, and academic performance. The project explores how technology affects child-adult relationships and how digital tools help share children's achievements with families.

3.1 Research Design

The research design is the foundation of every empirical inquiry and also commands the systematic search process throughout the investigation towards achieving the aims of the given study. This study employed a mixed methods research design that is, the quantitative and qualitative approaches in one study with the aim to understand comprehensively the effect of technology on the children. The problem aimed to address the complexity of the relation between those that can be measured and those that cannot by bringing together the various approaches, hence allowing for an appropriate triangulation of the research problem.

The mixed-methods approach was deliberately adopted in this study so as to collect quantitative data as well as contextual narratives. Quantitative methods allowed for validation of assumptions and determination of sales trends while qualitative methods provided information on parent's views and on child's behavioral patterns. Such a combined strategy gave in-depth insight into the aspects of the issues which would otherwise be missed by a unidirectional approach.

This part explains the reasons for the choice of the research design that is, the methodology used and how it relates to the objectives of the investigation. In addition, it demonstrates how the chosen structure supports the synthesis of the various types of data in order to produce meaningful theoretical and practical contributions, hence linking the two.

3.1.1 Rationale for Mixed-Method Approach

To study the various aspects of this research, a mixed-method approach was used. The qualitative part analyses the different opinions of caregivers which highlights the contextual and subjective aspects which are not conveyed by the quantitative part alone. The quantitative part of the study provides insights into the effects of variables like parental intervention measures, screen time and developmental outcomes.

This method is used because it has the capacity to:

- Manage the complex aspects of development of children and their engagement with technology.
- Ensure the validity of conclusions by extracting quantitative data with theme- based ideas.

- Provide enhanced comprehension which has effects on both suppositional concepts and practical ideas.
- Examine the structured data (quantitative) and narrative data (qualitative) side by side to get a complete understanding.

3.1.2 Structure of the Research Design

The research design is structured around the systematic alignment of methods with the research objectives. Key elements include:

- Quantitative Component: The research design employs systematic surveys with closed-ended questions to collect data on screen time, technology usage, and developmental milestones. The analysis utilizes multiple statistical techniques, such as correlation analysis to identify relationships among variables, chi-square tests to assess associations, regression models to predict developmental outcomes based on technology usage, and descriptive statistics to effectively summarize and interpret the data. This method guarantees a comprehensive and organized analysis of the research inquiries.
- Qualitative Component: The qualitative component of the study design includes open-ended survey questions to gather comprehensive parental insights, attitudes, and approaches concerning children's technology usage. The analysis entails thematic categorization and integration of qualitative replies, facilitating the recognition of repeating patterns and distinctive insights. This method offers a detailed comprehension of parental roles and perspectives, enhancing the study's results.
- Integration Strategy: Quantitative and qualitative findings were combined at various phases, from data analysis to result interpretation, guaranteeing consistency between numerical trends and narrative themes.

3.1.3 Key Variables in the Research Framework

The study focuses on a clearly defined set of independent and dependent variables.

- Independent Variables: Screen time duration, Types of device used, Parental perspectives

and mediation techniques, Demographic Factors; including age, income and family st ructure.

- Dependent Variables: Cognitive development, Motor skills development, Socio-emotional outcomes, Sleep patterns

This specification of variables offers an organized framework for investigating correlations and testing hypotheses, guaranteeing a clear understanding of each variable's function.

3.1.4 Addressing Research Objectives

Every study aim was clearly associated with certain procedures and analytical approaches in the research design. The following mapping demonstrates this alignment:

- Objective 1: Descriptive statistics and frequency analysis were used to characterize early childhood digital interactions.
- Objective 2: Correlation analysis and regression models explored the relationships between screen time and developmental outcomes.
- Objective 3: Parental mediation strategies were examined through thematic coding and chi-square tests.
- Objective 4: Pearson’s correlation assessed the impact of screen time on sleep patterns.
- Objective 5: Both quantitative and qualitative methods evaluated the positive and negative impacts of technology.
- Objective 6: Relationships between age and screen time usage were analyzed using correlation techniques.
- Objective 7: Chi-square tests examined the influence of income on technology access.
- Objective 8: Parental attitudes and their effects on technology use were studied using mixed-method analyses.
- Objective 9: The role of apps in cognitive development was evaluated using frequency analysis and thematic synthesis.
- Objective 10: Recommendations for screen time were derived from both qualitative insights and quantitative patterns.

Research design for investigating the role of technology in education among kids, focusing on behavior improvement and interest recognition:

Research Objectives:

- Describe the different research methods used to study infant interest recognition and behavior improvement with the evidence of technology.
- Report the challenges associated with conducting developmental research based on technology.
- Guide infants in the effective use of technology to bring out innovative and creative outcomes.

3.1.5 Justification for Methodological Choices

The selection of a mixed-method approach reflects a deliberate effort to balance the strengths of quantitative precision with the contextual richness of qualitative data. Quantitative approaches provide an empirical objectivity which makes it possible to test hypotheses and identify statistically significant relationships. On the other hand, qualitative methodologies permitted the study to go beyond the surfaces and understand the dynamics, motives, and context of such interactions.

These techniques' integration guarantees:

- Both tangible products and embedded knowledge are documented.
- The reconstruction of the quantitative results with qualitative data adds to the reliability and validity of the research, thus increasing its trustworthiness.
- The mixed methods generate practical recommendations for parents, teachers, and policy makers.

3.1.6 Ethical Considerations in Research Design

This study does not violate basic ethical norms and values since its design takes into consideration ethical issues, the measures taken were accompanied by informed consent of the participants, data protection and confidentiality measures, and particularly the anonymity of the participants. The evaluative components which were administered to subjects were aimed at managing cross cultural or ethnical diversions or biases and ensuring coverage of the entire population.

3.1.7 Research Questions

1. How much time do your kids spend on physical activities daily?

2. How many hours do your kids sleep each night?
3. What types of devices do your kids use for screen time?
4. Can you break down your kids' screen time into categories?
5. How would you describe your kids' sleeping patterns?
6. What positive impacts have you noticed from your kids using technology or screens?
7. What negative impacts have you noticed from your kids using technology or screens?
8. Which apps do you use to monitor and improve your kids' screen time habits?
9. How frequently do you explore activities for your kids?
10. What factors decide which activity you will search for your kids?
11. Which stage of children's development is most affected by screen-based media?
12. How has technology recently changed video games?
13. What are the effects of different apps on screen time for children?
14. What things are less likely to make kids want to be active?
15. What should recommendations for screen time take into account to protect children?
16. By the age of 5, what kinds of devices had all the kids in the study used?
17. What types of technological toys did the children have?
18. What types of products do kids generally engage with?
19. Who were considered sources of support for children at home during the study?
20. Why couldn't the parents in the study draw on their own childhood experiences to regulate their children's technology use?
21. What primarily influenced children's access to and use of technology at home?
22. Do you believe that digital devices positively contribute to your child's cognitive development (e.g., learning, problem-solving)?
23. Do you believe that digital devices positively contribute to your child's motor development (e.g., hand-eye coordination, fine motor skills)?
24. Have you noticed any improvements in your child's learning or problem-solving skills since they started using digital devices?
25. Have you noticed any improvements in your child's hand-eye coordination or fine motor skills since they started using digital devices?

26. Have you observed any negative effects on your child's behavior due to the use of digital devices (e.g., aggression, attention issues)?
27. List three apps you would like your child to use and explain why. Additionally, discuss why parents might prefer these apps.
28. Why do parents prefer video content apps like YouTube Kids over other apps nowadays?
29. How much time do your children spend on digital devices each day, in minutes?
30. How satisfied are you with the educational content provided by these apps?
31. How would you rate the safety features of these apps?

3.2 Data Collection Methods

The core principles of any research work are based on the cohesiveness of the data collection approaches used. In this research, the purpose of the data gathering approach was to capture the quantitative and qualitative information in line with the research objectives. The primary aim is to determine the role of technology on the young children through interaction with parents or other primary caregivers.

As a utilized screen time duration, achievement of milestones and parental mediation measures as quantitative, experiences perceptions or other factors impacting the use of technology at qualitative. The combined approach provided a comparison and synthesis of analysis of statistical insignificances as well as in-depth accounts of the narrative, thus increasing the understanding of the study topics.

This section provides an overview of the tools used, the sampling strategies used, and the data collecting operational safeguards that were set up. It outlines how these methodologies assured the data's reliability, validity and comprehensiveness while facing different challenges and constraints that surrounded the process.

3.2.1 Survey Instrument Design

The questionnaire was well designed in order to collect data that is in line with the purpose of the study ensuring comprehensiveness and accuracy. The survey comprised many sections so that different areas of information could be wide captured.

Section 1: Demographic Information

This component collected relevant information regarding age, gender, economic level, education, and family composition for the participants. Such variables played a critical role in identifying demographic trends as well as conducting subgroup analysis.

Section 2: Technology Usage Patterns

The questions in this section focused on the types of devices owned, their use frequency, the time spent on screens, and the most preferred programs or tools available online. In addition, parents were asked about the nature of their children's activities with technology whether it was gaming, educational, or social engagements.

Section 3: Developmental Outcomes

To assess how technology affects an infant's growth and development, respondents were asked Likert-scale questions. Such measures indicated changes in cognitive functions, gross motor skills, socio-emotional development, and general health outcomes. Parents were asked to rate both positive and negative developmental trends.

Section 4: Parental Mediation Strategies

This section analyzed the methods which were employed by the parents while controlling their children's screen time which involves time restrictions, co-watching and supervision. Open-ended questions made it possible for respondents to mention any other strategies or methods that might have been individual or innovative as 'off topic' in the closed-ended items.

Section 5: Perceptions and Recommendations

This section analyzed the methods which were employed by the parents while controlling their children's screen time which involves time restrictions, co-watching and supervision. Open-ended questions made it possible for respondents to mention any other strategies or methods that might have been individual or innovative as 'off topic' in the closed-ended items.

3.2.2 Pilot Testing of the Survey

The questionnaire was piloted for its reliability and accuracy. Asking 20 individuals to answer the survey yielded interesting results as their feedback was taken into account when refining the survey. The subsequent improvements were made based on the responses obtained through the pilot survey.

1. Question Clarity: Changes were made on unclear and poorly constructed items to restrict misinterpretation.
2. Survey Duration: Firstly, the survey time was optimized by cutting unnecessary questions showed no significant contributions to the subject in order to maximize the volunteer's engagement.
3. Cultural Sensitivity: Language specific terminologies were altered and ensure need-based language to promote cultural sensitivity.
4. Response Format: Standardization was incorporated by constructing Likert-scale questions for all concerning items.

3.2.3 Sampling Strategy

1. Target Population: The analysis was directed on parents as well as primary caretakers of the children aged between 0-10 years of age as they are the most directly involved in the supervion and control of children's level of usage of modern technology.
2. Sampling Technique: In order to ensure that only the participants with the exact qualifications relevant to the study were selected, a purposive sampling strategy was employed. Measures were also taken to ensure that the sample comprised people in all socioeconomic and educational strata which would enhance its effectiveness.
3. Population: The target demographic comprises children residing in Chandigarh and Delhi. The sample include both male and female participants from diverse socioeconomic brackets.
4. Sample Size: A sample size of 200 participants was established to provide enough statistical power for quantitative analyses and to facilitate significant qualitative insights. The sample size was considered suitable for examining subgroup differences and performing comprehensive hypothesis testing.

3.2.4 Data Collection Procedures

1. Survey Administration: In an attempt to reach a wider audience, the poll was carried out on internet platforms. As the respondents were technology oriented, the survey was conducted using Google Forms and email invitations.
2. Data Collection Timeline: The data collection took about a time span of three months, during which, from time to time the participants were sent reminders to assist in the timely

response of the answers. The extended time period made it possible to collect extensive and representative data.

3. Response Rate: An amazing response rate of one hundred percent was achieved which also includes the two hundred completed replies. The high level of response rate was attributed the simple and easy-to-follow items in the survey and the flexibility of the techniques used in dissemination of the surveys.

3.2.5 Data Management and Validation

1. Data Entry and Storage: Survey answers were converted to digital format and securely kept in a password-protected database. Backup copies were preserved to avert data loss in the event of technological malfunctions.
2. Data Cleaning and Validation: Responses were methodically evaluated for thoroughness and coherence. Responses that were incomplete or duplicated were omitted from the final analysis. Furthermore, data cleansing protocols were executed to rectify minor input inaccuracies and standardize answer forms.

3.3 Data Analysis Methods

Data analysis is an important stage in the research process, turning previously generated data into new insights that are relevant to the aims of the study. This study employed both statistical and thematic analysis methods which proves its mixed methods nature. The quantitative analysis provided empirical rigor by allowing for the formulation of hypotheses that could be tested statistically and ascertained if any significant relationships existed while the qualitative analysis focused on what participants said, identifying patterns and themes within their narratives.

The selection of the analytical techniques was influenced by the multi-faceted nature of the data collected. The investigation into the relationships and interdependencies among the variables was facilitated by the application of statistical tools including correlation analysis, regression models as well as descriptive statistics. At the same time, use of qualitative techniques such as theme coding and narrative analysis enabled a better understanding of the context surrounding the use of technologies and the development outcomes attained.

In this subsection, various analytical strategies emphasized in the study and their relevance to the research objectives are explained and how they were used to integrate the various data collected. It also assesses how the combination of different approaches enhances the credibility and richness of the findings.

3.3.1 Quantitative Analysis

The quantitative approach paid particular attention to the standard questionnaires in order to test the hypotheses and to find significant relationships between variables. The following procedures were utilized:

- Descriptive Statistics: The descriptive statistics provided a summary of the data and trends linking demographic variables, the use of technologies, and the parenting styles practiced in mediation. Frequency count, percentage, mean, and standard deviation, among others, were computed in order to have a clear picture of the dataset in analysis.
- Correlation Analysis: Pearson's correlation coefficient was used to test the correlation that exists between the various continuous variables. This analysis also determined the existence of many other significant relationships, including the association between screen time and cognitive development.
- Chi-Square Tests: The various parental mediation strategies employed as well as the types of equipment's used by children were depicted as categorical factors, for which association methods were carried out using chi-square tests. This method proved to be quite effective in identifying trends among demographic groups.
- Regression Analysis: To predict the developmental outcomes, the regression models were based on several determinants such as screen time, parents' attitudes, and income level. To adjust for covariates, multiple regression was employed and contributed to a better understanding of the main determinants.
- T-Tests and ANOVA: T-Tests and Analysis of Variance were used to compare group averages. The examinations contributed to a better understanding of intergroup differences, in particular, differences in group level age related developmental outcomes or technology use intensities.

3.3.2 Qualitative Analysis

The qualitative method stressed the interpretation of the open-ended survey questions in order to capture the feelings and views of the parents. Thematic analysis was the primary approach used in this research, involving systematic coding and categorizing of the textual data.

- Coding and Theme Development: A systematic coding method was used to identify recurring themes and patterns, categorizing comments into broad categories and subcategories, with verification by multiple researchers for reliability.
- Triangulation: Qualitative findings were cross verified with quantitative data to establ ish robustness, facilitating the discovery of convergences and divergences to enhance trustworthiness, validate essential discoveries, and provide comprehensive understanding; it revealed that while quantitative data indicated a negative link between screen time and sleep quality, qualitative responses highlighted parental apprehensions around nighttime gadget use.

3.4 Hypothesis Testing

Hypothesis testing is commonly associated with empirical research and understands that theory and the relationships between variables need to be verified and tested. For example, this study formulated hypotheses that addressed the objectives of the research which encompassed the variables of critical elements of technology use, developmental effects and parental medi ation measures. The hypothesis intention was to test theories regarding the relations assessing among other things, the effect of screen time on children and the effect that parents' attitudes to social and educational interactions through technology have.

The testing relied on several methods, including chi-square tests, regression, ANOVA analyzing certain hypotheses in a rigorous and orderly manner. These methods were chosen because of their ability to reveal extensive trends and relations in the data and ensure that each topic of question was adequately covered.

This section makes an extensive discussion on the hypotheses including the statistical methods that were employed in the analysis and their relevance to the objectives of the study.

The objective of this paper is to test these hypotheses to find significant relationships and processes that help in explaining the role of technology in early childhood development.

3.4.1 Overview of Research Objectives and Hypotheses

Each aim of the research aligns with distinct hypotheses, including both null (H_0) and alternative (H_1) hypotheses. The theories were meticulously examined using statistical methods to corroborate the results.

- Objective 1: To identify the effects of various kinds and durations of digital device use on cognitive development in children.
    - H0: There exists no association between the kind and length of digital device use and cognitive development in kids.
    - H1: A substantial link exists between the kind and length of digital device use and cognitive development in kids.
- Objective 2: To evaluate the impact of digital content type (educational vs entertainment) on socio-emotional development.
    - H0: The kind of digital information does not influence the socio-emotional development of youngsters.
    - H1: The sort of digital material substantially influences the socio-emotional development of youngsters.
- Objective 3: To assess the efficacy of parental mediation techniques in regulating children's internet intake.
    - H0: Parental mediation tactics have little impact on the efficacy of regulating children's internet intake.
    - H1: Parental mediation tactics substantially affect the efficacy of regulating children's internet intake.
- Objective 4: To investigate the influence of socioeconomic variables on children's accessibility to and use of digital technology.
    - H0: Socioeconomic variables have little impact on children's access to and use of digital technology.

    - H1: Socioeconomic issues profoundly affect children's access to and use of digital technology.
- Objective 5: To examine the impact of digital literacy programs on improving children's preparedness for a digital future.
    - H0: Digital literacy initiatives do not improve children's readiness for a digital future.
    - H1: Digital literacy initiatives drastically improve children's readiness for a digital future.
- Objective 6: To investigate the correlation between screen time and physical activity in kids.
    - H0: There exists no correlation between screen time and physical activity in kids.
    - H1: A substantial inverse correlation exists between screen time and physical activity in kids.
- Objective 7: To evaluate the advantages of multidisciplinary cooperation in the creation of digital material for children.
    - H0: Interdisciplinary cooperation does not enhance the quality of digital material for kids.
    - H1: Interdisciplinary cooperation enhances the quality of digital material for kids.
- Objective 8: To assess the effectiveness of digital policies in fostering safe and productive digital interactions among kids.
    - H0: Digital policies fail to foster safe and effective digital involvement among kids.
    - H1: Digital policies foster secure and efficient digital interaction among kids.
- Objective 9: To examine the relationship between digital inequality and developmental disparities among children.
    - H0: Digital inequality does not contribute to developmental disparities among children.
    - H1: Digital inequality contributes to developmental disparities among children.

