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# Reading vs. Screening: The Development of Generation Alpha

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**A thesis submitted to**

**Regis College**

**The Honors Program**

**In partial fulfillment of the requirements for Graduation with Honors**

**by**

Frances Gibson

**April 2024**

**Thesis written by**

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## ABSTRACT

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### Reading Vs. Screening: The Development of Generation Alpha

Advisor's Name: Rebecca Betjemann, Ph.D.

Reader's Name: Amanda Miller, Ph.D.

Child development is an important field of research as it allows us to understand what promotes the cognitive, emotional, physical, social, and educational growth that shapes the adults we become. Every generation grows and learns in a new environment that is constantly changing, and it is vital that we determine what factors benefit or deter our development. This is especially true for Generation Alpha, who are uniquely recognized for being true digital natives. Technology has been integrated into nearly all aspects of our society and has had numerous benefits in terms of convenience, social connection, and education. However, overindulgence of certain types of screen-time can negatively affect child brain development. This rise in technology has also impacted the amount of time children spend ludic reading at home during key periods of development. Reading during early childhood is extremely important for healthy development as it promotes language, literacy, intelligence, and social growth. In this thesis I argue the importance of limiting harmful media and promoting more ludic reading during early childhood to benefit the development of Generation Alpha.

## ***Introduction***

Since the rise of technology in recent decades there has been a noticeable decline in the number of children who read books for pleasure (Clark, 2012), that is to say, independent reading done in one's leisure time (ludic reading). This decline is most evident in our newest generation of youths, Generation Alpha, which describes anyone born from the year 2010 to 2025. This thesis will show that there is a clear correlation between the decline in ludic reading among Generation Alpha and the rise of technology. It will also provide sufficient evidence for the importance of reading on healthy brain development as well as the potential drawbacks of too much screen-time on development.

The children who are members of Generation Alpha are in critical cognitive, emotional, and social periods of development. Development begins from a young age with motor skills and the beginnings of language, followed by psychological development and logic as well as abstract and idealistic thought (Piaget, 1962). It is during these stages that certain developmental trajectories can be altered by factors like change in environment and learning. This thesis will explain in more depth several of the current theories on how children learn and progress and what factors play a role.

Research shows that ludic reading does benefit brain development, language development, literacy, empathy, social cognition, cultural understanding and general intelligence (Clark & Rumbold, 2006). The aspects of development concerning empathy and social cognition are related to the development of Theory of Mind that occurs in early childhood (Bal & Veltkamp, 2013). Ludic reading also supports overall brain structure and connectivity, which is likely related to each of the benefits listed above (Clark & Rumbold, 2006).

I chose to focus specifically on Generation Alpha, not only because they are currently in important developmental periods, but because they are the first generation to be born digital natives. Screens are present in nearly every aspect of their lives and will always be integrated in their experiences, attitudes and their expectations of the world. Since they are growing up with current technological advancements, they will be the most adept at using digital devices and media platforms. With access to smartphones and tablets from an increasingly early age, Generation Alpha spends more time using screens than any of the previous generations (Jha, 2020), which negatively correlates to time spent reading (Clark, 2012).

In this thesis, I do acknowledge that technology is an incredibly helpful and progressive education tool from which new generations will benefit greatly. I look not only at non-educational screen-time, but also technology use in schools and I compare reading printed books to e-readers. The argument I will make throughout this paper is that there are developmental consequences to such early, consistent screen-time exposure outside of school. This can inhibit the development of social skills and empathy, affect attention span, as well as delay development of expressive and receptive language.

In this thesis I review research that provides valuable information for the parents of our next generation. After providing sufficient evidence from previous research, I would encourage current and future parents to limit screen time for their children or postpone the use of private devices in general during early development and promote more reading.



## ***Chapter One – Current Theories on Childhood Development***

Childhood development is an area of study devoted to understanding constancy and change from conception through adolescence. The ultimate common goal is to identify the factors that influence the consistencies and changes in youths during the first two decades of life (Berk, 2015, p. 4). The subject of development is often divided into four domains, which all influence one another: physical, cognitive, emotional, and social. For this thesis's purposes, we will only concern ourselves with the latter three domains. Cognitive development describes the changes in intellectual abilities such as attention, memory, academic and general knowledge, problem solving, imagination, creativity, and language. Emotional and social development describes the changes in emotional communication, self-understanding, knowledge of others, interpersonal skills, friendships, intimate relationships, and moral reasoning and behavior (American Psychological Association, 2023). This development does not take place overnight, of course, but is acquired over several different stages of life, termed periods of development. These periods of development can further be explained using several theories on what most influences childhood development.

### **Periods of Development**

Piaget's stages of development, while an old model, is still relevant today for how we approach children's learning and development. The first period of development is *infancy and toddlerhood*, from birth to two years, when dramatic changes occur in the body and brain. During this stage, the child experiences a variety of motor, perceptual, and intellectual

capabilities. These include the beginnings of language, initial intimate ties to others, and the first independent steps (Piaget, 1962).

The next stage, *early childhood*, spans from two to six years. Motor skills become more refined, and children become more self-sufficient. The child also learns how to play “make-believe” in this stage which promotes all aspects of psychological development. Thinking and speaking ability grow at a rapid pace and a sense of morality develops. This is also the stage in which theory of mind develops, which will be expanded on later in this chapter. This all helps children create ties with peers (Piaget, 1962).

The *middle childhood* period extends from age six to 11 years and children begin to acquire new responsibilities. Changes include increased athletic ability, more logical thought processes, and mastery of fundamental reading, writing, math, and other academic skills. This stage also brings a greater understanding of self, morality, and friendship (Piaget, 1962).

The last child development period is *adolescence* between the ages of 11 and 18, otherwise known as the transition to adulthood. The ability to form and process abstract and idealistic thoughts develops. Young people begin to establish more independence and form personal values and goals (Piaget, 1962).

