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Article

The Effect of Using Tablets on Preschool Children's Cognitive and Social Skills in Saudi Arabia: A Correlational Study

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Abstract

The present study aims to assess the effects of tablet usage on the cognitive and social development processes of preschool children in Saudi Arabia, considering the increasing prevalence of digital tools in early learning. A sample of 60 children aged 3 to 6 years was divided into two groups: thirty children who had previously used a tablet and thirty who had not. A correlational approach was employed to analyse how tablet usage influenced motor skills, gait, object perception, language, classification, and social interaction. The results highlighted the effectiveness of iPad tablets in enhancing cognitive abilities, particularly object recognition ($M = 3.3$, $SD = 1$ vs. $M = 2.4$, $SD = 1$; $t = 4.06$, $p < 0.05$) and language proficiency ($M = 18.4$, $SD = 2$ vs. $M = 14.7$, $SD = 2$). However, a negative impact was observed on communication skills (mean = 1.3 vs. 1.9; $t = -2.9$; $p < .05$). Other social skills showed comparable mean scores and did not exhibit significant differences. Furthermore, both classification skills (mean = 10.2, $n = 121$ vs. mean = 8.7, $n = 106$, $t = 2.14$) and counting abilities (mean = 9.9, $n = 122$ vs. mean = 7.3, $n = 106$, $t = 4.01$) were enhanced. The findings suggest that while tablets can be beneficial for learning, they may have a detrimental effect on social interaction. The study recommends the development of engaging academic content for three-year-olds and the implementation of parental education programmes to promote the positive use of technology and mitigate potential negative impacts.

Keywords

Tablets, Cognitive Skills, Preschool Children, Saudi Arabia, Social Skills, Digital Learning, Communication.

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Introduction

Technology has rapidly advanced in numerous aspects of life, and this trend extends to the field of education, particularly in childhood development. Among the most prevalent devices now found in households and classrooms globally are tablets, alongside other digital tools. These technologies have introduced new possibilities for early childhood learning, fundamentally changing the methods by which young children are educated, in contrast to traditional teaching methods. Tablets feature applications designed to enhance cognitive, linguistic, and motor skills in children under the age of five, while also fostering curiosity and creativity (Liu et al., 2024; Yang, 2024). The potential of these devices is largely attributed to their touch functionality, which facilitates personalised approaches to the educational process, accommodating individual learning speeds and preferences (Liszkai-Peres et al., 2024). However, as technology becomes increasingly integrated into the lives of young children, understanding its impact has become of critical importance for educators, researchers, parents, and policymakers. It is essential to maximise the developmental benefits of these tools while mitigating any adverse effects on children's cognitive or socio-emotional growth (Fitzpatrick et al., 2024).

The rapid development of electronic infotainment has significantly transformed the ways in which children, including preschoolers aged 3 to 6 years, engage with media during their highly formative years. This age group consists of learners who exhibit a strong sense of curiosity and often rely on trial and error to acquire the knowledge they need. Consequently, they require interactive technology that facilitates and enhances their learning process (Lee-Cultura, Sharma, & Giannakos, 2022). In contrast to devices primarily designed for entertainment, tablets serve a dual purpose, promoting not only entertainment but also fostering the development of problem-solving, motor skills, and social interaction. Many developers capture the audience's interest by blending educational content with entertainment, while aligning with school curricula to establish foundational competencies.

The literature (Al-Sayed, Mohammadi, & Al-Anzi, 2019; Awaad, 2022; Firas, 2020) suggests that students' engagement with digital communication enhances various cognitive skills, such as reading readiness, IQ, executive function, and spatial awareness (Diamond & Lee, 2011; Kalabina, Nikitina, & Nikolaeva, 2024). However, studies by Shafy et al. (2024) and the Center for Strategic Studies (2012) highlight the negative impacts of excessive digital use, which include reduced attention spans, increased rates of obesity, and lower academic performance. Ongoing concerns are raised regarding the effects of digital addiction and its potential influence on the development of social skills (Bengisoy, 2017).

The present research addresses this gap by examining the impacts of tablet use on the cognitive and social development of preschool children in Saudi Arabia. It is hypothesised that there will be no significant differences in cognitive and social skills between tablet users and non-users ($\alpha = 0.05$). The use of tablets, particularly in early childhood education, has generated considerable interest, resulting in a substantial body of research examining the effects of these devices on children's learning processes. The existing analyses have revealed that educational applications can facilitate the development of skills such as literacy, numeracy, and problem-solving (Liu et al., 2024; Yang, 2024). For example, interactive narrative applications are argued to enhance both first- and second-language learning (Martinez-Merino & Rico-González, 2024), while games centred on numerical and measurement themes promote numerical cognition in children. However, these studies address only part of the issue, and the discussion regarding the negative effects of prolonged tablet use remains inconclusive. Concerns include potential impacts on physical activity, reduced attention spans, and the weakening of traditional play-based learning (Fitzpatrick et al., 2024; Vasil'eva, 2024).

Concerns regarding the role of technology in children's learning have intensified, particularly with the integration of tablets into early childhood classrooms. As families and schools increasingly adopt these tools, questions about the sustainability of such devices have gained prominence (Phan Thi Thuy, 2023; Popova et al., 2024). Consequently, there is a growing interest in understanding how the benefits of tablets can be effectively maximised while addressing the various challenges they present (Kim & Choi, 2023). This rising interest is reflected in the increasing body of research that highlights the diverse impacts of technology usage, particularly among preschool-aged children. However, cross-sectional analyses of the global implementation of tablets in education reveal variations influenced by cultural and educational system differences, underscoring the importance of contextual factors in explaining developmental outcomes.

As the integration of technology in education continues to grow, the increased use of tablets in early childhood education has sparked discussions, with some arguing that academic research on the subject is still insufficient. One major limitation is the lack of longitudinal studies that monitor tablet usage over time in relation to the development of children's cognitive and social skills (Fitzpatrick et al., 2024). Moreover, there is a notable absence of studies that explore the influence of culture and context on tablet usage, particularly in the domains of teaching and learning (Liszkai-Peres et al., 2024). In Saudi Arabia, despite a growing interest in tablet usage within preschool education (PSD), few researchers have examined the impact of tablets on the complexity and social development of preschool children. This gap highlights the need for further research that considers cultural contexts, educational practices, and the acceptance of technology by parents (Yang, 2024).