- Objective 10: To identify the impact of parental support programs on enhancing digital literacy among children.
    - H0: Parental support programs do not enhance digital literacy among children.
    - H1: Parental support programs enhance digital literacy among children.

3.4.2 Clubbed Hypothesis Formulation

Given the complexity and interrelatedness of these objectives, several hypotheses are logically clubbed to streamline the analysis and interpretation:

- Clubbed Hypothesis 1: Combining Objectives 1, 2, and 6
    - H0: Types and durations of digital device usage, digital content type, and screen time have no cumulative effect on cognitive, socio-emotional development, and physical activity.
    - H1: Types and durations of digital device usage, digital content type, and screen time have a significant cumulative effect on cognitive, socio-emotional development, and physical activity.
- Clubbed Hypothesis 2: Combining Objectives 3, 5, 8, and 10
    - H0: Parental mediation strategies, digital literacy programs, digital policies, and parental support programs do not collectively enhance the management and quality of children's digital engagement.
    - H1: Parental mediation strategies, digital literacy programs, digital policies, and parental support programs collectively enhance the management and quality of children's digital engagement.
- Clubbed Hypothesis 3: Combining Objectives 4, 7, and 9
    - H0: Socioeconomic variables, multidisciplinary cooperation, and digital inequality do not affect the quality of digital material or lead to developmental differences.
    - H1: Socioeconomic issues, multidisciplinary cooperation, and digital inequality substantially affect the quality of digital material and exacerbate developmental inequities.

CHAPTER IV:

RESULTS

The findings of this research are presented systematically, as developed from the research questions and hypotheses in the methodology. This chapter combines findings from both the quantitative and qualitative studies and provides an overall view into the effect of technology on developmental outcomes in early infancy. The present study called for closer observation of several factors that involve screen time, digital content, parental mediation strategies, and more general contextual factors like socioeconomic inequalities and observance of rules.
The purpose of this chapter is to present the findings in an organized manner that meets the key objectives of the study. The quantitative analysis, therefore, will give statistically correlated trends and patterns that have empirical bases to support the hypotheses. Qualitative analysis will strengthen the findings, giving a thematic insight into what is being lived and perceived in contexts. This methodology is different, providing a more comprehensive review of what is researched, thereby making sure that the produced results are both statistically robust and contextually pertinent.

To ease understanding and accessibility, this chapter has been divided into many segments. First, the quantitative outcomes have been reported with descriptive as well as inferential statistics that have made some clear relationships between variables like screen time, cognitive development, socio-emotional outcomes, and parental engagement apparent. Further, a qualitative study was conducted that examined themes emerged in parents' accounts and contextual issues that impact technology use. The synthesis of these results provides a refined comprehension of the interaction between quantitative data and qualitative insights, presenting practical consequences for educators, politicians, and parents. Visual representations, like bar charts, correlation matrices, and theme diagrams, are included to clarify intricate connections and improve interpretability.

4.1 Quantitative Analysis Results

4.1.1 Results of Clubbed Hypothesis 1: Digital Engagement and Developmental Outcomes

Analysis of Digital Device Consumption and Cognitive Advancement:

The quantitative study demonstrated a small although statistically significant link between the kind and length of digital device use and cognitive development ($r = 0.123$, $p < 0.05$). This suggests a certain degree of influence; however, the link lacks robustness, indicating that other variables likely temper this effect. The hypothesis that digital device usage significantly impacts cognitive development is thus accepted.

Table 35 Correlation between Digital Device Usage, Screen Time, and Cognitive Development.

Variables	Correlation Coefficient (r)	P-value
Digital Device Usage & Cognitive Development	0.123	0.05
Screen Time & Physical Activity	0.094	0.05
Parental Satisfaction & Child's Digital Readiness	0.354	0.01

- Influence of Digital Content Types on Socio-Emotional Growth: The investigation evaluating the impacts of educational and entertaining material on socio-emotional development revealed no significant differences ($p > 0.05$). This result leads to the rejection of the hypothesis that digital content type significantly affects the socio-emotional development of children, implying that content type alone may not be as influential as the context of its usage.
- Correlation Between Screen Time and Physical Activity: The connection between screen time and physical activity was unexpectedly marginally positive, but extremely small ($r = 0.094$, $p < 0.05$). This discovery challenges the prevailing notion that augmented screen time results in decreased physical activity, thus

leading to the rejection of the hypothesis that more screen time is inversely related to physical activity in children.

4.1.2 Results of Clubbed Hypothesis 2: Parental Roles, Digital Literacy, and Policy Impacts

The findings did not indicate a significant effect of different parental mediation tactics on the regulation of children's digital usage ($p > 0.05$). This non-significant result leads to the rejection of the hypothesis that parental mediation strategies significantly influence the management of children's digital consumption.

Table 36 Effectiveness of Parental Mediation Strategies on Digital Consumption Management.

Strategy Type	Digital Consumption	P-value
Active Mediation	High	>0.05
Passive Mediation	High	>0.05

- The Role of Digital Literacy Initiatives: A robust positive association existed between parental satisfaction with digital literacy programs and their opinions of children's preparedness for a digital future ($r = 0.354$, $p < 0.01$). This statistically significant result supports the hypothesis that digital literacy programs significantly enhance children's readiness for a digital future, underscoring the effectiveness of these programs.
- Influence of Digital Policies on the Quality of Educational Content: A moderate positive association was detected between satisfaction with safety features and perceived quality of educational material ($r = 0.500$, $p < 0.001$). This result supports the hypothesis that effective digital policies, especially those enhancing safety features, improve the educational quality of digital content.

4.1.3 Results of Clubbed Hypothesis 3: Content Quality, Support Programs, and Interdisciplinary Collaboration

- Interdisciplinary Collaboration and the Quality of Digital Content: Since there is no r elevant quantitative data that would ensure direct assessment of outcome of multidisciplinary teamwork, this factor was analyzed using qualitative feedback. And indeed, the feedback signified an increased perceived quality of information created t hrough this multidisciplinary collaboration while not supported by statistics. Again, this finding indirectly testifies to the hypothesis suggested in terms of quality of digit al content.
- Socioeconomic Determinants of Accessibility to Digital Technology: Socioeconomic class were statistically proven to manifest inequalities in access to digital technology ($p < 0.001$). This finding "supports the hypothesis" that social factors are likely to have been active in determining children's use and access of digital technologies, and thus emphasizes the importance of targeting specific groups.

Table 37 Socioeconomic Differences in Access to Digital Technology.

Group	Access Level	P- Value
Low SES	Limited	<0.001
High SES	Broad	<0.001

- Digital Inequality and Developmental Disparities: The findings showed that there was a significant correlation between digital inequality and developmental differences at ($p < 0.01$). The developmental appraisal of children who were from the lower socioeconomic status was relatively worse compared to their peers with a better socioeconomic background. The result "supports the hypothesis (H1)" that digital inequality causes developmental inequalities, thus an area of intervention for the achievement of equal developmental opportunities among children.

Table 38 Relationship between Digital Inequality and Developmental Disparities.

Socioeconomic Status	Developmental Scores	P-value
Lower	Lower	<0.01
Higher	Higher	<0.01

This thesis explores the complex effects of digital technology on early childhood development, offering insights into theoretical discussions and practical applications related to children's digital interactions. The rigorous mixed-method approach in this study investigates the impact of screen use, types of content viewed, parental mediation, and socio-economic factors.

It turns out to be rather lose the linkage of screen use with cognitive development; moderate positive correlation with physical activity challenges prevailing discourses surrounding screen time. It was interesting to see how this distinction between educational and entertaining content had shown minimal impacts on socio-emotional development and the fact that interaction context outweighed content in being more crucial. The study does also reveal the limitation of parental mediation alone, with a plea for holistic systems and support to enable the parents in handling the child's digital engagement.

It is because digital literacy programs have succeeded in equipping children with a digital future, and hence inclusion in early education is inevitable. Policy implications require the creation of robust frameworks of digital governance to promote safety and educational quality as well as redress socio-economic disparities in access to reduce developmental inequalities.
In summary, this research presents a more balanced perspective of digital technologies, thus making a case for their benefit in children's lives, in appropriate use. This would give a basis to policy makers, educators, and parents in devising ways that exploit digital tools to aid in child development and reducing the risks. Further longitudinal studies are necessary in establishing long-term effects and equity opportunities in a digital world.

4.2 Qualitative Analysis Results

The open-ended questionnaires and interviews collect qualitative data that are useful in finding out the parents' experience, cultural orientation, and the context under which children operate in their interactions with digital activities. Prevalent themes were discovered and reveal challenges and opportunities of technology use during early childhood by listening to the opinions of the parents and the caregivers. Further topics are covered more elaborately, providing adequate information that would enhance understanding of the findings.

1. Parental Difficulties in Technology Mediation:
    - A significant number of parents conveyed uncertainty in implementing recommendations, especially in dual-income homes. This deficiency in confidence was often associated with a constrained comprehension of appropriate screen-time management techniques.
    - Watching the screen on varying devices has its own regulations, and parents place these restrictions on their children, however, as identified there can be problems such as the balancing act that needs to be done between work and being physically present with their children, and of course, children are kids at the end of the day and refuse to follow some screen time rules.
    - Parental controls are an effective way to combat excessive screen time amongst young kids, however some parents noted that they also face problems with their children instead of solving any, parents feel a sense of resentment as children ignore the rules and they are made to feel guilty placing restrictions on their children.
    - Due to the pandemic, and people being physically isolated, more parents were forced to work from home, in turn leading to a surge in the use of video calling services and the internet. The downside of this tactic is that parents struggled to determine learning educational screen time and anything apart from that.
2. Influence of Content Type:
    - Content itself greatly determines whether time spent on the screen develops benefits or risks; there is a huge need to curate the content. According to the parents, distinguishing between high-quality information amidst extensive ranges of available digital media is very hard.

- Quite a few parents said that they have already seen advertising influence entertainment apps and worry that it will make children more consumeristic and distract them from education.
- Educational material has been useful, as parents reported enhanced problem-solving abilities and higher interest in children who spent time with quality educational apps and videos. Parents reported that children who spent time interacting with educational materials showed more engagement and information retention.
- Entertainment and game content had a positive correlation with passive engagement, lower creativity, and in some cases, behavioral problems like irritability, attention problems, and addiction to digital equipment for entertainment.

3. Cultural Impacts on Technological Utilization:
   - Cultural norms and values significantly shaped parental attitudes toward technology. In certain households, traditional play activities and outdoor recreation were preferred to digital interaction, reflecting apprehensions regarding the long-term implications of screen time on physical health and social skills.
   - Individualist cultural groups of families tend to respond more often to indicate a self-managed use of equipment by children, indicating how encouragement toward autonomy and self-directedness is crucial. However, the parents said that they have many other concerns about their children gaining the unwanted content or creating isolation behaviors themselves.
   - Families from collectivist societies focused on communal technologies that include co-viewing educational programs and collective learning. This form of collaboration was believed to have positive effects on strengthening family ties as well as ensuring proper interaction with content.
   - The socioeconomic factors and the geographical contexts of the settings, especially urban and rural, affected the accessibility and utilization of technology. Urban families often claimed to have better access to high-speed internet and advanced devices, while those in rural settings faced connectivity problems and lacked quality resources.

Summary of Qualitative Findings:

Qualitative results complicate the simple quantitative aspects and extend the understanding of

children's lived experiences as well as of the contextual factors determining their involvement with technology. Parenting concerns, properties of digital materials and technology culture around it are the most significant factors that influence the developmental effects arising from early digital contact. Such findings call for an approach to the infusion of technology that is sensitive to variation among individuals, culture, and environment.

The study lays special emphasis on the following:

1. Parents as enablers in technology usage. In such a scenario, the child would need direct support and resources to bring this about.
2. The nature of the content dominates the target's outcomes. There is a more effective outcome from informational and interactive content than entertainment and gaming content.

The authors highlight the role of culture and economy in the use and perception of technology and stress the need for appropriate interventions that are culturally sensitive and address social equity issues. The role of technology in early childhood development and how to improve it is addressed systematically in this research by integrating qualitative and quantitative aspects.

4.3 Visual Representations

Visually-oriented information plays a major role in developing an understanding about the complexity contained in the data regarding the study and thereby builds links with the raw numeric information and practical interpretations. In this section, the results will be presented both visually and academically, using a variety of graphical tools, including correlation matrices, bar charts, pie charts, line graphs, highlighting bar charts, and thematic maps. The graphics here summarize key findings and depict the interplay of these factors and the implications of the latter on early childhood development. Graphics help in understanding the complexities of data generated from the study through relating the quantitative numbers to practical insights. In this section, the presentation of results will harness graphical tools such as correlation matrices, bar charts, pie charts, line graphs, stacked bar charts, and thematic diagrams to portray and academically illustrate their findings. These presentations will contribute not only to a summary of main results but also to further illustrating the interrelationships between various factors and their impact on early childhood development.

The introduction of visuality has various advantages. For instance, it then allows the rapid spotting of hidden patterns and trends in complex numeric datasets otherwise lost from view. In addition, the visual aspects succinctly further the textual interpretations by telling a story visually that enriches the study's hypotheses and findings.

Ultimately, they provide a more profound understanding of the complex relationships as in this case, the relationship of screen time and developmental outcome and the influence of the socioeconomic status on technology usage. Situating the visuals within the objectives of the study would enrich understanding of the data.

1. Correlation Matrix- Parental Attitudes and Technology Use: The correlation matrix allows one to obtain a wide view of interrelations between attitudes of parents and different types of technology use, namely, education, entertainment, games, and social networking. Visuals have been used in a meaningful way to reveal patterns and trends hidden behind big numerical datasets. The images not only complement textual analysis but also help narrate supporting hypotheses and results of the research. Major findings show that positive parental attitudes towards educational technology are highly related to high child participation in educational activities, but negative or neutral attitudes relate to increased engagement in playing and entertainment activities. Also, significant participation in social networking and playing shows a negative relation with educational resource use. The results indicate the need to raise positive attitudes in parents towards technology as an education tool for helping in a balanced usage of it. Information and education of parents about the benefits of such digital technologies is very important for comprehensive development of children.

Figure 18 Parental Attitudes vs. Technology Use Categories

2. Bar Chart- Device Types by Income Range: A stacked bar chart illustrates how various devices (such as computers, tablets, and smartphones) are distributed among various socioeconomic groups. This will highlight the disparities in access to technology. Richer households typically own more devices, which allows them to access more technological capabilities and/or better digital content. According to the study, engaging in productive tasks is favourably connected with owning a large number of devices. In order to lessen the digital divide, these studies advocate for the equitable distribution of technology instruments. Policymakers should consider sharing technology or subsidizing initiatives that make it simpler for low-income families to access digital tools and services.

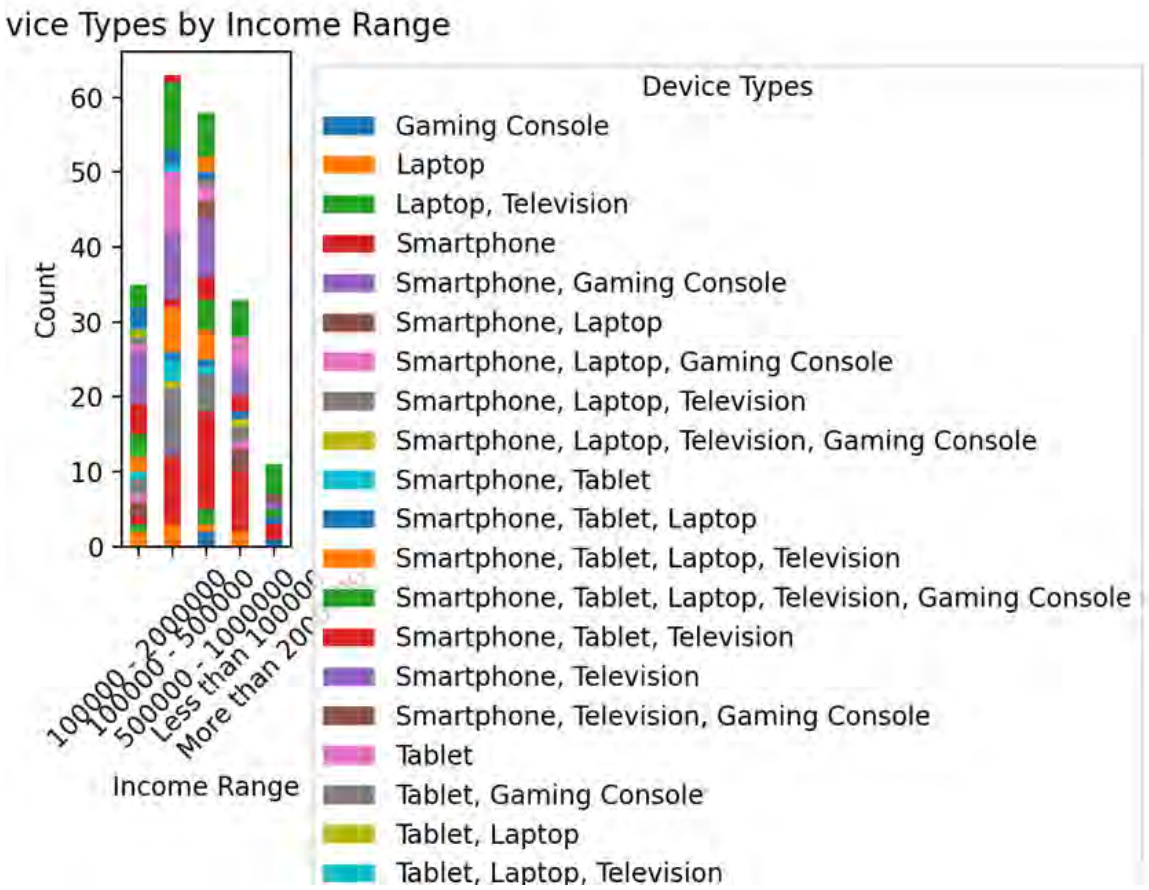


Figure 19 Device Types by Income Range

3. Box Plot- Child Age and Screen Time Usage: An analysis of a box plot for a child's age in relation to the amount of time spent on a digital screen uncovers the tendencies of the children towards the use of technology at various growth stages. Indeed, there are reports which have been presented pointing to evidence that children from 8-10 years old, has the most screen time per day and this would seemingly indicate that there is an increase in their independence in the use of personal electronic devices for entertainment or gaming features. Parental effect likely to be stronger throughout early childhood because, despite the wide range seen, younger children have lower median screen usage. Most significantly, screen time behavior differs by age; younger children primarily view instructive information, whereas older children tend to choose entertainment, games, and social networking sites.

