A Thematic Analysis of Gender Stereotypes in Children's Top Mobile Applications of 2018

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ABSTRACT

People around the globe rely on their mobile devices for instant access to entertainment and social media. Children comprise a large majority of individuals who use smartphone applications, particularly for gaming and learning opportunities. Understandably, these apps become part of the identity development process, including the formation of one's gender identity. App developers include gendered content to capture and maintain children's attention, but much of the existing research examines children in late childhood and early adolescence, leaving the ages of six to eight relatively undiscussed. The researcher utilized a thematic analysis to review 20 children's mobile applications for instances of gender stereotypes. Social cognitive theory offers a guiding principle for understanding the process of developing one's gender identity, as well as the role that external stimuli, such as digital media examples and parent models, play. This study aimed to determine whether mobile applications targeting the identified age group use gender stereotypes, as well as how they employ these stereotypes within the application. The researcher randomly selected 20 top children's applications on the Apple App Store and examined them for gendered instances, such as occupations and interests as well as character depictions. The results reflect that instances of gender stereotypes do occur in the children's mobile applications. Many of the applications portrayed feminine stereotypes surrounding nurturing and caregiving tasks ("Mommy in Training"), making it one of the most frequently exploited feminine stereotypes in the sample. The "Boys will be Boys" stereotype comprised the most frequently displayed masculine stereotypes across the studied applications. These findings represent the idea that society places higher value on these stereotypes than others, such as social relationships ("The Power of Motivational Friendship") or recklessness ("The Risk Taker"). Implications include modeling of traditionally masculine and feminine stereotypes for young users by utilizing popular characters recognizable by most children in the target age range.

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GENERAL AUDIENCE ABSTRACT

Handheld electronic devices, such as smartphones and tablets, encompass some of the most widely used electronic devices in today's society. Most families in America have at least one mobile device with internet capability. Apple, the manufacturer of perhaps the most popular brand of electronic devices, pre-install their App Store on all devices they sell, giving users instant access to hundreds of thousands of different mobile applications that offer functions to make every aspect of life simpler. Young children spend a significant amount of their time playing games on these devices, although the American Academy of Pediatrics (2017) recommends that parents limit their children's daily screen time to no more than 2 hours, depending on the age of the child. The games that children download and play impose a number of different messages and stereotypes on their users, including gender stereotypes. Due to the substantial time children dedicate to these apps, the messages communicated regarding gender play crucial roles in the development of their gender identity. Social cognitive theory offers valuable insight and guidance into the gender identity development process. Therefore, the present study examines the gender stereotypes conveyed within 20 of the top children's mobile applications available on the Apple App Store in April 2018. The researcher randomly selected 20 children's applications, 10 each from the Top Free and Top Paid categories and examined them for gendered instances, such as occupations and interests as well as character depictions. The results reflect that instances of gender stereotypes do occur in the children's mobile applications. These represent the idea that society places higher value on certain stereotypes, like being caring and nurturing ("Mommy in Training") or engaging in messy, adventurous play ("Boys will be Boys"), than others, such as social relationships ("The Power of Motivational Friendship") or recklessness ("The Risk Taker"). Implications include modeling of traditionally masculine and feminine stereotypes for young users by utilizing popular characters recognizable by most children in the target age range.

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Introduction

A vital developmental milestone during early childhood centers on the learning and processing of gender roles and stereotypes (Halim et al., 2018; Bigler & Liben, 2007; Fagot & Leinbach, 1989). The models that shape this growth come from the environment and interactions that children experience, including family members, peers, and media characters (Halim et al., 2018; Fagot & Leinbach, 1989). Children interact with these models in a number of different ways, including observation of parental and sibling demonstrations and exposure to media characters through video games, television shows, and movies (Golden & Jacoby, 2018). From these interactions, children can begin to build an understanding of gender roles. Although the American Academy of Pediatrics [AAP] (2017) acknowledges that digital media offers both positive and negative impacts on children's development, it encourages parents to find a balance for their children that allows them to reap the potential benefits of media while limiting their screen time to reduce overstimulation. The various electronic device manufacturers assist parents in balancing their children's media exposure by offering a customizable user experience. The Apple App Store, where the selected apps for this study can be found, includes a growing number of applications that target various age groups.

The Apple App Store first launched in 2008, with roughly 600 apps available for download (Federal Trade Commission [FTC], 2012). Since its inception, the App Store has grown each year, with the current number of available applications in the millions, demonstrating its popularity with users. In July 2017, the Apple App Store had 2.3 million applications available for download (Clement, 2020). Of this number, games comprised 783,000 (Clement, 2020). Children likely play apps they can download for free, as the Apple App Store paid versus free app distribution demonstrates that 90.4% of the available apps are free and only

9.6% require purchase (Statista, 2020). No specific breakdown of application availability across mobile device manufacturer app stores exists, but the majority of applications, and certainly the top apps like Netflix, Hulu, Facebook, Twitter, can be downloaded on all of the different platforms. What can be said is that while most developers remain loyal to one app store, many do publish in both the Apple App Store and the Google Play Store; 58,000 app developers released apps in both of the top stores as of July 2014, the most recent breakdown available (Ariel, 2014). The availability of apps depends on the developers themselves, as they must pay subscription fees to the store owners (Osadchiy, n.d.). Many of the top media companies, like Disney, PBS Kids, and Nickelodeon, develop children's applications using their own characters; they either produce their own apps, like Disney does, or they outsource their development, like PBS Kids (Barba, 2016). Other top app developers include Toca Boca, Sago Sago, and TinyBop (Barba, 2016). Some apps allow you to create your own avatars, while others permit you to choose from a selection of characters to represent your profile; for example, Facebook allows for users to create avatars, while Netflix offers a variety of popular characters to choose from (Lee, 2020; Welch, 2018). Both the Google Play Store and the Apple App Store offer users a rich database to browse and download apps from to address specific interests, like entertainment, productivity, or education.

Parents, skeptical of allowing their children to spend too much time on electronic devices, often limit their children's use unless it focuses on educational purposes. App developers seized this opportunity to gain more downloads and users, creating additional apps under the guise of education and learning. However, developers do not operate with the same definition of education, so content deemed as learning often varies in quality and quantity from application to application. Additionally, app developers do not simply create gaming or

educational applications; in fact, the top developers have roles in building business, productivity, gaming, and educational apps, among others (GoodFirms, 2020). A child can easily convince their parents that a game they want to play bears educational aspects simply by showing them the title and icon of the application. The information presented within these programs receives no regulation for accuracy or safety, leaving the determination up to parents to decide whether the game presents factual, helpful lessons.

Regardless of the purpose of the content children access on electronic devices, the American Academy of Pediatrics [AAP] (2017) recommends that parents restrict children's screen time due to the associated risks, including the effects on mental, physical, and emotional health. The current recommendations for screen time assert that children under the age of 2 should have no screen time, and children over 2 should have no more than 1-2 hours per day (Kaneshiro, 2019). These recommendations stem from the finding that children who consume more than 1 hour per day of screen time experience lower rates of "psychological well-being, including less curiosity, lower self-control, more distractibility, more difficulty making friends, less emotional stability, being more difficult to care for, and inability to finish tasks" (Twenge & Campbell, 2018, p. 271). Exceeding the recommended hours of screen time contributes to the occurrence of these problems, yet children regularly surpass these suggestions. Children ages 6 to 8 spent an average of approximately 2.6 hours per day of total screen time, with an average of 1.2 of those hours spent using electronic devices (Twenge & Campbell, 2018). Higher levels of screen time also correlate with increased rates of anxiety and depression in older children and adolescents as well as less ability to self-regulate their emotions (Twenge & Campbell, 2018).

Despite these recommendations and data, many children continue to gain their social interactions from electronic devices (Arnott, 2016), and they learn about different aspects of life

from the media content with which they interact (Chiong & Shuler, 2010). Mobile applications convey valuable information that shapes aspects of the user's life and identity (Chiong & Shuler, 2010). Similarly, children whose understanding of gender roles and stereotypes stems solely from the exaggerated depictions in media may be more likely to limit their interests to those presented within this input and societal expectations (Ter Bogt et al., 2010; Coyne et al., 2014). Different age groups require different models and stimuli; therefore, it is important to recognize the age groups and the ages they encompass as defined by experts on child development and health.

The Centers for Disease Control and Prevention [CDC] (2020) categorizes the childhood years into different age groups, beginning with infancy and extending into adolescence. They define infancy as birth to 1 year, toddlerhood as years 1-3, preschool-age as 3-5, middle childhood as 6-11, young adolescence as ages 12-14, and adolescence as ages 15-17 (CDC, 2020). Middle childhood, the targeted age group for the present study, includes a number of developmental milestones that must be achieved before moving to the next stage. Some of these changes include developing a sense of independence from their families, becoming more socially aware and desiring to be accepted by their peers, and understanding their identity and place within society (CDC, 2020). During middle childhood, gender identities begin to develop, and this process looks differently for boys and girls (Farr, Bruun, Doss, & Patterson, 2017). Boys describe themselves using generally masculine traits, often distancing themselves from characteristics that may be seen as feminine by society (Morelli, 2020). Comparatively, girls utilize androgynous descriptions of themselves, employing both feminine and masculine attributes (Morelli, 2020). For these reasons, the type and intensity of gender stereotypes that

media exposes children to during middle childhood carry heavy implications for the identities they convey throughout the rest of their lives.

These mobile applications have the potential to be more influential on children because of their interactive nature (Radesky, 2015). The implications of this exposure in regard to social cognitive theory include that through this interaction, children gain a narrow perspective and experience with gender stereotypes (Boyse, 2010). If they spend too much time with a particular character or application, children may begin to identify with these experiences alone and utilize only them to develop their identity (Boyse, 2010). Children spend significant amounts of time on their cell phones and other mobile electronic devices, on average between four and eight hours a day (Welch, 2018); they become engrained in the games they play. Therefore, children may limit their understanding of themselves to the stereotypes portrayed within these media applications, especially if they do not interact with other models outside of their screen time. For example, if a child spends most of their time playing with Barbie, their gender identity develops using the narrow depictions and stereotypes that Barbie represents and portrays as the foundation. This ignores the plethora of examples surrounding them on a daily basis from their parents, siblings, and other experiences. While these media depictions certainly may have positive impacts on gender development, it can also have a largely negative effect due to the fact that many of the stereotypes in the media center on exaggerated illustrations of gender, failing to represent the possibilities available in gender exploration.

While past research on gender stereotypes demonstrates the prevalence within media, the available data highlights television and other forms of visual media. However, due to the relative novelty of mobile applications, this form of media remains largely understudied. The literature that does exist centers on children ages twelve and up, leaving middle childhood (from ages six

to eight), even less understood, warranting examination of gender stereotypes presented in the available mobile applications that target this age range. Therefore, this study addresses this gap in literature and attempts to emphasize the messages that these programs communicate to users. Many applications may weave their gendered content into the entertainment components in such a way that their users may not be consciously aware of what they consume. To address these concerns, this study analyzes 20 of the top children's mobile applications available on the Apple App Store in April 2018 to document whether these games contain gendered instances and stereotypes.

Literature Review

The following section highlights the existing research surrounding social cognitive theory, child development, gender identification, and gender stereotypes. I selected the ages of six to eight as the target age range for the study for a number of significant reasons. For instance, the Apple App Store had a dedicated section for this age range that enabled me to ensure that the apps remained focused on one set of ages. Additionally, these ages experience gender constancy, an important task of child development. Finally, this age group remains understudied in regard to the effects of media and screen time. The existing research discussed in this section demonstrates the limited literature that exists that I hoped to expand with the results of my study.

Theoretical Framework

This study utilizes social cognitive theory to better understand the cognitive processes of young children and how gender development forms. Addressing the overall structure and function of social cognitive theory and how past research applied the theory in relation to media and gender serves a critical role in the current study. Social cognitive theory relies on external factors, such as media, and how this world influences a child's learning. The concepts of symbolic modeling and observational learning serve as a guiding force for the study, as the applications used require children to witness familiar characters engaging in gendered activities. Social cognitive theory asserts that observing behaviors and the consequences of these behaviors provides individuals the necessary environmental input to learn about appropriate and inappropriate behaviors. Thus, the selected applications allow children to opportunity to learn about gender stereotypes by interacting with characters whose only roles in the applications are to engage in gendered activities. Social cognitive theory stands as an extension of social learning

theory (SLT), making it imperative to first discuss the background and important constructs of SLT.

Social Learning Theory

Albert Bandura conducted the "Bobo doll" experiment from 1961 to 1963 (Bandura, 1977). This experiment analyzed how young children interacted with a blow-up doll after observing models interact with the same doll in various ways, contributing to the formation of social learning theory (Bandura, 1977). The children viewed multiple conditions of behavioral engagement with the Bobo doll, such as aggression and gentleness, observing models interact with the doll (Bandura, 1977). The models acted out either aggressive or nurturing/playful behavior, or they ignored the doll (Bandura, 1977). Afterwards, the children played with the doll (Bandura, 1977). An overwhelming number of children mimicked the behavior of the model, implying the children learned this behavior through observation (Bandura, 1977). The children deduced the possible consequences from the present situation (Bandura, 1986).

Throughout 1961 and 1963, Bandura manipulated the variants to include gender and different behaviors. However, SLT's main findings suggest that individuals gain and understand behaviors by observing and copying others. SLT argues that people learn through direct instruction and observation of models in multiple contexts. The theory also proposes that whether individuals mimic those behaviors relies on the perceived rewards or consequences associated with the behavior (Bandura, 1986). SLT eventually expanded into social cognitive theory, which incorporates previous behavioral theories that relied on reinforcement of behaviors instead of cognitive processes (Bandura, 1986).

Key concepts. Social learning theory contains five main takeaways. First, it accepts learning as a cognitive process occurring in a social context, not strictly a behavioral factor, also

referred to as social learning (Bandura, 1986). Next, it acknowledges that learning may occur through observation of behavior and the rewards and punishments associated with that behavior, or vicarious reinforcement (Bandura, 1986). Third, it asserts that learning does not require a new behavioral change to occur (Bandura, 1986). Learning happens through observation, gathering information from the observation, and making decisions based on the information. Together, these steps form observational learning. While reinforcement adds to the learning process, it does not serve as the only factor in learning a new behavior. For example, it is possible for an individual to learn what not to do as well. An individual may learn from consequences that resulted from unaccepted behavior. The fourth takeaway, repetition, plays an important role in learning a new behavior; individuals must repeat behaviors a number of times to solidify them as habits (Bouton, 2014). An individual must engage in the behavior and experience the rewards or consequences as part of the process. It is important to note that simply learning a new behavior does not replace or extinguish an old behavior (Bouton, 2014). Finally, reciprocal determinism describes that the individual, their environment, and their behaviors all interact and influence each other (Bandura, 1986). Social learning theory became social cognitive theory in 1986, retaining the discoveries and assertions presented in social learning theory (Bandura, 1986).

Social Cognitive Theory

Several studies use social cognitive theory as a theoretical lens (Bandura, 2001a; Bussey & Bandura, 1999; Schunk & DiBenedetto, 2020). Social cognitive theory, SCT, represents an inclusive approach that attempts to understand and explain the development of human behavior (Bandura, 1986). Much of the work done with SCT comes from Albert Bandura himself, the father of SCT; many others adopted his ideas and concepts, expanding them for use in various settings. Deriving from SLT, SCT explores the relationships between cognitive functions such as

attention, retention, production, and motivation (Bandura, 2001a; Bandura, 2001b). Bandura believed researchers could analyze these observations to explain how an individual learns from social experiences (Bandura, 2001a; Eyal & Rubin, 2003). This may include direct or indirect experiences such as observations.

Since its inception, SCT has been widely applied in the fields of psychology, business, and communication. Designed to understand behavior, the theory argues that individuals learn from directly and indirectly observing others' behaviors and the consequences associated with those behaviors. When applied, this construct explains the effects that internal and external factors such as environmental and social influences (media exposure) have on an individual's behavioral changes (Bandura, 1986). This model determines three factors responsible for changes: behavioral, personal, and environmental (Bandura, 1986). Behavior refers to the actions an individual takes, personal factors including elements connected to the person, and the environment indicates all factors outside of the individual, such as the reactions of others (Bandura, 1986). The behaviors or actions an individual makes influences the environment, while the environment simultaneously influences the action (Bandura, 1989). Personal factors consist of an individual's attributes affiliated with the individual, such as roles, social standing, and emotional and physical characteristics (Bandura, 1986). These personal factors make the situation unique for each individual. Environmental factors bear the responsibility for external elements such as interactions with others and media exposure. Additionally, SCT addresses the intake of an individual's knowledge by observing others during social interactions, personal experiences, and outside media messages (Bandura, 1989). The influence of the environment develops the individual's internal feelings and impacts their behavior (Bandura, 1986). SCT hypothesizes that a triadic relationship with behavioral, environmental, and personal factors in

turn determines an individual's behavior (Bandura, 1989). These bidirectional relationships therefore influence each other while also influencing the others (Bandura, 1989). The outcome of these bidirectional relationships are the resulting actions.

Key Concepts.

Social Learning. Social learning happens both intentionally and unintentionally from models within a person's environment. Humans learn directly from observing parents and through personal experiences (Bandura, 2001a). However, they also learn from modeling other factors in life, such as characters on their favorite television show (Bandura, 2001a).

***Observational Learning*.** Observational learning provides individuals with the opportunities to watch a situation and then process the information (Bandura, 2001a). The individual experiences the events that occurred and translates the outcomes (Bandura, 2001a). They then observe the rewards and consequences of the social interaction and take away meaning (Bandura, 2001a). Here, the observer may assign importance to the situation and therefore store the processed information for a later time. Observational learning allows the individual to analyze a situation, weigh the costs and benefits, and then choose whether or not to repeat the behavior (Bandura, 2001a; Moyer-Gusé, 2008). The observer then uses the model to mold and even redefine their epistemological beliefs (Bandura, 1986).

***Human agency*.** Social cognitive theory focuses on external factors and accounts for the concept of human agency (Bandura, 2001b). Not just products of their environment, people act as agents that experience the events that occur (Bandura, 2001b). People use their cognitive processes to reach goals that create meaning and satisfaction in their lives. Human agency refers to the awareness that the individual themselves engage in this behavior and recognizes individuals as self-regulating, self-developing, self-reflective, and proactive (Bandura, 2001b).

Four main components comprise the elements of intentionality, forethought, self-reactiveness, and self-reflectiveness.

First, a person's decision to participate in a behavior defines intentionality. Bandura (2001b) states that "agency refers to acts done intentionally," insinuating that some cognitive process or degree of planning occurs before participation (p. 6). The notion of planning agency allows for the actor to understand and produce different outcomes, or the consequences of the act (Bandura, 2001b). One must acknowledge that a person cannot account for every possible detail or outcome. However, in order to keep moving forward, a person must choose a directed intention (Bandura, 1991; Bandura, 2001b). Intention can also include a group collaboration on shared intention in which they rely on each other to complete a plan (Bandura, 2001b). For example, if a young boy wanted to join a basketball team, he would need to make the decision to practice and train. This goal could also be used for group collaboration. If the same young boy asked his friends to train and practice together, they would be working to hold each other accountable. The group now relies on the others to practice.

Second, forethought refers to an individual's ability to predict and anticipate possible future outcomes of potential actions (Bandura, 2001b). This forethought allows for an individual to look forward and create a plan of action in order to achieve the desired outcomes while also permitting the individual to avoid any unwanted consequences (Bandura, 2001b). Forethought provides direction and creates meaning in a person's life. Individuals can anticipate certain consequences by observing their environment; thus, the ability to use these consequences to make current decisions demonstrates foresightful behavior (Bandura, 2001b). Furthering the example above, the next step would be for the boys to create a fitness plan to help them reach their goal of joining a team. This plan may be as simple as training to complete a mile in eight

minutes. They may also include a plan to perfect their shooting technique to allow them to maximize possible points when playing. This plan helps the boys avoid going to try out for the team and not knowing the proper technique to shoot the ball.

Third, self-regulation means being able to appropriately carry out behaviors requiring a level of self-control (Bandura, 1986). Self-regulation has a set of self-referent subcategories of self-monitoring, performance self-guidance via personal standards, and corrective self-reactions (Bandura, 1986). In order to be successful, the boys need to form a consistent routine where they actively practice and push themselves. This step of self-regulation requires holding themselves accountable for their training. This self-control could be practiced by not skipping a run to watch television.

Finally, self-reflectiveness occurs when a person attains the capability of examining the behavior and consequences, which involves evaluation of motivation and values (Bandura, 2001b). In self-reflectiveness, people evaluate their motivation to attain goals, which also refers to independent improvement and development (Bandura, 2001b). By keeping a detailed log of their physical improvements, the boys can reflect back on their goals. When reviewing their progress, they may feel motivated to continue practicing.

Self-efficacy. Researchers state that self-efficacy serves as the key mechanism of human agency (Bandura, 2006). A high enough level of self-efficacy must occur, as it determines the degree of a person's confidence. Bandura (2006) argues that individuals avoid tasks or goals that they believe to be too complex to complete correctly. Social cognitive theory states that learning from observing most likely happens if identification between the observer and the model takes place (Bandura, 2006). When an individual identifies with the model (gender, sex, race, etc.),

they more often mimic the model because they can connect and find similarities (Bandura, 1988).

Human capability. Social cognitive theory's foundational argument maintains that humans learn from modeling observed behaviors and their perceived consequences (Bandura, 2001a). SCT identifies four human capabilities, including symbolizing capability, self-regulating capability, self-reflective capability, and vicarious capability (Bandura, 2001b). First, symbolizing capability allows people to understand their environment and then encode the environmental events. Symbols allow individuals to assign meaning to experiences, thus allowing them to conceptualize possible experiences and test them through rational cognitive processes. A person's cognitive process controls what environmental factors they observe, and the meaning assigned to them (Bandura, 2001a). Symbols take an experience and form it into a cognitive model to call upon for future judgement (Bandura, 2001a).