Children use tablets and other digital devices in preschools to enhance their cognitive, linguistic, and fine motor skills, as well as their creativity. Preschool children are also able to engage with interactive tools designed to promote problem-solving and social interaction. However, existing literature presents two perspectives on MOOCs: their benefits for learning, as well as their impact on students' ability to focus, physical well-being, and social interaction skills. The literature review of studies conducted in other countries reveals that significant gaps remain regarding the longitudinal impact of tablets and the influence of cultural factors. Thus, studies based in Saudi Arabia that focus on the use of tablets and their effects on the cognitive and social development of preschool children are limited. This highlights the need for regionally-based, small-scale research to inform both instructional practices and policy decisions.

Theoretical Framework

Tablets, Internet and Preschool Children

Tablets are regarded as devices in between the laptops, and smartphones, which have touch screens and are easy to use (Shafy et al., 2024). When I ask the children's caregivers during interviews, the term 'tablets' refers to the devices used by serious preschool children. Tablet development has undergone significant evolution since the 1990s, beginning with the Apple Newton PDA, followed by the iPad (2010) and the Samsung Galaxy Tab (Tohrey & Al-Zahrani, 2020). This technology is characterised by its integration with the Internet, alongside various technological memberships, and is commonly used by preschoolers. A preschool child, as defined by Aboabat (2018), refers to a child aged between 3 and 5 years, typically enrolled in kindergarten; however, in this study, children aged 3 to 6 years are included, regardless of their enrolment status.

Technology, including the use of tablets and mobile phones, has contributed to changes in early childhood development experiences, primarily through the gaming industry, which has created content tailored to the needs of developing children (Shafy et al., 2024). Nevertheless, educators highlight the importance of tablets as modern learning tools, aligning with Vygotsky's concept of guided development (Hedges, 2021). Al-Qahtani (2012) also emphasises the use of tablets for educational purposes, such as facilitating anytime, anywhere learning, self-paced learning, and group learning. Tablets further enhance motivation, reduce anxiety, and help children overcome shyness during the learning process.

Cognitive Skills

Cognitive skills in preschool children encompass fundamental intellectual abilities such as shape and object recognition, similarities, numbers, relationships, differentiation, language classification, and numeracy (Al-Duraij et al., 2011). These skills enable children to comprehend and process sensory information, categorise items based on their attributes, connect ideas or concepts, and distinguish between various sights and sounds. Critical activities, such as reading and writing, rely on language development to enhance cognitive abilities and necessitate the coordination of sensory and motor tasks. Furthermore, organisational and mathematical learning is reinforced through activities such as classification and counting. While there remains considerable debate among scholars regarding the scope of cognitive skills appropriate for preschool children, this study focuses on seven essential cognitive skills as proposed by the developmental theories of Piaget and Vygotsky (Al-Khafaf, 2013; Malik, 2023). These skills collectively support children's cognitive development and foster learning during their early years and beyond.

Summary of Social Skills in Preschool Children

In preschool children, social skills refer to both verbal and non-verbal abilities that enable them to interact, share, express emotions, and adhere to rules and regulations (Abdullah, 2015; Dashti, 2007). These skills, which are acquired through observation and interaction within their environment, play a crucial role in fostering acceptance towards other children and contributing to broader societal objectives. For the purposes of this research, the working definition of social skills includes independence, verbal and written communication, teamwork, flexibility, self-direction, and emotional regulation. These skills can be assessed through interviews and performance indicators. The identified skills include independence, which refers to a child's ability to meet their basic needs autonomously (Boutros, 2022), and communication development, which progresses from gestural forms to linguistic and social-performative stages (Bilal, 2020). Cooperation pertains to collaborative behaviours exhibited during group activities, as described by Mihriz (2004), while adaptation refers to a child's capacity to adjust to changes in their environment, as outlined by Zahran (2005). Initiative involves the ability to take active and leadership roles (Hassan, 2021), and emotional skills are essential for enhancing interactions with peers and adults, thereby fostering better social adaptation (Al-Sayed et al., 2019).

Literature Review

The literature review part of the study scans the available literature in order to present a sound analysis of the area of interest. This section employs a critique and comparison style of analysis where each work is assessed according to its findings, research approach, and subject. Finally, through a discussion of both similarities and differences that examine the strength, limitations, agreement, or contradiction, research gaps and research directions are therefore profiled. Such organization concerns the formation of a strict theoretical framework and the identification of the most significant trends in existing literature. The section will be handled as follows: there is a thematic organization of studies, the comparative analysis of findings, the identification of research gaps, suggestions for further research, and the final summary and conclusion to locate the study with other similar studies.

Analysis and Comparison of Key Studies

Literature reviews on technology-facilitated social skills training have reported varied outcomes. Studies involving both tangible tabletops and digital tablets have explored the impact of interactive electronic stories and storytelling on preschool children. Mousa (2015) examined this area, with Mousa's study involving 90 children, where positive changes in cooperation, empathy, and participation were observed. On the other side, in the identical year, on digital storytelling with 50 kids also revealed social responsibility skills such as waiting for a queue had enhanced. Both the studies indicated that these types of technologies should be brought into the curriculum to develop the social skills in the in preschool era period. Conversely, Osman and Omer (2017) found that the use of electronic games in Saudi preschools led to only modest improvements in social skills. This suggests that while technology may foster positive changes in social development, the nature of the digital intervention and the context in which it is applied may influence the extent of these effects.

Similar to cognitive development and problem-solving skills, results are mixed with regard to the use of tablets for educational purposes. Studies by Papadakis, Kalogiannakis and Zaranis (2018) and Al-Sayed et al. (2019) reviewed the efficiency of the tablets and learning apps in developing cognitive aspects to a greater degree. Stamatios et al. noted that 365 children had better mathematical learning with computers when they used tablets together with appropriate educational applications or software. Hegazi et al. also reported improvements in perception, memory, and attention among 75 Kuwaiti pre-schoolers. However, these findings contrast with the results of Moawad and Al-Moussa (2017), who found no statistically significant difference in problem-solving skills among 26 children using tablets. These discrepancies highlight the importance of considering the specific conditions and, where relevant, the methodologies employed in each study.

