

The Effect of Early Screen Exposure on Attention and Memory Development

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ABSTRACT: Early childhood is a critical stage that forms the cornerstones of cognitive development and is therefore of great importance. During this crucial period, children shape their minds and develop their cognitive skills through experiences gained from their environment. In particular, the cognitive skills acquired during this period lay an important foundation for the individual's future life. This process plays a decisive role in the effectiveness of fundamental processes such as long-term learning, attention, and memory, and the healthy functioning of these processes is critically important for an individual's future learning abilities. In recent years, with the increase in access to digital technologies, children's screen exposure has increased significantly. Taking this situation into account, research aimed at understanding its effects on cognitive development has gained momentum. The duration of children's exposure to screens in their environment and the nature of the content can affect memory development, which is related to attention processes, both directly and indirectly. At this point, important issues that parents and educators need to pay attention to come to the fore. Parents and educators must carefully evaluate the amount of time children spend in front of screens and the content they are exposed to during this time. In this context, thoroughly examining the effects of early screen exposure on children's attention and memory development aims to provide valuable insights into children's cognitive development.

KEYWORD: Early childhood, mental and cognitive skills, exposure, attention processes

INTRODUCTION

During this crucial period, children shape their minds and develop their cognitive skills through experiences gained from their environment. In particular, the cognitive skills acquired during this period lay an important foundation for the individual's future life. This process plays a decisive role in the effectiveness of fundamental processes such as long-term learning, attention, and memory. The healthy functioning of these processes is critically important for an individual's future learning abilities. In recent years, with the increase in access to digital technologies, children's screen exposure has increased significantly. Taking this situation into account, research aimed at understanding its effects on cognitive development has gained momentum. The duration of children's exposure to screens in their environment and the nature of the content can affect memory development, which is related to attention processes, both directly and indirectly. At this point, important issues that parents and educators need to pay attention to come to the fore. Parents and educators must carefully evaluate the amount of time children spend in front of screens and the content they are exposed to during this time. In this context, thoroughly examining the effects of early screen exposure on children's attention and memory development aims to provide valuable insights into children's cognitive development. Thus, research in this area can shed light on supporting children's development. In particular, the results of these studies can help determine appropriate screen usage habits for children's healthy development and form fundamental references for shaping educational policies. This study is an important effort that aims to comprehensively detail the effects of screen use in early childhood on cognitive processes by integrating findings from the existing literature on the subject and new research results. Furthermore, in this context, where differences according to developmental level and age are also carefully addressed, an in-depth analysis is presented on how children's attention and memory systems are shaped and how screen exposure affects these processes. Ultimately, it is clear that understanding the effects of early screen exposure on attention and memory development could form the basis for interventions in both clinical and educational settings. This is extremely important in terms of contributing to the development of strategies that support children's healthy cognitive development. Furthermore, while emphasising the need for further research and investigation in the future, it is expected that such studies will clearly identify the elements that require attention in children's developmental processes. Therefore, the importance of research on early childhood is increasing, and it is becoming essential to conduct more research at . New research in this field has the potential to increase the knowledge base that will help educators and parents make informed decisions, as well as provide a better understanding of children's relationship with screens. Comprehensively and systematically establishing the fundamental principles of attention and memory in early childhood is of great importance in terms of explaining in detail and comprehensively the critical role of

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these important concepts in children's cognitive development. Attention involves a complex series of processes encompassing the effective selection of environmental stimuli and the sustained focus on these stimuli; these detailed processes directly influence children's capacity to understand and comprehend their environment and process new information, thereby making significant contributions to their learning processes. Memory, on the other hand, is a concept closely related to the ability to effectively store, recall, and retrieve acquired information when needed. The development of these two cognitive functions is closely linked to exposure to environmental stimuli in early childhood and forms the building blocks of children's cognitive skills. Negatively affecting attention and memory functions in early childhood has the potential to lead to serious and significant problems in later life, such as learning difficulties, cognitive delays, and academic failure. In this context, the effects of screen exposure on cognitive development have a significant impact, particularly on the development of these two important functions, and this topic is highlighted as an area that requires in-depth investigation. The literature has investigated changes in attention and memory development associated with screen use in various academic studies; it has mostly revealed important findings that high levels of screen exposure in early childhood may be linked to attention deficits and memory difficulties. However, debates and uncertainties regarding whether these relationships are direct and causal continue. Furthermore, how factors such as the intensity, frequency, and type of exposure transform these negative effects is also an important topic of discussion in the research field. Within this framework, these detailed studies conducted in the field of cognitive development provide critical information and valuable data to better understand the effects of early screen exposure on attention and memory functions, to carefully observe these effects, and to minimise potential harm. Consequently, this conceptual framework provides an important basis for understanding the interactions of attention and memory functions and allows for a better interpretation of the research findings presented in this context in the following sections. Studies in this context are of great social importance as they can contribute to the development of children's academic achievements as well as their general life skills.