Self-regulation capability occurs when an individual evaluates their behavior by making adjustments based on possible anticipated outcomes and how that behavior aligns with social standards (Bandura, 2001b). Self-regulation therefore refers to people as being self-directors, causing self-satisfaction, which they obtain from "fulfilling valued standards and discontent with substandard performances serve as incentive motivators" (Bandura, 2001a, p. 267). A person produces motivation from evaluating their own behavior. Self-regulation not only comes from negative feedback, but also from creating personal goals and working to fulfill them.

Third, self-reflective capability arises from the capacity to reflect upon one's self and the quality of thoughts and actions (Bandura, 2001b). Self-reflective capability means people have to examine themselves as well. People evaluate their own thoughts and actions and then form judgements based on the perceived consequences (Bandura, 2001b).

Finally, vicarious capability happens when an individual learns from observing others and their actions plus the perceived consequences (Bandura, 2001a). Vicarious learning eliminates the need for trial and error, enhanced by binging on mass media that creates a captivating symbolic environment (Bandura, 2001a). Vicarious capability allows for the emergence of culture tendencies and patterns, permitting advanced cognitive processes for observational learning that enables humans to increase information intake and perfect skills (Bandura, 2001a). These capabilities also make it possible for humans to learn from observing others' experiences (Bandura, 2001a).

Modeling. A key element in social cognitive theory, modeling takes more than one form. SCT identifies three different modeling behaviors; the first, life models, refers to those individuals enacting the observable behavior (Bandura, 1972). An example of life models stems from watching a parent exchange money for goods or services, perhaps the most natural of the three types. The second form of modeling, verbal instruction, occurs when someone shares the behavior with properly detailed instruction so an individual may mimic the behavior (Bandura, 1972; Bandura, 2001a). This model is like a step-by-step handbook to the behavior. An example of instruction modeling would be when a teacher stands in front of the classroom and explains a craft by each step. For instance, the teacher may say, "Fold the paper hamburger style, like this," providing the student with verbal cues and the opportunity to watch. The third form of modeling is symbolic modeling. A symbolic model is a fictional character or a real person who demonstrates behaviors in media such as television or games (Bandura, 1972). Individuals are capable of learning behavior from these symbolic models by observing their behaviors and then decoding them. An example of indirect observation comes from modeling the media; for instance, a character from a television show. A single model can send several messages to

numerous people at the same time through one action, as Person ‘A’ may perceive the action differently than Person ‘B.’ Vicarious experiences influence a person's reality, meaning they do not have to directly encounter it in order to learn from the action. The consequences have no negative impact, but individuals can still process the feedback and apply it to future judgements (Bandura, 2001a). Symbolic modeling allows an individual to assign meaning to external agents; for example, a character from a television show. A child watching *Dora the Explorer* may see Dora as a symbol of a girl’s leadership and sense of adventure. They then decode Dora as a symbolic model for approved adventurous behavior in females. Symbolic modeling includes both positive and negative representations. When referencing gender role development and stereotypes perpetuated in media, individuals may notice that men less frequently assume roles as teachers or nurses. This instills the negative perception that these roles remain strictly feminine (Bandura, Ross, & Ross, 1963; Schunk & DiBenedetto, 2020). Holmes and Johnson (2009) argue that these representations serve as a blueprint or guide to fulfilling these roles or behaviors. Additionally, Holmes and Johnson (2009) suggest that these symbolic models influence the perceptions of roles and what society deems acceptable. From these examples, individuals can decode behavior and begin to understand acceptable and unacceptable actions by analyzing rewards and repercussions (Bandura, 1999). Finally, individuals may turn to media messages for understanding how they themselves should behave within their gender roles.

Individuals observe modeling directly or indirectly. Direct and indirect observation both include four parts: attention, retention, production, and motivational processes (Bandura, 1986; Bandura, 2001a). In order for learning to be successful, those four parts must be met. Attention refers to when people give selective or additional thought to specific social behaviors (Bandura, 1986; Bandura, 2001a). For example, if Katie wanted to wear makeup, she may focus on her

older sister who wears makeup. Retention occurs when people adjust the observation and rewards/punishments into a simplified symbol that the individual can easily access to mimic the observation (Bandura, 1986; Bandura, 2001a). Once Katie has watched her sister enough times, she will need to retain or remember the behavior. At this point, retention has been met. Production requires the stored symbol or information to be properly reproduced into an action (Bandura, 1986; Bandura, 2001a). In order to meet production, Katie will need to put on her own makeup. This is Katie performing the behavior herself. Katie has now committed this to memory. Positive and negative feedback account and allow for adjusted behavior in the future (Bandura, 1986; Bandura, 2001a). Finally, the motivational process necessitates an individual to apply any feedback they personally receive while enacting a behavior and then repeat the adjusted behavior, enabling a script to occur (Bandura, 1986; Bandura, 2001a). If Katie saw her sister get picked on by someone else for her makeup, this may impact Katie's motivation to mimic the behavior. However, if Katie sees her sister being praised for wearing makeup, she may feel more motivated to repeat the behavior in the future.

SCT and Media

Social cognitive theory as a mass communication theory considers the important role that media plays in society (Bandura, 2001a). Bandura (2001a) focuses on how the media distributes information about behaviors and consequences. Researchers analyze media as symbolic communication because the messages can be interpreted in many different ways by a wide variety of people. Mass media influences several social norms, including gender identity (Calvert, 2001). Bandura (2001a) suggests that SCT theory sets a framework in order to explain things such as human thought, affect, and action. Social verification creates distorted views of reality if shared beliefs of the reference group that an individual associates with differ and the

group isolates from social cues (Bandura, 1982). The media construes messages in multiple ways, and no one group of people shares the exact same thought when exposed to a particular message. Individuals spend a considerable amount of time incorporating a symbolic environment through which they develop information about their internal processes such as values, beliefs and behavioral patterns due to the illusionary environment of the mass media (Bandura, 2001a).

Motivation

Motivation lies within relationships in SCT. Specifically, children may feel motivated to reflect media characters. This motivation carries over from childhood to adolescence. Children identify with these media characters easily, especially if they already share some characteristics like gender (Hoffner & Buchanan, 2005; Schunk & DiBenedetto, 2020). Children may experience more motivation by media characters if their behavior repeatedly receives rewards. For example, while a child plays a game, if the character earns points or prizes for preparing dinner, they may see this rewarded behavior and use the positive implications in real life. This implies motivation and symbolic modeling from indirect observation of behavior. Social cognitive theory focuses heavily on observational learning from models. Children often rely on media messages when forming gender identities and other behaviors. As smart devices and applications become more prevalent in society, knowing what model examples exist in mobile games serves a crucial role. Previous research showed that children's media included both traditional and hyper stereotypes and traits for femininity and masculinity. Thus, the research questions for the current study attempt to determine whether the new platform offers new information, stereotypes, and presentations, or whether they continue to perpetuate the existing stereotypes seen throughout history. With this theory foundation established, a discussion of the existing literature surrounding child development will provide the basis for understanding the

processes involved in cognitive and social development and gender identity formation and why technology so easily influences these stages.

Influences on Childhood Development

The most critical periods of development occur during childhood. Several factors in an individual's life, such as environmental considerations and learning, influence development. Playtime serves an important role in a child's psychological and cognitive development because it leads to creativity, social skills, and brain stimulation as children inherently learn about the world around them (Scheu & Xu, 2012). Although human behavior remains complex and multifaceted and must be considered when analyzing children's development, media exposure also must be acknowledged as a crucial factor (Kirsh, 2009). Parents, socioeconomic status, mental health, and media exposure work together to influence children through the messages they deliver, and media messages have a larger impact on children than adults (Sester & Green, 2010; Konigsberg, 2000). Konigsberg (2000) suggests that media provides children with the opportunity to let go of anxiety or experience new emotions, providing a platform for self-projection on characters, meaning they can learn from the characters' experiences rather than having to learn firsthand (Sestir & Green, 2010). This self-projection helps children understand actions and feelings without having to do something incorrectly or feel embarrassed. Media, such as film, can give children a significant figure to identify with (Sestir & Green, 2010; Konigsberg, 2000). Research suggests that media creates a new fantasy experience for children and allows for the displacement of feelings on fictional characters and places (Sestir & Green, 2010; McIlwraith, 1981). This expands the idea of a fantasy that children can internalize and learn from media.

Media Devices and Mobile Apps

The Federal Trade Commission [FTC] (2017) states that smart devices such as tablets, iPhones, and smartphones offer applications (apps), programs installed to devices that permit various usages. Users download applications from app stores that typically come pre-loaded on their devices. The leading stores for downloading mobile apps include Apple, Google Play, and Amazon (Statista, 2016). App providers saw a drastic growth in app downloads in recent years, with users downloading 35.7 billion apps from the Apple and Google Play stores alone in 2016 (Statista, 2016). When downloaded, apps remain on the device until deleted by the user, allowing the user to frequently and repeatedly utilize them (Federal Trade Commission [FTC], 2017). Developers in the smart device community identified a need for child-friendly content for all stages of childhood that properly caters to their developmental needs (Nielsen, 2012). App stores, particularly Apple, categorize games by age group to target children in the recommended demographic.

With more than 3,000,000 apps available in 2017, thousands of these apps target children ("Number of Apps Available," 2017). The analysis of these applications' content serves a vital role in identifying and categorizing applications for specific gender cues and stereotypes and how they portray these messages to children. In 2017, the conversation persists, as app developers continue to create new apps specifically for children. The AAP (2013) stresses that both the benefits and consequences of this new screen-based media remain heavily unknown and require further research in all areas. It is important to understand that when used strategically, media and technology hold the potential to complement learning and add to imagination development, physical activity, socialization, and conversation (NAEYC, 2012).

Media Exposure Limits and Screen Time

The AAP created an online family media plan that lists basic suggestions for children's digital media use based on age (Korioth, 2016). A 2016 report states that children younger than 18 months should not be exposed to screen media, except video chatting, due to possible overstimulation, which may lead to distraction and irregular sleep patterns (AAP, 2017). The same report asserts that children between the ages of two and five should be restricted to one hour of digital media use per day (AAP, 2017). Introducing children to screens at this age holds developmental benefits when the children observe quality programs such as "Sesame Street." Finally, children six and older should have limited screen time, as maintaining a productive life schedule bears more importance than entertainment (AAP, 2017). Children thrive on routine that includes opportunities for cognitive, emotional, and social development. A day for a standard child typically includes school, homework, at least one hour of physical activity, social interaction, and a minimum of eight hours of sleep. When children do consume digital media, the advantages arise from their understanding of the messages within the media, not simply the intake (AAP, 2017). Parents need to be proactive in helping their children understand media and utilize it in a meaningful way.

Existing Research on Development and Technology

Many studies analyze toddlers, preschool-aged children, teens, and young adults and their use of technology (DeBell & Chapman, 2003; Livingstone et al., 2005). This focus on younger children and adolescents created a gap, leaving the ages of six to 12 understudied. Digital technology expands on a continuous basis, demonstrating the need for continuous research. Due to the perceived risks associated with digital media, Livingstone and Haddon (2008) push for researchers to focus on children younger than twelve, as they tend to be more vulnerable and

impressionable while lacking maturity, coping strategies, and the ability to fully understand and process media (Livingstone & Haddon, 2008). Therefore, research needs to focus on younger children and how they interact with digital media.

The advancement of technology changes the ways that individuals interact, and the development of social media creates an alternate, virtual environment that shifts an individual's reality. Smartphones serve as a pervasive part of society, and the uses have expanded past calls and texting to include activities such as gaming, media consumption, and personal media creation. Electronic devices such as tablets and smartphones reshape the way children communicate, learn, and develop internal processes (Eder et al., 2016). Tablets come in a series of sizes and different capabilities, depending on the manufacturer. These popular devices, equipped with apps that parents, teachers, and other role models use to communicate with children, can be found in homes and classrooms. As of 2019, an estimated 1.23 billion people used tablets, and 79% of consumers utilize them for entertainment purposes (Ash, 2019). School technology use has expanded as well, with 41 percent of students from kindergarten to second grade having access to laptops or tablets and 58% of third to fifth graders having access to tablets in 2014 (Nagel, 2014).

Researchers explain that learning takes place naturally through experience, observation, context, culture, and activities (Lave, 1988). Mobile technology provides the opportunity of a traveling learning environment, creating anytime communication, processing, and information sharing. Teachers actively utilize technology in the classroom (Lacina, 2008). With the development of computers and mobile technology, researchers define the learning that takes place with these platforms as Mlearning, a cross of mobile technology and here-and-now elearning that extends to communication and learning anywhere and anytime (Martin &

Ertzberger, 2013). Mlearning differs from traditional learning styles, in which individuals physically sit in a learning environment (Martin & Ertzberger, 2013). Martin and Ertzberger (2013) looked at the potential impact mobile learning had on an individual's improvement in achievement and aptitude compared to computer-based instruction. The study placed participants in an instructional design/tech course and categorized them into either iPad/iPod or computer-based groups to learn identical art lessons (Martin & Ertzberger, 2013). Additionally, the researchers analyzed the medium used for mobile-based learning to establish if tablets and iPods affected mobile learning (Martin & Ertzberger, 2013). The results showed participants in the computer-based treatment scored higher than the individuals that used mobile technology (Martin & Ertzberger, 2013).

Many teachers and parents incorporate apps into children's cognitive development. Several apps focus on improving adolescents' literacy and mathematical skills. Henkel (2016) conducted a study to better understand the influence of mobile applications on literary development in children. Literary apps comprise digital artifacts that have their own way of incorporating texts and words (Hayles, 2002). Previous research on children's literature included analyzing the covers, content, format, images and overall materiality (Henkel, 2016). However, researchers suggest that literary apps have their own significance and provide different opportunities for development (Henkel, 2016). Hayles (2002) recognized books as an area that needed further exploration, especially with the introduction of literary apps. Further research suggests that these literary apps for children cannot be considered material like picture books and fail to be seen as an object because they lack physicality (Hayles, 2002; Al-Yaqout & Nikolajeva, 2015). These apps also do not offer users the same affordances that physical books do with a spine, pages, and printed text (Al-Yaqout & Nikolajeva, 2015). Apps can influence

children's learning and understanding of certain topics (Tucker & Johnson, 2016). Literary apps possess specific qualities and lessons but still comprise an area of underdevelopment. Henkel (2016) concluded that app format constructs a far-reaching anomaly with significant impact on children's learning capabilities, and the use of tablets and other smart devices changes the nature in which learning takes place.

Bandura (2001a) acknowledges the advancement in the twenty-first century with new technology and states,

> Whereas previously, modeling influences were largely confined to the behavior patterns exhibited in one's immediate environment, the accelerated growth of video delivery technologies has vastly expanded the range of models to which members of society are exposed day in and day out. (p. 22)

Today, social interactions and the shaping of everyday realities have ties to electronics.

Children's Technology Usage

Children learn from social interactions, observation, and media. They learn from observing their environment and the media, parents, trial-and-error, exploration, and interaction. They also discover new information from novel technology such as smart phones, tablets, and mobile applications. According to Kamenetz (2017), 98% of homes with children have mobile devices, and 42% of children have their own tablets. Furthermore, 49% of children 8 and younger use screens before bedtime on a regular basis (Kamenetz, 2017). Forty-one percent of children in this same age range consume roughly 2.25 hours of screen time on a daily basis (Miller & Kocurek, 2017; Kamenetz, 2017). Younger children were more likely to use the internet to watch video clips than older children (Findahl, 2013). Further research suggests that youth between the ages of five and eight lack understanding of technical and social aspects of the

internet when compared to older individuals (Danovitch, 2019; Yan, 2005). Moving forward, researchers find it important to focus on the use of these technologies by children under twelve (Danovitch, 2019; Livingstone & Haddon, 2008). Experts consider children younger than twelve to be more vulnerable to potential developmental setbacks due to lower maturity levels, fewer coping strategies, and weaker information processing abilities (Danovitch, 2019; Livingstone & Haddon, 2008). Considering all the time children spend with media, researchers need to understand what drives their media usage.

Researchers have also focused on parasocial relationships with characters and familiarity via interactive apps. Parasocial relationships refer to "one-sided relationships" in which one party engages in all of the interaction with the other party, with no reciprocation from the other side (Choi, 2017). A person often relates to celebrities or characters that they observe on media devices, and in the unlikely event that they see these individuals in real-life, they must recognize that despite the closeness they feel with this person, they do not have a real relationship (Choi, 2017). For example, Kobe Bryant's death in January 2020 had ripple effects around the world, with hundreds of thousands of people feeling the impacts of the loss despite never having met Bryant (Rohlin, 2020). Richards and Calvert (2015) analyzed how children may connect with familiar characters on these platforms as well as the trust established in these relationships to understand how young children determine and identify source credibility with a familiar and unfamiliar character (Richards & Calvert, 2015). They hypothesized that children would trust Elmo more widely as the credible character than the "novel" character DoDo (Richards & Calvert, 2015). However, the results showed that children believed the last character who was correct over familiarity (Richards & Calvert, 2015).

Applications such as “Barbie Fashion Closet” and “Wild Kratts World Adventures” allow children to actively interact with characters. These applications in particular serve as expansions of popular toys and television shows. The content of these games exposes children to new experiences and learning opportunities, as children have the capacity for observational and social learning from media characters (Bandura, 2001a). Understanding the impact media has on children and their cognitive development and social agency allows for the exploration of how children learn and understand gender identity and stereotypes.

Defining Gender

While establishing that a relationship between sex and gender exists serves an important role, even more crucially comes the need to recognize that gender and sex remain two separate entities (Reeder, 1996). Sex is determined by an individual’s biological attributes such as reproductive organs (Hyde et al., 2019). Gender is the social, cultural, and psychological construct of being male or female. Traditionally, gender refers to each culture's traditional social roles and stereotypes for men and women.

Through gender stereotypes and roles, individuals learn how to perform and conform to societal expectations of their assigned gender. For instance, the idea of being a “real man” in the twenty-first century United States defines being weak or emotionally unstable as unacceptable. “Real men” must show leadership and act as the head of the household while showing strength and repressing their emotions (Kachel et. al, 2016; Pease, 2012). To be traditionally feminine means being physically attractive, expressive, and nurturing (Kachel et. al, 2016). Similarly, West and Zimmerman (1987) suggest that “psychological, cultural, and social means” construct gender (p. 125). West and Zimmerman (1987) coined “doing gender” in order to show gender as an individual process (p. 126). They argued that in “doing” gender, both men and women feel

obligated to conform to the social expectations of their gender (West & Zimmerman, 1987, p. 126). Further, West and Zimmerman (1987) proposed that "doing" gender occurs as a complex act that requires activities reflective of masculine and feminine expressions. Finally, gender stands as a developing element of social influences that reinforces basic principles of society. While researchers recognize sex and gender as distinct concepts, gender identification and gender stereotypes in society remain linked and reliant on an individual's perceived sex.

Gender Development

Gender development does not occur only in early childhood, although much of it does take place during this impressionable time (Perry & Pauletti, 2011). Gender development happens in multiple shifts throughout the course of an individual's life, beginning in the early years of childhood (Bandura & Bussey, 1999; Martin & Ruble, 2009). Traditionally, parents introduce assigned gender roles to their children early on (Perry & Pauletti, 2011). Early gender stereotypes include assigning pink to girls and blue to boys. Oftentimes, society uses pink and blue to gauge a child's sex without having to ask. Parents typically demonstrate gender roles first, followed by close family and friends, school life, and mass media (Bandura & Bussey, 1999). For example, parents expect their daughters to be better readers and their sons to be better in math (Lummis & Stevenson, 1990). Initially, boys and girls hold equal capabilities of being successful in math; however, girls begin to lose their confidence in math skills because external influences tend to discourage them and push them towards subjects that do not require math.

Gender Development and Age

By the age of three to four months, infants become aware of their own sex and can distinguish between male and female (Quinn et al., 2002). Around six months of age, infants can gauge the differences in voices and faces between both sexes (Quinn et al., 2002). By the time an

infant turns ten to twelve months old, they associate basic stereotypes with males and females (Quinn et al., 2002). For example, a ten-month-old infant can perceive that females carry purses and males use hammers. However, just because infants can understand basic gender stereotypes does not mean they know their own gender. Poulin-Dubois (1998) found that 50% of girls 18-months of age have some awareness of their own gender while boys did not. The same study found that 50% of both boys and girls between the ages of 18-months and 24-months understood the label "boy" (Poulin-Dubois, 1998). Stennes et al. (2005) assert that toddlers between the ages of two and two-and-a-half understand to which group they and their peers belonged. Campbell et al. (2002) established that at two years old, children can accurately select images that correspond to gender labels. Zosuls et al. (2009) claim that once a child understands their gender identity, an increase in play with gender-stereotyped toys occurs.

Gender development patterns include the expansion of identities (Kar et al., 2015). Among these identities includes the social identity of gender (Martin & Ruble, 2009). Cognitive development between the ages of six and eight relies heavily on experience and interactions (Murty, Calabro, & Luna, 2016). Society drives young children to seek heightened sensations and experiences in order to develop cognitively and socially. The seeking of information serves as motivation when developing gender-typed behaviors. Self-socialization states that children try to understand gender and how it applies to them. During information seeking, they begin to understand gender categories (Martin et al., 2002). Murty, Calabro, and Luna (2012) concluded that, by using the Experience-Driven Adaptive Model, children use prior experiences and observed models when making decisions. This finding supports the idea of developing awareness of "self" and then using the information to figure out how to behave (Baldwin & Moses, 1996).