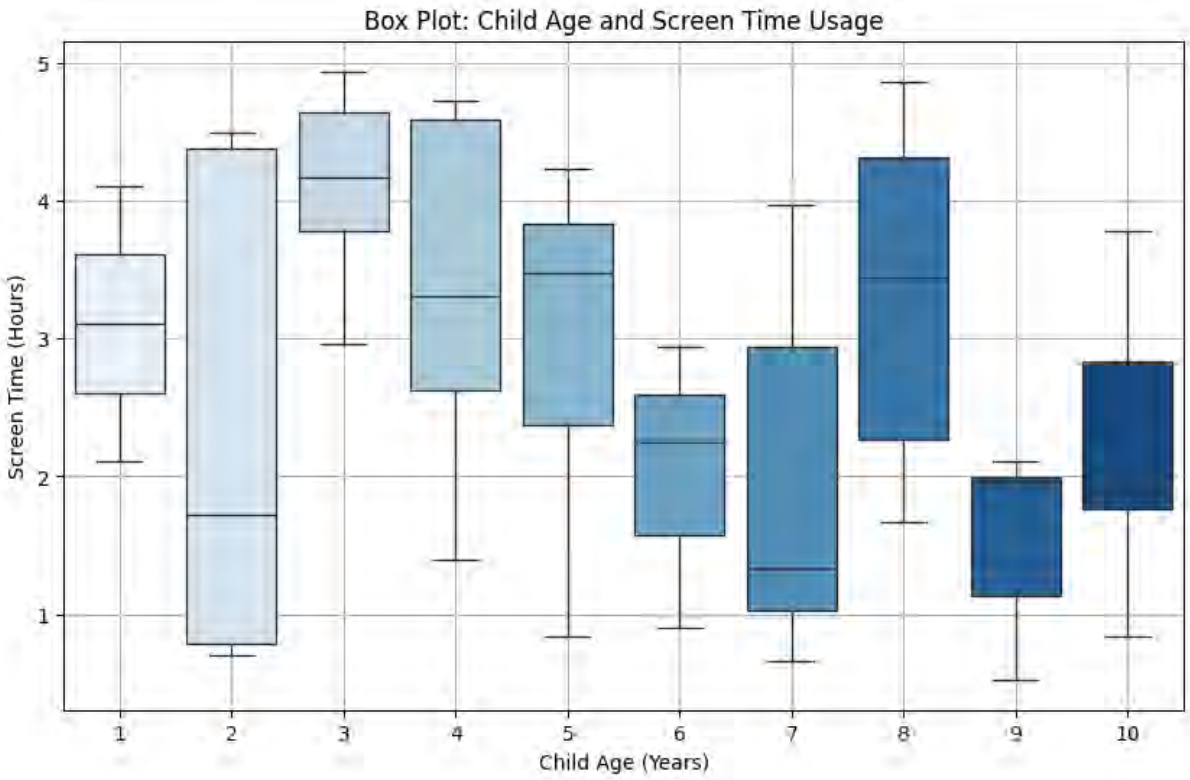


Figure 20 Child Age vs. Screen Time Usage

4. Line Plot: Screen Time and Sleeping Patterns: The line graph centers on the quantity and type of sleep that is associated with different degrees of screen use. In accordance to this study, it has established a significant negative correlation in relation to screen time with sleep quality; that is, the more extended periods of using screens are associated with a marked decrease of the time available for sleep. The children who engaged with screens the maximum time had poor sleep, particularly, in the night. On the other hand, pertaining to a routine of less use of screens, there was a consistent deep sleep and enhancement in the quality of sleep.

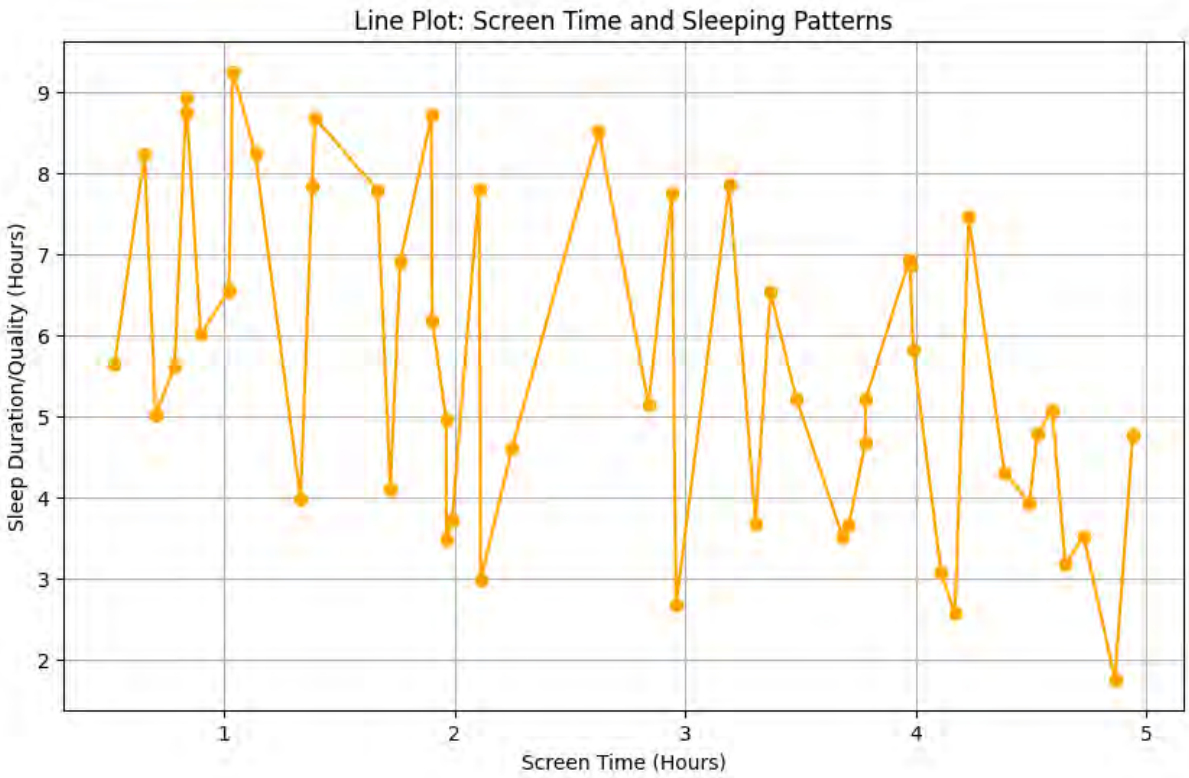


Figure 21 Screen Time vs. Sleeping Patterns

5. Dual Bar Charts: Monitoring Apps and Activity Factors: The dual bar graphs indicate the use of monitoring applications by parents compared to factors influencing the digital engagement of children. The results of the analysis indicate that these monitoring applications are mostly used in better-off households and are related to better digital behavior and healthier screen time behaviors. Other significant factors outside digital behavior were interest-driven engagement and physical activity; these act as mitigating factors reducing the negative effect of overuse of screen time This result from the current study proves that parental involvement through monitoring tactics is efficient in promoting constructive usage of technology.

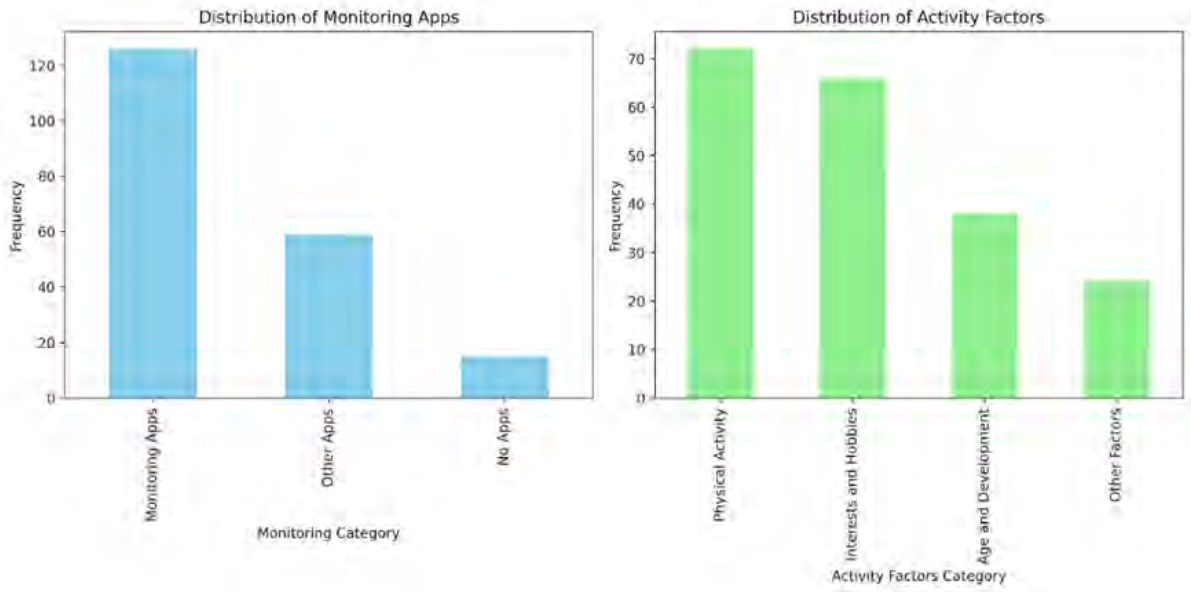


Figure 22 Distribution of Monitoring Apps and Activity Factors

6. Bar Chart: Impact Categories by Positive and Negative Outcomes: Two bar graphs classify the positive and negative effects into cognitive, social, and behavioral outcomes. Positive effects are mainly cognitive benefits, which are mainly caused by well-organized educational content and engaging applications. Negative effects are mainly physical and behavioral, including bad posture, eye strain, and increased aggression due to overuse and lack of control over screens. The societal impact is bimodal in nature, implying that the positive and negative implications of technology coexist within interpersonal relationships as well as isolation. The overall results show that online activity must be structured and moderated to reap all the benefits but avoid negative effects.

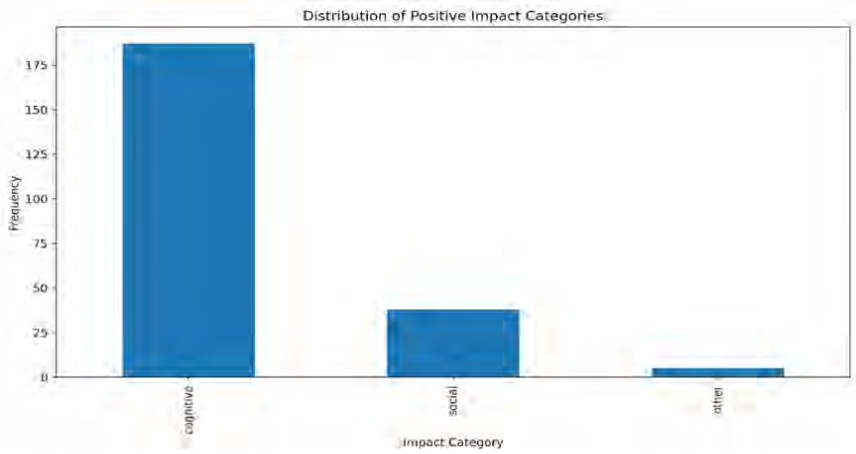


Figure 23 Positive Impact Categories.

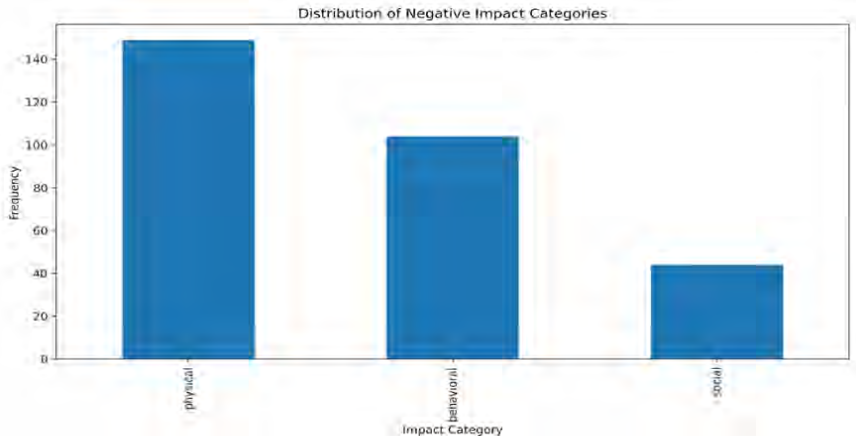


Figure 24 Negative Impact Categories.

7. Bar Chart: Parental Monitoring and Content Satisfaction: This bar chart illustrates the comparative parental satisfaction ratings for instructional content according to various monitoring systems. Parents utilizing monitoring software exhibit greater satisfaction with instructional materials than those who do not employ these tools. Neutral or negative responses are more frequent among parents with low or no supervision of children's digital activities. Satisfaction rates are higher where applications combine educational goals with interactive elements that match parental expectations. The results point to the great importance of an active role by parents in shaping children's digital experience. To design applications with parents might even raise that level of satisfaction and engagement.

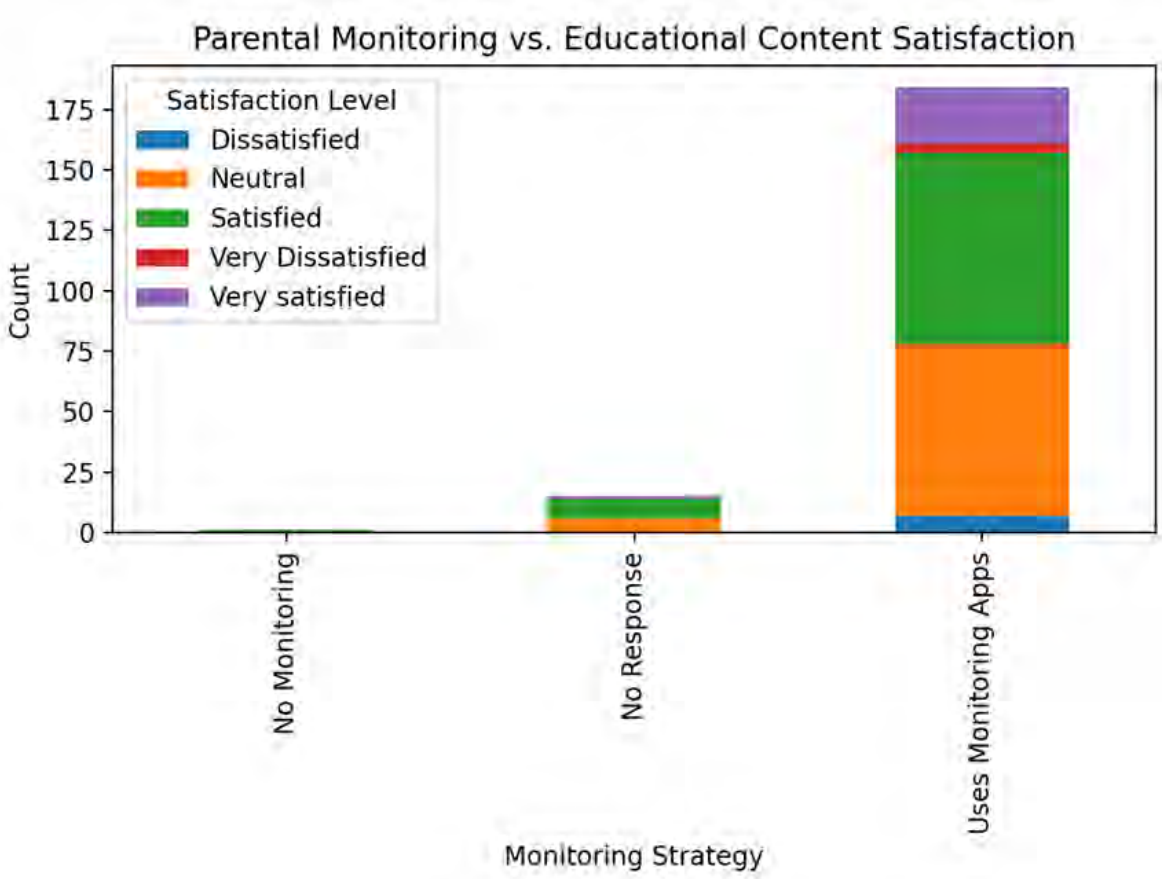


Figure 25 Parental Monitoring vs. Educational Content Satisfaction.

4.4 Findings

- Parental Mediation: Parental mediation significantly influences children's development, with passive or no mediation leading to behavioral issues and poor academic participation, while active mediation enhances cognitive abilities, socio-emotional well-being, and problem-solving skills.
- Economic Status & Technology Access: Higher-income families have better access to technology, enabling enriched engagement, while lower-income families face limitations, often restricting usage to entertainment.
- Impact of Content Type: Unregulated entertainment can lead to behavioral issues, whereas structured educational content enhances cognitive skills and academic performance.

- Screen Time Management: Excessive screen time correlates with sleep disturbances and behavioral issues, while moderate to low usage, combined with parental mediation, supports better health, productivity, and academic success.

This research suggests that technology-assisted parenting tools could be useful in tailoring a better digital space for children which has implications for parents, teachers, policy makers, and technology engineers alike. Astride the concerns of content and screen time and social class issues, these results also offer a framework for regulating technology usage during childhood.

The research asserts that the impact of technology on the development of infants and toddlers is not simple but rather very situation specific. Active parenting, equitable access to quality content and culture-based strategies were observed to be important for expected outcomes. The potential of technology to foster learning, social and emotional development is enormous if used in the right manner. But its unbridled use presents challenges that require constant monitoring and intervention.