## **Theory of Mind**

One of the most important developmental milestones for children occurs during early childhood. This is the development of *theory of mind* (ToM), the precursor to empathy. ToM is the ability to draw conclusions about others’ mental states, such as beliefs, desires and intentions, and using this to explain and predict people’s everyday behavior (Premack and Woodruff, 1978).

In other words, it is the understanding of other people's thoughts and feelings and the ability to recognize that others don't share the same thoughts and feelings as you. This capacity to experience other perspectives emerges in a predictable order, beginning with learning certain skills. These skills include modeling others' behavior, recognizing emotions of others, understanding they have different likes and dislikes than others, understanding that people act based on their own wants, recognizing the causes and consequences of actions, and the ability to pretend to be someone else during play (Westby & Robinson, 2014).

After acquiring the above skills, true theory of mind begins to emerge at the age of four or five and progresses in the following order. First comes the understanding of "wanting" and "thinking," that different people have different desires and thoughts and will act accordingly. Next is the understanding that "seeing leads to knowing" and you must experience something to know about it. Then comes the understanding that people can have "false beliefs" and will act based on what they believe, not on what is necessarily true. Finally comes the understanding of "hidden feelings" which means people can feel different than what they display (Wellman & Liu, 2004).

Empirical research into ToM acquisition also concludes that language development is closely intermingled with ToM development (de Villiers & de Villiers, 2014). The earliest stages of communication depend on an infant's engagement with others, and through these interactions they begin to learn words and meanings. According to the National Reading Panel, children can begin learning to read anywhere from age four to seven, though for most it is at age six or seven. This means that most of ToM would be developed before or during reading acquisition,

indicating there may be a relationship between the development of the two. ToM could be an important precursor for reading comprehension, like understanding stories and characters' perspectives. Inversely, further enrichment of language and comprehension feeds into the understanding of others' minds. These connections are multidirectional, as a mature ToM contributes to later pragmatic language development (social language skills). One method by which parents may help promote development of language and, consequentially, further development of theory of mind is by reading books with their children, as this is positively correlated with both (de Villiers & de Villiers, 2014). It is important to go beyond just reading and discuss characters' thoughts and feelings, as well as connecting these to their own experiences.

### **Developmental Theories**

There are many different developmental theories in conversation today that can help us explain how children learn and progress based on experiences and what factors may influence these developmental stages. The two theories I will discuss in this thesis include constructivist theory and ecological theory, as these stress the importance of environment and relationships on learning and certain aspects of development relevant to this thesis.

Constructivist theory ascertains that children gain new knowledge based on their previous experiences and understanding. Experience is used to create knowledge relating to their biological, physical, and cognitive stage of development. Learning is done by building and reflecting on past experiences that are representative of their environment. The importance of social interactions is also stressed in this theory as a way to promote cognitive development.

Criticisms of this theory are that it disregards societal and cultural effects on learning, meaning how the structure of the culture or society we are raised in affects our development. (For Review, see Saracho, 2023).

Ecological theory views child development as a system of relationships affected by multiple levels of the environment. This could range from family values and school to cultural values, laws, and customs. It embraces that family life can play a large role in the development of our personalities along with cultural and societal factors (Saracho, 2023). This theory answers the criticisms of constructivist theory by acknowledging the importance of culture and environment on development, while also agreeing with the importance of social relationships.

Both theories acknowledge that our development from childhood is influenced by more than just genetics (though these hold significant sway), whether this be family, relationships, environment, subconsciousness, or experience. Differences in the range of factors that influence our development are important for parents of young children to be aware of, because there are those that support and nourish healthy development as well as those that stagnate. The next chapter will explain how reading promotes healthy brain development and other benefits.

## ***Chapter Two – The Benefits of Reading on the Brain***

In this digital age we have grown used to having access to vast stores of information in an instant. We don't have to look far; with information or just quick entertainment right at our fingertips via the internet, it is simple to find distraction. However, this is correlated with a noticeable decline in the amount of time people spend ludic reading, or reading for pleasure (Liu, 2022). Ludic reading is an enormously complex cognitive act which draws on a variety of skills and processes in several different domains like attention, comprehension, absorption, and entrancement (Nell, 1988). A survey conducted by the National Assessment of Educational Progress (NAEP) in 2020 shows that the number of children between age 9 and 13 who read for fun has dropped in the past decade and is at its lowest levels since the 1980s. This decrease in reading rates among children is negatively correlated with an increase in participation with electronic media, video games, and portable digital devices (Gioia, 2004). It is important that this decline in ludic reading be combatted because reading offers us numerous cognitive and social benefits, especially during developmental stages. These benefits include, but are not limited to, support of overall brain structure development and connectivity, language and vocabulary acquisition, empathy and theory of mind development, and better social cognition (see Clark & Rumbold, 2006 for review). According to the ecological and constructivist theories of development, whether children spend more time reading or screening (and who they do this with) could be important environmental and social factors affecting their development.

### **Reading and Structural Brain Development**

There are many brain regions involved in reading and comprehension. The temporal lobe contributes to phonological awareness and discriminating sounds, Broca's area is involved in

speech production and language comprehension, the angular and supramarginal gyri links different parts of the brain so that letter shapes can be put together to form words, and white matter pathways help the brain learn and function and connects the brain's reading network (Edwards, 2016). As we learn to read, and our cognition grows, the reading centers in our brains experience increased activation and make new connections. However, recent research has been looking at what other alterations occur in brain structure among skilled readers, outside of just the known reading regions of the brain (Houston et al., 2014). A longitudinal MRI study investigated the structural brain changes that co-occur with reading acquisition in developing children to identify if ascertaining certain reading skills affects cortical volume. Results demonstrated that reading is connected to altered brain structure in the form of volume reductions in the left inferior parietal and frontal regions for children who performed better on the reading tests (Houston et al., 2014). This suggests that children who are more skilled readers or spend more time reading exhibit different development trajectories in specific brain reading regions, or the inverse, that children with these neural differences (due to other factors) are more likely to be skilled readers. These varying developmental trajectories in terms of cortical volume and structural changes early on in children of varying intelligence and reading ability show that cognitive abilities may be more related to structural brain changes than volume at any one point (Houston et al., 2014). This study provides additional evidence that becoming a more skilled reader at a young age is positively correlated with general intelligence later in life (Houston et al., 2014).