Gender develops roughly in three stages. First, gender identity begins to develop around the age of two (Kohlberg, 1966). At this age, children begin to understand the differences between male and female. Gender stability, the second stage of gender development, occurs around the age of four and asserts that children understand their own gender (Kohlberg, 1966). The third stage, known as gender constancy, starts loosely around the ages of five to eight (Kohlberg, 1966). Throughout this stage, children learn how to perform their own gender roles from parents, media, and social group interactions (Kohlberg, 1966). Even though gender continues to develop throughout a lifetime, research shows that cognitively, children understand the societal and physical differences between male and female. Gender stability in children serves a crucial function when it comes to models in their lives and in their media choices. Once a child reaches gender constancy, they begin to strongly identify with others in their social groups and feel motivated to reflect gender stereotypes (Kohlberg, 1966; Martin & Ruble, 2009).

Gender Identification

Gender identity refers to a person's perception of having a particular gender, which may or may not correspond with their birth sex. These identities can contradict, overlap, or remain in the foreground at times. A person's gender identity shapes their sense of self and can impact their gender development (Huffaker & Calvert, 2005). Martin and Ruble (2004) argue that gender differences develop through biology and factors of socialization, while stereotypes and roles tend to be unique and molded based on cultural differences and observations throughout one's life (Coyne et al., 2014). The American culture, like many others, functions within a gender binary of masculine and feminine in which gendered characteristics of members from one group distinguish them from the members of the other group, creating a division in what society

deems acceptable and expected for each group (Ridgeway & Correll, 2004). As individuals express their gender identity, they learn to perform their assigned roles (Bussey & Bandura, 1999). Bem (1974) pushed against this idea of the traditional American ideology of gender as either masculine or feminine. Instead, Bem (1974) argued that gender, being performative, forms a two-orthogonal dimension. This idea of two-orthogonal dimensions contends that people can range from low to high in masculinity or femininity, creating a spectrum (Bem, 1974). No two individuals perform their gender in the same way, even within the same culture, referring to the concept of gender fluidity (Booker, 2016). Gender performance refers to the way a person identifies, communicates, and dresses, as well as to their relationships, behaviors, and interests. An individual's gender performance may align with their assigned sex and sexuality.

Gender Stereotypes

A stereotype can be defined as a "preconceived and oversimplified generalization about a particular social group" (Holtzman & Sharpe, 2014, p. 41). Gender stereotypes denote characteristics prescribed to each gender and are usually based on personality, manner, careers and physical characteristics (Holtzman & Sharpe, 2014). Generally, gender stereotypes focus on the traditional beliefs about what constitutes masculinity and femininity, with regard to social roles, behaviors, relationship roles, and appearance. Stereotypes occur as both prescriptive and proscriptive. Prescriptive stereotypes refer to expected and accepted behaviors, whereas proscriptive stereotypes refer to rejected or inappropriate behaviors. Society often degrades women as bossy or rude when they speak assertively; generalizations such as this serve to restrict gender and personal development. Gender role stereotypes group together a set of characteristics specific to gender attributes or traditional norms. These norms and stereotypes vary from culture to culture and highlight the cultural and societal differences in typical "feminine" and

"masculine" behaviors (Baker & Raney, 2007). Stereotypes may include verbal and non-verbal communication, appearance, personality characteristics, and even careers. While gender stereotypes can be based on careers and hobbies they can also be based on personality traits.

Bem (1974) established the Bem Sex-Role Inventory (BSRI), a list of gendered personality traits. Developed over four decades ago, the BSRI remains the most commonly used and repeated measure of gender roles (Carver et al., 2013). She established this scale using previous scales, such as the Masculinity-Femininity Scale of the California Psychological Inventory created by Gough in 1954. Bem's (1974) scale features 20 masculine, 20 feminine, and 20 gender neutral (androgynous) characteristics. The BSRI quantifies gender traits and roles based on desired traits in American society, allowing for independent measuring of both feminine and masculine scores, meaning neither restricts the other (Carver et al., 2013). Table 1 (show in Appendix A) presents a reproduction of the BSRI. Bem (1974) reported that men scored significantly higher than females when asked about masculine traits, and women scored significantly higher than men on the femininity scale. Regarding the androgynous characteristics, men scored on the masculine side of zero and women scored on the feminine side of zero, making this a significant result. Bem (1974) also concluded that both men and women experience concern for social desirability; however, women scored significantly higher. These results suggest women face more concern for reflecting societal norms than men. Feminist and psychological researchers widely use Bem's inventory. Donnelly and Twenge (2016) conducted a meta-analysis on the BSRI from 1993 to 2012. This meta-analysis included changes to the BSRI in the 1990s. They reported that women's femininity scores have decreased significantly since the inception of the BSRI, indicating that over time, women have become less concerned with meeting societal norms (Donnelly & Twenge, 2016). However, the research does not

suggest a corresponding significant change in masculinity. Their meta-analysis also showed a significant increase in women's identification with masculine characteristics (Donnelly & Twenge, 2016). Furthermore, men's androgyny showed no change between either time period, while women's androgyny increased between 1974 and 1990 but not between 1990 and 2012 (Donnelly & Twenge, 2016). This finding suggests that in 2012, college-aged women may have been less concerned with aligning with feminine traits (Donnelly & Twenge, 2016).

The BSRI originally consisted of 60 traits, 20 per category, but has since been adapted to as few as 30 characteristics (Bem, 1974; Mateo & Fernandez, 1991). Mateo and Fernandez (1991) created a 12-item BSRI referred to as BSRI-12, a modification commonly used today. Recent studies utilizing the BSRI-12 scale include Gallén, Aznar, and Aranda (2018), Vafaei et al. (2015), and Carver et al. (2013). The BSRI-12 includes six masculine characteristics (leadership abilities, strong personality, acts as a leader, dominant, defends on beliefs, and makes decisions easily) and six feminine characteristics (warm, gentle, affectionate, sympathetic, sensitive to other's needs, and tender) (Mateo & Fernandez, 1991). Overall, the test has been found valid across decades, cultures, and ages (Gallén et al., 2018; Vafaei et al., 2015; Carver et al., 2013). The traits from both the original 60-item BSRI and the BSRI-12 played roles in the theme identification for this study.

Gender Identification and Stereotypes. Gender identification serves as an important developmental milestone in early childhood. Children learn to process gender-based information from images that they view from a variety of sources. A child's daily media interaction creates regular exposure to stereotypic gender representation (Lacroix, 2004). Children may become familiar with these gendered characters and associate them with genders in real life, and they learn to distinguish between genders and gendered objects. Children may also begin to decode

these gendered instances and make sense of gender-related messages. These images assist children in forming their gender identities. Unlike older media, applications allow children to actively interact and play with the media, making the content more immersive and easier to absorb. A child can interact more with digital characters and learn from their actions with hands-on media.

Gender Stereotypes in Media. Baker and Raney (2007) contend that media needs gender stereotypes to provide viewers shortcuts that help them make sense of media messages (Baker & Raney, 2007). While seen as necessary, these generalizations may also be problematic to the cognitive development of the audience (Baker & Raney, 2007). Researchers examined the effects that mass media such as television, magazines, video games, and the internet have on gender portrayals, gender stereotypes, and gender roles. Individuals who spend more time watching television tend to believe gender stereotypes to be accurate and expect others to fit into gender-stereotypical archetypes (Milkie, 1994). Past literature addressed the impact of these platforms on children's gender perceptions.

Outside of the BSRI, researchers define masculinity and femininity by traditional and hyper characteristics (Kachel, Steffens, & Niedlich, 2016).

Traditional Femininity. Traditionally feminine traits include community, expressiveness and physical appearance. It does not focus on sexualized appearance but on conservative beauty. These characters often appear in decorative clothing (Murnen et al., 2016). Additional traditionally feminine traits include caregiving and nurturing activities such as cooking, cleaning, and taking care of children or family members who need additional assistance (Sharma et al., 2016; Lakritz, 2019).

Hyper-Femininity. Traits related to hyper-femininity encompass associations with

subordination or sexualization. Sexualization heavily refers to body position, language and facial expressions (Murnen et al., 2016). Sexualized body position includes bent knees, curved spines, canted head, and "drifting" facial expressions (Murnen et al., 2016). "Drifting" facial expressions indicate a character's mouth being open or puckered in a seductive manner, as well as their eyes being softened (Murnen et al., 2016). Hyper-feminine traits include revealing clothing such as a shirt that accents breasts or midriffs (Murnen et al., 2016; Helgeson, 2011; Goffman, 1979).

Traditional Masculinity. Traditional masculine roles contain those of action but without violence, such as the body being in motion. Another trait of traditional masculinity involves stoic or unreadable facial expressions, like an individual who appears indifferent in moments of joy, grief, or other emotions. The stoic or unreadable expressions reflect the proscriptive gender stereotype of males avoiding expressiveness (Mager & Helgeson, 2011).

Hyper-Masculinity. Heavily associated with violence, hyper-masculinity often employs the appearance of aggressive facial expressions and weapons such as swords or guns (Vokey et al., 2013; Dill & Thill, 2007). Violent behavior may also be inferred by hands in fists or attacking postures (Vokey et al., 2013; Dill & Thill, 2007).

Stereotyped Verbal Communication. Verbal communication plays a role in forging and sustaining gender stereotypes (Wasserman & Weseley, 2009). Language tends to be male-generic, meaning it fails to include the ideas of both genders. Examples of male-generic language include policeman and fireman. Switzer (1990) found that male-generic language can lead to the assumption that the text only includes males. A 1984 study asked children from first grade through college to write a narrative about the average student (Hyde, 1984). When the instructions said "he," 88% of the stories focused on males; however, when the instructions emphasized "he or she," only 58% of the children wrote about males (Hyde, 1984). Vainapel et

al. (2015) analyzed the impact of male-generic language on self-report bias in regard to goal motivation and self-efficacy and found that surveys using male-generic language prompted lower scores than the same questionnaire using gender-neutral terms (Vainapel et al., 2015).

Linguistic relativity refers to the influential impact on perception and cognition (Wolff & Holmes, 2011). The principle of linguistic relativity suggests that language tends to be symmetrical with societal norms and perpetuates them (Wolff & Holmes, 2011). The gendering of language also positively correlates with sexism, gender inequality, and women playing technical roles (Prewitt-Freilino et al., 2012). Language can also cause individuals to assign meaning to gendered words such as names. Jung et al. (2014) found that people believed storms with masculine names to be stronger than storms with feminine names when in fact storms with traditionally feminine names caused more damage and had more strength. Society heavily associates traits such as strength with masculinity, which can cause people to assign gender meaning to specific adjectives.

Language typically places men in active and women in passive roles (Frazer & Miller, 2009). Language surrounding sexual activity increasingly reflects active and passive roles (Frazer & Miller, 2009). For example, “He raped her” places the male as the active pursuant and the women in a passive role. Additionally, language tends to frame men and women in different lights. Men who begin to age or remain single over a certain age receive comments such “silver fox” and “aged like fine wine.” Comparatively, society views women who age or remain single over thirty as having something wrong with them, referring to them as “leftovers” or “spinsters” and undesirable. This language serves to devalue women.

Furthermore, language often polarizes thinking, leading to the belief that two things must be exact opposites. For example, if women can cook then men cannot, or if girls love the color

purple then boys cannot. Polarized thinking also refers to the idea that a person can either be male or female or masculine or feminine. However, due to their performative nature, these concepts occur on a spectrum. This stigma restricts the idea of individuals performing individualized gender; queer performative theory challenges this notion of polarized thinking. The binary categories of sex, gender, and sexuality can cause people to ignore the differences from person to person.

Gender stereotypical language also reflects cultural power. Traditionally, cultures describe women as delicate objects and assign terms like sweetheart, baby girl, and honey, all inferring a person of juvenile nature. Kramarae (2005) discussed muted group theory, examining how language limits women's experiences and behaviors. Muted group theory asserts that women must exert more control over what they say and when they say it than men, who have the opportunity to speak more freely in a range of situations; because men developed many of the language practices accepted by society and global cultures, they offer men the ability to express themselves while forcing women to remain quiet (Kramarae, 2005, p. 55). Society may portray sexually active women as "sluts" while promiscuous men receive descriptions of "studs" and "babe magnets" (Kreager & Staff, 2009). Referring to sexually active men as "studs" insinuates active praise for the same activity for which society shames women (Kreager & Staff, 2009). Men who do not perform traditional actions of masculinity may find their manliness questioned with terms like "girly-man" or "sissy." Since both of these terms use female words as adjectives, it frames their behavior as less than that of a "real man." Language carries weight in American culture and perpetuates gender stereotypes through reinforcing male active roles, female passive roles, negative framing of femininity, and language in media coverage. Additionally,

communication between the two genders differs substantially, particularly in the twenty-first century, creating a further divide.

Both feminine and masculine communicators use communication as a tool to enhance personal values and goals. The tools differ from person to person, and people may even invoke different communication styles throughout their lives. Individuals do not have to restrict themselves to one communication style. A person's gender does not define whether they implement feminine or masculine communication, and this may also follow the spectrum theory of gender. Furthermore, communication includes actions, dress, and body language, not simply verbal interactions.

Stereotyped Nonverbal Communication. Researchers acknowledge specific traits of gendered non-verbal communication. Artifacts, or personal objects that express identity, simultaneously communicate messages about gender while allowing for people to create links with their gender identity (Collins-Nelsen & Puddephatt, 2018; Sinno & Killen, 2009). These objects range from clothing items to toys. Next, space and its utilization also communicate gender. The research suggests that men enter women's personal space more than women enters men's (Knapp et al., 2013). The third nonverbal communication stereotype refers to touch. Parents tend to touch their daughters more than their sons, which in turn leads boys to view touch as a trait of control (American Psychological Association [APA], 2017). Finally, physical appearance encompasses hair length, muscle mass, waist size, bone structure, or weight. Both sexes feel societal pressure to reflect beauty standards; for example, people view men with large muscles as masculine and women with small waists as feminine (Meltzer & McNulty, 2014).

Males and females communicate differently both verbally and non-verbally. Children develop gendered communication styles through observation, and their styles evolve over time

with additional external and internal stimuli. Especially important during childhood, non-verbal communication includes play, reflecting traditional gender-stereotyped play such as toy preference, color preference and play behavior.

Gendered Playtime. For decades, researchers argued that play serves a developmental purpose (Piaget, 1932; Smilansky, 1990; Scheu & Xu, 2012). Scheu and Xu (2012) claim that play during adolescence and early childhood differ, suggesting that by the time an individual reaches adolescence, they gain the capacity to make rational decisions based off of play experience. Limited comprehensive studies exist on children's toys; however, researchers assert that toys reflect gender stereotypes (Cherney & London, 2006). Maltz and Borker (1982) observed children to identify playtime communication patterns. Their main observations include that children tend to play in same-sex groups and that girls and boys play different types of games. Blakemore and Centers (2005) found that playing with masculine-stereotyped toys involves physical manipulation and relates back to the development of spatial skills. Dittmar et. al (2006) suggested that feminine toys like Barbie can be tied to damaging body esteem.

***Boy-Typed Games*.** Society tends to view boys as more active during play, and adults and the media often encourage boys to play sports such as basketball and football (Vealey & Chase, 2016). Their games reflect stereotypical gender traits such as aggression, competitiveness, and action (Blakemore & Centers, 2005; Vealey & Chase, 2016; Rudman & Glick, 2010). Boy-typed games assert four communication rules, including showing control and asserting identity, solving problems, attracting the attention of others, and standing out (Rudman & Glick, 2010). Boy games emphasize individuality and control (Rudman & Glick, 2010).

Girl-Typed Games. Girls' play also reflects gender-typical traits and roles. Girls tend to play in pairs of two or small groups (Rudman & Glick, 2010). For example, girls often play

house or school (Holmes, 2012). Both of these games allow for creativity to develop, unlike boy games, which use structured rules. Girl games also limit active movements. Adult language carries a significant impact on girl play. For example, adults rarely encourage young girls to engage in behavior such as playing in the mud because they may get dirty; society labels this behavior as un-ladylike. Unlike boys, girls spend most of their playtime talking (Goodwin, 2006; Holmes, 2012). Girl games also teach four communication rules: creating and maintaining relationships, modeling respectful and equal roles during play, including others during conversation, and showing sensitivity (Rudman & Glick, 2010).

Further, Su, Rounds, and Armstrong (2009) suggest that girls gravitate towards being people-oriented and boys towards being thing-oriented. This stereotype proposes that girls invest in relationships and personal advancements while boys devote time to sports and video games (Su et al., 2009).

Gendered Colors. Researchers argue that colors, such as pink and blue, serve as gender labels (Giudice, 2017; Shakin, Shakin, & Sternglanz, 1985). While gender differences begin around the age of two, preferences grow throughout childhood. Society tends to assign pink to girls and blue to boys (Giudice, 2017; Cunningham & MaCrae, 2011). Gendered colors create gender stereotypes that amplify gender differences. Wong and Hines (2015) analyzed the effect of color-coded toys on a child's preference for a particular toy. This study examined whether parents suggested stereotyped-colored toys to their children (Wong & Hines, 2015). For example, researchers gave children the option to play with a pink train or a blue train, as well as a pink doll or a blue doll. While the results showed that boys preferred the train more than girls and the girls preferred the doll more than boys, all the children showed preference towards the train (Wong & Hines, 2015). However, the color of the toys revealed that both genders enjoyed

the blue toys equally. These results indicate that gender color-coded items can significantly influence children's toy preferences. When analyzing gender-typical colors, researchers report that colors such as pink and blue serve as visual gender indicators that classify toys as appropriate for them to play with (Giudice, 2017; Ruble et al., 2007). Conversely, previous studies showed that color-coding toys did not affect preference, possibly attributed to children's ability to understand gender cues (Jadva, Golombok, & Hines, 2010).

Gender and Technology

Limited studies exist that focus on gender differences and children's apps. For example, some studies analyze how boys and girls use the Internet and other digital media differently (Goh, Bay, & Chen, 2015). One study reported no significant difference in how kindergarten-aged boys and girls use the internet (Bergin, Ford, & Hess, 1993). Bergin et al. (1993) also reported that when children begin to use the internet, they start at the same basic level, and gender has no influence on their understanding or cognitive abilities. Contrastingly, Reychav and McHaney (2017) found that society encourages boys to use technology more through positive reinforcement, boys tend to access technology and computers more easily and frequently, and they actively search for information on technology compared to girls. Girls also tend to avoid computers and technology subjects (Reychav & McHaney, 2017). The shifts in the research findings demonstrate a clear evolution in society's emphasis and acceptance of children's electronic device use and the role gender has on these perspectives.

While researchers have explored potential gender differences when it comes to technology efficiency, the impact of these platforms on gender development remains uninvestigated. Past studies have primarily focused on users of applications and gender differences but not gendered content and media effects on cognitive development. Therefore, a

need exists to further understand the influence these technologies have on young children's genders and how children understand gender stereotypes and roles. The presence of stereotypes in media influences children's gender development and identification.

Research Questions

As a preliminary study, the current research aims to provide important groundwork for the understanding of gender stereotypes in children's mobile applications. Due to the investigative nature of gender and the limited literature available regarding the effect mobile technology has on young children's development, the present study utilizes a qualitative approach, using the following research questions as a guide. Due to the exploratory nature of this study, the selected research questions examine the basic foundation for a new area of research to determine if this new media platform's gender depictions remain congruent with the findings of past literature.

RQ1: Are there gender stereotypes in children's applications?

RQ2a: Are there examples of traditional or hyper-masculine characters?

RQ2b: Are there examples of traditional or hyper-feminine characters?

RQ3: What activities do male and female characters engage in?

Method

Both quantitative and qualitative methods have been applied when analyzing children, gender and new media. However, the development of mobile devices and apps prompted the need to expand previous research. As addressed in the literature review, limited research exists in the area of cognitive development in children, apps, and gender. Given the exploratory nature and the limited research in the surrounding areas, the current study employed a qualitative approach, as it allowed for me to analyze data with flexibility and explore phenomena as they occurred.

Exploratory research allows an individual to understand a problem that previous research has not defined. Each study builds off of previous ones and leaves stones unturned. Using SCT as the theoretical lens, I further explored the role of electronic media in a child's gender development. SCT considers behavior, environment (external factors), and internal factors. While gender has been studied in numerous areas, the relationship between gender stereotypes and applications remains unstudied. This thesis utilized an exploratory approach in order to develop a thematic analysis.

Thematic Analysis

A methodological tool in identifying and analyzing recurrences in a data set, thematic analysis requires the researcher to loosely structure categories and themes to create a narrative. Boyatzis (1998) describes thematic analysis as applying a manifest and latent content analysis at the same time. Manifest content refers to the actual words and data content while latent content signifies the underlying meanings or insights. Typically, encoding qualitative data uses thematic analysis, in which the researcher searches for themes (Boyatzis, 1998). A theme can be defined in various ways; however, Boyatzis (1998) defines a theme as "a pattern found in the information

that at minimum describes and organizes the possible observations and at maximum interprets aspects of the phenomenon" (p. 4). Utilizing this approach allows for researchers to discover themes naturally (Braun & Clarke, 2006). Finally, adapting a thematic approach provides the opportunity to precisely communicate observations, insights, findings, and the researcher's interpretation of underlying meanings to others who may employ a different method. This creates a greater and more thorough understanding of emerging phenomenon (Boyatzis, 1998).

According to Boyatzis (1998), thematic analysis includes five motivations:

> 1. A way of seeing, 2. A way of making sense out of seemingly unrelated material, 3. A way of analyzing qualitative information, 4. A way of systematically observing a person, an interaction, a group, a situation, an organization, or culture, 5. A way of converting qualitative information into quantitative data. (pp. 4-5)

In addition to the five purposes listed above, Boyatzis (1998) suggests that thematic analysis allows an individual to adapt a "wide variety of information in a systematic manner that increases their accuracy or sensitivity in understanding and interpreting observations about people, events, situations, and organizations." (Boyatzis, 1998, p. 5).