The effects of electronic games on cognitive and social development have been the subject of ongoing discussion. Firas (2020) and Awaad (2022) investigated the roles of electronic games in these domains. In his study, Firas concluded that, although electronic games facilitated improvements in cognitive skills, feedback from 270 parents indicated that these same games had negative effects on social relationships. In contrast, independent research by Awaad found that the creative use of digital games contributed positively to the

development of children with mild intellectual disabilities. These two findings suggest that, while digital games can promote cognitive development, their impact on social aspects necessitates supervision and careful management.

Recent research has also extended to higher education settings, focusing on the broader use of technology across various educational levels. Andal and Venkataraman (2023) and Akintayo et al. (2024) found that the integration of technology in the classroom improved students' attention, learning, and communication between teachers and students. These findings align with the claimed benefits of technology in early childhood education, while also highlighting the need for structured application and faculty professional development to fully realise its potential. Akintayo et al. aptly noted the lack of long-term studies regarding the impact of educational technology.

Summary of Key Findings and Themes

The selected papers highlight that technology offers benefits in areas related to cognitive development, such as mathematical abilities, perception, and memory. However, the modification of social skills appears less optimal, with some studies reporting significant improvements in children, while others observe moderate or even declining social skills. Regarding the potential of instructional games and interactive narratives, two concepts emerge as particularly significant: digital games and interactive storytelling.

Main Points of Agreement and Disagreement

The common consensus across all the studies is that technology enhances cognitive skills, with a particular focus on mathematical abilities and memory, in line with the findings of Papadakis et al. (2018), Al-Sayed et al. (2019), and Awaad (2022). Furthermore, Mousa (2015) demonstrate that social skills benefit from the integration of interactive storytelling into the curriculum. There is also agreement regarding the importance of faculty development and the effective integration of technology to fully harness its potential, as discussed by Akintayo et al. (2024) and Andal and Venkataraman (2023). However, there is a divergence in opinions concerning the impact of digital games on social interaction skills. Firas (2020) found negative social outcomes, while Osman and Omer (2017) observed only slight positive changes. Similarly, Moawad and Al-Moussa (2017) present conflicting findings regarding the effectiveness of tablets in enhancing problem-solving skills compared to Papadakis et al. (2018).

Research Gaps and Future Directions

Studies has not fully explored the potential of technology to support early education, leaving longer-term impacts and the contextual factors involved largely unconsidered. Future research should focus on long-term studies, cross-cultural investigations, and the exploration of emerging technologies, such as the use of augmented reality in preschool settings.

Problem Statement

The integration of information technology into the teaching-learning processes progressively in early education has generated considerable concern and controversy among scholars on the consequences in respect to the children's development in learning. For instance, it can be ascertained by the prevalence of ownership of tablets; globally, Saudi Arabian preschool children join others worldwide because information technology gadgets proliferate to leap to e-learning facilitated by the COVID-19 pandemic (Fitzpatrick et al., 2024; Liu et al., 2024; Rowicka, Postek, & Bujalski, 2023). While positive correlations have been identified regarding the benefits of tablet use, such as improvements in cognition and problem-solving, concerns have been raised by some scholars—such as Yang (2024), Liszkai-Peres et al. (2024), and Popova et al. (2024) —about potential negative effects on social interaction and the emergence of early onset emotional issues. These findings underscore the need for further research to definitively assess the impact of tablet use on the activity levels of preschool children in Saudi Arabia.

A number of investigations have demonstrated that the functions of tablets can enhance both receptive and productive thinking, including language, counting, and orientation (Rubtsova et al., 2024; Ruiz-Garcia et al., 2024; Tan et al., 2023). Studies comparing the use of educational applications on tablets to academic achievement show improved outcomes in knowledge identification, classification, and recall among users. Conversely, research contradicting these findings suggests that excessive tablet use can reduce children's

attention span and interfere with fundamental social skills such as communication, conflict resolution, and emotional regulation (Fitzpatrick et al., 2024; Gökçen, Özel, & Çalışandemir, 2024; Liszkai-Peres et al., 2024). This discrepancy in findings highlights the dual nature of tablets, which serve not only as a valuable tool for children's learning and development but also as a potential factor that could impede the development of a child's overall well-being.

To date, no research has been conducted within the Saudi context to examine the impact of tablet use on the specific age group of preschool children, which has motivated the present study. Given that preschool children are at a critical stage where social and cognitive development is particularly significant, it is essential to determine how the use of tablet applications affects these domains. Such an investigation would help inform lifestyle choices and educational policies and practices for parents (Popova et al., 2024; Rowicka et al., 2023). Therefore, with the integration of digital content into early learning environments, it is necessary to establish the extent to which tablet-based activities in preschool education contribute to developmental goals. The significance and originality of the current study lie in the selection of participants, namely preschool children in the Kingdom of Saudi Arabia (KSA), and its aim of evaluating the relationship between tablet use and developmental milestones. This study will explore the intersection of tangible and social aspects to provide evidence-based findings that can assist educators, policymakers, and parents in understanding how tablets can be effectively utilised in learning environments for young children.

Study Objectives

1. To evaluate the effects of tablets on the development of the preschool children in Saudi Arabia.
2. To analyse the impacts of the tablet on the social relations and progress of preschool children.
3. To contribute towards filling the existing gap of knowledge related to technology usage in early childhood education practice in Saudi.
4. To propose relevant recommendations to both educators and parents for the most appropriate use of tablet incorporation.
5. To participate in the formulation of policies to create equality between online learning and normal physical learning of children.