Concepts of Attention and Memory in Early Development

The concepts of attention and memory in early development form the building blocks of children's cognitive processes. Not only are these processes of great importance during a crucial stage of children's lives, but they also constitute the initial sources of the learning process that continues throughout an individual's entire life. The concept of attention can be defined as the ability to be selective and focus among environmental stimuli, while the scope of this definition also includes the ability to distinguish external elements that distract the child's attention. This critical process significantly accelerates children's learning pathways and contributes positively to their development by facilitating their ability to access and process information while interacting healthily with their environment. The development of attention in childhood is shaped to a considerable extent not only by neurological maturation but also by the various experiences the child has. Memory is a complex system filled with dynamic processes involving the development, encoding, storage, and retrieval of experiences. Therefore, the early development of attention and memory lays the foundation for the child's learning ability and future cognitive functions. This fundamental structure plays a crucial role in ensuring the sustainability of the child's learning skills throughout their life. The relationship between attention and memory is of great importance as it is directly linked to how children perceive new information, how memories are stored, and how long-term memories are formed. This corresponds to its significant contribution to children's cognitive development through its effects that deepen learning and recall. Furthermore, these concepts are also closely related to the development of the nervous system. Children's responses to environmental stimuli and the way these stimuli are processed contribute positively to the morphological and functional maturation of attention and memory systems, supporting and enhancing children's overall cognitive development. On the other hand, the effect of screen exposure on young children stands out as an element that requires new and different dynamics in attention and memory development. While high levels of screen use can negatively affect cognitive processes by increasing distractibility, controlled and appropriate exposure offers new opportunities for supporting cognitive development and can contribute positively to children's learning processes. Therefore, consciously managing the opportunities and potential risks presented by attention and memory development in early childhood is of great importance for the sustainability of cognitive development and is a point that must be considered. The healthy development of attention and memory concepts in early childhood forms a critical foundation for the child's lifelong cognitive and emotional health. In addition, the role of screen exposure in shaping these processes is emerging as a critical area of research, highlighting the need for further scientific studies on this topic. Current research can help to better understand important concepts such as attention and memory and prevent future problems in these areas. In this context, studies on attention and memory development, particularly in early childhood, serve as a guide for educators and parents, while providing a solid foundation for developing important strategies to ensure these processes progress healthily. The role of attention and memory concepts in early development is among the critical factors that shape and determine children's educational success and overall development processes.

Effects on Memory Functions

The effects of early screen exposure on memory functions have a significant impact on children's developmental processes in many ways. This critical period is a very important stage in terms of shaping children's ability to sustain attention and their information processing skills. Intensive screen use by children not only negatively affects their attention spans but also directly impacts the encoding and recall processes of information, leading to difficulties in coping with various challenges. Children exposed to screens for long periods may experience a noticeable decline in their ability to store information in both temporary and permanent memory forms, as they work in an environment filled with empty stimuli. This situation can lead to significant deficiencies in the functionality of the working memory and difficulties in transferring new information to long-term memory. Furthermore, the excessive consumption of cognitive resources by screen

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use may strain children's working memory capacity, resulting in increased attention problems and difficulties with focus. High levels of screen exposure can cause regression, particularly in children's episodic and semantic memory domains. Therefore, both exposure duration and content quality emerge as two important factors during critical periods of children's cognitive development. Consequently, appropriately limiting screen time and using educational content in a balanced manner, at the reasonable levels mentioned above, are vital strategies for supporting memory development. The effects of excessive screen exposure strongly indicate that excessive screen exposure at an early age shapes children's cognitive and memory abilities in both the short and long term. It also highlights important factors to consider for ensuring children's mental development. Therefore, with appropriate restrictions and effective usage guidelines to be taken into account, it is possible to utilise technology without creating negative effects on children's cognitive development. This contributes significantly to the healthier and more effective development of their learning and memory functions. The conscious, careful and sensible use of technological tools not only develops children's cognitive skills but also enables them to manage the time they spend in front of screens efficiently. This management can also help them strike an ideal balance between these two activities by ensuring they allocate sufficient time to reading books, one of the classic learning methods. With careful and conscious use, aiming to reduce the negative effects of screen exposure on children, it may be possible to support children's learning and memory with this effective balance. Necessary research shows that screen exposure, when managed consciously, contributes positively to children's cognitive development. Families and educators must also take high-level responsibility to support children's cognitive development, and strategies should be developed to provide guidance in this regard. Regular and intelligent management of screen exposure is an important factor that will help children experience a healthier development process.