The current study used a thematic analysis to explore gender portrayal in children's applications to identify if children's games model gender stereotypes. A qualitative approach allows for the researcher to discover information naturally and arrive at an understanding of an emerging phenomenon, identifying patterns in the data (Babbie, 2014; Braun & Clarke, 2006). Therefore, a thematic analysis serves as a reliable approach for analysis of data (Vaismoradi, Turenen, & Bondas, 2013). By the final stage of the thematic analysis, the researcher should be able to interpret the information and themes in the context of the guiding theory, social cognitive theory, and share a complete narrative of the discovered themes.

This thesis conducted a thematic analysis of 20 applications. The following section discusses how these apps were selected and the procedure steps that followed.

Sample

The sample for this study comprises 20 applications consisting of 10 randomized children's applications from the Apple App Store's predetermined "Top Paid" and "Top Free" lists as of March 4, 2018. Analyzing 10 apps from each list allowed me time to exhaust the data collected from each app. Qualitative research utilizes a smaller sample size due to time-consuming steps such as reading and re-reading (Braun & Clarke, 2006). Additionally, a smaller sample size enabled me to spend more time with each app, providing me with more content and raw data for coding and offering a deeper and richer understanding of the content (Braun & Clarke, 2006). I believe it allowed for the study of a variety of genres so that themes could emerge. However, the sample size supported me in constraining the size of the study for a thematic analysis.

Apple separates apps by "Top Paid" and "Top Free" sections and then further divides games into several categories such as action, arcade, and kids. This study only utilizes the kid category, which organizes the applications by age range into three subcategories; five and under, six to eight, and nine to eleven. The present study focused on the children's applications developed for the ages six to eight because of the third stage of gender constancy. In this age range, children begin to stabilize within their gender identities and become aware of cultural gender stereotypes (Kohlberg, 1966; Martin & Ruble, 2009).

App Selection

Opening the "App Store," I selected the "Games" tab listed at the bottom of the screen. I scrolled down to the "Top Categories" list and selected the "Kids" category, then selecting the

appropriate age group, six to eight, and chose “Top Charts” to view a numerated list of both paid and free apps. I compiled the apps into two lists; to create an inclusive list, I utilized the top 50 apps on both the “Top Paid” and “Top Free” pages. I used the top 50 apps in order to provide a large enough sample to randomize after removing the apps that did not meet the criteria of a game or digital toy. Apps on the “Top Paid” list averaged approximately $2.99 noted in Table 2 (shown in Appendix A). Upon completion of the list, I removed applications from the list that did not meet the game or digital toy criteria. The “Top Paid” and “Top Free” sections included all apps available for the chosen age range. This means the list may have included apps such as “YouTube for Kids” and “Epic!”, a children’s book app. Since this analysis served to evaluate the content of interactive applications, I created an exclusionary list for app selection. Digital book, writing, quiz/flashcard, television, video, messaging system, sing-along, restroom edict, coloring, language, or meditation apps were omitted from the list. To determine if an app had these characteristics and the function of the apps, I read the description of the app provided by the store. The apps must be game-like in nature and provide a digital environment of entertainment or education that incorporated play. Once I removed all applications that did not meet the criteria from each category, 27 applications in the “Top Paid” and 34 applications in the “Top Free” remained. With the remaining 61 apps in the sample, I assigned each app in the “Top Paid” a number between one and twenty-seven. Similarly, I assigned remaining “Top Free” apps a number between one and thirty-four. Then, using random.org generated a list of ten numbers. The randomly selected 10 applications from each list were used as the sample; a description of the game play experiences for each of these apps can be found in Appendix B. Once complete, I documented the star rating (provided via Apple App Store), the app developer, app category, and age range for each app on the randomized list. Tables 2 and 3 (shown in Appendix A) display

this information. I did not purchase in-app purchases within the apps, as they unlocked new portions of the game not available to children without the means to purchase them.

Procedure

I downloaded each app to an iPad and played until I exhausted the available content, meaning I no longer discovered new information. For example, if the application did not continue to add new steps or obstacles, I stopped playing because the information became redundant. In the case of early exhaustion, I played the application for a minimum of one hour. I recorded the date and length of time spent with each app. Then I connected an iPad to a MacBook Pro using an adaptor and "mirrored" the image of the iPad onto the laptop screen. I recorded the screen for the entirety of app exposure, permitting me to evaluate the data again. I played the apps in a quiet space with the sound turned on to hear any music or sound effects. For each game, I read the description provided by the App Store before playing. Reading the app description provided an initial understanding of the game and any rules. For example, the description may tell me that the game targets girls, or it may contain a necessary narrative context to better understand the game. After interacting with each app, I kept detailed, handwritten notes for any instance of gender in the app. I chose written notes due to personal organization and comprehension of material. Gendered instances may refer to the assumed gender of chosen characters, color pallets, body language, actions and roles of characters. I repeated these steps until all 20 apps in the sample had been played until exhaustion. Saturation occurred when no new data or new themes emerged and enough data for replication existed, best achieved with a "rich and thick" data set. Rich refers to the quality of data collected while thick refers to the quantity. Ensuring both gave me a better chance of attaining a detailed and in-depth analysis (Fusch & Ness, 2015).

Before beginning data collection, I created two tables of the 20 randomized games and included the star rating, app developer, suggested age range, and the category (e.g., educational or entertainment). Table 2 lists the 10 "Top Paid" apps and Table 3 lists the 10 "Top Free" apps (shown in Appendix A). This information provided me with a general understanding of the game, as well as any directions before playing the game. Creating a table of this information offered context before engaging in game play. After playing all 20 games, I began analyzing the recorded data in five phases, detailed below. In the last phase of analysis, I replicated the thematic map in Adobe Photoshop (Figure 1 in Appendix A).

After downloading the applications in the sample, I began my data collection. For this thematic analysis, I chose to follow the steps laid out by Braun and Clarke (2006).

Analysis Procedure

Analysis commonly begins after the collection of all data occurs (Braun & Clarke, 2006). Therefore, I had to first play the apps and then begin the analysis. According to Braun and Clarke (2006), six phases of a thematic analysis exist. The first phase in a thematic analysis involves familiarization with the data.

Phase 1. "Familiarizing with data." In order to become familiar with the data, I began by reading the app description provided by the app developer. I also became familiar with the data during game play of each application, allowing me to enter the data analysis with prior knowledge and initial thought that occurred during data collection (Braun & Clarke, 2006). During this phase, I also kept detailed handwritten notes in my notebook. In this phase, the notes acted as first thoughts and record of biggest details. After game play, I rewatched the screen recordings two times and continued the note-taking process. Rewatching the screen recording allowed for me to pay closer attention to details I may have missed during game play. I became

immersed in the data during this step. As part of this, I played the games for an extended amount of time and attempted to unlock free parts of the game for additional data. Finally, as a part of notetaking I recorded instances that may lead to theme development. Phase one included five steps to help create a concrete foundation. I took the following five steps in order to complete phase one.

Step 1. While reading the notes taken during game play, I began to highlight instances and initial thoughts that stood out from the rest of the data. During game play, I asked questions of the data to try to find more meaning within the raw data. These guiding protocol questions are shown in Table 4 (see Appendix A). With the use of these questions, I recorded possible patterns within the data set.

Step 2. For step two, I read through the data a second time. At this step, I also typed out all handwritten notes as well as way for further exposure.

Step 3. In step three, I re-watched all screen recordings and continued the note-taking process.

Step 4. Using the notes taken in previous steps, I made mention of possible themes and worked on pattern connection.

Step 5. In this final step, I worked on organizing the data into similar groups. At this stage, the groups were loosely done. For example, the use of gendered color schemes may have been grouped together but not defined.

The first phase of familiarizing with the data, known as the foundation of the analysis, exposed me to the raw data. After this stage, I moved on to phase two, known as "generating initial codes" (Braun & Clarke, 2006).

Phase 2. "Generating initial codes" refers to the process of coding any elements that stand out from the rest of the data (Braun & Clarke, 2006). During phase two, I generated a list of initial ideas and what makes them interesting or unique from the rest of the data. For example, at this phase, I noted all instances that placed a character or the player in a caregiver role. Throughout this stage, I repeatedly asked the question, "What category does this incident indicate?" (Glaser, 1998, p. 140). I then began the coding process and identified any gendered instances or content. The coding process began when I reread any initial notes and started to identify any gendered instances or content. At this point, I used gendered instances to form codes. These codes created part of the analysis (Braun & Clarke, 2006). I coded the content of the data set for gendered instances, such as gender roles like a girl in a hairstylist position or gender stereotypes like boys enjoying cars.

Step 1. I produced a list of initial codes that would be used for my unit of analysis. These codes were formed on an important feature, insight, or detail that stood out from the rest of the data.

Step 2. I organized the data into groups that focused or highlighted relationships within the data set. For example, at this stage there were groups labeled as nurturing, strength, dangerous, and educational.

Step 3. I manually coded with color coded notes on each category. I used a highlighter to color code. After I highlighted the notes, I transferred the insights to colored sticky notes to begin clustering them together. I used colored sticky notes to separate the data point and to create a grouping visual on my bedroom wall. This method allowed me to physically see the information together.

Step 4. In step four, I coded until exhaustion of the data collected occurred. This means I continued to code the raw data until no new themes were developing (Braun & Clarke, 2006).

I ended phase two when I could no longer discover new themes or relationships emerging from the data. During this phase, I allowed for codes to be placed in more than one thematic group. Codes can be placed in more than one thematic group. This permits for overlap and shows through in the thematic map. This also reveals relationships and "funnels" themes that may fit together (Braun & Clarke, 2006). The next phase, known as "searching for themes," begins after the conclusion of phase two.

Phase 3. In the "searching for themes" stage, I placed data into concrete themes (Braun & Clarke, 2006). At this point, I organized data from the open codes into patterns or thematic categories. After organization, I went back through the gender instances and initial codes and began to eliminate those that did not belong, combine similar instances and reassigning labels to give a better understanding of what the code represented. I spent time gaining a better grasp of the data and began grouping, eliminating, combining, and reassigning labels. In a sense, I used this phase to funnel the data labels from the open coding into more focused key categories. This phase also provided additional insight when answering the proposed research questions (Braun & Clarke, 2006).

Step 1. I began by looking at the identified codes or categories. Some categories could be appropriately combined. After this, I was able to move on to step two.

Step 2. In this step I looked at the data from a bigger picture perspective. At this point I could see the lager patterns had emerged (themes). I used this perspective to start my first draft of my thematic map by moving the colored sticky notes around on my wall. Where there were overlaps, I used a string to represent the existing relationship between the themes.

Step 3. After creating the first draft of the thematic map there were obvious instances that were not redundant enough to form patterns. These themes and patterns were removed from the map because they were irrelevant. If something did not occur more than two times it was considered irrelevant. In this step, I also began writing lose definitions using the characteristics and content that must be present for something to be coded into this theme (Braun & Clarke, 2006).

Step 4. I continued to "play" with the data until themes formed (Braun & Clarke, 2006).

Step 5. In this final step, I identified a list of potential themes and listed relevant data under each theme. In this step, I left all data in their "candidate" themes so that I could review all data in phase four. In the following phase, I reviewed the themes to make sure they held up (Braun & Clarke, 2006).

Phase 4. In the "reviewing themes" phase, I reflected upon the potential themes and ensured the extracted themes aligned and fit appropriately. Within this stage, I began to edit the thematic map. I used this phase to combine themes or eliminate any inappropriate data (Braun & Clarke, 2006). I refined the "candidate" themes by removing themes that did not answer research questions or have a significant representation of the data (Braun & Clarke, 2006). Finally, I reviewed all the remaining "candidate" themes to ensure they precisely reflected the meanings and insight of the entire set.

On completion of phase four, I ensured the themes "worked" and coded for any additional data overlooked thus far. In this phase, I continued to code and recoded as needed. By the end of phase four, I had identified my themes and moved on to defining and naming them.

Phase 5. "Defining and naming themes" began when I felt the thematic map accurately represented the data set. I defined the themes by listing the most prevalent examples and writing down meaningful moments. I used the properties and characteristics to tell narrative of the theme in this step (Braun & Clarke, 2006).

Step 1. In step one I used theme characteristics and examples to begin naming the themes. I looked at the gendered instances that occurred and identified the ones that best represented the narrative. For example, if a theme was based on the color pink, the theme name may have been Pretty in Pink. I assigned names that best reflected the examples.

Step 2. In this step, I wrote a detailed analysis of each theme to include examples and instances within the data set.

Step 3. I wrote a narrative that paired appropriately with each theme. These stories should fit into an overall "storybook." The narrative should also begin to answer research questions to prevent too much overlap.

Step 4. The refinement process addressed the sub-themes or categories. If a theme contained a sub-theme, analyzing and defining these as well served an important purpose. I wrote an analysis of what made it a sub-theme and the role it had regarding the narrative of the overarching theme and overall narrative.

Step 5. I needed to create a completed list and set of qualifying characteristics as well as narrative for each theme and a list of what the theme did not include. To test this phase of completion, I wrote out a theme description in few sentences to make sure I could encompass the meaning of the theme. If I could not provide an accurate description of the theme I went back for further refinement.

Step 6. At this point, I assigned working names to the themes. The names should be clear and concise. The reader should be able to deduce the theme's content from the assigned name to lead into the final phase, producing the report.

Phase 6. "Producing the report" is the final chance I had to analyze data. In this stage, I began to isolate instances of gender portrayals to share as examples. In this stage I was able to relate the analysis back to the initial research questions. To do this, I reviewed the categories determined during the axial coding to guarantee complete development. At this point, I determined, recorded, and made note of any recurring themes and phenomena and represented them in the thematic map (Braun & Clarke, 2006). Using examples and visuals from the mobile applications, I told the story of the data set. Finally, I shared the analysis through examples and by creating the thematic map in Adobe Photoshop shown in Figure 1 (located in Appendix A). |

After data collection, the following terms were used for coding of gender instances. The following list includes the definitions from previous studies that correlate to the current work and were coded for in the analysis.

Relevant Definitions

Boy Characters. I coded a character as a male or boy character if they illustrated traditional male traits. Traditional male traits may include short hair such as a buzz cut or wearing of hats. These characters do not wear makeup and generally wear jeans or shorts. Their voices (if present) may be of deeper pitch. Their facial expressions may be limited or non-existent. Boy characters may be shown wearing more masculine colors such as blue or green. Finally, these characters might be portrayed in leading or primary roles.

Traditional Masculine Characters. Traditional masculinity focuses on functional clothing, strength (but not violence), and purposeful movement. Traditional masculine facial

expressions include stoic or unreadable expressions, perhaps because they often wear masks. This aligns with the traditional masculine proscribed role of not showing emotion (Rudman et al., 2012; Mager & Helgeson, 2011).

Hyper-Masculine Characters. Hyper-masculinity typically refers to suggestive violence. Cues of violence often contain weapons or armor or display a character's hands clenched into fists. Finally, a hyper-masculine facial expression may show anger or frustration (Vokey et al., 2013; Dill & Thill, 2007).

Girl Characters. I coded a character as a female or girl character if they portrayed traditional female traits. These traits may include hair styles popular among modern women such as long hair, styled pixie cuts (short hair), medium length hair, curled hair, color-treated hair, or accessories such as hair pins and headbands. Additional traits may incorporate makeup such as blush, eye makeup, or lip color. These characters also most likely reflect modern fashion trends. Girl characters may be depicted in dresses, skirts, or patterned clothing. These artifacts may also be of gendered colors such as pink or purple. Finally, female characters appear biologically different from male characters through portrayal of a smaller waist, broader hips, exaggerated facial structure (such as defined cheekbones), or breasts.

Traditional Feminine Characters. Mager and Helgeson (2011) define traditional femininity as encompassing two attributes of a friendly facial expression and decorative clothing. These two attributes link with the traditional feminine roles of communality, expressiveness, and appearance-focus but not sexual submission. Friendly facial expressions include those that do not suggest sexual activity, and the character projects either a closed-mouth smile or an open-mouth smile (Hatton & Trautner, 2011). Decorative clothing, defined as items such as a dress that may

prohibit active motion such as running or climbing, may also refer to overly exaggerated accessories that do not support clothing function, such as dangling earrings.

Hyper-feminine Characters. Hyper femininity heavily associates with sexualization of the body, expressed through bent knees, tilted heads, and arched backs (Rudman & Verdi, 1993). This may also include facial expressions such as wandering eyes or pouting lips (Mager & Helgeson, 2011). Sexually appealing facial expressions differ from friendly facial expressions (a traditional femininity trait). Sexual facial expressions include those that suggest sexual activity (Hatton & Trautner, 2011).

Gender Indeterminate Characters. I labeled characters that do not portray a clear gender as gender indeterminate. This includes animal characters that may be ungendered. Gender indeterminate characters may have both masculine and feminine traits, making the gender unclear. Ungendered characters may not reflect a gender because they reflect animals, cars, or other objects and do not show gender cues.

Encouraged Male Traits. These traits include career-oriented, leadership, aggression, assertiveness, and independence (Rudeman et al., 2012).

Encouraged Female Traits. Emotional, friendly, interested in children, sensitive, good at communication, friendly, and appearance-driven traits comprise encouraged female traits (Rudeman et al., 2012).

With the methodology and steps of a thematic analysis explained, the next section presents the results found during the course of my examination of the selected apps and the themes that I discovered.

Results

Using Bem's (1974) BSRI trait list and definitions provided above in the

of traditional and hyper- femininity and masculinity as a guide, ten themes emerged during the course of the study. These themes include "Boys will be Boys," "Blue Side of Life," "Mommy in Training," "Power of Motivational Friendship," "Pink Side of Life," "The Risk Taker," "Muscles Make the Man," "The Material Diva," "Read My Lipstick," and "Who Are You?" I considered themes present regardless of character-assigned gender. Table 5 (shown in Appendix A) includes the themes and their relative codes. Some applications fit into multiple different themes based upon various criteria, including character depictions and activities within the app.

Theme One: "Boys will be Boys"

This theme addresses instances of play typically engaged in by boys. Society encourages boys to enjoy playing outside, getting dirty, and going on adventures, as discussed in the Gendered Play section of the literature review. I observed 26 instances that I coded into this theme during gameplay (see Table 6 in Appendix A). In examining these applications for instances of this theme, I looked for boy colors, sports, competitiveness, male characters, environmental aspects like dirt and mud, and physical characteristics such as facial hair, tone of voice, and clothing style. The "Boys will be Boys" theme captures traditionally masculine traits including action or activeness without displaying violence, athletic ability, and competitiveness (Mager & Helgeson, 2011). The applications within this theme depict boys and men as adventurous. They show boys as learning about science and nature through exploration. Aesthetics chosen by the developers integrate colors like blue, green, and orange, which society deems as masculine. Male characters within the apps dress in shades of blue and green and athletic-style clothing; in Wild Kratts World Adventure, the Kratt brothers wear cargo shorts and

zippered hoodies. Some of the male characters have facial hair, such as Daddy Pig in Peppa Pig Holiday and some in Toca Hair Salon. These characters serve as symbolic models for children, allowing them to identify with masculine representation of society's expectations. They offer crucial visuals from which children gain a perspective of what their gender looks like in society. Examples of applications with instances captured by this theme include Sago Mini Road Trip and Wild Kratts World Adventure.

Sago Mini Road Trip

The player selects one car from a 20-car collection to drive on a long road trip. The cars range from race cars to hotdog-shaped cars and monster trucks. Out of the 20 vehicles, all but three utilize colors and designs on the vehicle targeted towards boys; the "boy" vehicles included police cars, race cars, trucks, as well as those in blue, green, and red colors. Most cultures categorize interests in automobiles and driving as masculine hobbies (Landström, 2006), especially poignant given that working on cars involves getting greasy and otherwise unkempt. In many families, the male figure assumes the role as primary driver when the family travels together. This app also includes other activities related to cars such as pumping gasoline and washing the vehicle. Men often bear the responsibility of completing these necessary tasks when possible, as they require manual labor (Version 1.4; Sago Sago Toys Inc, 2018).

Wild Kratts World Adventure

The characters in this game play outside in activities that encourage exploration and getting "dirty." Society expects boys to make impulsive decisions without regard for the consequences or risks. The game includes only male characters. The Kratt brothers travel the world within this game, and they rescue animals. They represent the plethora of animal rescue figures in mainstream media depicted by male actors, implying that only men hold the strength

and bravery to be able to save creatures in such distress. Furthermore, they educate the user on the animals presented within the app, again carrying the implication that men serve as the sole bearer of knowledge on animals that allows them to teach an audience (Version 2.1; PBS Kids, 2015).

Theme Two: "Blue Side of Life"

The "Blue Side of Life" theme encompasses stereotypes associated with male-dominated career fields. For example, Williams (2015) predicts that men account for 99% of the workforce in construction and other building jobs. In the fields of architecture and construction, female workers only comprise 11% of the workforce - this statistic includes those working in secretarial and design positions, traditionally feminine occupations (Williams, 2015). I found 23 instances of the "The Blue Side of Life" theme within the sample of games (see Table 6 in Appendix A). Dr. Panda Trucks and Dr. Panda Candy Factory include examples of instances coded into this theme. Although females do hold jobs within the physically-demanding "Blue Side of Life" occupations, the women who do so must wear the same protective clothing that all employees in these jobs do. This makes them appear more masculine than women in female-dominated fields like teaching. Many of the characters in the applications present as gender-indeterminate, symbolizing that even when women do take masculine jobs, they appear more masculine due to their clothing or hairstyles. They even may be depicted with deeper voices and more muscular builds. Women in these fields may identify as androgynous or female, but because of the stereotypes associated with construction and factory jobs, society views them as masculine. This limited display of construction workers and other employees in similar fields helps boys identify more closely with the characters and function to make those who identify with feminine traits

feel unwelcomed or excluded, despite the app descriptions' careful use of gender-neutral pronouns (i.e., they, them, their).