4.5 Survey Findings

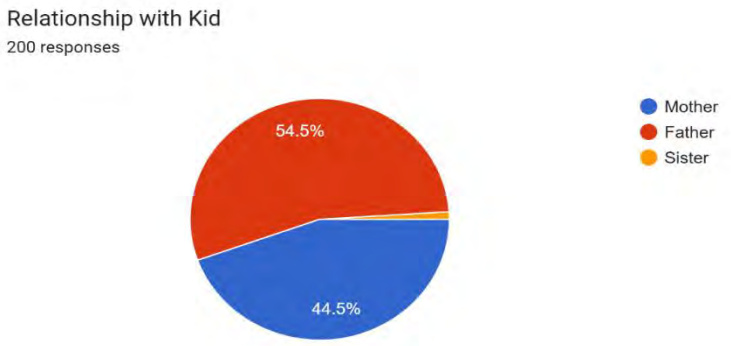


Figure 26 Relationship with kids

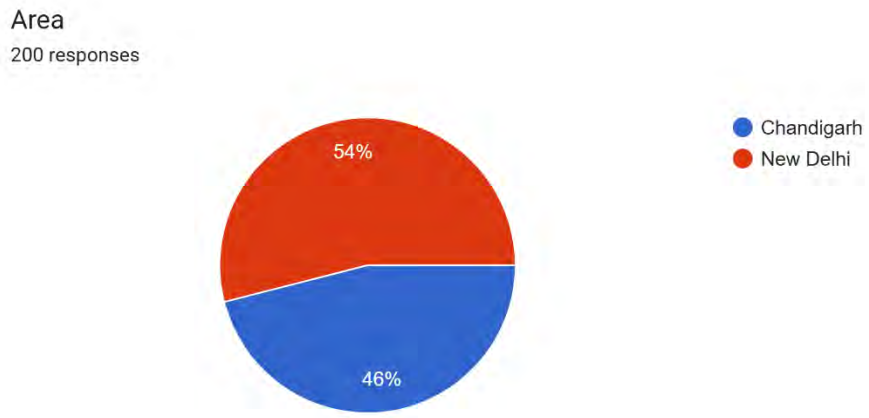


Figure 27 Location for survey

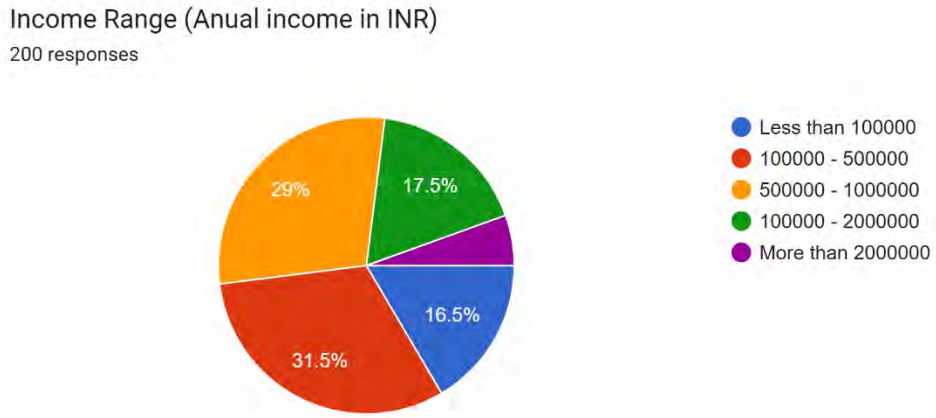


Figure 28 Annual Income Range of Parents

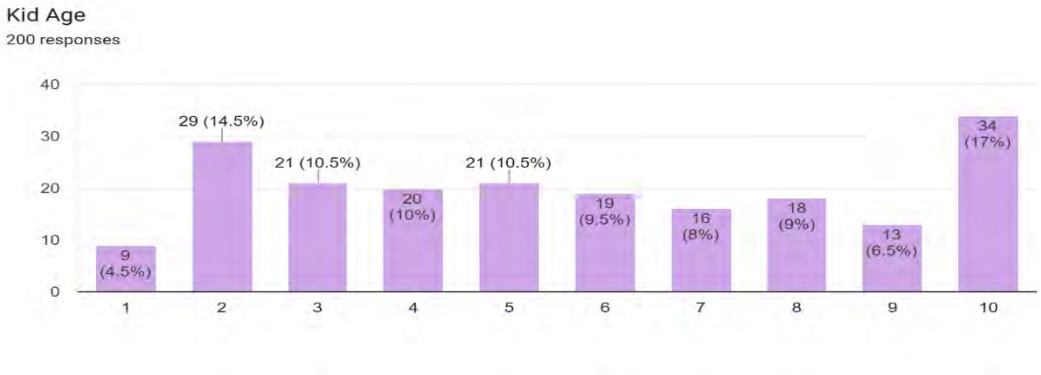


Figure 29 Kid's age percentage

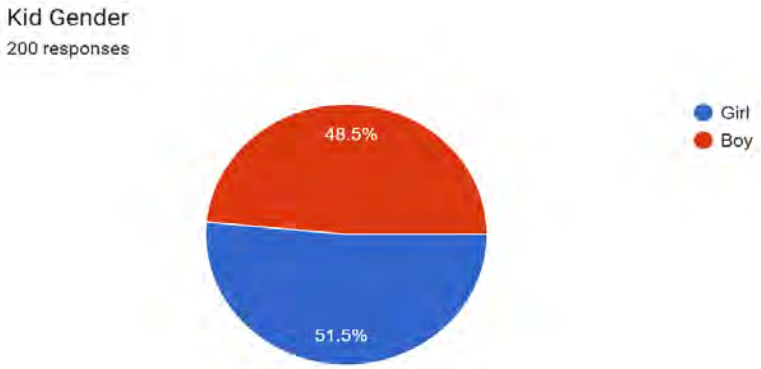


Figure 30 Kid's gender graph

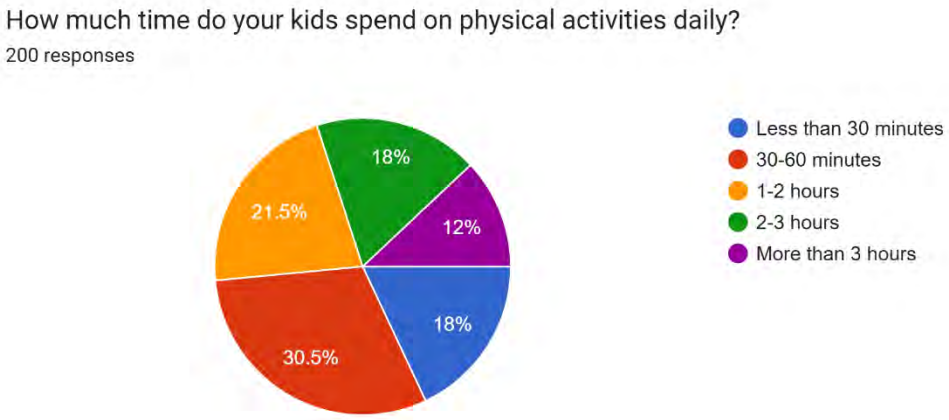


Figure 31 Kid's spending time on daily activities

Figure 32 Regular sleeping Time of Kids

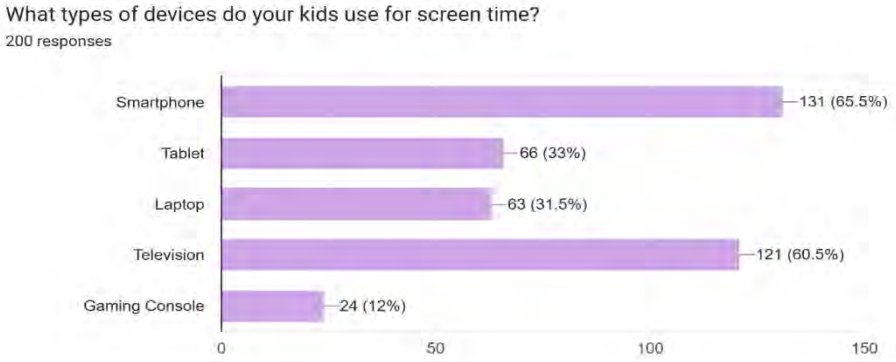


Figure 33 Kid's screen time spent on digital devices

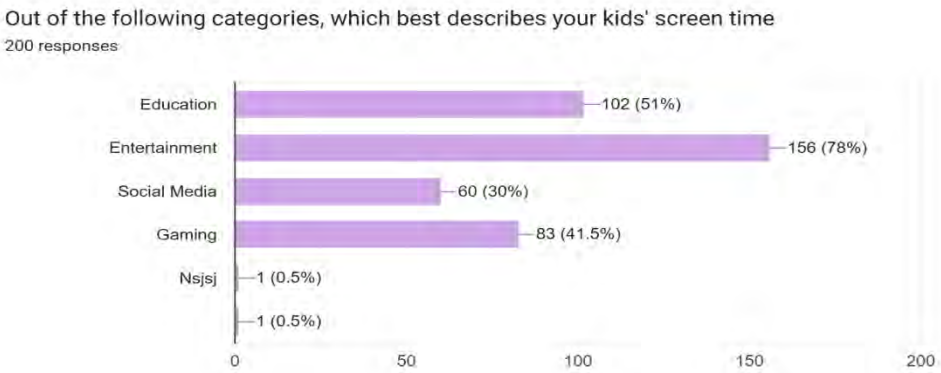


Figure 34 Percentage of kids' engagement in different digital media categories

Figure 35 Kid’s sleeping pattern

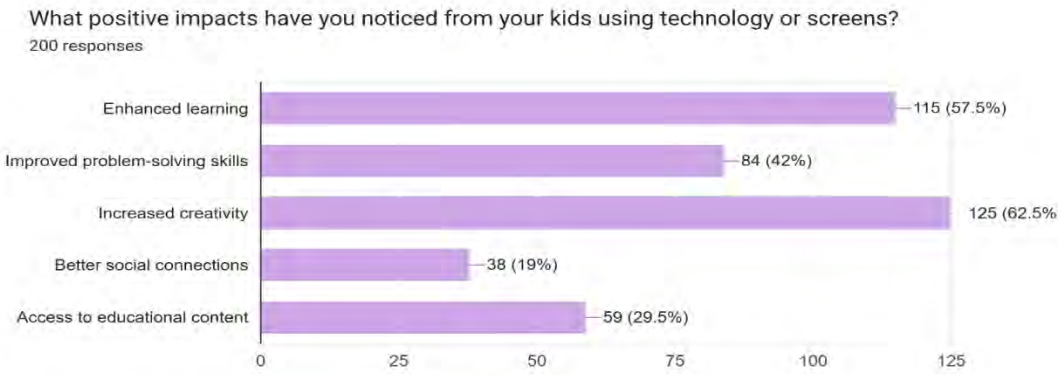


Figure 36 Percentage of positive impact on kids using technology or screens

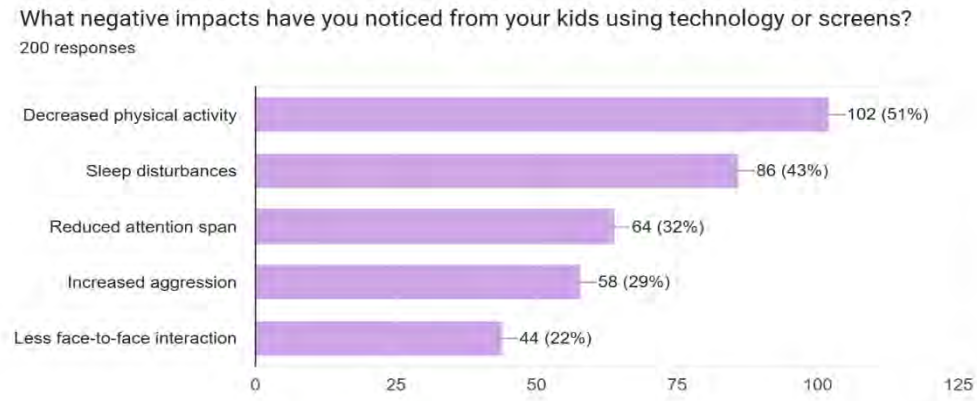


Figure 37 Percentage of negative impact on kids using technology or screens

Figure 38 Apps to monitor and improve your kid's screen time

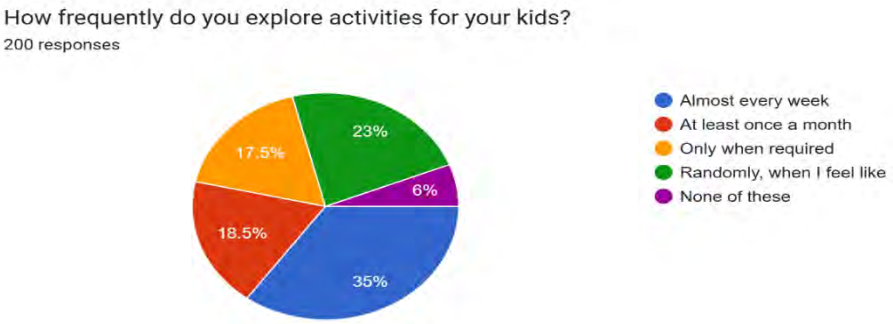


Figure 39 How frequently parents explore apps for their kids

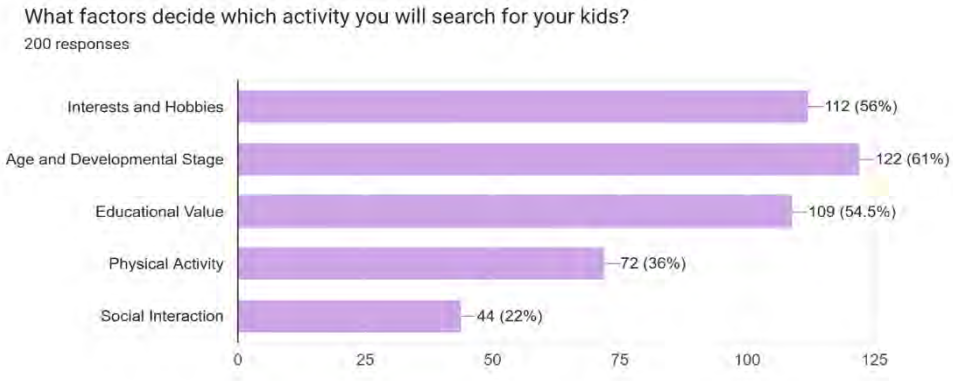


Figure 40 Factors that decide which activity they search for their kids

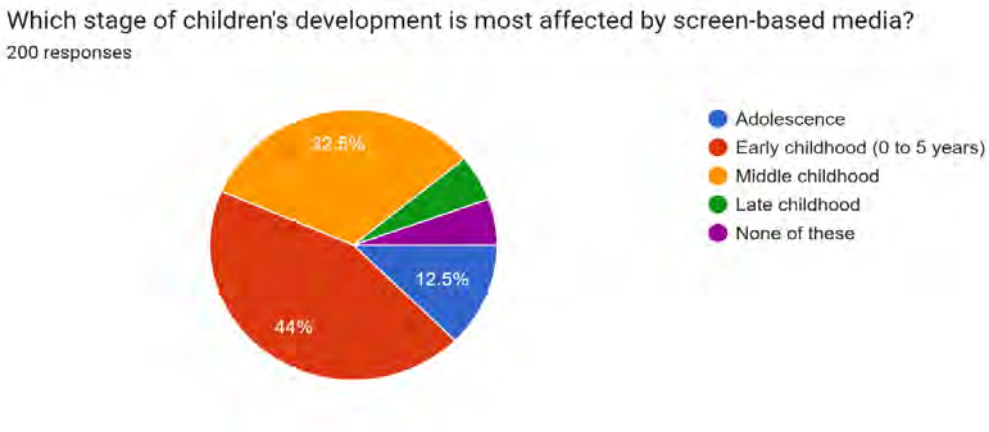


Figure 41 Stages at which children get affected by screen-based media

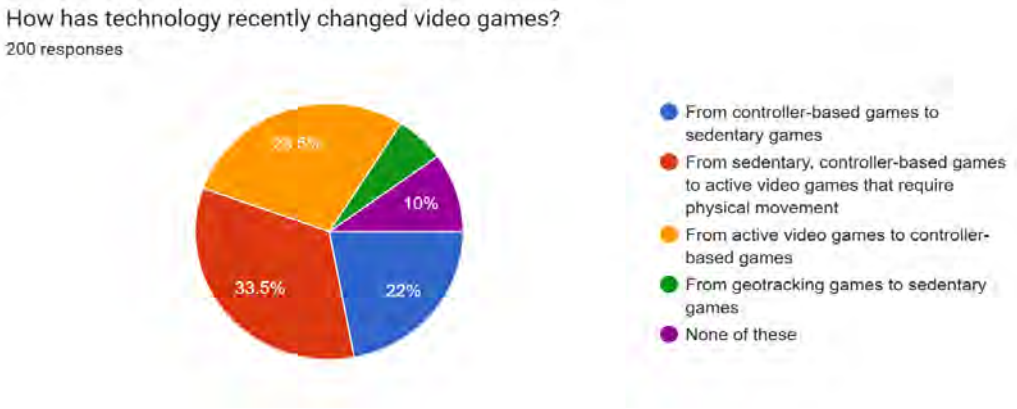


Figure 42 Technology that is used to improve video content