Differences According to Age

The responses of different age groups to screen exposure and the effects of this exposure on cognitive development show distinct and significant differences depending on age, and can have profound and lasting effects on the psychological state, social relationships, and cognitive abilities of each age group. Research conducted on individuals who were excessively exposed to screen use, particularly during early childhood, shows a marked decline in attention span, problems related to attention deficit, and a more pronounced manifestation of hyperactivity. Difficulties in sustaining interest in screen content among children in this age group can hinder the development and progress of attention functions. The serious consequences of screen exposure in early childhood bring with them the risk of spending more time in the virtual world and becoming detached from real-world experiences. During this critical period of development, memory development is also negatively affected, with the possibility of significant losses, particularly in short-term memory capacity. Inappropriate and excessive screen use for children's ages can cause difficulties in processing information, which can negatively impact learning processes. Carefully monitoring screen exposure is extremely important to support children's cognitive development. Educators and parents need to manage children's relationship with screens in a balanced way, defining appropriate time limits to contribute to their development processes. In this context, observations and assessments of children's screen use should play a vital role in supporting cognitive development. Taking into account each individual's level of screen exposure and their responses to this exposure, it is of great importance to take the necessary precautions and encourage appropriate activities. Furthermore, enabling children to balance their screen time by increasing their physical activities has become a critical prerequisite for their healthy development and will have positive effects on both their physical and mental health. Achieving and maintaining balance in screen use is an important issue that falls under the responsibility of all stakeholders in order to contribute to the development of children's social skills. Parents, educators and other relevant individuals play significant and effective roles in children's developmental journeys; therefore, it has become imperative that they work together to control their screen consumption. This collaboration is considered an important step that can have positive effects on children's cognitive development and social skills. Faithfully observing children's screen exposure and renewing and developing educational programmes in light of these observations is of critical importance in supporting their healthy development. In this context, parents and teachers should manage children's screen usage in a well-balanced manner and assist them by providing rich, varied, and interactive environments where they can develop their social skills. In this way, they can provide significant support for children to experience the appeal of the virtual world and the advantages of the real world in a balanced manner and develop their social relationships.

Research conducted on children, particularly those in pre-school and early primary school age groups, has revealed numerous significant findings in the existing literature on the effects of screen exposure. These studies clearly demonstrate that screen exposure shows marked differences depending on the age of the child. In particular, when children in this age group are overexposed to screens, serious setbacks can be observed in their attention development when compared to age-appropriate norms. This worrying situation can negatively affect children's processes of acquiring new information and may lead to a weakening of their ability to remember this information. Furthermore, a certain increase in tolerance towards screen use may be observed as children get older; however, it is crucial to carefully monitor and examine the developmental processes of attention and memory functions throughout this period. High levels of screen exposure during early childhood, particularly during this critical period when neural network plasticity is very high, can have serious negative consequences. Consequently, this high exposure can lead to setbacks in children's long-term cognitive development, while also significantly damaging the way children understand the world they think and feel. In this context, balancing screen usage habits and monitoring how children develop during this process is of great importance, as there is a high probability that these habits will have lasting effects on children's mental and emotional health in the future. Therefore, families and educators adopting a careful approach in this regard can contribute to

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children growing and developing in a healthy manner. Research indicates that the effects of screen use on attention and memory functions can vary significantly during adolescence and adulthood. Individuals at these ages may generally show greater resilience to screen use, and this can also lead to some positive outcomes associated with prolonged screen exposure. For example, in certain situations, screen use can facilitate access to information and learning processes. However, excessive exposure can lead to significant impairments, particularly in sleep patterns, attention spans, and overall cognitive functioning. Research has demonstrated a strong link between excessive screen use and attention deficits and memory problems. Consequently, age-specific responses and the measures that can be taken in this context are of great importance in reducing the potential negative effects on individuals' cognitive development and creating healthy development environments. Therefore, the effective development of age-specific intervention and education strategies is vital in minimising the negative effects of screen exposure. Effective and innovative approaches that support learning processes will contribute to individuals being able to participate in the digital world in a healthier and more balanced way, thereby improving their overall quality of life.