Dr. Panda Trucks

The player guides work trucks such as tractors and cranes around to either build structures or destroy them and collect building materials such as bricks and concrete. Another aspect of this game encourages individual outdoor play, such as playing in the mud and launching the characters off of ramps. Although only animals serve as characters in this application, making them gender indeterminate, they wear traditional construction outfits. The game emphasizes learning, teaching the player how to drive vehicles under the assumption that they might as well learn now, as they will be doing this when they grow up. Construction workers have a physically demanding job, helping to solidify their masculine identity. Knowing that they hold a difficult job reassures them they that they are "men" (Version 1.78; Dr. Panda Ltd., 2018).

Dr. Panda Candy Factory

The characters in this game work in a factory to make candy. Similar to construction, society typically assumes that primarily males work in factory settings, with few females in this occupation. The occupation in this game occurs in another male-dominated setting. Additionally, it utilizes science and technology, focusing on the fact that STEM fields value male employees (Charlesworth & Banaji, 2019). Factory workers usually have long shifts, often 12-hours per day; their jobs include a fast pace. Due to the importance of factories in the world's economy, individuals in this career field play a vital role in keeping society functioning (Version 1.02; Dr. Panda Ltd., 2018).

Theme Three: "Mommy in Training"

This theme embodies the aspects of the applications that promote nurturing behavior or household-related upkeep. Defined as caring for and providing the needs for growth and development, nurturing can be accomplished through words of encouragement or behavior that supports development (World Health Organization [WHO], 2018, p. 3). Nurturing behavior includes feeding, dressing, potty-training, hands-on play time, and validation of feelings. "Mommy in Training" connects traditional feminine roles, actions, activities, providing, and protection with the characters within the applications. Perhaps the best description of this theme arises from nurturing care, defined as a stable environment usually built by parents or other caregivers "that ensures children's good health and nutrition, protects them from threats, and gives young children opportunities for early learning, through interactions that are emotionally supportive and responsive" (WHO, 2018, p. 3). Therefore, this theme revolves around the learning and providing of nurturing care; I coded 18 instances into this theme (see Table 6 in Appendix A). I examined the applications for examples of nurturing behavior such as interacting with babies, developing and maintaining routines, bedtime, feeding, diaper changing, and other actions that placed the player in a caregiver position. Baby Dragons: Ever After High and Sago Mini Babies also display examples of instances within this theme. Society expects girls to be the caretaker, even in their jobs (Porter, 2019). Women who work outside the home often receive no escape from the roles that society assigns them, such as cooking, cleaning, and caring for others. Women tend to fill the secretary positions in office settings, which requires them to complete the more nurturing tasks for other staff, including sending faxes, answering phone calls, ordering/preparing coffee and lunch, etc. The tasks presented for girls within the applications

with instances coded into this theme further emphasize girls' destinies to become mothers and offers activities that set them up for success in these future roles. Although the user assumes the role of the character in these apps, the game requires them to be nurturing, warm, and empathic; otherwise, the animals they must care for die.

Baby Dragons: Ever After High

In this application, the player holds the sole responsibility for the daily care of a baby dragon, which requires physical attention such as playtime. Hands-on play with the "trainer," or player, helps the dragon grow and strengthens the relationship between the two. The player must feed their dragon to keep it healthy. Additional nurturing behavior includes preparing a bed for the baby dragon to sleep in, creating a sense of security and protection. The "trainer" introduces the baby dragon to routines like eating and nap time, which foster a stable environment and establish the importance of good habits (Version 2.82; Mattel, 2017).

Sago Mini Babies

This game encourages the player to take on the role of a caretaker. The player learns to change diapers and becomes responsible for teaching their baby music through use of instruments and shapes by playing with different shaped blocks. The babies in the game become visibly and audibly upset when their caregiver does not meet their needs. When this occurs, the player calms and soothes the baby by practicing nurturing behaviors (Version 1.2; Sago Sago Toys Inc., 2016).

Theme Four: "Power of Motivational Friendship"

Research shows that girls' playtime and games center around communication and small groups, allowing them to maintain relationships (Goodwin, 2006; Wood & Fixmer-Oraiz, 2016). The "Power of Motivational Friendship" theme builds on the notion that girls thrive on

communication-based friendships. For example, a small group of friends may enjoy playing house together; this playtime allows for supportive communication and strengthens their creative interactions. I observed 20 instances (see Table 6 in Appendix A) within the games that they coded into this theme; the items that I looked for include friends spending time with each other, taking pictures with their friends, and the option to share game progress and photos on social media with the player's real-life friends. If obvious communication occurred, then I coded for it; however, only word choice was coded, as I did not code for tone of voice or verbal expressions of emotion. Although both men and women require social interaction, the way men engage with their friends and peers varies greatly from the way women do with theirs (Migliaccio, 2009). Women thrive on verbal and written communication, spending hours with their friends talking, texting, video chatting, and other activities (Leaper & Robnett, 2011). Women often disclose more about themselves to their friends than men do, and society expects men to suppress their emotions and personal information (Migliaccio, 2009). Women's communication goes so far that it can even be detrimental to their relationships, as they gossip with their friends about other friends and acquaintances, which may or may not be relayed to the party about whom they gossiped. Comparatively, men's communication serves to assert dominance and independence in relationships (Migliaccio, 2009; Basow & Rubenfield, 2003; Eagly et al., 2000). Many of the studied applications targeted specifically to girls include opportunities to share significant moments from their gameplay to social media profiles. The overarching theme of "The Power of Motivational Friendship" speaks to women's tendency to encourage their friends and enjoy their social interactions to a degree that it consumes large portions of their day, as the activities in these applications symbolize. Applications that offer examples of this theme include Baby

Dragons: Ever After High, My Little Pony Rainbow Runners, Sago Mini Road Trip, and Strawberry Shortcake Bake Shop.

Baby Dragons: Ever After High

This application encourages players to purchase critter friends (baby raccoons, squirrels, bunnies, etc.) to keep their dragon company. The purchase of the critters results directly in the baby dragon's happiness, and the characters play together. The dragon protects her friends during adventures described as "scary" by the characters; however, the game does not show the user these images. The animals enjoy having tea with each other and conversing, although they speak in a fictional language not understood by the player. Several aspects of the game emphasize the importance of friendship, such as buying friends, having a tea party in which they enjoy each other's company, and the adventures with the overarching goal of protecting her friends; the social interaction directly correlates with the dragon's happiness and health (Version 2.82; Mattel, 2017).

My Little Pony Rainbow Runners

Throughout the ponies' journey to save Ponyville, their friends encourage the player to keep going through supportive words. These phases include, "You can do it," "You're the best," "We're here for you," and "Hang in there," helping the player continue and persevere after each obstacle. Society views empathy as a feminine trait due to the higher emotional index that women typically employ. A woman who disparages her friends rather than bolster them quickly loses her friends, making it more difficult to make new friends (Evaldsson, 2007; Aguilar et al., 2019). Girls more often support their friends with words of encouragement, much like mothers. The ponies also protect their friends from "the darkness" by putting their own lives at risk in selfless tasks. This represents the way that women in reality put themselves in positions to

defend or protect their friends against enemies or other perceived dangers (Version 1.5; Budge Studios, 2017).

My Little Pony Rainbow Runners exemplifies this theme with words of encouragement throughout the game. A female narrator cheers on Fluttershy during the levels. When successfully finishing a level, Fluttershy jumps through this colorful portal, and the narrator says, "That's the power of friendship." This phrase is used multiple times throughout the game and shows the importance of protecting friendships. The main premise of this application is to protect the pony's friends in Ponyville from losing all their color (Version 1.5; Budge Studios, 2017).

Sago Mini Road Trip

In the application, the player helps the character, Jinja, travel to spend time with friends in destination locations. The characters take photos with their friends and put the pictures in a scrapbook for memories. In today's social media-centric society, women spend a large portion of their interaction with friends taking pictures and posting them on their various social media profiles to share with their other friends and followers. Furthering this connection, the pictures from the application can be shared to the user's connected social media profiles to garner likes and comments from their real-life friends (Version 1.4; Sago Sago Toys Inc, 2018).

Theme Five: "Pink Side of Life"

The "Pink Side of Life" describes the third theme. Examples of children learning how to perform "pink collar" or traditionally feminine roles in the workforce compose this theme. Data in this theme stem from typically female industries such as nursing or teaching. Further career fields in the selected applications typically dominated by females include bakers, hairstylists/cosmetologists, and tailors. Applications with instances coded into this theme include Strawberry Shortcake Bake Shop, Toca Tailor: Fairy Tales, and Toca Hair Salon 3; I found 23

total instances (see Table 6 in Appendix A) that fall within the "The Pink Side of Life" theme, and coding focused on instances of female characters dressed in traditional female uniforms, female characters in traditional female occupations, or if the player assumed a role in a female occupation.

Strawberry Shortcake Bake Shop

In Strawberry Shortcake Bake Shop, the player learns how to properly perform the functions of a baker, meaning they represent the bakeshop, communicate with customers, take and fulfill the orders, follow recipes, and bake. The application allows for the player to express their creativity within the game guidelines. They have choices of utensils and colors, but ultimately, everything turns out the same. By the end of the game, the player learns how to bake at least one dessert by following the recipe in their cookbook. The game stores the created recipes in a virtual cookbook that can be shared to social media, mirroring the fact that recipes often get published in cookbooks for sale across the world. Traditionally, women occupy the majority of jobs involving baking. Women comprise 61.3% of the global baking community, with 130,000 employees in this field (DataUSA, 2018a). Furthermore, the game attracts female users through its use of feminine color schemes and girl characters, effectively discouraging boys from being interested in playing this game. Similarly, the societal perspective associated with baking being a female occupation drives men away from an interest in this field (Version1.7; Budge Studios, 2013).

Toca Tailor Fairy Tales

This application teaches the player about the occupation of a tailor by assuming the role of one within the game. The user learns how to fit clothes to different bodies, both male and female. They also discover pattern swatches and accessories such as buttons and belts. Although

the game permits the player to choose whether they want to be a boy or girl character, they appear identical minus length of hair. The clothing choices remain the same, regardless of the gender of the character. Most of the clothing choices center on feminine outfits, although a few masculine outfits do exist. No concepts of the game aim to attract male players unless they have a preexisting interest in fashion and clothing. DataUSA (2018c) found that female employees comprise 71.3% of tailors and dressmakers, roughly 37,800 people. This game highlights fashion as a feminine occupation, offering little in the way of attempts to engage male players (Version 1.0.5; Toca Boca AB, 2018).

Toca Hair Salon 3

Toca Hair Salon 3 provides a list of clients that would like a makeover. Within the game, the player learns the ins and outs of cutting, dyeing, and styling hair. Their game makes multiple trade tools available to support the role of hair stylist, allowing for endless creativity in this role while also giving the player control of facial hair, accessories, clothing, and backdrop. From a young age, girls develop an interest in doing their hair or having their hair done. Mothers often take their daughters to hair salons for haircuts, or daughters go with their mothers to their hair appointments. Parents put bows and headbands on their daughters from birth. Girls who do not express interest in keeping their hair styled or at least managed neatly may be perceived as more androgynous or as a "tomboy" by society. Naturally, this dedication leads many girls down a career path in cosmetology. Though some men do pursue careers within this field, those who do often embody more feminine traits, and society often deems them as "gay," regardless of their actual sexual orientation or gender identity (Clarke & Arnold, 2018). Men who do pursue jobs in female-dominated fields receive little respect and society frequently judges them as ineffective in their position (Clarke & Arnold, 2018). Females comprise 90.7% of the workforce of

hairdressers and cosmetologists, with 528,000 women assuming roles in this occupation (DataUSA, 2018b).

The "Pink Side of Life," "Power of Motivational Friendship," and "Mommy in Training" themes align with previous research completed on stereotypes for traditional femininity. This reveals that the applications perpetuate the gender stereotype of women being a nurturing caretaker and staying home. The applications present women who do work as holding jobs in traditionally feminine roles like cosmetology and clothing alterations. Although some men do assume roles within traditionally female occupations and demonstrate interests in staying home with their families, society shames them in many ways. They ostracize men, calling them "whipped" or "Mr. Mom," again emphasizing that only women or feminine individuals could possibly succeed or enjoy these tasks.

Theme Six: "The Risk Taker"

This theme encompasses the person that places themselves in a violent or risky situation, such as superheroes or adventurers in the wild. The characters in these applications do not necessarily engage in violence, but they do pursue adventure and dangerous activities that could, in real-life situations, lead to injury or death. The applications with instances coded into "The Risk Taker" theme mirror the depiction of men in other media portrayals, such as movies and television. These media outlets demonstrate that men take the most risks, usually in response to competition or provocation from an external source. Additionally, they show the men making impulsive, risky decisions, regardless of the consequences that may arise. Masculine characters may be strong, but they lack discipline and the ability to think before making decisions, as demonstrated by the stereotypes presented in the applications within this theme. Society expects men to take risks in order to save the day; if they do not answer this calling, they may be mocked

or degraded, called a "sissy," or be rated as less manly than the person who ultimately rose to the occasion. Applications with instances coded into this theme include Wild Kratts World Adventure, Batman, and Olaf's Adventures. Overall, I observed 17 instances (see Table 6 in Appendix A) of this theme within the selected applications; I looked for characters engaging in behaviors that could be perceived as dangerous or potentially harmful, high-adrenaline pursuits, and competitive activities.

Wild Kratts World Adventure

In this game, the Kratt brothers travel the world, performing risky tasks to help animals. For example, one activity involves the player swinging from vine to vine to collect food for monkeys. While swinging, the player can either fall and get injured or a big monkey can kidnap him. In another experience within the application, the brothers play with lemurs. Lemurs release a toxic fume from their tail, similar to a skunk's. The brothers throw the fume at each other as many times as it takes to weaken the other to the point of death. The characters appear to enjoy these risky activities, demonstrated by both smiling throughout the events. This application symbolizes the idea that only men can be rescuers or adventurers and mirrors the depictions seen in the media, such as Steve Irwin of *Crocodile Hunter*, Alex Paen of *Animal Rescue*, Dr. Jan Poll of *The Incredible Dr. Poll*, and Brandon McMillan of *Lucky Dog* (Version 2.1; PBS Kids, 2015).

Batman: Gotham's Most Wanted

Similar to the comic books, movies, and television show, Batman assumes the role of superhero. He flies through Gotham City, trying to stop Joker from destroying it. Joker throws explosives at Batman throughout the game. These explosives can injure Batman. Batman, like other superheroes, acts when he receives the calling, regardless of how risky the behavior may be; they act first, think later, and they often do not consider the consequences of their actions

until after they have already started or finished them. Research supports the assertion that men take more risks than women (Harris, Jenkins, & Glaser, 2006). Competitiveness drives risk-taking behaviors; within the Batman: Gotham's Most Wanted application, the Joker antagonizes Batman, contributing to the motivation to engage in the dangerous and precarious steps Batman takes to eliminate the threat Joker poses to Gotham. Additionally, society expects men to take risks, putting pressure on them to follow through and live up to those imposed expectations (Version 2.1.1; StoryToys Entertainment Limited, 2018).

Theme Seven: "Muscles Make the Man"

The characteristics portrayed within the instances coded into this theme include those of the stereotypical "macho man," such as athletic, strong, attractive, physically fit, and heroic. I coded 16 instances of this theme within the reviewed applications (see Table 6 in Appendix A). Examples can be found in Batman: Gotham's Most Wanted and Wild Kratts World Adventure.

Batman: Gotham's Most Wanted

As a superhero, Batman embodies the majority of the traits deemed to be hyper masculine. He has large muscles and wears a costume that accents those muscles. To save the world, he must be strong and athletic; he flies fast within the game, demonstrating his athleticism. Although some female superheroes exist, the superhero universe almost exclusively consists of males; only recently did creators begin expanding the lineup of female superheroes, and of the two most popular comic book worlds, DC and Marvel, females make up only 26.7% of all of the characters (Shendruk, 2017). Additionally, only 12% of mainstream comic book lead characters are female (Shendruk, 2017). Of the female superheroes that do exist, creators hypersexualize them, place the female superhero in distressing situations that require the male superhero to rescue them, characterize them with stereotyped traits, and portray them as the only

girl in a group of boys (Shendruk, 2017). Even the female superheroes that exist do not serve to attract girl viewers, but rather further attempt to capture the interests of boys through their hypersexualized traits, such as large breasts, tiny waists, and perfect hair and makeup (Shendruk, 2017). The male superheroes consistently put themselves in risky situations, either to save the world or to rescue their female counterparts, reinforcing the stereotype that only men possess the strength and abilities to save others (Version 2.1.1; StoryToys Entertainment Limited, 2018).

Wild Kratts World Adventure

The Kratt brothers' game includes violence and adventure. They do not appear scared; rather, the app portrays them as brave and fearless. They compete against each other, attempting to injure the other to win certain games. Based on the real-life Kratt brothers, they embody many features that make them appealing, including muscles and well-kept hair. They serve as "alpha males," meaning they lead, take control, have intelligence, solve problems, and remain confident, even to a fault. Men must have muscles for women to consider them attractive; society sees those who do not as less desirable. Essentially, the Kratt brothers communicate that boys should aspire to be like them (Version 2.1; PBS Kids, 2015).

Although traditional masculine stereotypes highlight men as the supporter of the family, engaging in activities like driving and math and science-related fields, some media depictions go to the extreme in their portrayals, showing men as muscular, strong, and unrealistically attractive. Further, the hyper masculine stereotypes within these applications serve as reminders that females do not possess the ability to take risks due to their lack of physical strength and require males to protect and rescue them from perilous situations; this also applies to saving animals. The images set up unrealistic expectations for men to strive to achieve, as well as for women to look for in their male companions. These stereotypes may make men who do not feel

as though they check these boxes feel inferior and either push them to change themselves to achieve these goals, or degrade themselves as unable to live up to the pressures imposed on them by societal expectations.

Theme Eight*:* "The Material Diva"

This theme best represents the materialistic possessions available to the player in the games and whether these possessions seemingly make the character temporarily happy. The material items create an exaggerated reality of status. I identified 10 instances of this theme within the studied applications (see Table 6 in Appendix A). The games with instances coded into this theme perpetuate the notion that a person can force happiness into their lives by purchasing and owning expensive attire and accessories. They also emphasize that wealth makes a person more attractive and desirable, even if they have nothing of real value to contribute. Furthermore, it alludes to the stereotype that women need the fanciest, most expensive items to feel happy or to surround themselves with the type of people with whom they want to associate (Allan, 2009). Examples stem from the hyper-focus on their personal appearances and material possessions. Applications that have examples of "The Material Diva" include Baby Dragons: Ever After High and Barbie Fashion Closet.

Baby Dragons: Ever After High

Rewards in this game include earning sparkly pink gems and gifts like crowns and shoes. The application also encourages the user to provide the baby dragon with a well-decorated living space. The player can 'buy' waterfalls, flowers, and other decorative items to make the place opulent. The game encourages the player to strive to earn money and gifts so that they can live a life of luxury. Those who can afford the best items receive the most attention and adoration in society, and the game reinforces this stereotype that one must have the finest things money can

buy in order to be happy (Version 2.82; Mattel, 2017).

Barbie Fashion Closet

Trendy outfits and styles fill Barbie's closet, allowing the user to change and customize her as much as they want. The game encourages the purchase of new clothing through the viewing of advertisements. The closet creates the illusion of endless apparel options that remain constantly available. The game emphasizes that beauty makes people more desirable and that clothing helps women at least appear to be wealthy and put-together. It mirrors the societal belief that a person can appear wealthy simply by wearing clothes that look expensive or bear designer labels (Version 1.70; Mattel, 2020).

Theme Nine: "Read My Lipstick"

The sexualization of female characters within the applications best describe this theme. The applications accomplish this through exaggerated makeup and facial features; for example, making the character's eyes abnormally big or giving them a slim waist with large breasts, wearing provocative clothing, and using seductive body language. I recorded 18 instances of this theme within the applications (see Table 6 in Appendix A). The instances coded within this theme communicate that society still expects women to put forth effort in their appearances to please men (Murnen et al., 2016; Meltzer & McNulty, 2014). Girls see the images of popular characters like Barbie and feel the pressure to fulfill the unrealistic expectations pushed on them by the media and men. Mothers and other caregivers need to appease their partners' sexual desires, meaning that even when they stay home to care for children or clean and cook, they must wear makeup and dress in nice, possibly uncomfortable clothing (Murnen et al., 2016; Meltzer & McNulty, 2014). Barbie Fashion Closet and Baby Dragons: Ever After High both include examples coded into the "Read My Lipstick" theme.

Barbie Fashion Closet

Society has deemed Barbie a hyper-feminine model for young girls since her 1959 debut, criticizing her unrealistic body dimensions (Aviles, 2019; Engeln, 2019). Although this application offers several Barbies from which to choose, all of them sport the slim waist, large breasts, and long legs popularized by the toy; this occurs in spite of the fact that the company released "body-positive" Barbie dolls in 2016 (Dockterman, 2016). This application also promotes the heavy use of makeup, familiarizing the player with Barbie's signature red lips and blue eyeshadow. The final stage in the application allows the player to position their Barbie in a variety of stances, some playful and some sexualized. For example, a playful stance places Barbie standing with a peace sign out, while a sexualized stance involves Barbie puckering her lips and pushing her hips out. The depictions of Barbie communicate to girls that to be noticed by others, they must draw attention to the parts of their bodies that men like, such as their breasts, hips, face, and legs. They set girls up for unrealistic expectations and goals, as Barbie's bodily proportions do not represent anything achievable by real-life individuals. Regardless, society pushes this image on young girls, contributing to them growing up feeling pressure to lose weight and change themselves to live up to the way they believe men want them to appear (Meltzer & McNulty, 2014).