Research Questions

1. In what ways does tablet use affect the cognitive development of Saudi preschool children?
2. How does the usage of tablets affect the amount of social contacts of preschool children and their level of emotional intelligence?
3. What are the gaps in the knowledge concerning the use of tablets in early childhood education in Saudi Arabia?
4. What recommendations can be provided on the implementation of tablet use by educators and parents for children at preschool age?
5. How can the findings drawn from this study be applied to inform the development of policies that encourage balanced digital learning and all-rounded child development?

Methodology

Methods

A correlational research method is a technique that "enables one to determine whether there is a relationship between two or more variables and, if so, the extent of the relationship" (Al-Assaf, 2010). The present study examines the nature and extent of interaction opportunities provided by tablets for preschool children and their impact on cognitive and social development. This is achieved through a correlational research design that quantifies the relationship between tablet use by children and the subsequent effects on these developmental aspects.

Sample

The target population consisted of all preschool children (aged 3-6 years) in the Kingdom of Saudi Arabia. Due to the challenges of recruiting a large number of preschool children who had never used tablets, particularly as finding such children through social media was only occasionally possible in remote areas with

limited internet access, the researcher directly contacted families in these regions (southern Jazan and northern Hail). In the first phase, 63 children were recruited. After collecting baseline data, and through purposive sampling, 30 children were selected to form a new group of never tablet users (Group 2). To select the group of children who had previously used tablets, the researcher employed the random cluster sampling method. One kindergarten was chosen at the start of the second semester of the 2022-2023 academic year. Thirty children who had experience using tablets were then identified using a selection table, forming the group of children with prior tablet use (Group 1).

To ensure comparability between the two groups, five primary variables that could potentially influence the dependent variables (cognitive and social skills) were considered: age, gender of the child, educational level of the mother, educational level of the father, and family income. The Chi-Square formula was utilised by the researcher to determine averages for these variables in order to assess the statistical significance between the two groups. Statistical analyses of data revealed that for all these variables, there were no significant differences between the means of the two groups, thereby further increasing confidence that the two groups were matched.

Research Instrument

The interview cards represent the study tool, prepared personally by the researcher to give the indication of the cognitive skills level and the social ones too among preschool children. The tool was developed by reviewing the relevant literature, references, and previous studies; the insights from those provided the basis for its creation, application, assessment, and results collection. The following works were used to construct the tool: Mespah (2018), Saeed (2019), Ibrahim (2019), Bilal (2020), and Hassan (2021). Before administering the instrument, its reliability was determined, and face and content validity were verified with reference to prior literature and relevant studies. Additionally, the validity was further strengthened through expert review and internal consistency checks. For the subsequent analysis, Pearson correlation coefficients were computed to assess the correlations between item scores and their corresponding dimension scores, as well as between the scores of all dimensions and the total tool score.

Instrument Reliability

Moreover, the reliability of the instrument was determined using Cronbach's alpha. The split-half reliability coefficients for the items of the cognitive skills subscales ranged from 0.753 to 0.941, with the overall split-half reliability coefficient for the 33 items on the cognitive skills subscale being 0.859. The internal consistency coefficient for the social skills subscales ranged from 0.789 to 0.933, and for the total social skills scale, it was 0.874 for all 15 items assessing the constituent skills. These findings demonstrate a high level of reliability both for the aggregate score and across all subscales of the instrument, thereby reinforcing the applicability of the instrument in part B of the study.

Study Scopes

1. Objective Scope: The specific objectives of this research are to find out the impact of tablets on the cognitive and social development of pre-schoolers. More specifically, the emphasis will be placed on the analysis of advantages and possible developing demerits connected with the adoption of digital devices in the early years learning setting.
2. Time Scope: The study will be conducted using data gathered during the academic year 2024-2025 concerning the trends concerning the use of the tablet after COVID-19. This study will achieve recent findings and observations randomly for one year to cover the results.
3. Spatial Scope: The proposed study will take place in preschools, some of which are located in different districts in Saudi Arabia. It includes both teaching institutions that are found in urban settings as well as rural-based teaching institutions in an effort to capture a mix of teaching institutions from the different socioeconomic backgrounds.
4. Human Scope: Participants of the research will include both the pre-schoolers who are of age 3-6 years and their parents and teachers. To enhance the generalizability of the study, participants will be selected to represent variations in education and household settings.

Study Significance

Theoretical Importance

1. In this connection, the findings are valuable to complement the existing literature on the effects of tablet usage on the cognitive and social development of preschool children in Saudi Arabia.
2. This provides a better perspective on both the benefits and the potential drawbacks of using tablets on children's learning development.
3. The present study provides relevant data from the local context, contributing to the global discourse on how technology affects children in non-Western societies.

Practical Importance

1. This research informs programmes and policies regarding the appropriate integration and utilisation of tablets in early childhood education.
2. It provides recommendations to parents on ways to maximise the benefits of tablets while minimising potential negative impacts.
3. The study is beneficial for training teachers to utilise technology in supporting teaching, with a focus on the holistic development of the child.

Results

The results of the study are presented in the results section, where the author compares children who use tablets before school with those who do not, focusing on their cognitive and social development characteristics. The findings are analysed using statistical analysis techniques, with an emphasis on areas where significant differences were observed and areas where no notable impact was recorded. The analytical approach is based on several hypotheses, and the results are presented in tabular form for each skill, offering clear orientation for the presentation of the findings. In this section, the author provides a summary of the results obtained and compares them with those of other experimental studies, discussing both similarities and differences. The results are presented in the following order: the first group represents overall cognitive skills/general efficiency, the second group concerns more specific cognitive skills/test-taking abilities, the third group focuses on social skills, and the fourth group addresses overall social skills. The first hypothesis stipulates that post hoc analysis and pairing of the mean scores obtained by children who use tablets before school and children who do not use tablets before school were not significantly different at the ($\alpha = 0.05$) level on the scale of cognitive skills. However, the outcome of administering the study tool is shown in the Table 1.