One such study examined the relation between fluid intelligence and reading and math skills. Fluid intelligence describes our reasoning ability and the way we deal with complex

information around us. Fluid intelligence relates to reading ability and becomes stronger when involving more complex reading skills (Peng et al., 2019). Researchers also found that intelligence and reading predict each other, meaning the development of one supports the development of the other and vice versa. Additionally, there could be a third “z” variable causing both (Peng et al., 2019). Both studies highlight the importance of reading acquisition in early childhood and beyond for structural brain development, which directly relates to fluid intelligence.

These correlations are encouraging for my contention that reading greatly benefits aspects of healthy brain development, but it is important to note that, for correlational studies, the results could be interpreted both ways. For instance, reading could promote structural brain changes or these changes in structure resulted in someone who reads more or has greater reading skill. When it comes to the brain and behavior, causal relationships are the most difficult to discern, but we can say for sure what factors relate to *each other*. This is true of all correlational data presented; nevertheless, the correlation is present and statistically significant.

## **Reading and Language**

The basics of our language centers begin to emerge before the age of three and only build from there. This developmental period when we first begin to acquire language is extremely important for later literacy, and as you may be able to guess, ludic reading from a young age nourishes language development. Reading for pleasure has been positively linked to reading attainment and writing ability, text comprehension and grammar, and a breadth of vocabulary (Clark & Rumbold, 2006).



We know that language ability grows rapidly from infancy to early childhood, but what may be unknown is the significant effect that language competency has on a child's conceptual, interpersonal, and self-regulatory abilities. It influences and is influenced by multiple developmental domains, and its importance is far reaching, as adequate expression and comprehension are rather necessary later in life (Dickinson et al., 2012). This is why it is important to nurture language development from the time it emerges. One way to do this is through book reading, and there are at least three ways in which this influences language learning. First, it provides children with the opportunity to hear new vocabulary in varying grammatical structures. Second, it promotes joint attention and interest, and lastly, it requires the reader to be active and engage in responsive interactions on word meanings (Dickinson et al., 2012).

One example that demonstrates how reading benefits language acquisition comes from a study on dialogic and traditional reading techniques on language development. Dialogic reading is reading part of a sentence aloud and letting the child fill in the blanks with the appropriate words. This experiment focuses on receptive and expressive language skills of 4–5-year-old children. The researchers support that reading to children at this age is useful for gaining vocabulary, communication, and memory skills but also further investigate the benefits of dialogic reading techniques versus that of traditional techniques. Dialogic reading requires higher levels of child interaction with the material and has positive impacts on child language skills, based on previous research (Zevenbergen, Whitehurst & Zevenbergen, 2003). A more current method used an experimental and control group and a pre-posttest format. The experimental group used dialogic reading techniques (more room for child expression and questioning) and the

control used traditional techniques which consisted of just listening to a story. Results demonstrated that dialogic reading better supported expressive language (vocabulary and sentence formation) and overall language development (Simsek & Erdogan, 2015).

### **Reading, Empathy, and Theory of Mind**

Empathy and theory of mind are similar concepts with some overlapping aspects that both describe, on some level, our ability to understand and relate to others. These are important characteristics for building and maintaining serious relationships. Empathy concerns our ability to share affective states with others while theory of mind, defined in chapter 1, is the precursor to empathy (Cerniglia et al., 2019). Recall from chapter 1 that the development of theory of mind is strongly connected with language acquisition (and vice versa). In the previous section, it was established that reading during early development is important for acquiring language and vocabulary skills, so one could also propose that reading during development, especially after the age in which theory of mind is developed, can support the emergence of empathy.

One study examined the association between children's reading habits and theory of mind. Reading fiction, not non-fiction, was associated with the development of the ability to understand the thoughts, feelings, and desires of others which is otherwise known as theory of mind (Van der Kleij et al., 2022). These results could also be explained inversely, meaning that following the development of ToM, a child is more likely to seek fiction stories over non-fiction. Another experiment that aimed to discover the association between reading and empathy found similar results. Participants were randomly assigned to reading fiction stories with emotional tones or to a non-fiction control group. Their empathy was assessed before and after via

questionnaires. Scores showed that reading fiction over non-fiction was associated with higher levels of empathy (Bal & Veltkamp, 2013). Though, the real distinction in this study was not entirely just genre but emotional connection to the story and characters that determined empathy. They found that readers who experience emotional connection while reading experience higher levels of empathy whether they were reading fiction or non-fiction, though an emotional connection to the story was more common in the fiction genre.

Another study explores the emotional connection to stories described above and how this impacts empathy. It is described as ‘getting lost in a book,’ as the reader becomes immersed in the point of view of characters and feels emotionally connected to the story. This type of “immersive reading” connects with the empathy centers of our brains. This is called the “fiction feeling hypothesis” and it describes how narratives with emotional content invite readers to be more empathetic and engage the affective empathy network of the brain (the anterior insula and mid-cingulate cortex). This hypothesis was tested using fear-inducing or emotional passages from the *Harry Potter* series and functional MRIs. Results showed that immersion readings (‘getting lost in the book’) were significantly higher for these passages than with neutral excerpts and activity in the mid-cingulate cortex correlated more strongly with these emotional passages (Hsu et al., 2014).

Not only is reading associated with empathy and theory of mind, but also with overall morality in various ways. Greater familiarity with fiction was positively connected to integrity, perceived moral agency, and increased awareness of moral self. Long term exposure to these types of fictional genres related to greater moral agency (Black & Barnes, 2021). This

association could mean that it is more beneficial in terms of empathy and morality to have an affinity for reading from a young age, or during development. It could also suggest that more moral, empathetic people seek the fiction genre over other genres.