Baby Dragons: Ever After High

Teen girls dressed in alternative-style shorts and tight tops portray the trainers in Ever After High. They also embody hypersexualized body features. The trainers, dressed head-to-toe in luxury costumes, all have long, flowing hair and big eyes with costume makeup. Similar to the depictions of Barbie, the teen girls represented in this application set unachievable goals for young girls to attempt to reach. They further perpetuate the stereotype that even in a caregiver

role, women must strive to be sexual and maintain an image of beauty (Sharma et al., 2016).

Theme Ten: "Who Are You?"

Some of the applications contained neutral characters or had no instances of gender stereotypes; additionally, several had characters for which I could not identify the gender. I coded these instances as neutral and gender indeterminate. Neutral refers to the instances of strictly learning or educational information like spelling or math. Gender indeterminate instances denote the characters for which the assigned gender remain unclear, as well as the characters portrayed by animals. The "Who Are You?" theme reflects that learning and certain career fields know no gender boundaries. All children must learn to spell and do math. Doctors and nurses can be both men and women. The instances within this theme have no underlying stereotype that they attempt to push onto the user and influence their development in some covert way. It also demonstrates that learning can be accomplished without relying on gender stereotypes to capture the user's interest. An overlap does exist within games in terms of the gendered and gender-neutral stereotypes and characters; just because a game includes gender neutral or gender indeterminate characters does not mean that it does not also have gendered characters. Several of the games in the sample includes gender neutral or indeterminate and either male or female characters or both male and female characters. I coded 50 instances of this theme (see Table 6 in Appendix A). If I could not identify a character's gender from their dress or appearance, then I coded them as gender indeterminate. The act of learning purely educational concepts, like spelling and mathematics, is gender neutral and was coded as such. Examples of this theme stem from the Sight Word Ninjas and Pepi Hospital.

Sight Word Ninja

I coded this application as not having any gendered instances. No characters or settings exist to influence the player. The player simply slices words on the screen to learn reading and spelling skills. The fact that no gendered instances occur within this application demonstrate that spelling and reading must be learned and mastered by all children, regardless of gender. The game does not attempt to attract one gender over another, instead presenting an exciting way to learn sight words (Version 2.0; Innovative Investments Limited. 2018).

Pepi Hospital

This application contains examples of gender indeterminate characters. Although the game includes some clear male and female characters, others remain unidentifiable. For example, it includes a purple, fuzzy, one-eyed monster dental assistant in scrubs who speaks an unknown language, as well as a blue monster acting as an eye doctor. The medical field has become increasingly gender diverse in the past few decades, moving away from a predominately male field. By using male, female, and gender indeterminate characters, the game developers effectively attract both boys and girls within the targeted age group. The game serves to communicate the progression that has occurred within the medical field and remind children that they can be doctors, nurses, dentists, and other occupations within healthcare regardless of their gender (Version 1.0.32; Antanas Marcelionis, 2018).

The Results section above described the various themes that emerged during my interactions with the games. I identified 9 themes that encompass traditional and hyper femininity and traditional and hyper masculinity, as well as one theme that included the gender neutral and gender indeterminate instances. The next section analyzes these themes to answer my research questions posed at the beginning of the study.

Analysis

I identified several research questions prior to beginning the study. These questions aimed to focus the potential findings around gender stereotypes and exposure within children's mobile gaming applications. The questions include RQ1: Are there gender stereotypes in children's applications? RQ2a: Are there examples of traditional or hyper-masculine characters? RQ2b: Are there examples of traditional or hyper-feminine characters? RQ3: What activities do male and female characters engage in? Although some of these questions can simply be answered "Yes," the circumstances and content that surrounds these responses to fully articulate the possible implications for the findings are important to note. Additionally, understanding how the applications exploit the stereotypes to achieve and communicate the overall goal of the game adds critical insight into the answers to these questions.

RQ1: Are there gender stereotypes in children's applications?

The children's applications reviewed for the purposes of this study, obtained randomly from the lists of Top Paid and Top Free applications for the 6-8-year age range on Apple's App Store, do contain gender stereotypes. The stereotypes presented in these games reflect the same typecasts depicted in other children's media, including books, television shows, and movies (Broekman et al., 2018). For example, many of the applications include stereotypes surrounding typical occupations, interests, and appearances. Baby Dragons: Ever After High, for instance, places the player in the role of a female trainer responsible for nurturing and raising the selected dragon. The application does not allow the user to choose whether they want to play a female or male trainer, as the game only includes female trainers pre-assigned to each dragon. This further perpetuates the stereotype that only females possess the capability to nurture and provide for an infant or animal. Of the 20 applications used in the study, 6 included instances of this stereotype.

RQ2a: Are there examples of traditional or hyper-masculine characters?

Many of the games assessed included examples of either traditional masculine or hyper-masculine characters. Some of the games presented portrayals of both traditional and hyper-masculinity. Several of the depictions appeared more subtly, while others showed obvious or even exaggerated illustrations. Wild Kratts World Adventure, for instance, offered images of both traditional and hyper-masculine characters. The Kratt brothers engage in behaviors embodied by traditional masculine individuals, including being adventurous, outdoorsy, science-oriented, leaders, and wearing unreadable facial expressions. However, they also showed hyper-masculine traits, such as engaging in violence, being competitive, taking risks, and being overly strong.

The themes "Boys will be Boys" and "Blue Side of Life" depict examples of traditional masculine characters and stereotypes. These two themes align with the predefined terms utilized to guide the study, supported by the BSRI. In "Boys will be Boys," an example of a traditionally masculine character stems from the activities presented in Sago Mini Babies; the mud does not slow Jinja, the boy character, down as he drives through it, and the character visibly enjoys the act of getting dirty. "Blue Side of Life" theme demonstrates traditionally masculine careers, such as working in a factory, as shown in Dr. Panda Candy Factory. Even in ToDo math, with a gender-neutral premise, the game's visual aesthetics attempt to appeal to boys through its use of trains, rockets, and blue and green color scheme. These traditional masculine characters and traits encompass dominant but not risky roles; they work hard, and they spend a lot of time at work, but they do not engage in dangerous activities.

Comparatively, the themes "Muscles Make the Man" and "The Risk Taker" represent hyper-masculine characters because the characters in games coded into these themes are risk-

taking, superhero, alpha-male types. They possess extreme strength and participate in dangerous activities. They engage in violence and use weapons; even when for a good reason, these qualities still put the characters in harm's way. Batman and the Kratt brothers portray hypermasculinity through popular and recognizable characters, further perpetuating the influence that these themes have on the user.

Tables 7 and 8 (found in Appendix A) reflect the various traditional and hyper-masculine characters found within the different applications.

RQ2b: Are there examples of traditional or hyper-feminine characters?

Similar to the images of traditional and hyper-masculine characters, several of the applications included in the study reflected traditional and hyper-feminine characters and traits. The "Pink Side of Life," "Mommy in Training," and "Power of Motivational Friendship" themes offer examples of traditional feminine characters who appear as caring, nurturing, and loving (Sharma et al., 2016). These characters fit the stereotypical image of mothers; they appear conservative and modest with their children's well-being in mind at all times. The study found that the examined applications do portray these gender stereotypes and traits, therefore exposing children to them in yet another form of media. The hyper-feminine characters, demonstrated in the "The Materialistic Diva" and "Read My Lipstick" themes, on the other hand, wear makeup, portray over-sexualized body shapes and facial expressions, and focus their attention on interests such as clothing and cosmetology (Murnen et al., 2016). These applications also showed either traditional or hyper-feminine characters, and some included examples of both within the same game. For example, Barbie Fashion Closet depicts only hyper-femininity, with Barbie's small waist and wide hips, sexualized puckering of her lips, and attentiveness to her appearance. Contrastingly, Little Kitten Adventures offers examples of both traditional and hyper-feminine

characters; the traditional feminine traits include nurturing the kittens by feeding, bathing, and protecting them, while the hyper-feminine centered on appearance. The results of the study demonstrate that hyper-femininity examples can be found in children's mobile applications alongside instances of traditional femininity, exposing children to varying degrees of influence.

Tables 9 and 10 (found in Appendix A) list the traditional and hyper-feminine characters throughout the studied applications. Characters that were not recorded as male and female characters were recorded as Gender Indeterminant and these characters are listed in Table 11 (found in Appendix A).

RQ3: What activities do male and female characters engage in?

The activities that the characters engage in vary by application and gender. The main activities that the male characters participate in include outdoor adventures like exploring and hiking, driving construction vehicles, building and demolition, STEM-related subjects, and saving the world. Female characters partook in activities such as bathing and feeding babies, teaching, dressing up, and applying makeup. Gender-indeterminate and neutral applications and characters completed activities such as math and spelling in addition to cooking and eating. These games differed from the others, as, while they included elements of entertainment, they overtly addressed learning subjects like mathematics and spelling. The player did not have to interpret the messages and purposes of the game, as there were no underlying intentions. These games did not include symbolic models; the player learned a subject rather than a real-life skill or gender role. The purely educational games did not include characters; Sight Word Ninja and ToDo Math simply showed the spelling words or math problems on the screen with no attached model to encourage interaction. The range of behaviors that the different characters enacted further drives the focus on gender stereotypes emphasized by today's society. The activities that

the characters participate in during the course of the applications further support the gender stereotypes being portrayed throughout other parts of the games, such as the characters and how they dress and behave.

Discussion

The data retrieved from this study carry critical implications regarding the status and presence of gender stereotypes in today's society as well as the role that children's media plays in perpetuating them. This research makes obvious the continuous and strong existence of gender stereotypes in all forms within children's gaming applications. Even applications that seem less innocuous by title or icon, such as Sight Word Ninja and Olaf's Adventures, impose at least subtle gender typecasts within the game; ToDo Math included one gender indeterminate character, but male stereotypes such as traditionally boy colors, trains, and rocket ships inspired the games within the application. Society expects boys to have an interest and innate ability in STEM-related subjects, so the apps that emphasized STEM aspects projected more instances of masculine stereotypes and traits. However, it could be that the randomized sample of applications simply did not include any STEM-related apps that targeted female players. A broader study with a different sample may yield different results in this aspect and could offer additional insight into the presence of female-oriented STEM apps. Furthermore, the applications that focused on nurturing care included very feminine characteristics. The depictions within the applications with gendered instances continue to align with past stereotypes; none of the applications attempt to rewrite or subvert the existing generational stereotypes. Rather, they embraced and found new ways to emphasize them, reminding the user that gender roles and stereotypes remain solidified within societal and cultural expectations and transcend time and technological bounds. The gendered instances in the apps fit within Bem's (1974) 60 stereotypes, showing that her model remains relevant in today's society and has not moved away from them as much as people may believe. Despite this, however, the neutral theme had the most prevalence of all of the stereotypes in regard to the number of instances within the applications. Even though

I used a small sample size and only a miniscule percentage of overall games, this prevalence reflects the fact that app developers continue to put forth an effort to be inclusive of all users. None of the app descriptions reference specific genders; the targeted demographic becomes noticeable only through game play, not through written communication.

As addressed in the literature review, social learning theory has five main concepts: social learning, observational learning, vicarious reinforcement, repetition, and reciprocal determinism (Bandura, 1986). Social cognitive theory includes a sixth key idea in addition to these five, adding self-efficacy to the main takeaways (Bandura, 2006). Children do not play the games from my study to learn gender roles, but these apps are now part of their environment, as they can be found at home, at school, and in the car; therefore, social learning happens unintentionally through their game play. However, applications also make social learning even more intentional, as users make the choice to play the games and expose themselves to the content within them. My study shows that these apps create a virtual environment for social learning; it is no longer just the world around the individual offering stimuli that encourage socialization and identity formation.

Regarding observational learning, children can watch the characters in the game make mistakes so that they learn the consequences secondhand; they do not have to be embarrassed and learn the repercussions of the behavior through firsthand experience. In my study, for example, when I see the girl pony in My Little Pony run through the mud and get hurt, this reinforces the stereotype that girls are not supposed to play outside in the dirt. Society expects girls to remain clean and tidy at all times; adults make negative comments when a girl appears messy or unkempt. In the game, the player observes the consequence of the girl being weakened by the mud, as they slow down, lose life points, and visibly appear sad; the player learns that this

is not acceptable behavior for them as a girl. Comparatively, when I see the presumably-boy characters in Dr. Panda Trucks drive through the mud and enjoy it, I know that the game encourages this behavior for boys; it is rewarded and expected. When adults see boys in dirty or tattered clothes, they assume that he has been outside having fun; they laugh and make light of his appearance. In the game, the player can see that this behavior is acceptable and rewarded by witnessing the character's enjoyment of the activity. Children encode this information and use it later in their lives where appropriate to drive their behaviors and choices. For example, if a child is out at recess and wants to play in the mud with some of their friends, they might think twice about it because they have seen the consequences of it from their observations within the app. The experiences of observing this in the game can, in a sense, help the child determine an acceptable path of doing their gender role in society. The examples from the applications can be used to decide to make a change or not make a change depending on how a person performs their gender already. It can help an individual understand how to fit in with their gender group during this stage of gender constancy.

Similar to observational learning, individuals use vicarious capability to link actions and consequences they witness others experience to learn gender roles and their implications (Bandura, 2001a). Through vicarious capability, a need no longer exists for learning through trial-and-error in real life; the individual watches the character in the media experience the repercussions of their actions so that they do not have to learn them firsthand. For example, in Little Kitten Adventures, the player helps the kitten pack for a friend's birthday party, which includes packing items like a costume, snacks, rain boots, a hat, and a stuffed pig. If the player fails to pack all of the necessary items before leaving their house, they will encounter an obstacle on the way to the party that they will not be able to pass due to not being prepared. In the game, a

pig sits in a mud puddle and looks lonely; to pass this obstacle, the player needs to pack a stuffed pig to give to the pig to keep him company. If the player did not pack the stuffed pig, then they fall in the mud puddle, get dirty, and have to go back home to take a bath and pack the correct item. A direct consequence occurs in this instance. Through vicarious capability, a child can learn from the game that not being prepared for obstacles in life or packing for an event correctly the first time has consequences, such as having to return home or losing time that prevents them from getting to their goal. These apps are individual experiences that allow players to experience vicarious learning, and my study supports the idea that these apps create a captivating symbolic environment to enhance the learning experience for the child. With this individualistic symbolic environment, these apps provide a training guide for children to learn the cultural importance of gender roles. The "Mommy in Training" theme games were very feminine and directly places the player in a caregiver role; the "Boys will be Boys" games emphasized boys being adventurous and independent in nature. My study supports the notion of vicarious learning and demonstrates the increasing importance of mobile applications in today's society as a training guide for children.

The concept of repetition asserts that an individual must engage in a behavior over and over again to commit it to habit and truly develop a new skill (Bandura, 1986; Bouton, 2014). The apps themselves include repetitive behaviors; each level is the same as the last, just a little bit harder. The games repeat themselves, and the repetition helps the player master the skills they need. This translates to the idea that the individual repeats the behavior of baking a cake to commit to memory the steps involved, such as preheating the oven, measuring the ingredients, mixing everything together, pouring the batter into the pan, and baking it in the oven for the correct amount of time to avoid undercooking or burning it.

Reciprocal determinism references the idea that a bidirectional relationship exists between the individual, their environment, and their behaviors (Bandura, 1986). In my study, the apps serve as the environment, the player acts as the individual, and the characters and activities create the behaviors being encoded by the player. In Baby Dragons: Ever After High, the player learns the importance of developing a routine in regard to caring for an animal; the player holds the responsibility for feeding the dragon, engaging the dragon in playtime, socializing the dragon, and ensuring that it gets enough rest. In return, the dragon stays happy and healthy, strengthening the positive relationship between the dragon and its trainer (the player). If the player does not care for their dragon, the game forces the player to restart, losing all of their progress and symbolizing the death of the dragon. The app tells the player that the dragon needs them. This carries over to real-life situations, as it prepares the player for the possible responsibility of owning a pet like a dog or cat. An animal communicates to its owner when they need to use the bathroom or needs food, water, or attention. If the owner fails to meet these needs, the animal suffers either socially or physically. Assuming that reciprocal determinism works, and these bidirectional relationships function appropriately, the player should be able to translate the information gathered from these games and apply them to real-life applications.

Self-efficacy refers to the idea that an individual must attain a certain level of confidence in their own ability to complete a task in order to successfully finish it (Bandura, 2006). By playing these applications, children build their self-esteem and strengthen their confidence in completing gendered tasks like changing a diaper or driving a car. They complete these activities in a safe environment with play-based consequences, finish them successfully, and experience the rewards and consequences of completing these behaviors in a symbolic environment. Seeing themselves perform these tasks in virtual situations strengthens their motivation so that when

faced with the same activities in real life, they know they can perform them because they have already done so in the games. Children develop competence as they beat the levels of varying and increasing difficulty throughout the time they spend engaging with the application. This helps them form their construct of self-efficacy, solidifying that they can accomplish tasks independently. Additionally, the apps further reinforce the gender stereotypes they aim to communicate, as they allow the player to discover that they possess the ability to take care of a baby or solve math problems. It alludes to a child's completion of a task; once they solve a problem within the application, they feel a sense of accomplishment and pride. If a male child finishes a masculine task within the application, he sees himself as masculine, strengthening his gender identity. The games use symbolic models to help the player learn how to perform gender by giving them someone they can relate to and vicariously learning through them.

Fictional and real-life characters serve as symbolic models when children observe them in the media demonstrating gendered behaviors (Bandura, 1972). Observational learning explains that children going through gender constancy have the ability to learn from watching the behavior of others, especially people of significance in their lives (Martin & Ruble, 2009; Bandura, 1986; Bandura, 2001a). My study supports the idea of symbolic modeling as children relate to these characters because they are easy to familiarize with. Not only do these characters act as role models, they also serve as friends. Based on the bidirectional relationships in social cognitive theory, two people who experience the same game may not encode the same message, which can impact their gender development in different ways. A player can play a game as a girl and assign the notion that Strawberry Shortcake is her hero. My study shows that children have the opportunity to assign personalized, deeper meaning to these characters than would otherwise develop just from observing because of the interactional aspect. However, not all symbolic

models are positive; this study demonstrates that games do expose children to multiple symbolic models. For example, in Batman: Gotham's Most Wanted, children experience both Batman and the Joker. From this game, they learn that Joker is a villain and that society does not value being mean. They also learn that Batman, a superhero, serves as a positive model. Comparatively, my study displays that gender roles are present in these applications and the games that have presumably female roles do not implement characteristics that would attract male players. This still shows that a negative perception exists when men step into these roles, serving as a negative symbolic model.

The concept of symbolic modeling also addresses the ideas of attention, retention, production, and motivational processes (Bandura, 2001a). These four concepts must occur in order for symbolic modeling to be successful. If a player has an interest in baking, then they may choose to focus on applications that teach baking roles. My study supports the idea that children have the ability to select games that reflect their wants and needs. The game becomes the child's focus, or the target of their attention, as they watch what the characters do to be successful in their roles and behaviors. My study also shows that once a child has played a game enough times, they can perform the actions better and mimic the role being done both in the game and outside of the game environment, encompassing the idea of retention. As a child becomes confident in their baking skills within Strawberry Shortcake, they may ask their mother to help in the kitchen; this accomplishes the step of production. The child shows that they can do the activity and have committed it to their memory. The idea of motivational processes refers to the idea that if a child actually cooks with their mother and their mother does something different than the characters in the application, the child can adapt and learn from both their mother and the character in the game. They do not have to choose one or the other to mimic; they have the

ability to learn from multiple models and combine these skills into the broader task of cooking. Overall, my study demonstrates that these symbolic models make it possible for children to learn in a virtual environment and translate these learned gender roles into their everyday lives, providing an understanding of their identity and how they should behave within their gender roles.

I noticed several less obvious implications within the apps as well. For instance, the majority of apps with feminine gender stereotypes have the player assume the role of the character in the application. When taking on the role of a certain character, it becomes easier to identify with that type of person; the player gets to assume the attributes of that person, even if only for an hour or two. An identification helps one understand gender roles, which serves as a central premise of social cognitive theory. Gender serves as a form of identification; people refer to themselves as their gender. One may say, "I am a girl," and that carries important implications for the person to whom they are communicating. This simple statement allows the receiver of the communication to target their responses and interactions to match that person's identity. When a person observes media, they look for a character that looks like them to help them solidify their gender and roles within that gender (Bandura, 1972; Bandura, 2001a; Holmes & Johnson, 2009). This applies to both girls and boys. This study showed that learning opportunities do exist for children to further develop their gender identities within an interactive mobile application; the findings from the study demonstrate that interactive gender identity development no longer has to occur strictly in a face-to-face engagement. Children gain valuable hands-on learning from electronics in a way that was not available 15 years ago. What this study does for social cognitive theory is that children learn to identify with themselves in these roles when the applications place them as the executor of the actions rather than a passive observer. The

applications completely change how someone learns from symbolic models. Children used to learn from watching symbolic models on television or movies (Bandura, 2001a); now, however, they can now actually engage with these same models that they encounter on other media forms. The user bakes, takes of the care of the dragon, dresses themselves; the app effectively communicates to the presumed girl player that she needs to learn to perform these activities because her destiny states that these responsibilities fall on her shoulders and will always be up to her to complete. These apps serve as a "how-to" guide for the user. Comparatively, the apps with male characters or masculine stereotypes utilize a third-person perspective; the user controls the actions of the in-game character by making them engage in certain behaviors. The user makes Batman dodge bombs; the player controls the Kratt brothers as they fight. This reinforces society's tendency to allow boys to avoid taking responsibility for their own actions. Statements like "Boys will be boys," "Look what she wore," or "You must have done something to make him do that," pushes blame onto the victim, excusing the boys' actions as natural and appropriate because of their gender. If Batman gets hurt, it is not his fault; it is Joker's fault. This speaks to the notion that when tragic events happen in real-life, like rape, society blames the victim, not the perpetrator. Society tends to blame the victim rather than the male offender. The games placing girls in control of their own actions while having boys be controlled by the player further pushes this societal expectation.