Table 1: *Significance of the Difference between the First and Second Groups in Cognitive Skills.*

Skill	Total Score	Groups	Number	Mean	Standard Deviation	T-Value	Result
Recognition of Objects from the Environment	4	1st Group	30	3.3	0.15	4.06	Significant
		2nd Group	30	2.4	0.17		
Matching Similarities	3	1st Group	30	2	0.16	1.83	Not Significant
		2nd Group	30	1.6	0.13		
Perception of Relationships	4	1st Group	30	3.3	0.14	4.41	Significant
		2nd Group	30	2.2	0.25		
Discrimination	6	1st Group	30	3.6	0.25	1.26	Not Significant
		2nd Group	30	3.1	0.26		
Language and Writing Skills	23	1st Group	30	18.4	0.54	4.13	Significant
		2nd Group	30	14.7	0.69		
Classification	14	1st Group	30	10.2	0.46	2.14	Significant
		2nd Group	30	8.7	0.50		
Counting and Calculation	12	1st Group	30	9.9	0.33	4.01	Significant
		2nd Group	30	7.3	0.52		

Table 1 presents a comprehensive comparative analysis of cognitive skills between two groups of preschool children: those using a tablet before going to school (Group 1) and those using it after going to school (Group 2). The cognitive abilities assessed include object and shape recognition, matching similar objects and shapes, understanding the relationship between different objects and shapes, differentiating between objects, expressing and writing, sorting, counting, and calculating. All skills are rated based on the total number of points, with both groups consisting of 30 participants each. Differences in general cognitive abilities were observed between the two groups, while some tests revealed no significant differences between the groups.

The highest increase in scores was observed in the Recognition of Objects from the Environment, where Group 1 achieved a mean score of 3.3 (SD = 0.15) out of 4, while Group 2 scored 2.4 (SD = 0.17) out of 4. The t-test obtained a 't' value of 4.06, where a significant difference presents itself between the two groups. It would consequently appear that there exists an actual disparity in object recognition performance between those who used and did not use the tablet devices. This study documents a possible advantage of activity involving interactive-also importantly, visual-tablet applications concerning an improvement of object recognition performance. Correspondingly, the outcome analyses for the Relationship Perception indicate great difference between the two groups. Group 1 achieved a mean score of 3.3 ± 0.14/4, while Group 2 scored an average of 2.2 ± 0.25. The obtained t-value of 4.41 supports this finding, suggesting that tablet usage may lead to improvements in children's ability to discern and interpret relationships between elements presented in such applications. These results align with those of Papadakis et al. (2018) and Awaad (2022), which indicated that young children benefit from engaging in interactive tablet-based activities to enhance relational reasoning.

The domain of Language and Writing Skills also demonstrates a significant difference at the 0.01 level. Group 1 achieved an average score of 18.4 (SD = 0.54) on the 23-point scale, while Group 2 scored an average of 14.7 (SD = 0.69). The t-value of 4.13 [$p < 0.01$] indicates a positive relationship between tablet use and improvements in language acquisition and writing skills. This can be attributed to the availability of educational applications designed to assist children in learning basic reading, expanding their vocabulary, and supporting writing through interactive, game-like interfaces. In the domain of Classification, Group 1 had a mean score of 10.2 out of 14 (SD = 0.46), while Group 2 scored a mean of 8.7 (SD = 0.50). The t-value of 2.14 suggests a significant difference, indicating that tablets may serve as an effective medium for helping children classify and sort information. Similarly, in the domain of Counting and Calculation, Group 1 students achieved a mean score of 9.9 out of 12 (SD = 0.33), while Group 2 students scored a mean of 7.3 out of 12 (SD = 0.52). The t-value of 4.01 confirms the potential of tablets as a tool to enhance numeracy skills and early mathematical achievement.

On the other hand, skills related to matching similarities and discrimination were equally poor and showed no significant difference between the two groups. The experiment revealed that Group 1 achieved a mean score of 2 (SD = 0.16) out of 3 in matching similarities, while Group 2 scored a mean of 1.6 (SD = 0.13), with a t-value of 1.83 ($p > 0.05$), indicating no significant difference. Similarly, in the domain of discrimination, Group 1 had a higher mean score of 3.6 (SD = 0.25) compared to Group 2, which had a mean of 3.1 (SD = 0.26), with a t-value of 1.26. This evidence suggests that while tablets may influence some cognitive skills, their impact on abilities such as pattern recognition and sensory discrimination may be limited. This finding aligns with the study by Ibrahim, Ghanim and Alkhaderjameel (2020), which also reported no significant gains in these areas among preschool children using tablets. Additionally, the results indicated a statistically significant positive effect on overall cognitive skills, as demonstrated in Table 2.

Table 2: *Significance of the Difference between the First and Second Groups in Overall Cognitive Skills.*

Skill	Total Score	Groups	Number	Mean	Standard Deviation	T-Value	Significance Level	Result
Overall Cognitive Skills	66	1st Group	30	50.8	0.97	7.28	0.05	Significant
		2nd Group	30	40.1	1.06			

Table 2 provides an overview of the overall cognitive skills of preschool children, specifically comparing Group 1, who use tablets, with Group 2, who do not. This table presents the cumulative value of cognitive abilities, based on the various areas examined in this study, with a total possible score of 66. The

study included 60 participants, with 30 individuals in each group, which facilitates a balanced comparison between the two groups. According to the findings, participants in Group 1, comprising children who use tablets, achieved a mean score of 50.8 (SD = 0.97), while participants in Group 2, comprising children who do not use tablets, achieved a mean score of 40.1 (SD = 1.06). This difference can be attributed to the significant disparity in overall cognitive ability between the two groups. The standard deviations indicate relatively consistent performance across subdivisions and demonstrate that the measurements do not vary significantly from the mean values.

The t-value of 7.28 far exceeds the critical table value of 2.024 at the 0.05 level of significance. This indicates that the observed difference in overall cognitive skills between the two groups is statistically significant, with children in the tablet-using group demonstrating superior performance. The difference in mean scores, combined with the high t-value, underscores the substantial impact of tablet use on cognitive development in preschool children. Such findings align with previous studies, such as those conducted by Firas (2020) and Al-Sayed et al. (2019), which emphasised that tablet use during early childhood enhances cognitive abilities. The connection to existing literature further substantiates the hypothesis that integrating technology into early education yields improved cognitive outcomes.