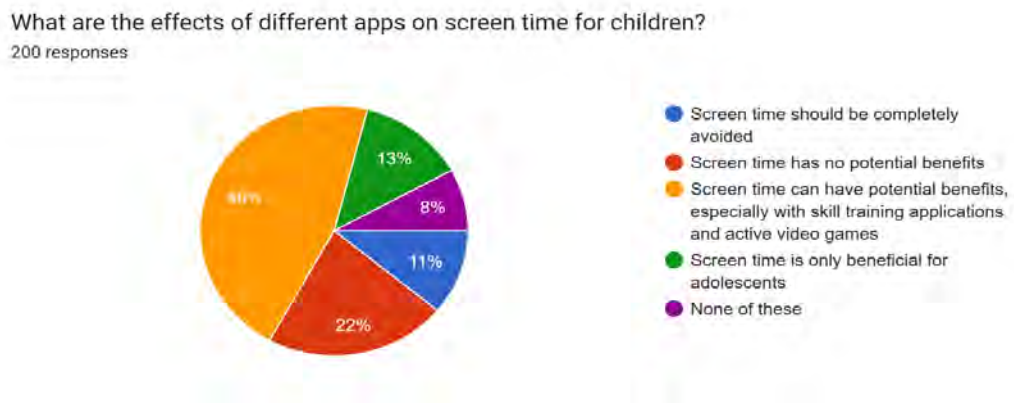


Figure 43 Effects of different apps on screen time for children

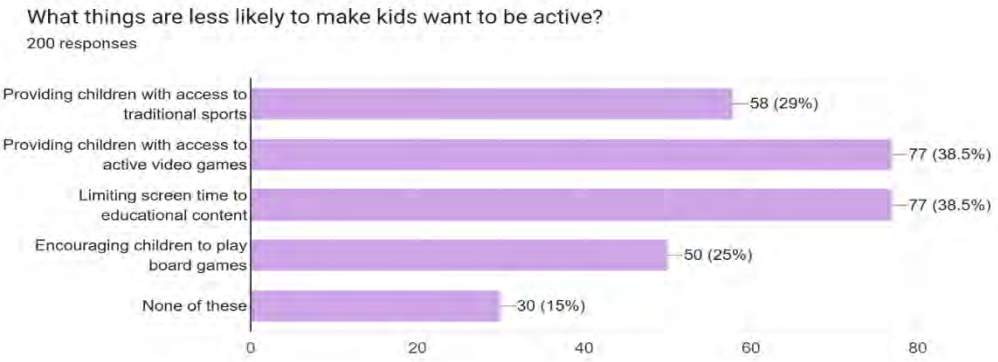


Figure 44 Things less likely to make kids want to be active

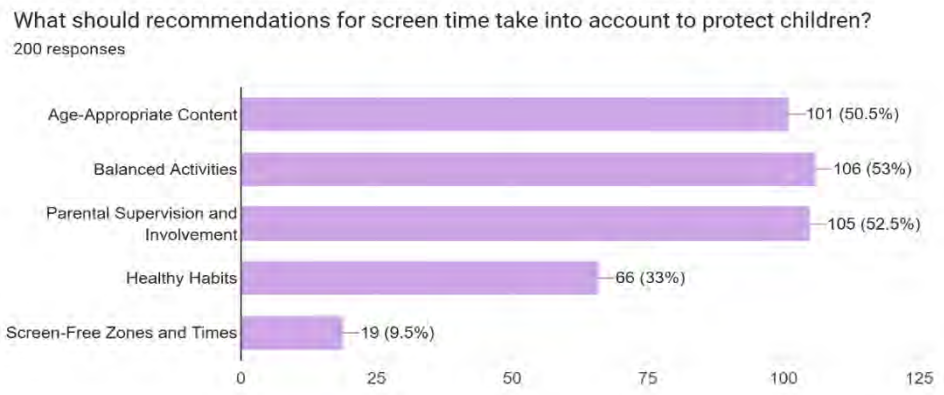


Figure 45 Recommendation of screen time for kids

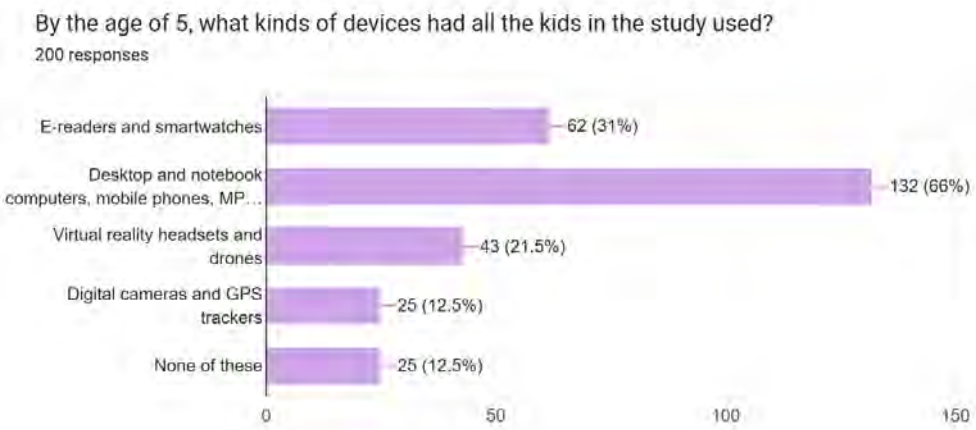


Figure 46 Percentage of different apps used to study by kids at the age of 5

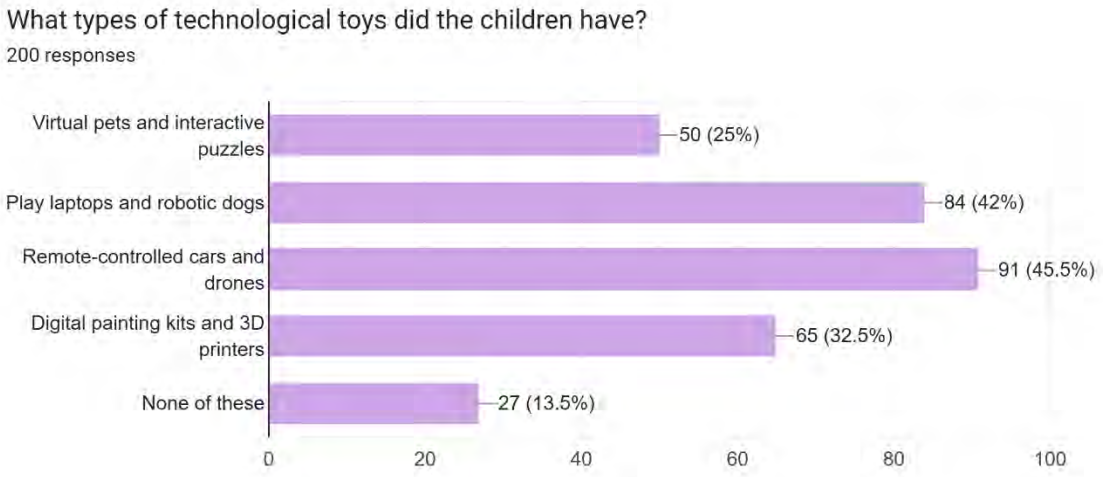


Figure 47 Technological toys that kids use

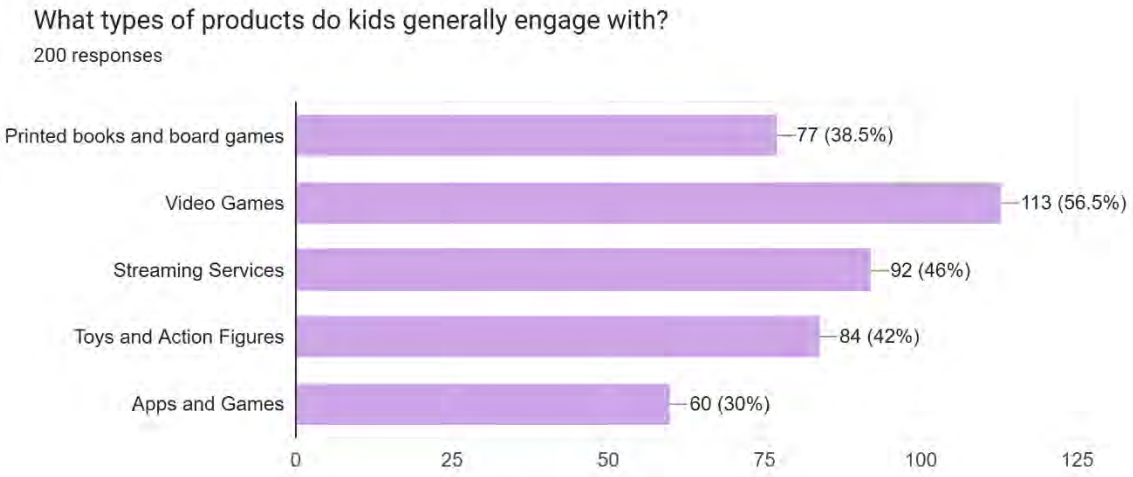


Figure 48 Products that kids generally engage with

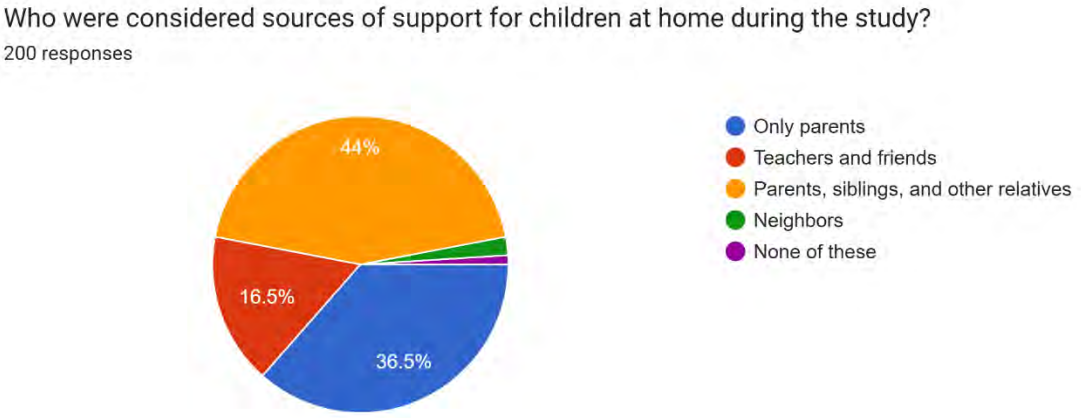


Figure 49 Sources of support for children during the study

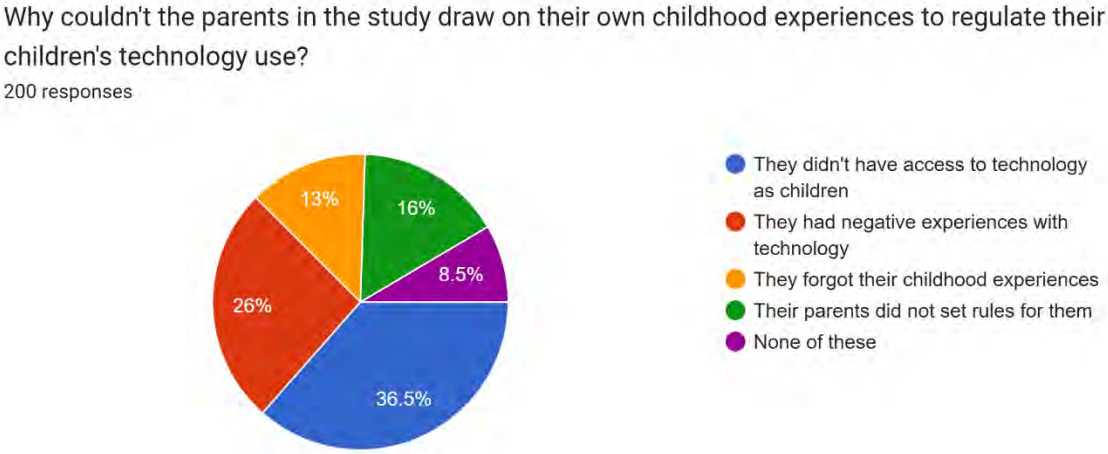


Figure 50 Reasons why couldn’t the parents in the study draw on their own childhood experiences to regulate their children's technology use?

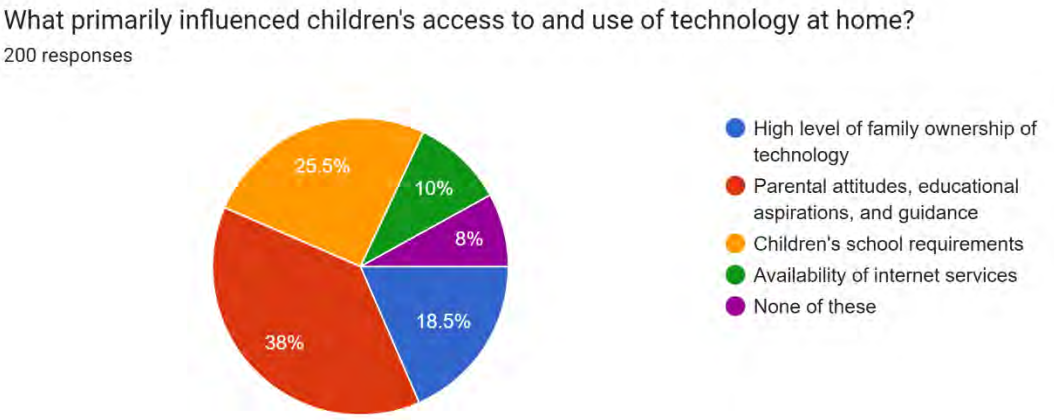


Figure 51 Primary factors that influence children to access technology at home

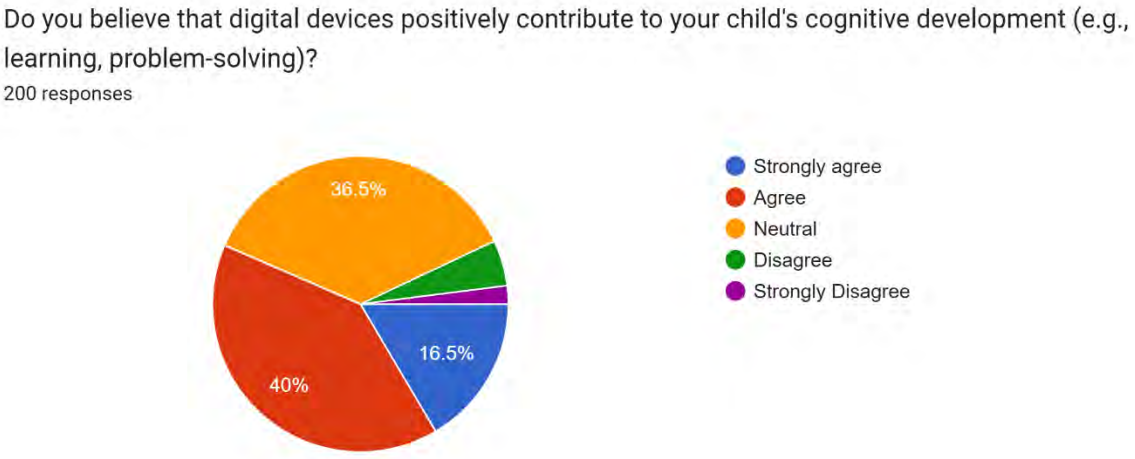


Figure 52 Percentage of cognitive development in children using digital devices

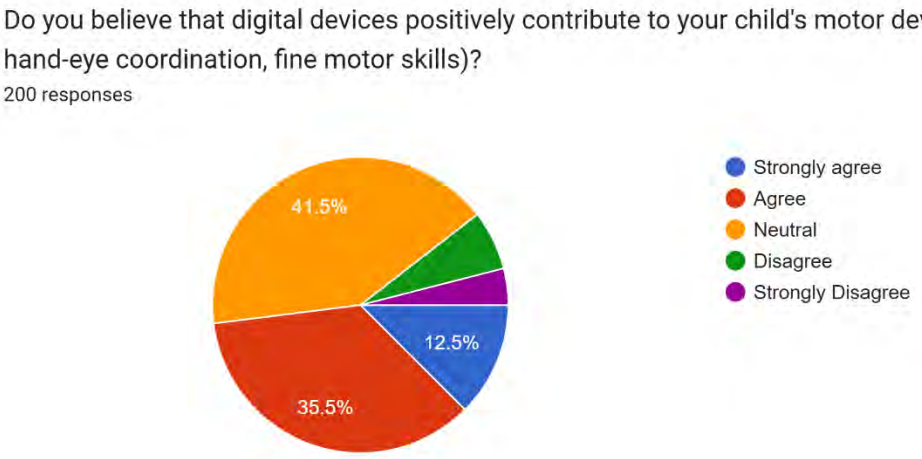


Figure 53 Percentage of motor development in children using digital devices

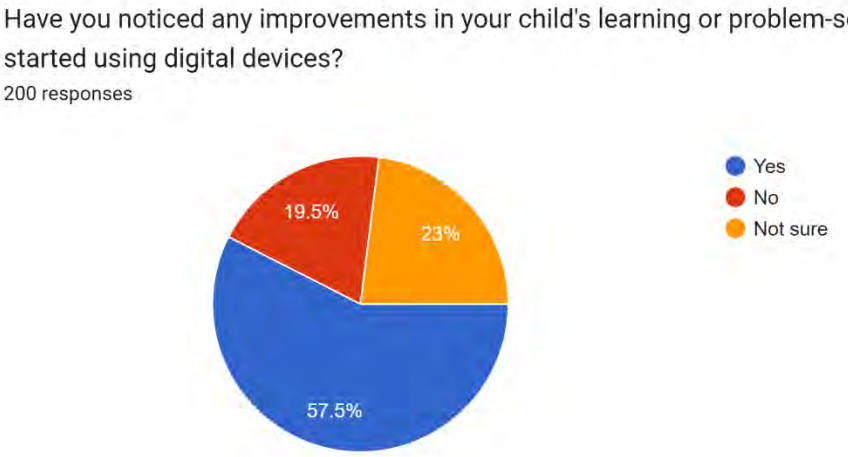


Figure 54 Percentage of improvement in children using digital devices

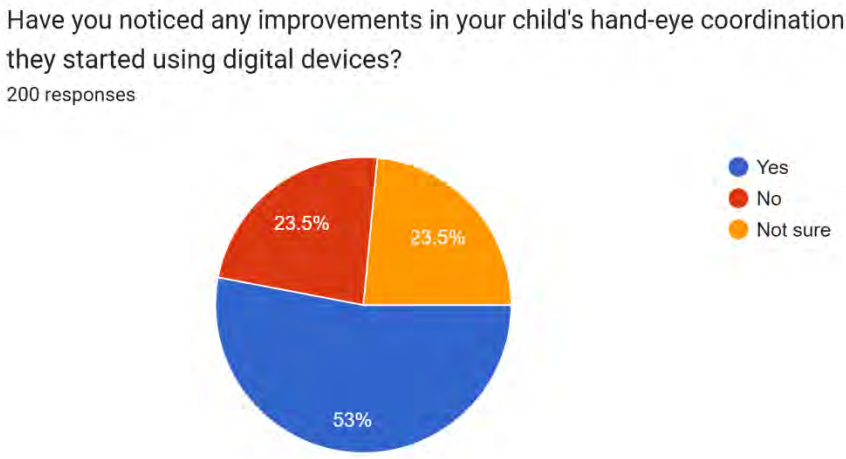


Figure 55 Percentage of motor skills development in children by using digital devices