Hayles (2002) asserted that literary apps, as non-physical experiences, do not offer the same affordances as paper books, as they do not afford the same opportunities and gratification; therefore, they cannot be considered material because they lack physicality. When reading a physical book, one gets the sense of satisfaction when they close it for the final time after completing the last chapter. An e-book does not provide the reader with this finality and

gratification; they may feel incomplete or unfinished since they did not get the opportunity to experience the closing of the book after reading the last page. It limits the user's sensory development and inhibits their innate need for touch and connection. Readers develop their own voices for the characters and a mental image of what they look like; e-books and movies eliminate this imagination, diminishing the creativity that serves as a crucial part of development. In the same way, these application-based games offer different experiences from playing a board game or parallel play with same-age peers. They cannot be considered material toys because they lack the physicality that serves an important role in learning and experience.

Mlearning, referring to a cross between mobile technology and here-and-now e-learning that extends to communication and learning that occurs anywhere and at any time, varies from traditional learning styles in that it offers more opportunities for learning (Lacena, 2008; Martin & Ertzberger, 2013). Although the researchers focused on academic learning when they coined this term, it certainly applies to the gender experiences children gain from playing mobile applications that include gender stereotypes and portrayals of gender roles. Mobile applications allow for an additional source of external stimuli that contribute to gender identification development. Traditionally, children observe gender roles and stereotypes through their peers, parents, and older family members, such as siblings and grandparents. However, thanks to the development of children's mobile applications, they can witness them from new characters on a continuous basis, wherever they go. The applications used in this study demonstrate a new facet to Mlearning, as children no longer sit in front of a screen and watch someone else engage in the learning activity; they actually actively participate in the learning experience. My study reflects that these applications give children the tools to carry the skills learned into the real world. They do not have to learn from watching their absent mother or father; after finishing the game, they

have the knowledge and skills to actually do it in reality, as the games have allowed them to do it already. This Mlearning helps children learn the consequences of their behaviors and commit them to memory, which further supports social cognitive theory; it makes them their own social agent (Bandura, 2001a).

Many of the applications within the studied games include characters from other media sources, such as popular television shows and movies or material toys; for example, children have intimate relationships with characters like Strawberry Shortcake, the Kratt brothers, Batman, My Little Pony, and Barbie. Parents and children likely choose to download these applications at least in part due to the familiarity they already have with these characters from other mediums. Parasocial relationships with these characters in the new situations presented on mobile platforms strengthens the existing relationship that children have with them and further reinforces the stereotypes that the characters have already demonstrated through their traditional presentations (Richards & Calvert, 2015). This study shows that these platforms have the capacity to strengthen current parasocial relationships or develop new ones with the characters in the games.

Researchers and parents alike know that children have the ability to learn from media models through observation and social interactions (Bandura, 2001a). As this research shows, apps provide the opportunity to provide interactive experiences with symbolic models or media characters. Each of the applications in this study place the player in a manipulative role; they control the actions of the characters or they assume the role of the character, depending on the overall goal of the game. These media characters act as symbolic models; now, children not only observe them on television or in material toys, but they also take on their persona and mimic their behaviors in interactive experiences (Koi, 2017; Richards & Calvert, 2015). Social

cognitive theory, therefore, asserts that the child player serves as the social agent for the character in the application (Bandura, 2001a). The self-social agent builds off of prior experiences and observed models for decision-making processes. By watching and interacting with these models, they take the experiences and lessons and make their autonomous decisions based on what they learn from the characters. The characters teach them what to do as well as what not to do, as the children see the consequences and rewards that the characters receive for certain behaviors. The concept of gender constancy, developing loosely around the ages of 5-8, refers to the idea that children learn how to perform their own gender roles through parents and media depictions (Kohlberg, 1966). Upon reaching gender constancy, children begin to feel motivated to mirror the gender stereotypes that they witness from their peers and the media depictions they observe; they now understand gender (Martin & Ruble, 2009). This study analyzed applications targeted to children ages six to eight and discovered that the media still portrays gender stereotypes, but they offer these stereotypes in an experience-based approach. The application platform completely changes the interaction and learning that occurs. Since experts know that gender constancy occurs during this time, we know that these experiences are significant and impact this age range in meaningful ways.

Because of the fluidity of gender, overlap in gender stereotypes portrayed in media depictions makes sense (Huffaker & Calvert, 2005). A person can feel sexy while also caring for a baby, just like a girl can want to play with dolls but also catch bugs or run through mud puddles with her brothers. However, in the applications, this research discovered that running through mud weakens female characters, but male characters enjoy it and experience no adverse consequences. This reinforces the idea that society expects and rewards boys for adventure and messiness while it degrades girls who enjoy the same activities.

The present study expands and supports the basic premise of social cognitive theory by examining a new form of technology and media and to discover how it contributes to individual gender identification and learning of roles and stereotypes. Television has been around for decades, while mobile applications remain relatively new; however, up until recently, people had to wait until they got home to watch television and observe the gender roles portrayed within their favorite shows. Now, these stereotypes travel with the user on their cell phones; mobile devices like tablets and smartphones make this media much more accessible than television and movies ever were for previous generations. Children make the choice to download particular apps based on their preferences. A lot of the games in my sample stemmed from television shows. My sample uses the top applications, which alludes to the notion that these games are the most popular games because children and parents already have familiarity with these characters, which serves as a motivation to download the games. They already feel connected to them because they already know who the characters are; they would not be seeking out these games if they did not already know the characters and like them. If that exposure did not exist, then it can be assumed that children would not be downloading these games. For example, a child downloads Batman: Gotham's Most Wanted because they know Batman from pre-existing sources and like him. They exercise their self-expression by basing their download and gameplay choices on their interests. This familiarity and pre-established relationships strengthen the gender roles from these characters because children already identify with them and know what to expect. My study shows that these top games reflect the popular media because parents and children know them and accept them as credible sources. These applications further expand the parasocial relationships between children and popular media characters, because the child, in a sense, gets to play with the character; however, the character still does not reciprocate the

relationship. The child engages, but the character does not know that the child exists. Additionally, the player takes on the role of the characters within these apps, and it almost serves as an obligation. They no longer just observe the gender roles and stereotypes on the screen; they now interact with the characters on a more intimate level. Thus, the present study demonstrates how social cognitive theory remains relevant in today's media- and technology-centric society and how it expands with the needs and demands of an ever-changing world.

Limitations

A number of different limitations exist within the current study. The most significant limitation of this study stemmed from not purchasing the additional in-app content. Several of the games limited the player experience due to this constraint. In-app purchases make different parts of the application available to the player. Since this study restricted the use of these in-app purchases, more data may have existed that I failed to analyze. Further data may have allowed for the development of supplementary themes. Another limitation of this study arose from the fact that one person conducted the research, meaning one person played all twenty games and kept notes. Involving two or three people to execute the study may allow for the discovery of different stereotypes. To manage this limitation, I played the game until no new content arose; this meant that I often played the applications for several hours rather than limiting the time spent on a single application to a finite length of time. The restriction of the targeted age range significantly limits the possible stereotypes and themes. It would be imperative to look at other age ranges to assess the differences in learning during gender stability and gender constancy stages. Gender constancy was important for my study because it was very experiential and observation-based; this guided the reasoning for selecting this age range. An expanded age range may present different stereotypes. Due to the nature of the study, I examined a small sample size,

randomly selecting only 10 of the top free and 10 of the top paid mobile applications available on the Apple App Store at the time of data collection. A larger sample size could yield various other stereotypes, allowing for the emergence of more themes for coding. Furthermore, the present study only examined the top applications available to Apple users; gathering data from the top applications on other mobile stores, such as the Android Store or Google Play, may generate significant variances in the data. Because the top applications change based on user activity and remain dynamic over time, the applications considered most popular one week likely become less popular over time. This implies that different games would be used by a researcher conducting the same study even a week later.

Future Research

This study should be used as a preliminary review for future research on children's applications. Testing the validity of the themes identified in this study serves as an appropriate next direction. Additionally, future research should expand the sample size beyond the top 20 games, allowing for the emergence of more organic data. Since this study limited the sample significantly by age and sampling procedure, more information needs to be collected. Therefore, additional studies that explore other age ranges offer a crucial opportunity for a more comprehensive understanding of present stereotypes. Finally, future research should incorporate children and parents to measure the impact mobile applications have on child development.

Conclusion

Gender roles and stereotypes play a crucial role in helping children develop their gender identity and relate to their peers of the same and different genders. The findings discussed in this study matter for parents because yes, parents can establish settings and locks on mobile devices, but today's children know how to maneuver around these safeguards. While mechanisms do exist to help parents protect their children, they do not limit all inappropriate media exposure; children may still play an age-inappropriate game by getting past the parental controls. This accessibility necessitates that parents monitor their children's screen time, as the effects last a lifetime. This unsupervised time or over-engagement with these apps can be detrimental to their development in varying aspects, including gender identity. Parental involvement serves as the most valuable and important indicator of the effect that the gender stereotypes in mobile applications can have on children. As technology continues to evolve, so too does its function in exposing children to a variety of gender typecasts that ultimately shape what they learn and understand about their gender and their identity. The technology already exists, and it will continue to advance and influence each new generation. However, what society chooses to do with this technology has the potential to carry even more implications for the future. Parents must decide what, when, and how they want to allow their children to interact with these stereotypes.

References

Aguilar, A. D., Lutrania, K. L., & Ceballo, E. C. (2019). The friend that got away: An exploration on female adolescent's friendship dissolution. *University of Mindanao International Multidisciplinary Research Journal*, *4*(1), 34-46. http://journal.umindanao.edu.ph/wp-content/uploads/2019/12/4110-The-Friend-that-Got-Away.pdf

Allan, A. J. (2009, February 27). The importance of being a 'lady': Hyper-femininity and heterosexuality in the private, same-sex primary school. *Gender and Education, 21*(2), 145-158. 10.1080/09540250802213172

Al-Yaqout, G. & Nikolajeva, M. (2015). Re-conceptualizing picturebook theory in the digital age. *Nordic Journal of Children's Literature Aesthetics*. http://www.childlitaesthetics.net/index.php/blft/article/view/26971

American Academy of Pediatrics [AAP]. (2013). Children, adolescents, and the media. *Pediatrics*, *132*(5), 958-961.

American Academy of Pediatrics [AAP]. (2017, October 21). *American Academy of Pediatrics announces new recommendations for children's media use*. https://www.aap.org/en-us/about-the-aap/aap-press-room/pages/american-academy-of-pediatrics-announces-new-recommendations-for-childrens-media-use.aspx

Antanas Marcelionis. (2018). Pepi Hospital [Computer software]. Pepiplay.com

App Store. (2017). *The statistics portal*. https://www.statista.com/topics/1729/app-stores/

Ariel. (2014, July 23). *Most app developers stick with one store.* Appfigures. https://blog.appfigures.com/most-app-developers-stick-with-one-store/

Arnott, L. (2016). An ecological exploration of young children's digital play: Framing children's social experiences with technologies in early childhood. *Early Years: An International Research Journal, 36*(3), 1-18. 10.1080/09575146.2016.1181049

Ash. (2019, July 30). 24 Tablet market share statistics and analysis. https://www.ejectejecteject.com/statistics/24-tablet-market-share-statistics-and-analysis/

Aviles, G. (2019, September 25). *Mattel launches line of gender-nonconforming dolls.* NBC News. https://www.nbcnews.com/feature/nbc-out/mattel-launches-line-gender-nonconforming-dolls-n1058646

Babbie, E. (2014). *The practice of social research* (13th ed.). Belmont, CA: Wadsworth.

Baker, K., & Raney, A. A. (2007). Equally super?: Gender-role stereotyping of superheroes in children's animated programs. *Mass Communication & Society, 10*(1), 25-41. https://doi.org/10.1080/15205430709337003

Baldwin, D. A., & Moses, L. J. (1996). The ontogeny of social information gathering. *Child Development, 67*(5), 1915-1939. https://doi.org/10.1111/j.1467-8624.1996.tb01835.x

Bandura, A. (1972). Socialization. In *Lexikon der psychologie. Band III.* Freiburg im Breisgau: Herder.

Bandura, A. (1977). Social learning theory. In B. B. Wolman & L. R. Pomroy (Eds.), *International encyclopedia of psychiatry, psychology, psychoanalysis, and neurology* (Vol. 10). New York, NY: Van Nostrand Reinhold.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1988). Organisational applications of social cognitive theory. *Australian Journal of Management, 12*(2), 275-302. https://doi.org/10.1177/031289628801300210

Bandura, A. (1989a). Human agency in social cognitive theory. *The American Psychologist, 44*(9). https://doi.org/10.1037/0003-066X.44.9.1175

Bandura, A. (1989b). Social cognitive theory of mass communication. In J. Groebel & P. Winterhoff-Spurk (Eds.), *Empirische Medienpsychologie* (pp. 7-32). Munchen: Psychologie Verlags Union.

Bandura, A. (1991). Self-regulation of motivation through anticipatory and self-regulatory mechanisms. In R. A. Dienstbier (Ed.), *Perspectives on motivation: Nebraska symposium on motivation* (Vol. 38, pp. 69–164). Lincoln: University of Nebraska Press

Bandura, A. (1999). A social cognitive theory of personality. In L. Pervin & O. John (Eds.), *Handbook of personality* (2nd ed., pp. 154–196). New York, NY: Guilford Publications.

Bandura, A. (2001a). Social cognitive theory of mass communication. *Media Psychology,* 3(3), 265-299. https://doi.org/10.1207/S1532785XMEP0303_03

Bandura, A. (2001b). Social cognitive theory: An agentic perspective. *Annual Review of Psychology, 52,* 1-26. https://doi.org/10.1146/annurev.psych.52.1.1

Bandura, A. (2006). Adolescent development from an agentic perspective. *Self-efficacy beliefs of adolescents, 5,* 1-43.

Bandura, A., & Bussey, K., (1999). Social cognitive theory of gender development and differentiation. *Psychological Review, 106*(4), 676-713.

Bandura, A., Ross, D., & Ross, S. A. (1963). Vicarious reinforcement and imitative learning. *Journal of Abnormal and Social Psychology, 67,* 601-607. https://doi.org/10.1037/h0045550

Barba, B. L. (2015, November 30). *What are the best developers for children's apps?* Quora. https://www.quora.com/Who-are-the-best-developers-for-childrens-apps

Basow, S. A., & Rubenfield, K. (2003). “Troubles talk”: Effects of gender and gender-typing. *Sex Roles: A Journal of Research, 48*(3-4), 183-187. https://doi.org/10.1023/A:1022411623948

Bem, S. L. (1974). The measurement of psychological androgyny. *Journal of Consulting and Clinical Psychology, 42*(2), 155–162. https://doi.org/10.1037/h0036215

Bergin, D. A., Ford, M. E., & Hess, R. D. (1993). Patterns of motivation and social behavior associated with microcomputer use of young children. *Journal of Educational Psychology*, *85*(3), 437–445. doi:10.1037/0022-0663.85.3.437

Bigler, R. S., & Liben, L. S. (2007). Developmental intergroup theory: Explaining and reducing children’s social stereotyping and prejudice. *Current Directions in Psychological Science, 16*(3), 162-166. https://www.jstor.org/stable/20183186

Blakemore, J. E. O., & Centers, R. E. (2005). Characteristics of boys’ and girls’ toys. *Sex Roles*, *53*, 619–633. 10.1007/ s11199-005-7729-0

Booker, L. (2016, April 13). *What it means to be gender-fluid.* CNN. Cnn.com/2016/04/13/living/gender-fluid-feat/index.html

Boyatzis, R. E. (1998). *Transforming qualitative information: Thematic analysis and code development.* Thousand Oaks, CA: Sage.

Boyse, K. (2010, August). *Television and children.* Michigan Medicine. med.umich.edu/yourchild/topics/tv#portray

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77-101. https://doi.org/10.1191/1478088706qp063oa

Broekman, F. L., Piotrowski, J. T., Beentjes, H. W. J., & Valkenburg, P. M. (2018, September). App features that fulfill parents' need in apps for children. *Mobile Media & Communication, 6*(3), 367-389. 10.1177/2050157918759571

Budge Studios. (2017). My Little Pony Rainbow Runners [Computer software]. https://budgestudios.com/en/apps/detail/my-little-pony-rainbow-runners/

Budge Studios. (2013). Strawberry Shortcake Bake Shop [Computer software]. https://budgestudios.com/en/apps/detail/strawberry%C2%A0shortcake-bake%C2%A0shop

Bussey, K., & Bandura, A. (1999). Social cognitive theory of gender development and differentiation. *Psychological Review, 106*, 676-713. https://doi.org/10.1037/0033-295X.106.4.676

Calvert, S. L. (2001). Young adults' perceptions and memories of a televised woman hero. *Sex Roles, 45*, 31–52.

Campbell, A., Shirley, L., & Caygill, L. (2002). Sex-typed preferences in three domains: Do two-year-olds need cognitive variables? *British Journal of Psychology, 93*(2), 203-217. https://doi.org/10.1348/000712602162544

Carver, L. F., Vafaei, A., Guerra, R., Freire, A., & Phillips, S. P. (2013). Gender differences: Examination of the 12-item Bem sex role inventory (BSRI-12) in an older Brazilian population. *PLoS One*, *8*(10). 10.1371/journal.pone.0076356

Centers for Disease Control and Prevention [CDC]. (2020). *Middle childhood (6-8 years of age).* https://www.cdc.gov/ncbddd/childdevelopment/positiveparenting/middle.html

Charlesworth, T. E. S. & Banaji, M. R. (2019, September 11). Gender in science, technology, engineering, and mathematics: Issues, causes, solutions. *The Journal of Neuroscience, 39*(37), 7228-7243. 10.1523/JNEUROSCI.0475-18.2019

Cherney, I. D., & London, K. (2006). Gender-linked differences in the toys, television shows, computer games, and outdoor activities of 5- to 13-year-old children. *Sex Roles, 54*, 717–726. https://doi.org/10.1007/s11199-006-9037-8

Chiong, C., & Shuler, C. (2010). *Learning: Is there an app for that?* PBS. www-tc.pbskids.org/read/files/cooney_learning_apps.pdf

Choi, A. (2017, April 5). *The parasocial phenomenon.* NOVA. pbs.org/wgbh/nova/article/parasocial-relationships/

Clarke, H. M., & Arnold, K. A. (2018). The influence of sexual orientation on the perceived fit of male applicants for both male- and female-typed jobs. *Frontiers in Psychology, 9*(656), 1-10. https://doi.org/10.3389/fpsyg.2018.00656

Clement, J. (2020). *Number of apps available in leading app stores 2019.* Statista. https://www.statista.com/statistics/276623/number-of-apps-available-in-leading-app-stores/

Collins-Nelsen, R., & Puddephatt, A.J. (2018). Gender, artifacts, and ritual encounters: The case of Tomboy Tools sales parties. Canadian Review of Sociology, 55(4). https://doi.org/10.1111/cars.12225

Coyne, S. M., Linder, J. R., Rasmussen, E. E., Nelson, D. A., & Collier, K. M. (2014). It's a bird! It's a plane! It's a gender stereotype!: Longitudinal associations between superhero viewing and gender stereotyped play. *Sex Roles, 70*, 416–430. 10.1007/s11199- 014-0374-8.

Cunningham, S. J., & MaCrae, C. N. (2011). The colour of gender stereotyping. *British Journal of Psychology, 102*, 598–614. https://doi.org/10.1111/j.2044-8295.2011.02023.x

Danovitch, J. H. (2019, April 26). Growing up with Google: How children's understanding and use of internet-based devices relates to cognitive development. *Human Behavior and Emerging Technologies, 1*, 81-90. 10.1002/hbe2.142

DataUSA. (2018a). *Bakers.* https://datausa.io/profile/soc/bakers

DataUSA. (2018b). *Hairdressers, hairstylists, & cosmetologists.* https://datausa.io/profile/soc/hairdressers-hairstylists-cosmetologists

DataUSA. (2018c). *Tailors, dressmakers, & sewers. https://datausa.io/profile/soc/tailors-dressmakers-sewers*

DeBell, M., & Chapman, C. (2003). *Computer and Internet use by children and adolescents in 2001: Statistical analysis report.*

Dill, K. E., & Thill, K. P. (2007). Video game characters and the socialization of gender roles: Young people's perceptions mirror sexist media depictions. *Sex Roles*, *57*, 851–862. https://doi.org/10.1007/s11199-007-9278-1

Disney Publishing Worldwide Applications. (2015). Olaf's Adventures [Computer software]. https://lol.disney.com/games/mobile-apps

Dittmar, H., Halliwell, E., & Ive, S. (2006). Does Barbie make girls want to be thin? The effect of experimental exposure to images of dolls on the body image of 5- to 8-year old girls. *Developmental Psychology*, *42*, 283–292. 10.1037/0012-1649.42.2.283.

Dockterman, E. (2016). *Barbie's got a new body.* TIME. https://time.com/barbie-new-body-cover-story/

Donnelly, K., & Twenge, J. M. (2016). Masculine and feminine traits on the Bem sex-role inventory, 1993-2012: A cross-temporal meta-analysis. *Sex Roles*, *76*, 556-565. https://doi.org/10.1007/s11199-016-0625-y

Dr. Panda Ltd. (2018). Dr. Panda Candy Factory [Computer software]. http://drpanda.com/games/dr-panda-candy-factory

Dr. Panda Ltd. (2018). Dr. Panda Restaurant [Computer software]. http://drpanda.com/games/dr-panda-restaurant

Dr. Panda Ltd. (2018). Dr. Panda Trucks [Computer software]. http://drpanda.com/games/dr-panda-trucks

Eagly, A. H., Wood, W., & Diekman, A. B. (2000). Social role theory of sex differences and similarities: A current appraisal. In T. Eckes & H. M. Trautner (Eds.), *The developmental social psychology of gender*. London, England: Psychology Press.