One plausible explanation for these findings is the constructive nature of tablet-based learning, which aligns with the developmental needs of preschool-aged children. The use of tablets is particularly effective due to their integration of multimedia materials, diverse exercises, and various instructional games that encourage exploration and experiential learning through practical engagement. This approach correlates positively with Thorndike's trial-and-error theory, which posits that children learn by repeated attempts and adjustments in response to their experiences. Tablet applications emulate this process by providing opportunities for concept reinforcement through interactive and repetitive tasks, tailored to suit the developmental stage of early childhood. Consequently, as demonstrated in Table 2, the overall cognitive abilities of the group using tablets exceed those of the group who do not use tablets among preschool children.

Beyond endorsing the integration of technology in early learning, this finding also underscores the importance of incorporating technology in early childhood education. However, it emphasises the need to align the selection of technological tools with the natural developmental profiles of young learners to optimise their effectiveness in the teaching and learning process. The second hypothesis was that the mean of children who use tablets before school was also equal to the mean of the children who do not use tablets before school at the ($\alpha = 0.05$) level as rated on the social skills scale. The results after the study tool application are depicted in Table 3.

Table 3: *Significance of the difference between the First and Second Groups in Social Skills.*

Skill Name	Total Score	Groups	Number	Mean	Standard Deviation	T-Value	Result
Independence and Self-Reliance	4	1st Group	30	3.0	0.30	-0.8	Not Significant
		2nd Group	30	3.3	0.29		
Communication Skills	3	1st Group	30	1.3	0.12	-2.9	Significant
		2nd Group	30	1.9	0.16		
Cooperation	4	1st Group	30	4.6	0.54	-1.63	Not Significant
		2nd Group	30	6.0	0.67		
Adaptation and Participation	6	1st Group	30	2.7	0.21	0.46	Not Significant
		2nd Group	30	2.6	0.18		
Initiative	23	1st Group	30	2.6	0.19	-1.18	Not Significant
		2nd Group	30	2.9	0.16		
Emotional Skills	14	1st Group	30	2.4	0.22	1.06	Not Significant
		2nd Group	30	2.1	0.20		

Table 3 presents a comparative analysis of social skills between preschool children who use tablets (Group 1) and those who do not use tablets (Group 2). The table examines six critical social skills:

independence and self-reliance, communication abilities, collaboration and teamwork, adaptability and participation, self-initiation and organisation, and emotional regulation. Each skill is assessed based on a defined maximum score, ensuring consistency in evaluation. Both groups comprise 30 participants, maintaining an equal distribution to enhance the validity and reliability of the comparative analysis.

The findings suggest that the use of tablets may hinder certain social skills. For the subdomain of Independence and Self-Reliance, the average score for Group 1 (tablet users) was 3.0 (SD = 0.30), while Group 2 (non-tablet users) scored an average of 3.3 (SD = 0.29). The t-value computed is -0.8, showing that the variation between groups is not statically significant, meaning the effect is not large enough to be conclusive though it may appear that the use of the tablet somewhat reduces independence and self-reliance. A significant difference between the groups is observed in the mean scores for Communication Skills. Group 1 (tablet users) achieved an average score of 1.3 (SD = 0.12), while Group 2 (non-tablet users) attained a slightly higher mean of 1.9 (SD = 0.16). The calculated t-value of -2.9 indicates that tablet use negatively impacts communication skills, suggesting that children using tablets may face disadvantages in their communication development. This finding aligns with observations made by Ibrahim et al. (2020), who argued that minimal face-to-face communication might indeed reduce both verbal and non-verbal interaction. In the Cooperation category, Group 2 (non-tablet users) achieved an average score of 6.0 (SD = 0.67), while Group 1 (tablet users) attained an average score of 4.6 (SD = 0.54) out of a maximum score of 4. Despite this observed difference, the variation is not statistically significant, as indicated by a t-value of -1.63. Similarly, in the Adaptation and Participation domain, Group 1 obtained an average score of 2.7 (SD = 0.21) out of 6, while Group 2 achieved 2.6 (SD = 0.18). The t-value of 0.46 indicates no significant difference between the mean scores. This suggests that tablet use has a minimal impact, if any, on adaptability and participation in group activities.

Regarding the results for Initiative, the average score for Group 1 was 2.6 (SD = 0.19) out of 3, while Group 2 achieved an average of 2.9 (SD = 0.16). The t-value of -1.18 suggests no significant difference, indicating that the extent of tablet use does not affect children's proactivity. In terms of **Emotional Skills**, Group 1 showed a slight advantage, scoring an average of 2.4 out of 14 (SD = 0.22), compared to Group 2, which scored an average of 2.1 out of 14 (SD = 0.20). However, these differences are statistically insignificant, as indicated by the t-value of 1.06. The results of the study indicate that certain aspects of tablet use may have a negative effect, with a significant disadvantage observed in communicative skills. These findings align with those of Ibrahim et al. (2020), supporting the notion that reduced face-to-face interaction, resulting from excessive tablet use, disrupts communication skills. However, these results do not coincide with those of Mousa (2015) and Hassan (2017), who found improvements in certain social skills, such as tablet users' compliance with etiquette and other social rules. The discrepancy in findings may be attributed to various factors, including differences in research methodology, the subject population, or the types of activities engaged in with tablets. Beginning with the most pronounced negative effect on the development of communication skills, other social skills were found to experience only a moderate or negligible negative impact from tablet use. This suggests a need for further research into the effects of technology usage during early childhood. Finally, the impact of tablet use on social skills, according to the results of this analysis, is negative, with relatively insignificant effects on children's interactions. The results for overall social skills are presented in Table 4.