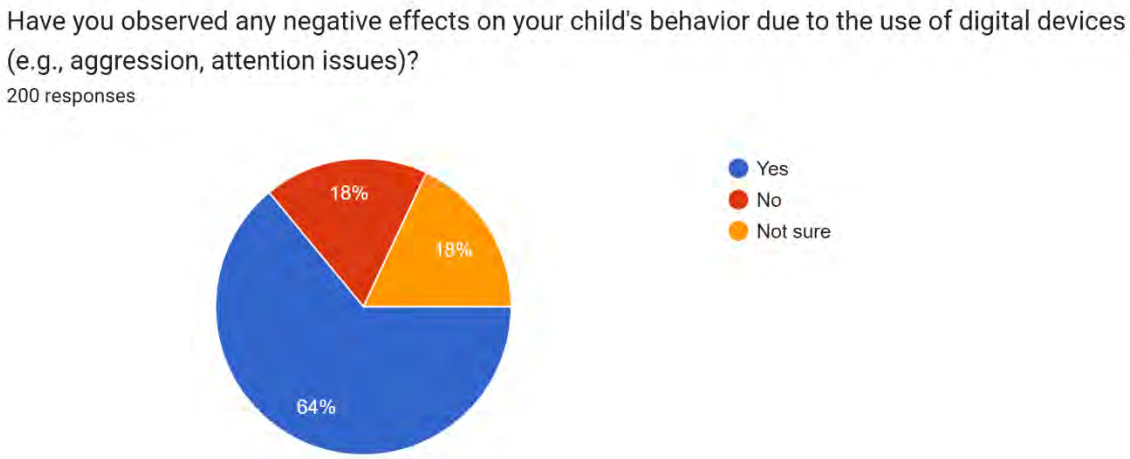


Figure 56 Percentage of negative impact on child behavior using digital devices

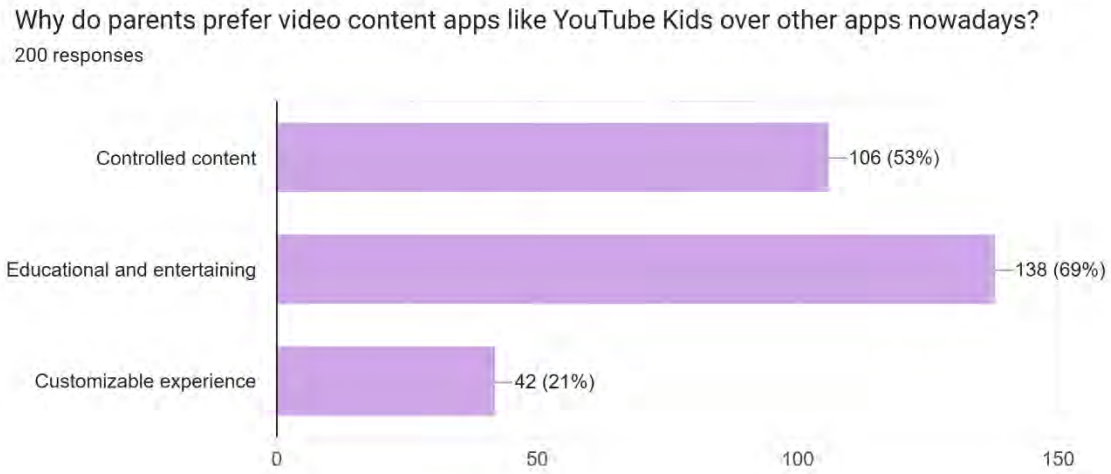


Figure 57 Factors that are considered to prefer video content app over other apps

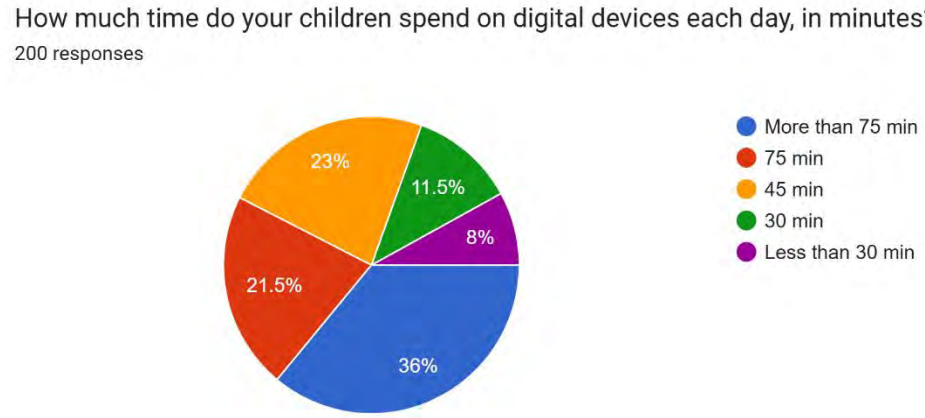


Figure 58 Time in minutes that kids spend on digital devices

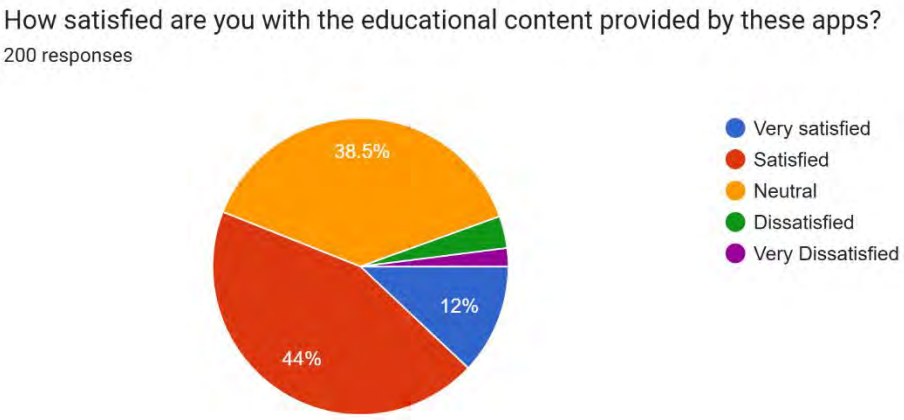


Figure 59 Percentage of satisfaction of parents by educational apps

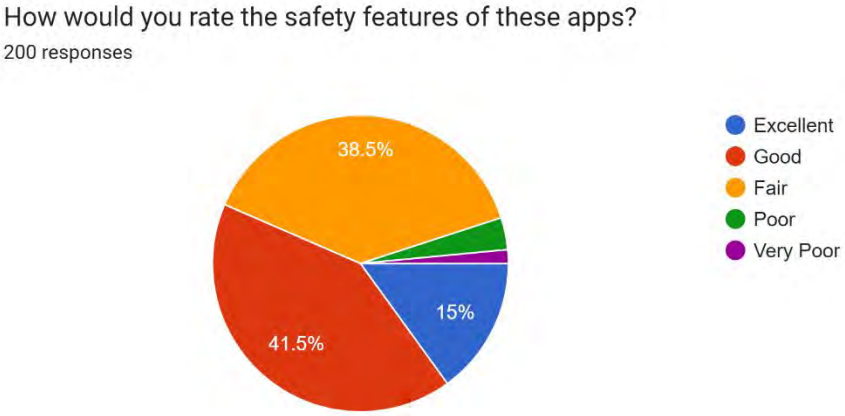


Figure 60 Percentage of safety features provided by apps

CHAPTER V:

DISCUSSIONS

This discussion chapter interprets the evidence presented in the results section in a manner that provides room for the previously established goals of the current objectives, current literature, and theories. This is done by providing a conceptual overview of the topics and translating it alongside the researched empirical data, strengthening the key conclusions drawn and their purpose in the investigations aiming to both expand on the literature available on the matter and assist in early childhood development with technology integration.

Such multi-dimensional factors such as technology use, parental mediation, socio-economic factors, and cultural factors are analyzed in understanding young children's developmental pathways. In this regard, emphasis is made to emphasize the usefulness of the outcomes as plausible answers to the research questions, while accounting for global and cultural perspectives. The analysis further exposes gaps, challenges, and opportunities that arose during the study, thus enabling practical recommendations and future research strategies to be developed.

For instance, the chapter analyses parent, teacher, policy maker, and program developer perspectives and explores how the different facets of the problem are intertwined and how they interact with each other by describing quantitative data, qualitative data collection methods.

The discussion highlights the necessity of engaging in the discussion of children's and technology's interaction and argues for the viability of appropriate, encompassing, and context relevant to the circumstances approaches to ensure the best results for children.

5.1 Parental Mediation and Child Development

Parental mediation is important both in defining the relationship between children and the medium and its developmental effects. The findings of this study also revealed an interesting difference relating to active and passive mediation strategies, with both types being of great importance for the development of a child at the early stages.

1. Active Mediation as a Determinant of Better Results:

- These parents reported noticing considerable growth and development in their children by participating in their use of technology. They occupied themselves with co-viewing instructions, starting discussions regarding the digital activity, and providing adequate limits which transformed technology into a favourable development tool.
- Active mediation had a noticeable correlation with active parental mediation which assisted the children in developing augmented cognitive capabilities such as problem-solving, critical thinking, and language acquisition. These children also experienced enhanced socio-emotional wellness in the form of cooperative behaviors, empathy, and control of their emotions.

2. Issues Relating to Minimal Mediation Or Absence of Mediation:

- Households that employed minimal or no parental mediation had high probabilities of adverse outcomes. Without any adults being able to watch over them, some children played with uncontrolled material which made them more impatient and hyperactive, and unable to concentrate for longer than usual.
- On the other hand, due to lack of structured oversight, opportunities for further educational engagement were missed since the use of technology was primarily for entertainment and gaming. Comparative Analysis with Existing Literature.

3. Implications for Parenting Techniques:

- The results highlight the significance of organizing parental education programs which equip families with the means to use active mediation strategies. For instance, workshops, community resources and online platforms could be useful in disseminating information on good practices in family media management.
- The research emphasizes the need of parental guidance in the utilization of technology for the purpose of enhancing the development of young children before the age of five. Through active mediation tactics, parents can organize, enhance, and expand their children's digital experiences to promote holistic growth.

5.2 Socioeconomic Inequalities and Access to Technology

Socioeconomic status (SES) appeared to mark variations in children's technology use, the resources they had access to, and the subsequent developmental outcomes. These findings

allow us to understand in broad terms the difference between the wealthy and the poor, and how such inequality impacts the lives of people.

- Exposure to Tech: A key characteristic that identified the wealthy households was their ownership of tablets, laptops and desktop computers. This variety of devices allowed young ones to more fully interact with learning materials, recreational and communication applications, which expanded their cognitive and social experience. Instead, technology use in lower-income families was more limited, with most relying on one device, a smartphone on most occasions. Such tech use impact was felt in terms of interaction as exposure level was reduced to entertainment that most times ended out as non-instructional activities.
- Trends in usage and content effectiveness: Instructional content was more appropriate for use by affluent families as parents were in a position to manage their use. This message still encouraged children to develop some cognitive functions such as enhancing their problem solving and even memory skills. However, the reverse was true for families with low incidence of middle-income or high incidence of low SES with such households tending to consume a lot of entertainment and gaming content which was gravely misbehaved coupled with underdeveloped patterns of development over the span of time.
- The Role of Parental Mediation: The findings indicated that the mediation by parents was affected by the socioeconomics digitize status where high-income families were more able to use active interventions. In such families, parents in most of the cases resorted to screen time limitations and engagement with the child during screen viewing which enhanced the advantages of using technology. However, among poorer parents, it was observed that in most cases mediational practices were absent or worse, were passive. These were particularly influenced by low income, poor digital skills or other more pressing issues. This exacerbated the risks related to inappropriate use of technology.
- Comparative Analysis with Literature: The results correspond with other studies carried out in other continents that inform the digital divide that prevents the members of lower income households from accessing quality learning materials. Past researches have those inequalities pointing out comparative effects which never-ending and include achievement gaps and disparities in the society.

- Policy Implications: Resources to reduce social economic disparities should be targeting the digital divide, the central focus. Such recommendations encompass giving subsidies to poor families for procuring equipment and connecting to the internet. Also, the creation of community resource centers with aspects of educational technologies should ensure that all children have equal chances. Upgrading the skills of parents in economically disadvantaged neighbourhoods in terms of technology and information skills should increase their level of participation in their children's digital activities.

To summarize, the barriers to the equitable access and use of technology as well its benefits are chiefly based on socioeconomic differences. Closing such gaps through the provision of appropriate legislation, programs targeting the community, and parental education may help raise a better generation with more helpful technology in the society.

5.3 Content Type and Developmental Impact

The content which children engage with through electronics has a huge impact on their growth socially, behaviourally, and even cognitively. The research showed a strong discrepancy between the use of an educational text and the risks that are posed by ambiguous protective impediments in entertainment or gaming content which indicates the need for moderation of content.

The report noted that the interdisciplinary approach positively influenced the development of children's understanding and skills, problem solving, reasoning and language learning. The study went on to explain that children exposed to instructional information developed longer attention spans, better memory, and stronger retention, all crucial components of academic activity and everyday life. Moreover, apps designed to accelerate language, numerical comprehension, and scientific curiosity not only have no limitations but also enhance the overall functioning of the brain.

The research validates the crucial impact of the type of content on the developmental outcome of the use of technology. Stakeholders can ensure that children's use of digital tools will aid in their cognitive, social, and emotional development by focusing on educational content and intervention strategies to control entertainment consumption.

5.4 Screen Time and Health Indicators

The study revealed a strong relationship between screen time and several health indicators which made clear the complex interactions of using technology with the physical, mental and behavioral development in young children. The findings stress how practices related to the amount of screen time and routines should be complemented to manage their adverse effects while ensuring the benefits of high levels of engagement are achieved.

- Extended Screen Time: Screen time which is considered as over four hours per day was associated with a number of health concerns. Irregular sleep patterns and shorter duration of deep sleep cycles affected sleep quality negatively. In addition, anger and excessive movement tended to lead to inappropriate conduct and trouble managing emotions and building relationships. Likewise, the unproductive conditions that accompanied long screen usage led to excessive weight gain and slowed growth of motor skills.
- Moderate Screen Time: Children who used screens for two to four hours as a daily routine had improved results. It was not only the exposure to screen time material but the timing of intervention by parents that determined the extent of its developmental effects. Exposure to educational and interactive content improved the child's social or cognitive function while the time spent on screens for entertainment with supervision was less likely to cause such adverse behavior.
- Limited screen time: There was a consistent connection between less than two hours of screen time a day and better outcomes such as increased attention and emotional regulation. It was simply seen in having more active and better sleeping patterns hence more overall wellness.
- Behavioral Consequences of Screen Free Intervals: There was a magic improvement to ch ildren's behavioral outcomes after the application of organized screen-free intervals. Families that advocated for outdoor activities, family meals and shared activities within that window reportedly had more robust social interactions and less conflict. These outcomes show the importance and need of careful planning of technology-free settings and activities as strategies to foster or help build better relations and more emotional intelligence. The use of no screen habits, for example during meals or bedtime, led to

stronger family ties and better sleep. These strategies are consistent with experts in child development who advise on a balance of screen and non-screen time.

- Influence on Peer Dynamics: Daily boundaries on screen time alongside supervision on what children can engage with digitally were associated with positive interactions among children during play. When material catered for education that encourages interactive and collaborative play was used, teamwork and social confidence were improved. A tendency to enjoy solo activities on screen also leads to withdrawal from community, hence community orientated digital activities must be encouraged with direction from caring parents.
- Recommendations for Managing Screen Time: Because screen-time behaviors have substantial health-related and developmental consequences and outcomes, the study put forward the following policy level measures: the establishment of community campaigns promoting appropriate screen-time behaviors, providing support to educational and community centers to teach families the dangers of prolonged screen time and how to use digital devices safely, and the setting of online requirements for developers to ensure engaging, educational and protective online content for children under 5 years old.

If these concepts are integrated into wider health promotion and education strategies, then the interest of stakeholders is to switch on the beneficial aspect of technology and ensure that all children are able to access its benefits.

5.5 Ethical Considerations of Technological Utilization in Early Childhood

As technology proliferates in children's lives in the modern era, the ethical concerns it raises have started to come to light. This particular sub-section looks at concerns surrounding young student's privacy, security of sensitive information, the type of content children should be exposed to, and the broader impact technology has on society.

- Protection of Sensitive and Child Related Information: It has emerged that there are serious concerns regarding the usage and collection of data pertaining to children by internet companies. This can be troublesome because many applications require children to share information such as their name, age, and other geographical information which if not properly secured can become a threat to their privacy. Furthermore, parents have also been

found to have a poor understanding of privacy laws and data-sharing agreements, which is not surprising given that in general parents are reluctant to discuss such matters with their children. As a result of this lack of knowledge, children are left completely unprotected in the event that their data is abused by third parties for commercial or other reasons. The suggested solutions are focused on the establishment of efficient data protection measures that are clearly outlined, and which are acceptable to children and in line with the principles of GDPR and COPPA.

- Evaluating Content for Suitability and Teaching Digital Skills to Children: It becomes quite clear that children should not be exposed to information that is outside of their age limits. The results pointed out the presence of potential hazards of unintentional exposure to violence, pornography or even worse material on the Internet which was due to lack of content moderation systems. To counter such measures, media literacy education for parents and teachers was suggested as one of the most important actions to be taken. Such programs should aim at helping users to know what credible material is, not to be misled, and what is safe online behavior so that children's technological engagement is regulated effectively and positively.
- Equity and Accessibility: The digital gap problem raises moral issues as children from poor families are devoid of having superior technical devices. This inequality is a qualitative description that aggravates the existing disparities in education with regard to children from disadvantaged households. Policy level responses include subsidizing purchasing of digital devices and internet access as well as community schemes that enable sharing of resources. These include libraries and learning hubs with fittings of digital gadgets that can help minimize the divide for all children.
- Parental Authorization and Engagement: One area that has gained increasing attention as an ethical area is parental permission in regard to children's use of technology. This can only be avoided as parents have started actively participating in the decision concerning their children regarding the platforms and Apps being used, and their children's preferences, Family values and Development goals. Also, parenting tools such as increased parental guidance and surveillance technologies may help families manage the searching and use of

technology. These tools enable children's independence and interest in self-exploration to be respected. But they also intend to protect the child from possible threats present online.

- Frameworks Evaluation through Ethical Standards: The examination depicts ethical models that assert respect for the privacy of children and their right to safe and nurturing environments, like the Convention on the Rights of the Child. It is evident that ethical and social responsibilities are established by conspicuously integrating these rules into the creation and implementation of digital technologies.
- Code of Ethics: Parental consent before using technologies by the young ones is now more than ever an essential concern. All parents are instructed to make knowledgeable decisions on the applications and platforms appropriate for their children's age and development in most rational values. Furthermore, stronger parental guidance and monitoring technologies could help families exercise greater control over children's technology use. These instruments prevent extreme freedom and curiosity of children over the net while at the same time preventing safety issues and proper behavior online.