Effects on Attention

Early screen exposure has significant and highly complex effects on children's attention development. During this critical developmental period, children spending long periods of time in front of screens is associated with many factors that can increase distractibility and make concentration significantly more difficult. Prolonged and continuous screen use can cause children in this period to have shorter attention spans, reduced tolerance to environmental stimuli, and significantly higher sensitivity to distractions. Attention span, which is particularly critical for the development of educational and social skills, is significantly negatively affected by this situation and threatens children's functionality in their daily lives. Furthermore, detailed research has proven that screen exposure has direct negative effects on many functional components of attention. In particular, declines can be observed in the areas of selective attention and sustained attention, making it difficult for children to gain self-discipline. These negative effects lead to a weakening of the focus capacity that forms the basis of children's cognitive processes, thereby causing situations that seriously negatively affect their learning processes. At the same time, the negative effects of screen exposure on complex attention processes such as attention version, attention sharing, and attention regulation in response to many different stimuli are frequently evaluated and emphasised in the literature. In this context, ensuring an appropriate balance between screen time and screen content in early childhood is critical in supporting attention development. Controlling screen exposure in terms of both time and content can significantly contribute to reducing negative outcomes such as attention deficit, hyperactivity, and learning difficulties in children. Furthermore, implementing various interventions supported by appropriate stimuli and attention-building activities during this period can strengthen children's attention skills and make significant positive contributions to their cognitive development. Therefore, conscious and careful approaches should be developed against the negative effects of screen use at an early age on attention, ensuring the healthy development of children's cognitive and attention functions and providing high-level support for this process. At the same time, it is recognised that it is critically important for families and caregivers to take conscious steps in this process, as this can help children manage their screen time and content more effectively and healthily. It is also highly valuable for educators to play a role in this process by setting an example for children and supporting their learning processes. In this way, a comprehensive awareness-raising process is needed to minimise the negative effects of children's screen exposure and ensure a healthy development process. Furthermore, for reducing screen exposure, families engaging in activities with their children, playing games, and offering alternative activities such as nature walks helps strengthen attention skills while also increasing children's social interaction skills. On the other hand, setting limits on screen time and explaining the importance of this to children contributes to the development of their independence and sense of responsibility. Raising awareness among parents, educators, and society on this issue will be one of the most important steps towards enabling children's healthy development through a joint effort. This process, which is equally critical for children's social skills and emotional development, should be among the common goals of all individuals.

Effects on Memory Functions

The effects of early screen exposure on memory functions have a significant impact on children's developmental processes in many ways, and this impact needs to be addressed from multiple angles. This critical period is a crucial stage in terms of shaping children's ability to sustain attention and their information processing skills. Children's intensive screen use not only negatively affects their attention spans but also directly impacts the encoding and recall processes of information, potentially leading to difficulties in coping with various challenges. Children exposed to screens for long periods may experience significant declines in their ability to store information in both temporary and permanent memory forms, as they work in an environment filled with empty stimuli. The difficulties experienced by children who spend long hours in front of screens can profoundly affect their thought processes and cognitive abilities, negatively impacting them. This situation can lead to significant deficiencies in the functionality of the working memory and difficulties in transferring new information to long-term memory. The excessive consumption of cognitive resources by screen use can strain children's working memory capacity, increasing the likelihood of more attention problems and difficulties in focusing. High levels of screen exposure can cause regression, particularly in children's episodic and semantic memory areas, and this situation emerges as a factor that negatively affects their overall cognitive development. Therefore, both the duration of exposure during critical periods of children's cognitive development and the quality of content are clearly prominent as two important factors. In this context, appropriately limiting screen time and using educational content in a balanced manner, at the reasonable levels mentioned above, are vital strategies for supporting memory development. The effects of excessive screen exposure strongly indicate that excessive screen exposure at an early age shapes children's