### **Social Cognition**

Social cognition or social ability references the skills we use every day to interact and communicate with others. It is how people process, store, and apply information about others for social interactions. This could be in the form of verbal or nonverbal communication, or knowledge of body language. While those who enjoy ludic reading or who read frequently are often characterized as socially awkward, research has shown that this stereotype is not the case. One study found that comprehending characters in a fictional narrative parallels the ability to comprehend peers in the real world. In general, lifelong exposure to the fiction genre was positively correlated with social ability in the form of conflict resolution, peer cooperation, empathetic listening, and forming relationships (Mar et al., 2006).

The research above describes a correlational relationship between reading fiction and social cognition, meaning the inverse could also be true; that children with the social ability described above gravitate toward that genre. However, many studies have been done to ascertain a causal relationship. A meta-analysis was conducted to determine if fiction ludic reading causally affects social cognition as opposed to non-fiction or no reading. The research pooled experimental data and analyzed 53 effect sizes from 14 studies and found that there is a causal relationship (Dodell-Feder & Tamie, 2018). Fiction reading leads to a small but statistically significant increase in social cognitive performance among readers.

The many benefits of reading from a young age are clear. Reading promotes positive structural brain development and intelligence, it helps nourish the acquisition of language, it supports the development of theory of mind and can result in increased moral agency and empathy and can even improve social ability. This is why it is important that reading does not disappear among the next generation of developing children. The next chapter of this thesis will examine how dramatically the environment of our newest generation has changed and what effects it may have on development and reading levels.

### ***Chapter Three - Generation Alpha***

Generation Alpha (Gen Alpha) describes the generation of people born (or who will be born) between 2010 and 2025. As such, these children are being raised in an entirely different world environment than previous generations. Among these environmental changes are rapidly advanced technologies, the Covid-19 pandemic, and technology in education. These changes open the door to new opportunities for future research in terms of how these factors may affect child development and reading levels in Generation Alpha. Recall from chapter 1 that the ecological and constructivist theories contend that brain development and learning are sensitive to changes in environment and early social interaction. This section will investigate the differences between Gen Alpha and previous generations in terms of digital familiarity, the effects of Covid-19 on Gen Alpha, and the increase in media learning in schools.

#### **Generational Differences**

Gen Alpha is the first generation that will not know the world before technology, in other words, they are “digital natives.” This term describes those who are “native speakers” of the language of computers, video games, and the internet (Tootell et al., 2014). Their birth year coincides with the launch of the iPad and Instagram, the most preferred technology brand and one of the most popular social media applications of the time. They were born into a digital environment in which technology has always been a part of their everyday lives. Actions that took their predecessors years to become familiar with, such as using touchscreens and navigating various apps on smartphones, Gen Alpha generally masters by the age of two (Jha, 2020). There are many potential positives to being born digital natives, such as familiarity with educational

advancements in terms of technology (such as online learning platforms, AI, or educational gaming programs) and Gen Alpha's propensity to embrace innovation, progressiveness, and advancement (Ziatdinov & Cilliers, 2022). However, there are also some potential negatives.

One consequence of being digital natives is that Gen Alpha uses mobile games and gaming systems like Xbox and Nintendo more than engaging in outdoor activities or real-life play (Jha, 2020). It is important to be aware of the effects that these changes in forms of play can have on today's youths. Online gaming has become so widespread that both the American Psychiatric Association and World Health Organization have classified some gaming habits as disorders, like Internet Gaming Disorder, in the DSM-5 (Jha, 2020). Such a disorder is described as continuous and repeated involvement in game play that significantly disrupts daily work/education (DSM-5). Not only could excessive video game time lead to disruptions in daily life, it could also affect brain development (Takeuchi, et al., 2016). Researchers showed this through a study of video game play on children's brain development. The study used a diffusion tensor imaging mean diffusivity measurement to measure microstructural brain properties and examined the correlation with videogame play in a sample of young girls and boys. The results showed that increased videogame play is associated with delayed development of microstructures in several brain regions and decreased verbal intelligence, which could subsequently lead to decreased reading ability (Takeuchi, et al., 2016).

Besides new technology, other environmental changes in recent decades have also affected child literacy levels, as research shows that general reading levels in schools have decreased over time. In the book *Our Labeled Children*, Robert J. Sternberg and Elena L.

Grigorenko state that there has been a noticeable, steady decrease in reading level, literacy, and verbal skills over the years, despite the steady increase in population IQ throughout the 21<sup>st</sup> century (known as the Flynn Effect). This decrease in reading level, literacy, and verbal skills is ongoing today. Recent studies also conclude that the Flynn effect has been decreasing in developed countries, while continuing its steady increase in developing countries (Bratsberg & Rogeberg, 2018). Genetic and family studies determine the cause of this decline to be mostly environmental, with little genetic influence (Bratsberg & Rogeberg, 2018). This decline in verbal skills has been connected to a decline in the reading levels of textbooks used in schools, making reading material easier (Sternberg & Grigorenko, 2000). Essentially, this is a “dumbing down” of textbooks – what was a fifth-grade textbook in 2000 would pass as a third-grade textbook a few generations prior - leading to a decrease in literacy. The authors found factors contributing to the simplifying of texts to be a downward spiral in the revision of reading material and the adoption of “easier” books becoming more common than others. Ultimately this is associated with lower reading levels for students.

The authors of *Our Labeled Children* also argue that this decreasing reading level has contributed to the increased amount of learning disability diagnoses. Reading disabilities vary greatly over time, as does the standard for diagnosing them. Today, more people are likely to appear to have a reading disability relative to their general ability (Sternberg & Grigorenko, 2000). In a report from Pediatrics, scientists from the CDC and HRSA have found that developmental disabilities and learning disabilities in children have increased from 2009 to 2017. As stated above, this increase could be due to the development of better diagnosis tools and an increase in awareness for these disabilities.