Table 4: *Significance of the Difference Between the First and Second Groups in Overall Social Skills.*

Skill Name	Total Score	Groups	Number	Mean	Standard Deviation	T-value	Significance Level	Result
Overall Social Skills	30	1st Group	30	16.6	0.81	-1.76	0.05	Not Significant
		2nd Group	30	18.8	0.94			

Table 4 also examines the overall social skills of preschool children in the tablet group (Group 1) in comparison to the no-tablet group (Group 2). The overview of various social skills is presented in a separate table, where the results of multiple evaluations are summarised, with the total possible score being 30 points. Each group comprises 30 participants, ensuring that the comparison is both rational and applicable for interpreting the data. The findings reveal that Group 1, comprising children who use tablets, achieved a mean score of 16.6 (SD = 0.81), while Group 2, consisting of children who do not use tablets, attained a mean score of 18.8 (SD = 0.94). The standard deviations for both groups are relatively low, indicating a reasonable degree

of consistency among participants. However, the t-value is -1.76, which is below the accepted critical t-value of 1.96, with degrees of freedom (df = 58) at the 5% level of significance. As a result, the difference in overall early social skills between the two groups is not statistically significant, and the observed negative trend is not substantial.

These findings align with previous studies by Shafy et al. (2024), Firas (2020), Ibrahim et al. (2020), and Amanda (2021), which observed that tablet use did not negatively impact overall social skills as initially hypothesised. However, the results of the present study contradict those of Hassan (2017), who found that children who frequently used tablets exhibited poorer social skills compared to children who did not use tablets. The differences in outcomes may be attributed to characteristics outlined in prior research by Zahran (2005) and Al-Sayed et al. (2019), who found that several social skills, such as sharing and recognising the emotions of others, are acquired in early childhood, typically through hands-on practice in social activities at home. These fundamental social skills are crucial for interactions with others and are strengthened by children's everyday environments, which are less influenced by tablet use. Therefore, despite an increase in screen time, children remain equally capable of developing these essential social skills.

In contrast, certain social skills, such as independence, self-reliance, communication, cooperation, and initiative, primarily depend on social interactions and formal engagement. These skills require teamwork and verbal communication, both of which may be hindered by excessive tablet use. Such skills may not develop optimally due to limited opportunities for frequent interaction with peers and adults. This is particularly evident in the domain of cooperation, where other research has highlighted a more pronounced negative impact on children's ability to engage with others. Alternatively, Table 4 suggests that tablet use may have a negative effect on social development; however, the non-significant nature of this effect across most aspects indicates that its impact is minimal. This highlights the need for further longitudinal research to examine the long-term relationship between tablet use and social skills, as well as to explore the mediating roles of parental involvement, screen time restrictions, and the types of content accessed by children.

Discussion

In detail, the present research aimed to evaluate the impact of tablet usage on the cognitive and socio-physical development of preschool children in Saudi Arabia, investigating both the potential benefits and drawbacks. The analysis revealed statistically significant differences in the cognitive abilities of children who use tablets in school compared to those who do not (Fitzpatrick et al., 2024; Liu et al., 2024). In terms of social skills, the findings indicate that the effects were either limited or negligible, with some mixed results. In certain areas, a negative trend was observed regarding social skills, but these were not statistically significant. However, these negative trends appeared to be more pronounced among learners with higher-functioning autism (Liszkai-Peres et al., 2024). When analysing the practice of executive function and cognitive development, several aspects indicated that the use of tablets yielded positive results for preschool children. Consequently, distinctions in object identification, relational understanding, language and writing, as well as categorisation, numeration, and calculation were notably prominent (Liu et al., 2024; Popova et al., 2024). The results further revealed that children who used tablets outperformed their counterparts in these areas, providing evidence that tablet applications support brain functions by presenting material that stimulates interest (Yang, 2024). This aligns with related studies documenting the role of interactive technologies in promoting learning during the early years of life. On the other hand, the study found no differences in matching similarities and discrimination, suggesting that some cognitive abilities may not be enhanced by tablets, likely because certain tablet tasks are passive in nature (Rubtsova et al., 2024).

Concerning social interaction and emotional development, the findings presented a mixed picture. While communication skills were significantly diminished among tablet users, other social competencies such as independence, cooperation, adaptability, and initiation did not show a significant P value between the two groups (Martinez-Merino & Rico-González, 2024). This suggests that tablet use may limit opportunities for verbal practice and face-to-face communication, potentially hindering development. However, the absence of severe negative consequences in other areas indicates that children continue to learn appropriate forms of interaction and social behaviour through regular, everyday interactions and structured play, even while using tablets (Tepetaş, Ünsal, & Cengiz, 2024). In this respect, the study also fills a gap in the understanding of early

childhood education technology utilization in Saudi Arabia by presenting information on Saudi preschool children. These findings offer valuable insights into how cultural and educational factors influence the relationship between technology and child development, particularly in the context of the emerging field of digital learning (Hart et al., 2024).

Based on the arguments presented in this study, there is a clear indication that educators require research-based recommendations to optimise the use of tablets in the classroom. These insights can be utilised by both educators and parents to incorporate tablets into teaching and learning, with the goal of enhancing children's cognitive development while mitigating the potential social costs associated with tablet usage (Popova et al., 2024). This involves limiting the amount of time children spend on such media, encouraging activities that promote social interaction, and ensuring the integration of tablet use within purposeful play and other socially appropriate tasks. In addition, the findings contribute to the development of educational policies aimed at balancing the use of digital devices in learning, thereby promoting policy guidelines that support the optimal growth of children. These findings will be invaluable for policymakers, who can use them when formulating interventions to ensure that technology serves as an enhancement to learning strategies, ultimately fostering more holistic early childhood development (Yang, 2024).

This research was conducted in the cities of Riyadh, Hail, and Jazan in the Kingdom of Saudi Arabia during the second semester of the academic year 2022-2023, with preschool teachers as the target participants. The primary aim of the study was to assess the effects of tablet use on the cognitive and social development of preschool children. The current study drew from the analytical perspectives presented in prior literature to define appropriate informational and interpersonal skills for preschool-aged children. Specifically, it aligned with Mousa (2015), Firas (2020), in selecting social skills such as communication, cooperation, self-initiative, and emotional skills. Additionally, it agreed with Moawad and Al-Moussa (2017), Al-Sayed et al. (2019), and Awaad (2022) in identifying cognitive skills such as classification, differentiation, memory, and achievement, particularly in relation to counting and mathematics comprehension. The study employed a correlational research methodology, which was deemed suitable for the research objectives and enabled the identification of key findings.