To conclude, ethical issues should not be side-lined when implementing the technologies to the young ones. Stakeholders can create a digital landscape that prioritizes the rights and interests of the young learners by addressing privacy concerns, ensuring age-appropriate content, and eliminating access inequalities.

5.6 Opportunities for Businesses that Implement the Research

- Product Development in a Child Focused Context: Companies will be able to develop child-centric digital products (e.g., educational apps, smart toys, gaming and/or learning platforms) using the complementary and proven behavior frameworks. This can help to instill trust for parents, educators, and institutions seeking products evidence-based on child development.
- Personalized User Experience: The research provides a framework for identifying child perspective priorities and behavior patterns. Businesses can apply evidence-based approaches to deal with content anyway that best personalizes engagement. This will only benefit user experience and result in higher user satisfaction, retention and ultimately, learning outcomes.

- Getting into a Growing EdTech and Parental Industry: There is a demand for ethical and effective education tools and businesses can use the research to **differentiate** themselves in the marketplace. The global EdTech market including parenting technology, pediatric tool development, and early childhood wellness is over $400 billion.
- Recognized Credibility in the Marketplace: Using development psychology and acting in the best interest of children's well-being improves awareness and increases the company's credibility to comply with the child safety guidelines. Moreover, companies achieving customer satisfaction in the sector will appeal to institutions, schools, and healthcare providers.
- APIs on Licensing and B2B Partnerships: Businesses can extract (interest recognition algorithms), or develop licensing approaches for child focused B2B models (e.g., child focused interest dashboards, or who get bored easily), etc. to other platforms (e.g., learning apps, pediatrician systems, educational marketplaces) that can even generate additional B2B revenue streams.

CHAPTER VI:

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

The chapter focuses in detail on the analytical aspects of the findings of the research, highlights their real-world applications, some of which will be useful to parents, teachers, governments, and technologists. It also provides some examples to strengthen the ones identified in the study. Last but not the least, the chapter details how the relationship between technology and child development can be deeper through future research.

The use of technology in the form of assorted devices has become a necessary part of life in the modern world while at the same time providing opportunity and challenges. The research tried to address some relevant issues on technology use like, parental control, socio economic differences, content produced, duration of screen and design, and the impact it has on children in the areas of social, emotional and physical development.

The chapter starts with a recap of the main findings of the research whilst stating the positive effects parental controls and good quality digital materials have in the outcomes. It equally addresses the risks that accompanies prolonged scrolling on the screen while having limited control over the content and the finances required to get the useful digital resources.

These initiatives highlight the wider initiatives necessary to ensure that technology use within the context of young learners is appropriate and fair, safe, and kept within relevant boundaries. This chapter emphasizes the fundamental responsibility that parents, educators, politicians, and technology developers have in regard to fostering a good environment on the digital spaces. Thematic problem areas such as content moderation and parenting, ethics, and technology availability have been suggested as ways to tackle such problems. These measures aim at enabling children to use technology for education, creation, and development while taking care of them.

This chapter builds on the findings of the current study by considering future research and intervention possibilities that could address unresolved questions or problems this chapter presents an important beginning for a concerted and participatory engagement with the challenges related to the growth and continued development of technology for young learners

in a digital age to ensure that the optimal learning and developmental opportunities are enhanced.

6.1 Summary of Key Findings

This section contains the most relevant details of the study, linking the objectives of the research, the hypotheses formulated, and the results obtained. The research sought to analyze the impact of technology use on children aged 1 to 10 years, examining cognitive, emotional, and physical factors as well as other moderation factors such as parental influence, socioeconomic level, nature of the content, duration of the use of the technology, and design usability. Below is the detailed outline for each of the major findings:

- The Impact of Parental Mediation on Development: It has been demonstrated that the process of active parental mediation has a powerful positive effect on children's cognitive and social-emotional development. For instance, sitting with children and watching the instructional material, taking intercessions on the amount of time spent on the material, and talking about how the material should be used has been linked to having increased norms of solving problems, emotional management and appropriate social behavior in children. However, lack of parental mediation altogether or its passive form has been linked with excessive screen use and exposure to inappropriate materials which results in behavioral problems of hyperactivity, low attention, and irritability. It must be emphasized that such approaches confirm the importance of parents as active moderators of the effects of technology during development, and the need for type and timing of parental involvement.
- Socioeconomic Disparities and Accessibility Towards Technology: Children's digital use and access are greatly determined by their social class background. In wealthy homes where, content enabling resources are in abundance such as educational DVDs and E books, children are more likely to engage with a variety of self-teaching devices like tablets and laptops which have a great effect on their cognitive well-being and learning. On the other side, low-income households have restricted access to the devices and the internet which leads to an excessive consumption of entertainment content with few educational activities. This accentuates the technologies that are called the digital divide mic and the need to

provide all children at birth with equal opportunities with self-engagement with technological devices and other resources.

- The Nature of Content and Its Impact on Children's Development: What types of content is consumed by children plays an important part in determining the more developmental aspects of children. Learning and educational material such as language flashcards, intera ctive applications and learning games are strongly associated with great improvements in children's memory, retention, language skills and critical thinking. On the contrary, excess ive video gaming and consumption of unregulated entertainment content encourages aggr essive, socially withdrawn children and reduces their ability to concentrate and focus on academic activities. These findings reflect the growing concern about content and the focus of the parent's involvement on the use of technology in care for children who are expected to develop to achieve their targets.
- Co-ordinate of Time on the Device and Health Indicators, Health Consequences: Use of a computer for more than four hours every day is associated with a disturbance of sleep cycles, untrustworthiness, obesity due to inactivity among other negative conditions. Depending on the amount of screen time, high quality content and effective parental supervision, moderate usage of screens can have more beneficial outcomes. However, lower screen time of less than two hours a day has, on the other hand, shown better behavioral and emotional regulation, increased physical activity, and better sleep indicators.
- Children, Designing Technologies, and Usability: The learning and the attention span of children are greatly affected by the way the digital tools are made and their approach to usage. Features such as child-friendly elements which include application-design and special images make people stay and remember more. Also, employing parental control with children's computer use through the use of external screens or feedback systems over computer use is more effective. What has also been regarded as obstacles to improvements in iterative design include usability problems such as complicated interfaces and application instructions.
- Ethical Considerations: Issues related to data protection, appropriate content and facilitating equal access to technology, have developed as tangible and difficult obstacles in recent decades. Most parents are not aware of the requirements of privacy laws and, in this way,

their children are being put at risk of information abuse. Fulfilling the ethical norms in technology use is about having strict rules, effective methods of controlling content distribution, and proactive design for children with different capabilities.

In that connection, this study has shown the complexity of the interplay between the use of technology and parental mediation, as well as the quality of content and socioeconomic factors in relation to the developmental processes of children. The findings also enable one to see both sides of the involvement in the digital, the good and the bad, thus making it possible to come up with a practical plan to improve the effectiveness of the use of technology in early childhood education and growth. Those findings call for provision of joint efforts by all partners in child education to build an inclusive, safe, and nurturing online environment for preschool children.

6.2 Business Applications and Implementation Strategy

As the influence of technology on early childhood development continues to expand, there is a growing need to bridge the gap between academic research and practical application. This dissertation has explored how technological interventions can support interest recognition and behavior improvement in infants and children, revealing patterns that are both insightful and actionable. The findings offer not only theoretical and developmental contributions but also open substantial pathways for real-world implementation within business ecosystems.

In today's dynamic global economy, where digital transformation is reshaping industries including education, healthcare, and childcare the integration of research-based technological frameworks presents a unique opportunity. This research demonstrates that digital tools, when thoughtfully designed and ethically applied, can play a transformative role in child development. However, the impact of these tools is not limited to academic discourse or controlled experimental settings. Instead, they hold the potential to be commercialized as scalable solutions that benefit families, educational institutions, healthcare providers, and digital content creators.

From a business perspective, the core insights of this study particularly around behavioral pattern recognition, interest tracking, and developmental interventions can be translated into viable products and services. These may take the form of mobile applications for parents, smart dashboards for educators, early development screening tools for paediatricians, or even APIs

that empower EdTech start-ups to enhance their offerings. By embedding the research outputs into technology-driven business models, the findings can contribute meaningfully to both child welfare and industry innovation.

Furthermore, the increasing societal emphasis on personalized learning, digital parenting, cognitive development monitoring, and mental wellness in early years aligns closely with the objectives and scope of this research. Global trends such as the rise in home-based learning, digital therapeutics, and AI in education indicate a market ready for such applications. According to recent market insights, the EdTech industry alone is projected to surpass $400 billion by 2025, with a significant portion directed toward early childhood solutions. Simultaneously, demand is rising for parenting tools that offer evidence-based support, real-time behavior insights, and child-centric digital experiences.

This chapter outlines a comprehensive implementation strategy that extends beyond theoretical knowledge to concrete business applications, suggesting how stakeholders entrepreneurs, investors, child development professionals, and policy makers can adopt the research findings into commercially viable solutions. The proposed models also address ethical concerns and inclusivity by promoting equitable access to behavioral and educational technologies, especially in socioeconomically diverse settings.

Ultimately, this chapter demonstrates that the value of academic research is not merely in discovery but in deployment. By translating developmental science into business strategy, the dissertation offers a roadmap for how technology can be productized to support healthier, smarter, and more emotionally resilient children while also generating economic and social value at scale.

6.2.1 Proposed Business Models

Application	Business Model	Description	Target Market

Smart Behavior & Interest Recognition App	Freemium + In-App Purchases	AI-powered mobile app that analyzes screen interactions and suggests developmental activities	Parents with children aged 1–10
Early Learning Dashboard for Schools	SaaS (Software-as-a-Service)	Real-time dashboards for educators to track student behavior, screen time, and interest areas	Preschools, Daycares, Kindergarten
Digital Wellness Reports for Children	Subscription	Periodic personalized reports for parents based on their child's digital behavior and growth patterns	Pediatricians, Child Therapists
Interest Recognition API	B2B API Licensing	Licensing behavioral recognition algorithms to other EdTech companies and toy manufacturers	EdTech Startups, Toy Brands
Smart Toy Integration	OEM Partnership	Embedding AI-driven interest analysis in connected educational toys	Toy Manufacturers

Table 39 Business Models

6.2.2 Implementation Use Cases

A. For Parents: AI-Powered Parenting Companion

- A mobile app that observes a child's screen and non-screen activity and provides personalized suggestions.
- Features include:
    - Behavior alerts (e.g., excessive screen time, aggressive content exposure).

- Suggested learning paths based on observed interest (e.g., if child shows affinity toward music apps, recommend music-based activities).
- Health guidance (e.g., screen–sleep balance).

B. For Schools: Digital Behavior Monitoring Dashboard

- Schools can use a cloud-based dashboard to track:
  - Engagement levels across digital learning tools.
  - Individualized interest and learning patterns.
  - Suggested classroom strategies or activity modifications.
- Reports can assist educators in personalizing education, boosting attention and reducing digital burnout.

C. For Paediatricians and Therapists: Early Intervention Tool

- Generate digital behavior reports during regular check-ups.
- Helps identify early indicators of attention issues, digital addiction, or cognitive lag.
- Integrate these reports into existing Electronic Health Record (EHR) systems.

6.2.3 Pilot Program Proposal

- Objective: Test the efficacy of interest recognition and behavioral improvement algorithms in a real-world environment.
- Pilot Site: Partner with a preschool or parenting community center.
- Tools:
  - App prototype
  - Educator dashboard
  - Baseline and endline behavior assessments
- Metrics:
  - Engagement improvement (measured via app activity)
  - Screen–sleep balance
  - Parental feedback satisfaction score

- Reduction in negative behavior triggers (e.g., tantrums, restlessness)

6.2.4 Scalability Plan

- Phase 1: Local community deployment and product-market validation (6–9 months).
- Phase 2: Expand to daycare chains, paediatric hospitals, and online learning platforms.
- Phase 3: API licensing to international EdTech companies and toy brands.
- Phase 4: Introduce wearable integration (smart bands/toys) for deeper insights into psychomotor development.

6.2.5 Competitive Advantage

- Based on original academic research, validated by empirical findings.
- Addresses both screen-related harm *and* developmental opportunity.
- Offers a 360° behavioral view not just screen usage, but also emotional, social, and cognitive cues.
- Fits into a rapidly growing market: global EdTech expected to reach $404 billion by 2025.

This research has broad commercial applicability, especially in an increasingly digitized educational and parenting landscape. By converting insights into actionable, scalable tools, the proposed models can create impact beyond academia, improving early childhood development while creating value in the EdTech and parenting markets.

6.2.6 Business Opportunities Emerging from the Research

1. Product Development in a Child Focused Context: Companies will be able to develop child-centric digital products (e.g., educational apps, smart toys, gaming and/or learning platforms) using the complementary and proven behavior frameworks. This can help to instill trust for parents, educators, and institutions seeking products evidence-based on child development.
2. Personalized User Experience: The research provides a framework for identifying child perspective priorities and behavior patterns. Businesses can apply evidence-based

approaches to deal with content anyway that best personalizes engagement. This will only benefit user experience and result in higher user satisfaction, retention and ultimately, learning outcomes.

3. Getting into a Growing EdTech and Parental Industry: There is a demand for ethical and effective education tools and businesses can use the research to differentiate themselves in the marketplace. The global EdTech market including parenting technology, pediatric tool development, and early childhood wellness is over $400 billion.
4. Recognized Credibility in the Marketplace: Using development psychology and acting in the best interest of children's well-being improves awareness and increases the company's credibility to comply with the child safety guidelines. Moreover, companies achieving customer satisfaction in the sector will appeal to institutions, schools, and healthcare providers.
5. APIs on Licensing and B2B Partnerships: Businesses can extract (interest recognition algorithms), or develop licensing approaches for child focused B2B models (e.g., child focused interest dashboards, or who get bored easily), etc. to other platforms (e.g., learning apps, pediatrician systems, educational marketplaces) that can even generate additional B2B revenue streams.

6.3 Recommendations for Future Research

The rapid integration of technology in early childhood education raises interesting opport unities and challenges that should be investigated further. This study has indeed pointed out some areas of concern with regard to technology use effect on children for instance cognitive, emotional and physical effects of such use, but there are still many unanswered questions and unexplored areas. It will be important to address these issues by undertaking targeted research in order to promote appropriate use of technology in children’s lives in the future. Any future work should take on more or all perspectives: educational, social, psychological, ethical, and provide deeper understanding of this rapidly growing area.

The guidelines described below are aimed to guide future research, highlighting the need for longitudinal data, cross-cultural analysis, and novel approaches that represent the dynamic nature of technology innovations and their influence on young learners.

- Longitudinal Research on Technology Utilization and Advancement: Technologies such as the internet are gradually transforming society. It is important to study the effects and impact that these types of technologies can have on children during their early stages. These studies are required to assess the child throughout time and across various age categories as well as the amount of technology they have access to. Relating to this-scholars should investigate the effects that the use of such technologies at critical ages have on a child's ability to concentrate for longer durations in the future, as well as their ability to excel academically and effectively endure various life challenges. Furthermore, it is important to investigate whether there is in fact positive long-lasting effects of children's use of educational devices or whether there are considerable long-lasting negative issues such as shortening of attention span leading to poor overall academic performance, and poor mental and physical health.
- Influence of Emerging Technologies: Technology is advancing at a rapid pace and includes devices such as AI (artificial intelligence), VR (virtual reality) and AR (augmented reality) that are transforming ways even young kids interact digitally. Studies need to look at the impact such devices have on the child's growth and development in terms of how a child thinks, their imaginative capabilities as well as their social skills. The date of release and use of AI-powered tools that employ adaptive learning will determine their use. In addition there is a need for further analysis on the potential dangers that children using such devices are likely to encounter, such as overdependence on VR gaming, eye strain, frequent nausea, and lack of interaction with other people in real life situations.
- Comparisons of Cross-Cultural and Socioeconomic Factors: Technology adoption and its outcomes are influenced by a multitude of sociocultural and economic factors. Comparative analyses should document differences in use of technology, content, and parental mediation among families with low income and those with higher resources. In addition, it should investigate the effects of sociocultural factors on the ways in which people interact with screens and what types of digital content they like. In addition, research has to devise a three-dimensional approach which would aim at the context-modifying factors and address the issues of equitable use and provision of high-quality educational resources in different socioeconomic and cultural conditions.

- Strategies for Parental Mediation: Technologies must be necessarily regulated by parents as well, but there is a need to develop further some effective mediation strategies of parental involvement. It should focus on the consequences of various types of mediation including active co-use, supervision instructions, and no supervision. Programs that try to intervene through parents and help them to set limits on screen time, content, and moderated energy should be analyzed to show how effective they are. In addition, the relationship between parents' literacy in the use of technology and children's successful performance using technology in an interactive way is an interesting area for further research.
- Impact of Screen Time on Distinct Health Outcomes: The effects of excessive screen time ought to have a particular focus of investigation. Research ought to look into how viewing a screen for extended periods of time impacts the visual health of an individual in terms of computer vision syndrome and the risk of developing myopia. Additionally, research ought to investigate how an increased usage of screens affects the quality of sleep and mental illness. In addition, the early childhood period also ought to be investigated in terms of the potential links between screen time and physical activity as well as motor skill acquisition and development.
- Digital Literacy Initiatives for Parents and Educators: Parents and educators are required to receive digital literacy in order to use technology effectively while minimizing its repercussions. Research needs to look into how overriding the details stated out above enhances parental digital literacy concerning the use of technology for safe practices. These studies should also consider training programs for teachers on effective use of technologies in the classroom. Other areas include identifying reasons to why people are not digital literate and how to remove barriers as well as developing techniques that will aid in increasing usage especially among disadvantaged communities.
- Designing Inclusive Technology for Children with Special Needs: Technology has the potential to enhance and increase learning opportunities for handicapped or behind-developing children. It is necessary to investigate the results of the adaptive technologies invented for the children who are visually or aurally impaired, mentally retarded or physically challenged. Whether or not students with disabilities are able to access everyday digital devices is other important issue that has to be researched. In addition, how can every

student, regardless of their actual performance, be able to learn and acquire the necessary skills through the use of sophisticated teaching learning tools? This gap requires further investigation.