Another aspect of being raised in Gen Alpha that may differ from previous generations is early life on social media. While previous generations were slow to become accustomed to sharing their lives online, Gen Alpha's social media presence comes naturally. According to a 2020 survey, children between 8 and 12 years old devote 4-5 hours each day on average to the internet, social media, gaming, and texting on mobile devices (McCrindle & Fell, 2020). This early exposure to social media leaves Gen Alpha more vulnerable to risks such as cyberbullying, trafficking, and suicide than previous generations (Jha, 2020). The increasing use of online games and media among generation alpha is one factor that could explain the decrease in time spent reading. Previous generations did not have as much unrestricted access to these uses of technology as an alternative to reading and outdoor play during development. Though previous generations had television, of course, streaming and media consumption today has changed drastically from the past. For Gen Alpha to experience the positives rather than negatives of being born digital natives, it is imperative that parents find a way to incorporate educational rather than destructive uses for technology and limit, or monitor to some degree, children's time spent on the internet or on videogame play. These differences in environmental influence between Gen Alpha and previous generations were only exacerbated by the arrival of Covid-19.

### **Effects of Covid-19 on Gen Alpha**

Another major change to the environment that Gen Alpha experienced during their development was the global pandemic, Covid-19, which spanned from 2019 to 2023 and had profound effects on the lives of many, the scale and scope of which are unprecedented and still yet unknown. Countries and territories around the world implemented quarantines, or stay-at-

home orders, which caused major disruption to everyday life and impacted the financial, emotional, and physical well-being of both children and adults (Andrade et al., 2022). In relation to this thesis, Covid-19 and the “lockdown” in the United States (lasting about 5 months) had many short-term effects on the environment that Gen Alpha is now experiencing, while the long-term consequences are still being researched.

The effect that the pandemic may have on the development of Gen Alpha cannot be solidified as of now but can be predicted using the life course theory. This theory helps us understand the repercussions of macro-level sociohistorical events which can be developmental turning points. Some immediate developmental effects could be heightened levels of anxiety and depression in adolescents due to the stressors of the pandemic such as social distancing and lockdown (Benner & Mistry, 2020). During the height of the pandemic, schools were forced to shut down to prevent the spread of Covid-19, causing school aged students to be socially isolated, which can affect psychosocial adjustment (Benner & Mistry, 2020). Additionally, theory suggests that events such as this pandemic can set in motion accumulating advantages or disadvantages that can affect long-term trajectories of well-being (Benner & Mistry, 2020). These long-term effects have yet to be determined as they require longitudinal studies and more time post pandemic.

More specific effects on how Covid-19 has impacted children can be seen by examining the effects of school closure on reading level and education. Covid-19 changed education for students of all ages via the transition to online learning, educational losses due to school shutdowns, and increased anxiety and depression associated with these changes (Hoofman &

Secord, 2021). A study from 2020 suggests that reading skills were substantially impacted during the disruption in education caused by Covid-19. The study used data from an oral reading fluency (ORF) assessment to measure fundamental reading skill in K-12 students in over 100 US school districts. The otherwise consistent growth of ORF in students significantly decreased in Spring of 2020 following school closures (Domingue et al., 2021). Another similar study also modeled reading gains during the pandemic school closures and found supporting results. It predicted the rate of reading gain in kindergarten children would decrease by 66% from the normal rate of increase. It also determined that this decrease from the average gain in reading ability could be mitigated by parents reading at home daily with their children (Bao et al., 2020).

The increase in screen time for children participating in online learning during school closures also raised some concerns. Studies demonstrated that preschooler students had increased levels of inattention and self-regulation problems associated with the increase in screen time (Wong, 2021). This increase in inattention suggests online learning during Covid-19 may have negatively affected child education. Additionally, while children were out of school and practicing social distancing during the pandemic, there was an increase in the amount of video game play and social media use among children at home (Donati et al., 2021). Gaming is often used as a form of escape and a method to cope with psychological stress, such as from a global pandemic, which was a likely contributor to the increase in gaming. As a result of more time spent on video game play, there was also a reported increase in gaming disorder (GD) symptoms among adolescents (Ko & Yen, 2020). It is important that parents and guardians are aware of this disorder and how it can develop from unrestricted video game play.

Lastly, closure of schools also led to an increase in online learning. I was in my senior year of high school during this stage and experienced first-hand the shift from in person classes to Zoom lectures. When online learning became more common during the pandemic, it paved the way to the expansion of distance education and an increase in the integration of technology in education (Kang, 2021), the effects of which I discuss in the following section.

### **Online Learning in Schools**

The combination of advancing technologies and the pandemic has led to a whole new form of education for Generation Alpha. As we learned in the previous section, the integration of technology in schools has significantly increased in the wake of Covid-19. This integration came in the form of interactive online learning modules, recorded lectures, and artificial intelligence (AI) education tools. These innovations have several educational advantages such as allowing students to learn from anywhere and at their own pace, which improves learning efficacy, and providing open access and equal opportunity to all students (Kang, 2021). However, the effects of online learning on reading and child development are still being studied.

At the most basic level, an increase in technology use in schools means students read more learning material on computers or other devices rather than reading print. One review of the current literature contends that online reading comprehension requires different skills and strategies than reading print to effectively comprehend the material (Leu et al., 2005). Online learning is mediated by students' ability to read and communicate in online environments, requiring new skills like inferential reasoning which go beyond what is required of reading on

print for traditional textbooks (Leu et al., 2005). The digital natives of Gen Alpha are already especially adept at these new skills required for online learning, reading, and comprehension.