Research on the impact of tablet use on preschool children has demonstrated a McCarthy Bar coefficient, showing fluctuations between positive and negative effects (Fitzpatrick et al., 2024; Tepetaş et al., 2024). This study draws two main conclusions. Firstly, the nature of the current era necessitates the direct use of tablets, and by extension, smartphones, by all individuals. Given this context, it may not be advisable to restrict preschool children from using such devices, as it could result in social isolation, non-integration, and delays in their interactions with both the community and their surrounding environment. In light of these considerations, the researcher suggests that further studies should be conducted by educators, psychologists, and sociologists to explore how this digital transformation can be effectively managed and funded (Hart et al., 2024). Secondly, as indicated by the findings of the present study and the comparisons with existing literature, a direct positive correlation exists between the controlled use of the internet (in terms of time and type) and cognitive skill development (Liu et al., 2024).

Recommendations

1. Develop effective and engaging educational media aimed at enhancing the cognitive abilities of developmentally challenged preschool children, while simultaneously fostering social functionality.
2. Implement parent and teacher training programmes that offer practical strategies for achieving a balanced use of tablets, supporting both cognitive and social development.
3. Promote the integration of cooperative elements within tablet applications, encouraging children to interact with one another to progress, thereby enhancing their understanding of social interactions.
4. Establish clear guidelines for limiting screen time and selecting appropriate content, in order to mitigate potential adverse effects on social skills and communication.
5. Conduct controlled cross-sectional or, ideally, longitudinal studies to compare the effects of tablet use on children's overall development and cognition over time.

Study Implications and Future Directions

The results obtained highlight the dual nature of the effects of tablet usage on preschool children: fostering intellectual development while simultaneously impeding their social development, particularly in terms of communication. This underscores the need to strike the right balance in incorporating digital technologies into developmentally appropriate learning for young children. Future research should focus on investigating the long-term developmental outcomes associated with tablet use, specifically its effects on social and emotional development (SED). It would also be valuable to include older participants and those with autism spectrum disorder (ASD) in mixed-age samples to increase the generalisability of findings. Further, research examining more interactive forms of content, particularly educational applications, would be helpful in identifying key aspects of tablet use that can enhance or better align with developmental objectives. Local policymakers and educators should consider integrating tablets as supportive tools rather than primary learning instruments, ensuring that children have adequate opportunities for face-to-face social interaction, which is an essential component of their learning experience.

Study Limitations

Some key limitations of the study include the relatively small sample size of 60 preschool children, which limits the generalisability of the findings. Furthermore, the study exclusively involved participants from Saudi Arabia, which restricts the ability to apply the results to other cultural and educational contexts. The cross-sectional design of the study provides insights into the initial effects of tablet use but does not capture the developmental changes that may arise over time as a result of continued use. Additionally, the study does not differentiate between the types of digital content accessed or the duration of tablet use, factors which could contribute to variations in the study's outcomes.

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Appendix 1

The Research Instrument Items Related to Cognitive Skills.

Dimension	Item
Recognition of Environmental Objects	1. The child is given a set of figures (indicated in the test sheet), and then s/he is expected to say the name of each picture.
Matching Similarities	2. The child is then requested to fit an image shown on the right side with the image on the left side (pictures of utensils). 3. The child is asked to look at one picture on the right side and find its counterpart on the other (transportation pictures).
Perceiving Relationships	4. The child is asked to match a picture on the right with the corresponding one on the left (images of office tools). 5. The child is asked to match a picture on the right with the corresponding one on the left (images of fruits).
Discrimination	6. The child is asked to listen to a set of sounds, then point to the picture that corresponds to each sound. 7. The child is asked to circle the letter matching each letter on the right side. 8. The child is asked to connect each letter on the right side with its counterpart on the left. 9. The child is asked to circle the word that matches the word on the right side.
Language and Writing Skills	10. The child is asked to draw a tree. 11. The child is asked to colour the picture without going outside the lines. 12. The child is asked to trace through a maze to reach the goal. 13. The child is asked to copy a horizontal line. 14. The child is asked to copy a vertical line. 15. The child is asked to copy a circle. 16. The child is asked to copy a zigzag line. 17. The child is asked to copy the alphabet letters by tracing the dots.
Classification	18. Ask the child to circle the large-sized objects. 19. The child is asked to circle the small-sized objects. 20. The child is asked to circle the long pens. 21. The child is asked to circle the short boys. 22. The child is asked to circle the similar groups. 23. The child is asked to identify which group is larger (boys or chairs).
Counting and Arithmetic	24. The child is asked to count from 1 to 10. 25. The child is asked to identify the missing number (6, ___, 8). 26. The child is asked to circle the tree with more apples. 27. The child is asked to add numbers and state the result. 28. The child is asked to point to the geometric shape when its name is spoken. 29. The child is asked to state the name of the geometric shape when shown.

Appendix 2

The Research Instrument Items Related to Social Skills.

Dimension	Item
Independence and Self-reliance	1. After having dinner and feeling sleepy, what will you do (Options)? 2. Your father asks you to go out with him, but you need to change your clothes. What will you do (Options)? 3. After playing in your room with your friends, what will you do (Options)?
Communication	4. If you are playing with your peers and one of them does not speak Arabic, how would you say "Thank you" with gestures? (Options) 5. Your mother asks you to sit with your little sister, and during that, your friend asks you to play with him, what would you do (Options)?
Cooperation	6. After playing in the park with your friends, what would you do (Options)? 7. When you see a child carrying something heavy, what would you do (Options)? 8. Your mother asks you to cooperate with your siblings in cleaning the house, what would you do (Options)?
Adaptability and Sharing	9. Your friend loses his toy in the park, what would you do (Options)? 10. You usually play alone at home, and your friends ask you to join them in play. What would you do (Options)? 11. You have three toys, and you are asked to play with only one. Which one would you choose (Options)?
Initiative	12. The flowers in your garden start to wilt, what would you do? 13. If you see your father carrying some items into the house, what would you do (Options)?
Emotional Skills	14. One of your friends gets hurt on his foot. What would you do (Options)? 15. When you see children bullying another child, what would you do (Options)?