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cognitive and memory abilities in both the short and long term. At the same time, it highlights important factors that need to be considered for children's mental development. As children go through this stage where they struggle to concentrate and have difficulty processing information, it is possible to utilise technology without creating negative effects on their cognitive development by implementing appropriate restrictions and effective usage guidelines. This contributes significantly to the healthier and more effective development of their learning and memory functions. The conscious, careful and sensible use of technological tools not only develops children's cognitive skills but also provides an opportunity to manage the time they spend in front of screens efficiently. This management can also help them strike an ideal balance between the two activities by ensuring they allocate sufficient time to reading books, one of the classic learning methods. Effectively limiting screen exposure will increase their attention spans and help develop their cognitive functions to their full potential. With careful and conscious use, the goal of reducing the negative effects of screen exposure on children can be pursued, and this effective balance can support children's learning and memory. The necessary research clearly shows that screen exposure, when managed consciously, contributes positively to children's cognitive development. Families and educators should also take high-level responsibility in this regard to support children's cognitive development, and effective strategies should be developed to provide guidance on this issue. The regular and intelligent management of screen exposure stands out as an important factor that will help children experience a healthier development process. Indeed, the conscious use of technology can add meaning to learning processes and positively influence children's future success by directing them towards more beneficial content that will develop their cognitive skills. In short, it is clear that children receiving conscious guidance from their families during this process will be able to effectively evaluate the opportunities offered by screens, thereby contributing to strengthening their knowledge acquisition processes. Therefore, carefully planning screen time, which is one of the key points that both families and teachers should focus on during this process, should be supported by conscious guidance as it will positively affect children's learning skills and memory functions. This guidance will be an extremely strategic approach for children to sustain their intellectual development in the long term.

CONCLUSION

The effects of early screen exposure on attention and memory development reveal extremely important and noteworthy results in terms of children's cognitive development. Extensive research has revealed that high screen use is associated with a marked decrease in attention processes and a reduction in concentration span, and it can be said that this situation significantly negatively affects the attention span children show towards environmental stimuli. In particular, the negative effects of increased screen exposure on this process become even more pronounced. Furthermore, there is evidence of a marked decline in memory functions; specifically, a decrease in short-term memory and working memory capacity becomes more pronounced as children's screen usage time increases. While these findings clearly demonstrate that screen exposure negatively affects cognitive processes, it should be noted that there are also notable differences depending on age. It has been determined that these negative effects are much more pronounced in younger age groups and that developing cognitive systems are more sensitive to the negative effects of screens. The results of the research conducted, in parallel with other studies in the literature, clearly show that limiting high screen use at an early age is a protective and supportive approach to attention and memory development. This situation gives rise to noteworthy implementation and policy recommendations for parents, educators, and policymakers. It is crucial to establish appropriate limits to support children's cognitive development by making screen use controlled and supervised. In addition, screen time should be limited, and alternative activities and games should be encouraged, providing opportunities to develop children's creative and social skills. Furthermore, effective educational programmes developed with this goal in mind must be implemented, and family awareness must be raised. Future research is particularly important in terms of examining long-term effects in depth and increasing studies on children from different socioeconomic backgrounds. Educational programmes developed through collaboration between educators and health professionals play a critical role in supporting children's development. In conclusion, early screen exposure has observed negative effects on attention and memory development, and it is of great importance to develop early intervention and conscious usage strategies to reduce these negative effects. In this process, it is essential for everyone to do their part to support the healthy and balanced development of children for their healthy future. It is essential that parents and the education system work together to create a healthy growth and development environment for children. Furthermore, the importance of activities such as spending time outdoors, interacting with nature, and developing face-to-face social relationships should be emphasised in order to balance children's interactions with screens and prevent them from living in a world limited to screens. Time spent in nature, in particular, increases children's overall health and happiness levels while also positively affecting their mental development. Undoubtedly, such an approach will be an important strategy that supports children's cognitive and emotional development. These beneficial changes, achieved by limiting screen exposure, will contribute to children becoming healthier, more creative, and more independent individuals in the future. Therefore, adopting a conscious and disciplined approach to screen time has become an indispensable responsibility for both families and educators. The effects of early screen exposure on attention and memory development reveal important and noteworthy findings, particularly regarding children's cognitive functions. Various studies suggest that excessive screen exposure at an early age may weaken attention processes and negatively affect memory functions. In this context, a shortening of children's attention spans and difficulties in focusing have been observed, along with a decrease in memory capacity. Furthermore, age-related developmental differences can cause variations in the severity and nature of these effects; that is, each individual may respond differently to screen exposure. When examining the mechanisms behind these negative effects associated with screen use, it has been found that cognitive resources are rapidly depleted due to excessive stimuli, and as a result

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of increased distracting stimuli, children experience significant difficulties, particularly in long-term memory processes. The literature provides strong and convincing evidence that early screen exposure negatively affects children's cognitive development. For these reasons, screen use in child development should be limited, and screen time should be carefully regulated. Furthermore, encouraging activities that support children's attention and memory development will play an important role in reducing these negative effects. In conclusion, the harmful effects of early screen exposure on attention and memory development should be carefully considered, and conscious strategies should be developed accordingly. Studies conducted in this field form an important basis for improving children's cognitive quality of life and supporting their healthy development, and may also guide future research.

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