This is advantageous for Gen Alpha as several studies demonstrate that many computer supported collaborative learning models (CSCL) are effective in increasing vocabulary skills and reading comprehension. One such tool is the online flipped learning model used during Covid-19, which uses better online media services like assigning class materials and presentations to be viewed at home, implementing distance learning to fit a student's schedule and collaborative active learning. Results showed this method improved student engagement and comprehension compared to other methods like simple scheduled Zoom lectures (Setyosari, et al., 2021). Some curriculums for younger students also incorporate vocabulary games to great effect. Research shows that this increased post-test scores for vocabulary comprehension, reading comprehension and vocabulary production compared to students who did not use online vocabulary games during study (Zarei & Amani, 2018). These results clearly show that technology has a place in education for our newest generation.

We have learned in this chapter that Gen Alpha is being raised in a vastly different environment (especially socially following Covid-19) than previous generations which, from the viewpoint of the ecological and constructivist theories, could affect their learning and development. The way this shapes who they will be as adults is not yet known. However, one correlation remains clear, and that is as use of technology outside of education increases, time spent reading during child development has decreased. As I have made clear in this chapter, there are many other environmental influences that have been related to ludic reading levels and

reading skill like Covid-19, more technology in education, and social media developments. More definitive studies are necessary to determine causal relationships. In the next chapter we discuss how the rise of technology may lead to less reading and what effects it could have on development.

## ***Chapter Four - The Rise of Technology on Reading and Development***

Over the past few decades, technology has been transforming the way people read, think, process information, and maintain attention. While reading requires a high degree of focus and engagement, electronic media (such as television, social media, or video games) requires less cognitive demand which can foster shorter attention spans and accelerated gratification (Gioia, 2004). Since the rise of technology has been the suspected cause of the decline in ludic reading (Gioia, 2004), this chapter will focus on how the effects of technology on the brain (depending on the type of media) compare to the benefits of reading and the brain, as well as some research-based recommendations for child media use for the best long-term outcomes of brain development. This includes the recommended amount of time children should spend online outside of education, methods for optimizing media learning in schools, and educational games and internet uses that are beneficial. Since the effects of screen time on the brain depends on the type of media consumption, this section also discusses some types of unharmed screen-time.

### **Screen Time and Attention Span**

The iPhone was released in 2007 and by 2018 78% of the United States population owned this device. The average person now spends over 24 hours a week online (Hymas, 2018). Because technology and the internet have become such a large part of our lives, our brain has been affected by the environment it inhabits. The consequence has been a reduced capacity for deep thought and continued focus. As the brain becomes accustomed to shorter, simpler content and instant gratification it reduces the ability to deep read and is turned into a basic signal-

processing unit (Insights, 2015). The main factors that impact attention are social media consumption, television viewing, technology adoption rate, and multi-screening behavior. These factors have negatively affected different aspects of our three types of attention: sustained (prolonged focus), selective (avoiding distraction), and alternating (switching between tasks) (Landhuis et al., 2007 and Espiritu, 2016).

This is supported by a study that investigates the effects of social media consumption on cognitive concentration (Yngve, 2020). The method utilized the Flanker and Stroop tasks to measure attention/concentration through reaction time and accuracy. The Flanker task shows the subject arrows pointing in two possible directions and asks them to quickly click the arrows whose direction corresponds to that of the middle arrow. For the Stroop task, the names of colors are written out and the word itself could be any color (i.e. 'red' written in red or 'red' written in blue). This task relates most to selective attention and asks the participant to quickly identify the color shown not the color written (Yngve, 2020).

The method used a random sample of people aged 20 to 60 who performed the two tests. The tests were taken at home in a calm environment. One group was not allowed to use any social media beforehand while the other group was asked to use Facebook. The difference in reaction time and accuracy was measured for the two groups and compared between social media and no social media groups. Results showed that social media does clearly affect attention as selective attention was negatively affected by scrolling on social media (Yngve, 2020). Though this study uses an older age range than this thesis is focused on, it is relevant to note that if social



media use can affect an adult brain in terms of attention span it could also affect a child's attention.

### **Screen Time and Connectivity**

We know that reading supports healthy brain development in terms of structure (Houston et al., 2014), so now let us compare reading and exposure to screen-based media on the developing brain connectivity among youths. A study was done with children aged eight to 12 to determine if reading or screening was better support for functional connectivity in certain brain regions using MRIs. The methodology included parent surveys on their children's time spent reading versus using screen-based media. The MRIs then assessed resting-state connectivity with reading time and screen-time applied as predictors. The results found that time spent reading was positively correlated with increased connectivity in these brain regions, which were the left-side language centers and visual and cognitive control regions. In contrast, more screen time was related to lower connectivity in brain regions concerned with language and cognitive control. Because these are correlational studies, the opposite causal relationship could also be possible in both cases. (Horowitz-Kraus & Hutton, 2018). The results support the argument that screen time should be limited and reading supported to promote healthy brain development.

A more recent study uses longitudinal data from the Adolescent Brain and Cognitive Development (ABCD) project to show the effects of screen media use on subcortical structures, resting state connectivity, and mental health issues in early adolescence (He et al., 2023). The results show that the effects on child brain and development depend on the type of screen use. For instance, passive media use was associated with increased rule breaking behavior while

violent video game play correlated with depressive symptoms. Social media use was associated with decreased volume in certain brain areas like the hippocampus (memory formation) and the thalamus (sensory relay center) (He et al., 2023).

### **Technology and Empathy**

We know from the previous chapter that reading from a young age, reading fictional narratives, and developing emotional connections to fictional character stories have all been related to increasing empathy (Bal & Veltkamp, 2013). Increased screentime, however, may have the opposite effect. For instance, one study found that frequent browser switching during media usage is related to lower associative empathy (Bockarova, 2016). Another looked at the empathy scores in school children over the last few decades and found a decrease in empathy correlated with the increased popularity of television and introduction of personal computers in schools (Knezek et al., 2022).