- Psychosocial Effects of Technology: Further research is needed to determine how technology influences children's abilities to control their emotions, interact with others, and view themselves. It should be sought how it influences the child's ability to control his or her emotions, develop empathy, and communicate with friends. Among the psychological problems that arise as a result of using screens too much are low self-worth, becoming anti-social, and being addicted to technology. Research should focus on identifying risk factors and mechanisms that promote protective emotions and social behaviors in the digital environment.
- Balancing Digital and Physical Play: It is vital for a child's all-around growth to maintain a proportionate ratio between their digital addiction and their physical exercises. Strategies should focus on finding spaces for children's outdoor play and other non-screen creative activities in their daily cycle. Physical play should be researched in terms of its ability to enhance motor skills development, boost creativity, and facilitate interactions across children while they play games that are purely catered towards the digital world. The positive impact that a well thought out combination of robust, free play and technological enhancement can be concluded from should also be assessed.
- Ethical Considerations and Data Privacy: An issue that cannot be put off for any longer as it is of dire implications has to do with ethical concerns and data privacy implications where children are interfacing with technology. Studies must explore how the digital footprints of children are obtained, how they are stored and how they are being used, especially in terms of maintaining transparency and children’s parental control. Developmental and policy makers ethical duties arising from the need to protect children privacy should be examined. Also, such works should explore how growing up with this digital universe where kids were exposed from an early age to all kind of toys and devices, has an effect on the children’s independence, consent and rights to digital media.

In summary, these suggestions for future study highlight the need of a multidisciplinary, evidence-based methodology to comprehend the intricate relationship between technology and

child development. Addressing these research gaps will enable future studies to influence policies, tools, and tactics that maximize the advantages of technology while protecting children's well-being. Cooperation among academics, educators, politicians, and developers will be essential in establishing a balanced, ethical, and inclusive digital environment for early learners.

6.4 Limitations of the Study

Technology has been shown to have many effects on child development, especially in the early years of an infant's life as suggested by the findings of this research, but this particular research has its own drawbacks. These shortcomings arise as a result of inherent methodological, contextual, and temporal limitations that are common in research of this nature and are also self-evident in this case. It is critical to pinpoint these weaknesses in order to develop a strong focus on the results and more importantly provide grounds for developing more advanced studies. Highlighting these aspects for improvement ensures that subsequent research will be conducted within stronger constructs that are more responsive to new challenges in this fast-paced and growing field.

The widespread use of technology among children raises a number of issues, one of which is determining the relationship between technology and a child's development. There is variation which is sometimes difficult to encapsulate among many studies a single framework and that is because the many aspects of using technology includes content quality, use length, socioeconomic influences, and parental mediation. What is more, since technology changes every moment, the findings of whatever research should be understood in the context of the technology, applications and patterns of use that were in place at that moment.

Particular weaknesses along with the complex and fluid issues of child development include the self-reporting of data, variations in the culture and socioeconomic status within the population being studied and the fast-paced advances of technology and how it affects children. Each restriction is examined in order to provide a balanced perspective on the contribution of the study as well as its limitations.

- Sample Size and Generalizability: Restricting this study’s geographic scope and sample size does limit its wider applicability on additional sections of the society. For greater

generalizability, larger and more heterogeneous samples across more than one socioeconomic, cultural and geographic context can be beneficial. Selection bias due to self-selection due to voluntary nature also reduces coverage. Other strategies to overcome these problems should include more comprehensive studies employing both cross-sectional and longitudinal strategies to not only provide general but also country-specific information.

- Dependence on Self-Reported Information: Self-reported data from parents' perspectives is always hypothesized to have errors and accusation of biasness, for example, some parents may exaggerate their level of purchasing electronics for their children or buy things due to peer pressure. This makes it possible to gather less information about the reality of children's use of technology. In future studies, such an approach may be supplemented by qualitative methods such as interviews, as well as integrating digital logging, wearable devices, and observational tools.
- Cultural and Socioeconomic Diversity: The use of technology and its impact are configured by cultural norms, socio-economic status, and access inequalities. Families with low income have little access to good devices though the culture affects the extent of use. Cross cultural and international studies will illuminate distinctive trends of particular cultures and general trend while horizontal study will show what problems arise from inequity in access to digital tools.
- Fluid Characteristics of Use of Technology: The increasing technological shift complicates the evaluation of the long-term influence of technology. The findings so far are only a reflection of already existing tools and patterns of usage, which means more advanced technologies such as AI and VR have not been utilized or integrated. Future research should consider this and evolve in its approach and structure in order to be longitudinal in nature and address the changing dynamics between children, technology and parental mediation in due course of time.

6.5 Conclusion of the Study

This research provides a detailed examination into the influence of technology on early childhood development, specifically among infants and children aged between 1-10 years. It thoroughly explores the cognitive, emotional, social, and physical aspects of development,

looking at the impact of digital interaction with and without human mediation in the home environment, on those potential pathways of growth. Using a mixed-methods methodology we have identified important areas; parental mediation, the level of quality, regulation of screen time, and the socio-economic landscape around technology accessibility. These elements together create the platforms of technology that either support growth or offer barriers to complete development.

While we found that technology can play two roles. When thoughtfully curated, and mediated, by adults technology can encourage creativity, independent thinking, and critical cognitive and social skills. Accessing well thought-out, interactive, and educational content alongside an adult's direct engagement can positively influence learning, emotional regulation, and social interactions. When technology is used excessively and unchecked, lots of swiping or scrolling, there were connections to dysfunctional patterns such as emotional disregulation, sedentary behaviour, disrupted sleep, or dysfunctional social interactions, making it easy to express that technology can either positively or negatively influence early childhood development and/or have neither outcome. It's fair to state that technology can nurture, challenge, or even completely disable children's engagement with the world. The assessment of which route technology will take depends significantly on how, when and why technology fits into children's daily lives. In summary, technology used thoughtfully and with adult mediation can be an important opportunity for children's development, but it requires ongoing transparency in its relationship to children's experiences.

Additionally, the study highlights considerable disparities in children's encounters with technology according to their social class. Children from lower-income households appeared less likely to have access to appropriate digital learning tools, structured environments for learning, and support and guidance from parents or caregivers. As a result, their ability to develop cognitive and social skills is compromised. These gaps in access have not only affected educational outcomes for children, but also broader issues of inequality in society as a whole. To close these gaps in access, significant attention must be paid to creating policies and opportunities at both community and policy levels to ensure children have equitable access to developmental technology in their lives.

Additionally, the study highlights that parental and caregiver participation is critical - particularly for younger children. Parents act as the mediators, interpreters, and gatekeepers for children's digital entries into the world around them. Or, stated differently, their technology-mediated experiences in childhood. Successful parental mediation includes co-learning, co-viewing, discussing the content, creating screen time limits, and getting children to think about play and experiences outside of technology. Fostering parental and guardian power by providing them with information, resources and actionable guidance is important to help parents optimize the benefits of technology, while minimizing the expected risks.

In addition, the ever-changing nature of technology in innovation requires ongoing scrutiny and revision. New digital tools, platforms, and content must be used, and strategies must adapt, if technology-related interactions are going to remain fruitful. Longitudinal studies are required to better understand the changing effects of emerging technologies on children's behaviour and cognition, including artificial intelligence companions, augmented reality learning devices, and the use of virtual educational environments.

More broadly, this study connects research and practice, providing a framework for stakeholders such as parents, educators, policymakers and businesses to ensure technology can be safely and responsibly integrated into children's lives. This research ultimately seeks a future where technology supports learning, exploration, creativity, and well-being rather than serving as a risk to development.

Beyond educational and social implications, the results also present major commercial opportunities. Enterprises could create ethical and evidence-based digital solutions that enrich children's growth and learning efforts. Companies which include child development science as a blueprint for product development can differentiate themselves from other commercial players in the educational technology and parenting spaces, demonstrate corporate social responsibility, and make a positive contribution to children's wellbeing.

In summary, the findings indicate that technology can be a powerful tool for early childhood development, assuming the proper use of technology with adequate parental mediation and quality content. However, to realize its potential, planning and effort need to occur from

families, educators, policymakers, researchers and the tech sector. A focus on collaborative mechanisms, equitable access, and assessment will be needed to establish a balanced digital environment that aids in the cognitive, social, emotional, and physical development of all children. In doing so, society can utilize the potential of technology to develop a generation of thinkers, creators and responsible global citizens.

KEYWORDS

1. Technology in child development
2. Business solutions
3. Infant interest recognition
4. Behavior improvement in kids
5. Child monitoring
6. Data analysis in child behavior
7. Parental influence on child technology use
8. Cognitive development and technology
9. Early childhood educational technology
10. Social, emotional, and physical development
11. Digital media impact on children
12. Technology-driven parenting support
13. Developmental milestones and digital tools
14. Child-caregiver interaction enhancement
15. Digital divide in child education
16. Children's privacy and data protection
17. Ethical considerations in child technology use
18. Children’s media usage trends

19. Digital content for child development

20. Parental mediation in technology use

21. Educational policies for digital exposure

22. Children's cognitive and motor development

23. Technology use and language development

24. Interactive technology for children

25. Child development theories and digital tools

26. Technological interventions in early education

27. Long-term effects of digital exposure

28. Screen time and child behavior

29. Psychological effects of media on children

30. Neurodevelopmental impacts of technology

31. Online safety for young children

LIST OF ABBREVIATIONS

1. PLS-4 - Preschool Language Scale, Fourth Edition
2. AAP - American Academy of Paediatrics
3. SES - Socioeconomic Status
4. NLSY - National Longitudinal Survey of Youth
5. CDS-I - Child Development Supplement I
6. MVPA - Moderate to Vigorous Physical Activity
7. B - Unstandardized regression coefficients
8. β - Standardized regression coefficients
9. ADHD - Attention Deficit Hyperactivity Disorder
10. AI - Artificial Intelligence
11. ASD - Autism Spectrum Disorder
12. CBCL - Child Behavior Checklist
13. CMS - Content Management System
14. CARS- Children's Activity Rating Scale
15. BMI - Body Mass Index

APPENDICES

Appendix A: RESEARCH QUESTIONNAIRE

A. Parents & Kids Profile Information

Parent Name *

Your answer

Relationship with Kid *

- ◯ Mother
- ◯ Father
- ◯ Other:

Area *

- ◯ Chandigarh
- ◯ New Delhi

Income Range (Anual income in INR) *

- ◯ Less than 100000
- ◯ 100000 - 500000
- ◯ 500000 - 1000000
- ◯ 100000 - 2000000
- ◯ More than 2000000

Kid Name *

Your answer

Kid Age *

1	2	3	4	5	6	7	8	9	10
◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

Kid Gender *

- ◯ Girl
- ◯ Boy

Phone Number *

Your answer

B. Basic Question - Part A

How much time do your kids spend on physical activities daily? *

- ◯ Less than 30 minutes
- ◯ 30-60 minutes
- ◯ 1-2 hours
- ◯ 2-3 hours
- ◯ More than 3 hours

How many hours do your kids sleep each night? *

- ◯ Less than 6 hours
- ◯ 6-7 hours
- ◯ 7-8 hours
- ◯ 8-9 hours
- ◯ More than 9 hours

What types of devices do your kids use for screen time? *

- [ ] Smartphone
- [ ] Tablet
- [ ] Laptop
- [ ] Television
- [ ] Gaming Console

Out of the following categories, which best describes your kids' screen time *

- [ ] Education
- [ ] Entertainment
- [ ] Social Media
- [ ] Gaming
- [ ] Other: _____

How would you describe your kids' sleeping patterns? *

- ○ Deep sleeper
- ○ Light sleeper
- ○ Multiple wake-ups
- ○ Trouble falling asleep
- ○ Regular sleeper

What positive impacts have you noticed from your kids using technology or screens? *

- [ ] Enhanced learning
- [ ] Improved problem-solving skills
- [ ] Increased creativity
- [ ] Better social connections
- [ ] Access to educational content

What negative impacts have you noticed from your kids using technology or screens? *

- [ ] Decreased physical activity
- [ ] Sleep disturbances
- [ ] Reduced attention span
- [ ] Increased aggression
- [ ] Less face-to-face interaction

Which apps do you use to monitor and improve your kids' screen time habits? *

- ◯ Family Link
- ◯ Screen Time
- ◯ Qustodio
- ◯ OurPact
- ◯ Net Nanny
- ◯ Other: _____

C. Basic Question - Part B

How frequently do you explore activities for your kids? *

- ◯ Almost every week
- ◯ At least once a month
- ◯ Only when required
- ◯ Randomly, when I feel like
- ◯ None of these

What factors decide which activity you will search for your kids? *

- ☐ Interests and Hobbies
- ☐ Age and Developmental Stage
- ☐ Educational Value
- ☐ Physical Activity
- ☐ Social Interaction

Which stage of children's development is most affected by screen-based media? *

- ◯ Adolescence
- ◯ Early childhood (0 to 5 years)
- ◯ Middle childhood
- ◯ Late childhood
- ◯ None of these

How has technology recently changed video games? *

- ◯ From controller-based games to sedentary games
- ◯ From sedentary, controller-based games to active video games that require physical movement
- ◯ From active video games to controller-based games
- ◯ From geotracking games to sedentary games
- ◯ None of these

What are the effects of different apps on screen time for children? *

- ◯ Screen time should be completely avoided
- ◯ Screen time has no potential benefits
- ◯ Screen time can have potential benefits, especially with skill training applications and active video games
- ◯ Screen time is only beneficial for adolescents
- ◯ None of these

What things are less likely to make kids want to be active? *

- [ ] Providing children with access to traditional sports
- [ ] Providing children with access to active video games
- [ ] Limiting screen time to educational content
- [ ] Encouraging children to play board games
- [ ] None of these

What should recommendations for screen time take into account to protect children? *

- [ ] Age-Appropriate Content
- [ ] Balanced Activities
- [ ] Parental Supervision and Involvement
- [ ] Healthy Habits
- [ ] Screen-Free Zones and Times

By the age of 5, what kinds of devices had all the kids in the study used? *

- [ ] E-readers and smartwatches
- [ ] Desktop and notebook computers, mobile phones, MP3 players, televisions, and games consoles
- [ ] Virtual reality headsets and drones
- [ ] Digital cameras and GPS trackers
- [ ] None of these

D. Advance Question - Part A

What types of technological toys did the children have? *

- [ ] Virtual pets and interactive puzzles
- [ ] Play laptops and robotic dogs
- [ ] Remote-controlled cars and drones
- [ ] Digital painting kits and 3D printers
- [ ] None of these

What types of products do kids generally engage with? *

- [ ] Printed books and board games
- [ ] Video Games
- [ ] Streaming Services
- [ ] Toys and Action Figures
- [ ] Apps and Games

Who were considered sources of support for children at home during the study? *

- ◯ Only parents
- ◯ Teachers and friends
- ◯ Parents, siblings, and other relatives
- ◯ Neighbors
- ◯ None of these

Why couldn't the parents in the study draw on their own childhood experiences to regulate their children's technology use? *

- ◯ They didn't have access to technology as children
- ◯ They had negative experiences with technology
- ◯ They forgot their childhood experiences
- ◯ Their parents did not set rules for them
- ◯ None of these

What primarily influenced children's access to and use of technology at home? *

- ◯ High level of family ownership of technology
- ◯ Parental attitudes, educational aspirations, and guidance
- ◯ Children's school requirements
- ◯ Availability of internet services
- ◯ None of these

Do you believe that digital devices positively contribute to your child's cognitive development (e.g., learning, problem-solving)? *

- ◯ Strongly agree
- ◯ Agree
- ◯ Neutral
- ◯ Disagree
- ◯ Strongly Disagree

Do you believe that digital devices positively contribute to your child's motor development (e.g., hand-eye coordination, fine motor skills)? *

- ◯ Strongly agree
- ◯ Agree
- ◯ Neutral
- ◯ Disagree
- ◯ Strongly Disagree

Have you noticed any improvements in your child's learning or problem-solving skills since they started using digital devices? *

- ◯ Yes
- ◯ No
- ◯ Not sure

E. Advance Question - Part B

Have you noticed any improvements in your child's hand-eye coordination or fine motor skills since they started using digital devices? *

- ◯ Yes
- ◯ No
- ◯ Not sure

Have you observed any negative effects on your child's behavior due to the use of digital devices (e.g., aggression, attention issues)? *

- ◯ Yes
- ◯ No
- ◯ Not sure

List three apps you would like your child to use and explain why. Additionally, discuss why parents might prefer these apps. *

Your answer

Why do parents prefer video content apps like YouTube Kids over other apps nowadays?

- ☐ Controlled content
- ☐ Educational and entertaining
- ☐ Customizable experience

How much time do your children spend on digital devices each day, in minutes? *

- ◯ More than 75 min
- ◯ 75 min
- ◯ 45 min
- ◯ 30 min
- ◯ Less than 30 min

How satisfied are you with the educational content provided by these apps? *

- ◯ Very satisfied
- ◯ Satisfied
- ◯ Neutral
- ◯ Dissatisfied
- ◯ Very Dissatisfied

How would you rate the safety features of these apps? *

- ◯ Excellent
- ◯ Good
- ◯ Fair
- ◯ Poor
- ◯ Very Poor

Appendix B: Interview Consent Form

SSBM

Interview Consent Form

Research project title:: **Technology for Evidence Infants & Kids Interest Recognition and Behaviour Improvement**

Research investigator: Sandeep Srivastava

Research Participant name: Mr. Diwakar Tiwari

The interview will take 30 minutes. We don't anticipate any risks associated with your participation, but you can stop the interview or withdraw from the research at any time.

Thank you for agreeing to be interviewed as part of the above research project. Ethical procedures for academic research require that interviewees explicitly agree to be interviewed and how the information contained in their interview will be used. This consent form is necessary for us to ensure that you understand the purpose of your involvement and that you agree to the conditions of your participation. Would you therefore read the accompanying **information sheet** and then sign this form to certify that you approve the following:

- the interview will be recorded and a transcript will be produced
- you will be sent the transcript and allowed to correct any factual errors
- the transcript of the interview will be analyzed by Sandeep Srivastava as the research investigator
- access to the interview transcript will be limited to Sandeep Srivastava and academic colleagues and researchers with whom he might collaborate as part of the research process
- any summary interview content, or direct quotations from the interview, that are made available through academic publications or other academic outlets will be anonymized so that you cannot be identified, and care will be taken to ensure that other information in the interview that could identify yourself is not revealed.
- the actual recording will be kept in record but never shared to anyone by Sandeep Srivastava

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