A more specific type of screening behavior includes video-gaming. Because many video games today include more violent content, a study was done to determine the effects of exposure to media violence on cognitive desensitization, lowering empathetic concern for others and prosocial behavior (voluntary behavior benefitting another). Participants completed a survey to determine use of violent video gaming and took a test for empathetic concern. Results showed a negative correlation between violent video gaming and empathetic concern and prosocial behavior towards strangers (Fraser et al., 2012). Despite the negative effects some types of media consumption can have on the brain and development, not all uses of technology are harmful, as discussed in the following section.

## **Reading e-books Versus Printed Books**

Another new development since the rise of technology in recent decades is the use of electronic reading devices (e-books) via Kindle, Apple iBooks, Kobo Books or a host of other digital reading platforms. It would make logical sense that more people today would use e-books rather than printed books due to convenience of access and pervasiveness of mobile devices; however, recent surveys show this is not the case. As of 2017, parents report that only 28% of children have read a book over a smartphone or tablet. The study speculates that the disparity between availability and use of e-books may be due to parents' skepticism about the benefits of reading an e-book versus a printed book for their children (Etta, 2019). The following section aims to show parents that while screentime in the form of social media, gaming, television or other non-educational uses over time spent reading may be harmful to healthy brain development, the use of e-books over printed books has no such detriments.

As shown previously in this thesis, we know that shared book reading activities between parents and young children promote their language development. One study aimed to discover whether this finding was also true when using e-books. Ninety preschoolers and their mothers were randomly assigned to either an e-book reading group, a printed book reading group, or the regular kindergarten literacy program group which acted as the control. The groups were compared on variables of word comprehension and phonological awareness. The results illustrated that both the e-book reading group and the printed book reading group showed promising progress in word comprehension and phonological awareness compared to the control group, with no significant difference between these two intervention groups (Korat & Heibal,

2013). This shows that there are few drawbacks in reading skill, comprehension, and language development when it comes to comparing e-books to printed books for young children.

This is not to say that reading e-books has no downsides when compared to reading printed books; these disadvantages just don't relate to healthy brain development. Two other studies on the use of e-books versus printed books in older children compared variables of story comprehension, eye fatigue, and headaches. The first study found that elementary school students who read printed books scored better on the comprehension quiz afterwards than those who read the e-book version. Furthermore, those who read e-books reported having greater eye-fatigue afterwards than those who read the printed book (Jeong, 2012). The second study agrees with the first in that e-reading may inhibit reading comprehension, cause more strain on the eyes, and additionally cause more headaches (Jabr, 2013). The author offers some insight into why this occurs. Reading on screens may include more distraction from disrupting media notifications and readers are prevented from being able to intuitively navigate and mentally map long texts on devices that require scrolling, rather than turning a physical page. These are factors that affect reading comprehension. Reading on screens was also more cognitively and physically taxing than reading on paper, as scrolling demands a more conscious cognitive effort. In addition, LCD screens on phones and tablets strain the eyes and cause headaches as a result of synthetic light shining directly into the eye for long hours (Jabr, 2013). This offers some insight as to why many people may prefer reading printed books over e-books despite the higher convenience and availability of e-books. Another reason could be that books can be found free at any library while e-readers can be expensive and easily damaged in the hands of younger children.

While reading a printed book will never lose its appeal to me, I find myself reading with my Kindle more often for its convenience. It is easier to obtain books and the built-in reading light is perfect for reading in the dark. I have, however, experienced many of the side effects of using an e-reader that have been listed by the studies in this section. After reading for several hours straight I sometimes develop a headache and almost always eye fatigue. To offset these affects I adjust the lighting on my Kindle to the point where the least stress will be put on my eyes (low lighting for dark rooms and vice versa). I have also invested in blue-light glasses which block harmful light from your eyes, and found these remedies worked well for me. The cons of e-readers do not overcome the convenience of them in my opinion. In conclusion, reading e-books at a young age is just as beneficial as reading printed books in terms of language and cognitive development. However, for better reading comprehension outcomes and less eye-fatigue as your child ages, printed books may be more beneficial.

When choosing between reading and non-educational screentime in what better aids child development, the choice is clear. The use of screens and television, with the exception of e-reading, has few benefits for young children and is linked to poorer developmental outcomes (Lerner, 2017). Reading, on the other hand, supports and nourishes child development in numerous ways. It is important for the parents and future parents of our newest generation to promote healthy brain development by limiting time spent on screens, and increasing time spent with books.

### **Recommendations for Children's Media Use**

Researchers have determined that excessive screen time with certain types of media has been associated with developmental delays. They assessed children's screen-time behavior (hours per week) and developmental outcomes at ages 2, 3, and 5 via the Ages and Stages questionnaire and maternal report. This test is designed to pinpoint developmental progress and catch developmental delays in young children. It includes questions about your child's communication, gross motor, fine motor, problem solving, and personal social skills. Results showed poorer performance among children who had more screen-time per week, meaning too much screen-time can impinge on a child's ability to develop optimally (Madigan et al., 2019). Due to these possible outcomes, professional recommendations include encouraging family media plans and managing screen time to avoid excess use and offset potential consequences (Madigan et al., 2019).

A Family Media Use plan is an interactive tool developed by the American Academy of Pediatrics (AAP) that includes a media time calculator so parents or guardians can monitor the amount of time each child is spending on media use. A similar tool to the Family Media Use plan is the Family Assessment of Screen Time or FAST, developed by psychologists to compare the amount of time each family member spends using screens. Family members can use this to gauge their own feelings and each other's feelings about screen-time. Both the AAP and the World Health Organization (WHO) have come out with the recommendation that children have no screen-time exposure before 18 to 24 months of age (with the exception of video chatting) and children aged 2 to 5 should have an hour or less of screen time per day and solo screen-time should be avoided. Setting an example for less media usage in the home is important, as children at this age learn certain behaviors from observation of parents or older siblings (WHO, AAP).

Some parents may have the belief that children aged 2 and younger can learn from educational children's television shows, however television viewing consistently fails to teach kids aged 2 and under as well as live interaction does in terms of simple imitation, language, and emotional learning (Anderson & Pempek, 2005). This is because children younger than 2 years old require hands-on exploration and real social interaction with caregivers to develop their cognitive, language, motor, and social skills (Hill et al., 2016). They have trouble transferring knowledge from digital media to their three-dimensional experience because of their immature symbolic, memory, and attentional skills. In order to facilitate learning from televisions and media, caregivers must watch with them and reteach the content (Hill et al., 2016). Despite this, television programs and home-videos are increasingly produced for young children and more children are watching them compared to past decades (Anderson & Pempek, 2005). Due to this research, I recommend that parents and guardians do not fully rely on educational TV and media over live interaction for their children's learning at this stage.

In the effort to obtain more helpful information, the National Institutes of Health began funding the Adolescent Brain Cognitive Development (ABCD) study in 2015. This is the largest ever longitudinal study on teen brain and behavioral development in the United States. The study has recruited more than 10,000 9- and 10-year-olds who are being followed into adulthood. Among the information being collected is screen-time data, and the first wave of ABCD data is already being used in studies on cognitive function, sleep disturbance, youth BMI, ADHD vulnerability and many more. One such study uses ABCD data to show that screen media use is related to subcortical structures, decrease resting state connectivity in the brain, and is correlated with mental health problems in early adolescence (He et al., 2023). In the meantime, I

recommend that parents continue to co-view children's media and keep an open line of communication about media for their child's protection. This includes being present to answer questions presented in certain media, preventing overuse of screentime for children below the age recommendation and young child exposure to inappropriate media.

### **Positive educational games and internet uses for kids**

Media and technology now have an unavoidable role in the lives of infants and young children. Not all media and internet use are harmful to child development; in fact, there are many programs and educational tools online that are designed for promoting learning, language, and other cognitive functions. For example, the interactivity of touch screen devices we enjoy today enables applications to identify when a child responds accurately and tailor its responses – supporting children at their level of competence (Hill et al., 2016). This section will go over more supportive technological innovations like this and other programs that have been proven through research to foster healthy brain development in children of the appropriate age.

One effective use of screens for children is live video-chatting with a responsive adult, such as facilitating social connection with distant relatives. Starting at 24 months of age, children have the ability to learn words over video-chat and interactive touchscreen interfaces that scaffold the child to choose the relevant answers (Hill et al., 2016). For older children (3 to 5 years), there are many well-designed television programs that improve cognition, literacy, and social outcomes – such as Sesame Street. Additionally, applications from Sesame Workshop and the Public Broadcasting Service (PBS) are effective in teaching literacy skills, math, and other social readiness skills to preschoolers (Hill et al., 2016).



Other applications, however, even when listed under the “educational” category in the app store, do not have the same efficacy and use little input from developmental specialists or educators. Parents must be mindful when selecting which educational television programs and apps they use for their children's education. They should avoid apps that include fast-paced programs, distracting content, or violent content. Resources for parents searching for quality apps and programs can be found through PBS kids, Common Sense Media, or Sesame Workshop, which are approved and recommended by the American Academy of Pediatrics.

Besides television and apps, game-based learning is also being investigated to determine any benefits to learning, because Generation Alpha generally seeks personalized and interactive education delivered through technology. Educational games allow players to be more autonomous, think critically, make decisions, and take appropriate actions. Game-based learning can also conform to the habits and interests of Gen Alpha. A study examining game-based learning for natural sciences in younger students found that there was an increase in scores from pre-test to post-test corresponding to the use of digital games (Koceski & Koceska, 2022). They also discovered the use of educational games increased the student's learning motivation and interest in the subject related to the game. The educational games included in this study were from the EDUINO collective platform and a game titled “Knowledge Hunter” for learning natural science (Koceski & Koceska, 2022).

Despite the benefits certain technological applications can have on child learning and development, I must stress that higher-order thinking skills and executive functions essential for school success, such as task persistence, impulse control, emotion regulation, and creative

thinking are best taught through unstructured and social play, as well as responsive parent–child interactions. Picture books are preferable to television and touchscreen devices for learning because they involve face to face social interaction between child and guardian and real time feedback for child learning (Hill et al., 2016).

## ***Conclusion***

Generation Alpha certainly has a bright future ahead as the first generation of digital natives. Advancements in technology in all areas of industry and education are occurring rapidly, and Gen Alpha has the potential to take us further. The oldest members of Generation Alpha would only be 13 years old as of now, so future research should include longitudinal studies. These are studies which span years and can conclude important, long-term findings for reading vs. screening on child development, since I have already researched and discussed the short-term benefits and detriments of both in this thesis. The purpose of this thesis was not to critique or chastise Gen Alpha or their guardians; no one can help that the environment is changing. The purpose is to convey the importance of reading for early brain development and to highlight a recent trend that may be cause for concern: that the amount of time that children today spend online is increasing while time spent reading during these critical developmental points is decreasing. It is my hope that this compilation of recent research has made clear the many benefits of reading during development on language, intelligence, empathy, social skills, and other cognitive functions. Adversely, I hoped to point out the potential detriments of excessive screen-time like developmental delays, attention span deficits, gaming disorder, etc. In order to provide parents and guardians with the knowledge and methods necessary to promote healthy development of Generation Alpha.

Due to the noticeable decline in child reading level, discussed prior in this thesis, the National Council on Teacher Quality is already proposing 5 policy changes to improve elementary student reading outcomes. These policies focus on preparing effective teachers

and improving child reading in schools. The policies include: Setting detailed reading standards for teacher prep programs, reviewing teacher prep programs, adopting a strong elementary reading licensure test, requiring districts to select high quality reading curriculums, and providing professional learning and support for teachers to sustain this implementation. While these policies are necessary and would likely be effective, I believe better reading practices begin at home and, as I have outlined in this thesis, ludic reading has numerous benefits to development that should not be supplemented for negative screen time.

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