Eder, M. S., Diaz, J. M. L., Madela, J. R. S., Mag-usara, M. U., & Sabellano, D. D. M. (2016). *Fill me app: An interactive mobile game application for children with autism.* Mindanao University of Science and Technology, Cagayan de Oro City, Philippines. https://doi.org/10.3991/ijim.v10i3.5553

Engeln, R. (2019, June 28). *Why young girls reject the new "curvy" Barbie.* Psychology Today. https://time.com/barbie-new-body-cover-story/

Entertainment One Ltd. (2003). Peppa Pig Holiday [Computer software]. Peppapig.com

Enuma, Inc. (2018). ToDo Math [Computer software]. Todomath.com

Evaldsson, A. C. (2007, December 5). Accounting for friendship: Moral ordering and category membership in preadolescent girls' relational talk. *Research on Language and Social Interaction*, *40*(4), 377-404. https://doi.org/10.1080/08351810701471377

Eyal, K., & Rubin, A. M. (2003). Viewer aggression and homophily, identification, and parasocial relationships with television characters. *Journal of Broadcasting & Electronic Media, 47*(1), 77-98. https://doi.org/10.1207/s15506878jobem4701_5

Fagot, B. I., & Leinbach, M. D. (1989). The young child's gender scheme: Environmental input, internal organization. *Child Development, 60*(3), 663-672. https://www.jstor.org/stable/1130731

Farr, R. H., Bruun, S. T., Doss, K. M., & Patterson, C. J. (2018). Children's gender-typed behavior from early to middle childhood in adoptive families with lesbian, gay, and heterosexual parents. *Sex Roles, 78*, 528-541. https://doi.org/10.1007/s11199-017-0812-5

Federal Trade Commission [FTC]. (2012). *Mobile apps for kids: Current privacy disclosures are disappointing.* https://www.ftc.gov/sites/default/files/documents/reports/mobile-apps-kids-current-privacy-disclosures-are-disappointing/120216mobile_apps_kids.pdf

Federal Trade Commission [FTC] (2017, February). *Understanding mobile apps*. www.consumer.ftc.gov/articles/0018-understanding-mobile-apps#basics

Findahl, O. (2013). *Swedes and the Internet 2012*. World Internet Institute.

Frazer, A.k. & Miller, M.D. (2009). Double standards in sentence structure: Passive voice in narratives describing domestic violence. *Journal of Language and Social Psychology*, *28*(1), 62-71.

Fusch, P. I., & Ness, L. R. (2015). Are we there yet? Data saturation in qualitative research. *The Qualitative Report, 20*(9), 1408-1416.

Giudice, M.D. (2017). Pink, blue, and gender: An Update. *Archives of Sexual Behavior*, *46*(6), 1555-1563.

Glaser, B. (1998). *Doing grounded theory: Issues and discussions.* Mill Valley, CA: Sociology Press.

Goffman, E. (1979). *Gender advertisements.* Cambridge, MA: Harvard University Press.

Goh, W., Bay, S., & Chen, V. H. (2015). Young school children's use of digital devices and parental rules. *Telematics and Informatics, 32*(4), 787-795. 10.1016/j.tele.2015.04.002

Golden, J.C., & Jacoby, J.W. (2018). Playing princess: Preschool girls' interpretations of gender stereotypes in Disney princess media. *Sex Roles, 79*(5), 299-313.

GoodFirms. (2020). *Top iPhone app development companies 2020.* goodfirms.co/directory/platform/app-development/iphone

Goodwin, M. H. (2006). *The hidden life of girls.* Maiden, MA: Blackwell Publishing. https://doi.org/10.1002/9780470773567

Halim, M. L. D., Walsh, A. S., Tamis-LeMonda, C. S., Zosuls, K. M., & Ruble, D. N. (2018, July 9). The roles of self-socialization and parent socialization in toddlers' gender-typed appearance. *Archives of Sexual Behavior, 47,* 2277-2285. https://doi.org/10.1007/s10508-018-1263-y

Harris, C. R., Jenkins, M., & Glaser, D. (2006). Gender differences in risk assessment: Why do women take fewer risks than men? *Judgement and Decision Making, 1*(1), 48-63. https://doi.org/10.1037/e511092014-212

Hatton, E., & Trautner, M. N. (2011). Equal opportunity objectification? The sexualization of men and women on the cover of Rolling Stone. *Sexuality and Culture, 15,* 256–278. 10. 1007/s12119-011-9093-2.

Hayles, N. K. (2002). *Writing machines*. Cambridge, MA: MIT Press. https://doi.org/10.7551/mitpress/7328.001.0001

Henkel, A.Q. (2016). Exploring the materiality of literary apps for children. *Children's Literature in Education*. https://doi.org/10.1007/s10583-016-9301-7

Hoffner, C., & Buchanan, M. (2005). Young adults' wishful identification with television characters: The role of perceived similarity and character attributes. *Media Psychology, 7*, 325-351. https://doi.org/10.1207/S1532785XMEP0704_2

Holmes, R.M. (2012). The outdoor recess activities of children at an urban school: Longitudinal and intraperiod patterns. *American Journal of Play*, *4*(3), 327-351.

Holmes, B., & Johnson, K. R. (2009). Where fantasy meets reality: media exposure, relationships beliefs and standards and the moderating effect of a current relationship. *Social Psychology: New Research*, *6*, 117-134.

Holtzman, L., & Sharpe, L. (2014). Media messages: What film, television, and popular music teach us about race, class, gender, and sexual orientation. Armonk, N.Y: M.E. Sharpe

Huffaker, D. A., & Calvert, S. L. (2005). Gender, identity, and language use in teenage blogs. *Journal of Computer-Mediated Communication*, 10(2). https://doi.org/10.1111/j.1083-6101.2005.tb00238.x

Hyde, J. S. (1984). Children's understanding of sexist language. *Developmental Psychology*, *20*, 697–706. https://doi.org/10.1037/0012-1649.20.4.697

Hyde, J. S., Bigler, R. S., Joel, D., Tate, C. C., & van Anders, S. M. (2019). The future of sex and gender in psychology: Five challenges to the gender binary. *American Psychologist, 74*(2), 171-193. https://doi.org/10.1037/amp0000307

Innovative Investments Limited. (2018). Sight Word Ninja [Computer software]. www.grasshopperapps.com

Jacobi, J. (2019, October 29). *Teens spend more than 7 hours on screens for entertainment a day: Report.* ABCNews. https://abcnews.go.com/US/teens-spend-hours-screens-entertainment-day-report/story?id=66607555

Jadva, V., Golombok, S., & Hines, M. (2010). Infants' preferences for toys, colors and shapes: Sex differences and similarities. *Archives of Sexual Behavior, 39*, 1261–1273.

Jung, K., Shavitt, S., Viswanathan, M., & Hilbe, J. M. (2014). Female hurricanes are deadlier than male hurricanes. *Proceedings of the National Academy of Sciences of the United States of America*. http://www.pnas.org/content/early/2014/05/29/1402786111.full.pdf+html

Kachel, S., Steffens, M.C., & Niedlich, C. (2016). Traditional masculinity and femininity: Validation of a new scale assessing gender roles. *Frontiers in Psychology*, *7*, 956.

Kamenetz, A. (2017, October 19). *Young children are spending much more time in front of small screens.* NPR. npr.org/sections/ed/2017/10/19/558178851/young-children-are-spending-much-more-time-in-front-of-small-screens

Kaneshiro, N. K. (2019). *Screen time and children.* MedlinePlus. https://medlineplus.gov/ency/patientinstructions/000355.htm

Kar, S. K., Choudhury, A., & Singh, A. P. (2015). Understanding normal development of adolescent sexuality: A bumpy ride. *Journal of Human Reproductive Science*, *8*(2), 70-74. 10.4103/0974-1208.158594

Kirsh, S. J. (2009). *Media and youth: A developmental perspective.* Hoboken, NJ: Wiley-Blackwell. https://doi.org/10.1002/9781444317435

Knapp, M., Hall, J., & Horgan, T. (2013). *Non-verbal communication in human interaction*. Stamford, CT: Cengage

Kohlberg, L. (1966). A cognitive-developmental analysis. In E. Maccoby (Ed.), *The development of sex differences* (pp. 82–173). Stanford, CA: Stanford University Press.

Konigsberg, I. (2000). Children watching movies. *Psychoanalytic Review, 87*(2), 277.

Korioth, T. (2016). *Family media plan helps parents set boundaries for kids.* AAP News and Journals Gateway. https://www.aappublications.org/news/2016/10/21/MediaParents102116

Kramarea, C. (2005). Muted group theory and communication: Asking dangerous questions. *Women and Language, 28*(2), 55.

Kreager, D.A, & Staff, J. (2009). The sexual double standard and adolescent peer acceptance. *Social Psychology Quarterly, 72*(2), 143-164.

Lacroix, C. (2004). Images of animated others: The orientalization of Disney's cartoon heroines from The Little Mermaid to The Hunchback of Notre Dame. *Popular Communication, 2,* 213–229. https://doi.org/10.1207/s15405710pc0204_2

Lacina, J. (2008). Technology in the classroom: Learning English with iPods. *Childhood Education, 84*(1), 247–249. https://doi.org/10.1080/00094056.2008.10523019

Lakritz, T. (2019, March 26). *Then and now: How household chores have changed over the years.* Insider. https://www.insider.com/household-chores-changes-history-2019-3

Landström, C. (2006). A gendered economy of pleasure: Representations of cars and humans in motoring magazines. *Science Studies, 19*(2), 26-48. https://www.semanticscholar.org/paper/A-Gendered-Economy-of-Pleasure%3A-Representions-of-in-Landstro%CC%88m/5fdc7906c2ccf0f05f8922cdcdbb70c0878a14c8

Lave, J. (1988). *Cognition in practice: Mind, mathematics, and culture in everyday life*.

Cambridge, UK: Cambridge University Press. https://doi.org/10.1017/CBO9780511609268

Leaper, C., & Robnett, R. D. (2011). Women are more likely than men to use tentative language, aren't they? A meta-analysis testing for gender differences and moderators. *Psychology of Women Quarterly, 35*(1), 129-142. https://doi.org/10.1177/0361684310392728

Livingstone, S., Bober, M., & Helsper, E. (2005). *Internet literacy among children and young people: Findings from the UK children go online project*. Department of Media and Communications, London School of Economics and Political Science, Lo ndon.

Livingstone, S., & Haddon, L. (2008). Risky experiences for children online: Charting European research on children and the internet. *Children & Society, 22*(4), 314-323. https://doi.org/10.1111/j.1099-0860.2008.00157.x

Lummis, M., & Stevenson, H. W. (1990). Gender differences in beliefs and achievement: A cross-cultural study. *Developmental Psychology, 26*, 254-263. https://doi.org/10.1037/0012-1649.26.2.254

Mager, J., & Helgeson, J. G. (2011). Fifty years of advertising images: Some changing perspectives on role portrayals along with enduring consistencies. *Sex Roles, 64*, 238–252. https://doi.org/10.1007/s11199-010-9782-6

Maltz, D. N., & Borker, R. (1982). A cultural approach to male-female miscommunication. In J. J. Gumperz (Ed.), *Language and social identity* (pp. 196–216). Cambridge, UK: Cambridge University Press. https://doi.org/10.1017/CBO9780511620836.013

Martin, C. L., Ruble, D. N., & Szkrybalo, J. (2002). Cognitive theories of early gender development. *Psychological Bulletin, 128*, 903 – 933. https://doi.org/10.1037/0033-2909.128.6.903

Martin, C. L., & Ruble, D. N. (2004). Children's search for gender cues: Cognitive perspectives on gender development. *Current Directions in Psychological Science, 13,* 67–70. https://doi.org/10.1111/j.0963-7214.2004.00276.x

Martin, C. L., & Ruble, D. N. (2009). Patterns of gender development. *Annual Review of Psychology, 61,* 353-381. 10.1146/annurev.psych.093008.100511

Martin, F., & Ertzberger, J. (2013). Here and now mobile learning: An experimental study on the use of mobile technology. Computers & Education, 68, 76-85. https://doi.org/10.1016/j.compedu.2013.04.021

Mateo, M. A., & Fernández, J. (1991). The dimensionality of the concepts of masculinity and femininity. *Psychological Investigations, 9,* 95–116.

Mattel. (2017). Ever After High: Baby Dragons [Computer software]. https://shop.mattel.com/shop/en-us/ms/dolls

Mattel. (2020). Barbie Fashion Closet [Computer software]. Play.barbie.com

McIlwraith, R. D. (1981). *Fantasy life and media use patterns of adults and children*. University of Manitoba. Winnipeg, Manitoba.

Meltzer, A. L., & McNulty, J. K. (2014, December 10). Telling women that men desire women with bodies larger than the thin-ideal improves women's body satisfaction. *Social Psychological and Personality Science, 6*(4), 391-398. https://doi.org/10.1177/1948550614561126

Migliaccio, T. (2009). Men's friendships: Performances of masculinity. *Journal of Men's Studies, 17*(3), 226-241. 10.3149/jms.1703.226

Milkie, M. A. (1994). Social world approach to cultural studies: Mass media and gender in the adolescent peer group. *Journal of Contemporary Ethnography, 23,* 354-380.

https://doi.org/10.1177/089124194023003005

Miller, J. L., & Kocurek, C. A. (2017, March 30). Principles for educational game development for young children. *Journal of Children and Media, 11*(3), 314-329. 10.1080/17482798.2017.1308398

Morelli, A. O. (2020). *Child development theory: Middle childhood*. https://www.helenfarabee.org/poc/center_index.php?cn=1272

Moyer-Gusé, E. (2008). Toward a theory of entertainment persuasion: Explaining the persuasive effects of entertainment-education messages. *Communication Theory*, 407-425. https://doi.org/10.1111/j.1468-2885.2008.00328.x

Murnen, S. K., Greenfield, C., Younger, A., & Boyd, H. (2016). Boys act and girls appear: An analysis of gender stereotypes associated with characters in children's popular culture. *Sex Roles, 74*, 78-91. https://doi.org/10.1007/s11199-015-0558-x

Murty, V. P., Calabro, F., & Luna, B. (2016). The role of experience in adolescent cognitive development: Integration of executive, memory, and mesolimbic systems. *Neuroscience & Biobehavioral Reviews, 70*, 46-58. https://doi.org/10.1016/j.neubiorev.2016.07.034

Osadchiy, V. (n.d.). *What to expect from the App Store and Google Play Store when you launch your first app.* Yalantis. https://yalantis.com/blog/apple-app-store-and-google-play-store/

Nagel, D. (2014, April 8). *One-third of U.S. students use school-issued mobile devices.* The Journal. thejournal.com/articles/2014/04/08/a-third-of-secondary-students-use-school-issued-mobile-devices.aspx

National Associations for the Education of Young Children. (2012). *Technology and interactive media as tools in early childhood programs serving children from birth*

through age 8. Position Statement. 1-15. https://www.naeyc.org/sites/default/files/globally-shared/downloads/PDFs/resources/topics/PS_technology_WEB.pdf

Nielsen. (2012, February 16). *American families see tablets as playmate, teacher and babysitter*. https://www.nielsen.com/us/en/insights/article/2012/american-families-see-tablets-as-playmate-teacher-and-babysitter/

Number of apps available in leading app stores as of March 2017. (2017, March). The Statistics Portal. www.statista.com/statistics/276623/number-of-apps-available-in-leading-app stores/

PBS Kids. (2015). Wild Kratts World Adventure [Computer software]. https://pbskids.org/apps/

Piaget, J. (1932). *The moral judgment of the child*. London: Routledge & Kegan Paul.

Perry, D. G., & Pauletti, R. E. (2011). Gender and adolescent development. *Journal of Research on Adolescence, 21*(1), 61-74. https://doi.org/10.1111/j.1532-7795.2010.00715.x

Porter, E. (2019, August 29). *Why aren't more women working ? They're caring for parents.* New York Times. https://www.nytimes.com/2019/08/29/business/economy/labor-family-care.html

Poulin-Dubois, D., Serbin, L. A., & Derbyshire, A. (1998). Toddlers' intermodal and verbal knowledge about gender. *Merrill-Palmer Quarterly, 44*(3), 338-354.

Prewitt-Freilion, J., Caswell, T.A., & Laakso, E. K. (2012). The gendering of language: a comparison of gender equality in countries with gendered, natural gender, and genderless languages. *Sex Roles, 66,* 268-281. 10.1007/s11199-011-0083-5

Quinn, P. C., Yahr, J., Kuhn, A., Slater, A. M., & Pascalis, O. (2002). Representation of the gender of human faces by infants: A preference for female. *Perception, 31*(9), https://doi.org/10.1068/p3331

Radesky, J. S., Schumacher, J., & Zuckerman, B. (2015, January). Mobile and interactive media use by young children: The good, the bad, and the unknown. *Pediatrics, 135*(1), 1-3. https://doi.org/10.1542/peds.2014-2251

Reeder, H. (1996). A critical look at gender differences in communication research. *Communication Studies, 47*, 318-330. https://doi.org/10.1080/10510979609368486

Reychav, I. & McHaney, R (2017). The relationship between gender and mobile technology use in collaborative learning settings: An empirical investigation. Computers & Education, 113, 61-74.

Richards, M. N., & Calvert, S. L. (2015). Toddlers' judgements of media character source credibility on touchscreens. *American Behavioral Scientist, 59*(14), 1756-1775. 10.1177/0002764215596551

Ridgeway, C. L., & Correll, S. J. (2004). Unpacking the gender system: A theoretical perspective on gender beliefs and social relations. *Gender and Society, 18*(4), 510-531. 10.1177/0891243204265269

Rohlin, M. (2020, January 26). *Kobe Bryant's death affects us all.* AllLakers. Si.com/nba/lakers/news/kobe-bryants-death-affects-us-all

Ruble, D. N., Taylor, L. J., Cyphers, L., Greulich, F. K., Lurye, L. E., & Shrout, P. E. (2007). The role of gender constancy in early gender development. *Child Development, 78*(4), 1121–1136. https://www.jstor.org/stable/4620693

Rudman, L. A., & Glick, P. (2008). *The social psychology of gender: How power and intimacy shape gender relations*. New York, NY: Guilford Press.

Rudman, L. A., Moss-Racusin, C. A., Phelan, J. E., & Nauts, S. (2012). Status incongruity and backlash effects: Defending the gender hierarchy motivates prejudice toward female leaders. *Journal of Experimental Social Psychology*, *48*, 165–179. 10.1016/j.jesp. 2011.10.008.

Rudman, W. J., & Verdi, P. (1993). Exploitation: Comparing sexual and violent imagery of females and males in advertising. *Women and Health*, *20*, 1–14. 10.1300/J013v20n04_01.

Sago Sago Toys Inc. (2016). Sago Mini Babies [Computer software]. Sagomini.com

Sago Sago Toys Inc. (2018). Sago Mini Road Trip [Computer software]. Sagomini.com

Scheu, I., & Xu, Y. (2012). Expanding Fröebel's garden: The effect of play on adolescents' cognitive development. *International Journal of Adolescence and Youth, 19*(2), 245-261. https://doi.org/10.1080/02673843.2012.741048

Schunk, D. H., & DiBenedetto, M. K. (2020). Motivation and social cognitive theory. *Contemporary Educational Psychology,* 1-10. https://doi.org/10.1016/j.cedpsych.2019.101832

Sestir, M. & Green, M.C. (2010). You are who you watch: Identification and transportation effects on temporary self-concept. *Social Influence*, *5*(4), 272-288.

Sharma, N., Chakrabarti, S., & Grover, S. (2016, March 22). Gender differences in caregiving among family – caregivers of people with mental illnesses. *World Journal of Psychiatry, 6*(1), 7-17. 10.5498/wjp.v6.i1.7

Shendruk, A. (2017). *Analyzing the gender representation of 34,476 comic book characters.* https://pudding.cool/2017/07/comics/

Shakin, M., Shakin, D., & Sternglanz, S. H. (1985). Infant clothing: Sex labeling for strangers. *Sex Roles, 12*, 955-963. https://doi.org/10.1007/BF00288097

Sinno, S. M., & Killen, M. (2009). Moms at work and dads at home: Children's evaluations of parental roles. *Applied Developmental Science, 13*(1), 16-29.

Smilansky, S., & Shefatya, L. (1990). *Facilitating play: A medium for promoting cognitive, socio-emotional, and academic development in young children*. Psychological & Educational Publications.

Squeakosaurus ug & co. kg. (2018). Little Kitten Adventures [Computer software]. https://squeakosaurus.com

Statista. (2020). *Distribution of free and paid apps in the Apple App Store and Google Play as of March 2020.* statista.com/statistics/263797/number-of-applications-for-mobile-phones

Statista. (2016). *App stores - Statistics & facts*. https://www.statista.com/topics/1729/app-stores/

Stennes, L. M., Burch, M. M., & Sen, M. G. (2005). A longitudinal study of gendered vocabulary and communicative action in young children. *Developmental Psychology, 41*(1), 75-88.

StoryToys Entertainment Limited. (2018). Batman: Gotham's Most Wanted! [Computer software]. Storytoys.com

Su, Y. L., & Reeve, J. (2011). A meta-analysis of the effectiveness of intervention programs designed to support autonomy. *Educational Psychology Review, 23*, 159–188. 10.1007/s10648- 010-9142-7.

Su, R., Rounds, J., & Armstrong, P. I. (2009). Men and things, women and people: A meta-analysis of sex differences in interests. *Psychological Bulletin, 135*, 859-884.

Switzer, J. Y. (1990). The impact of generic word choices: An empirical investigation of age- and sex-related differences. *Sex Roles, 22*, 69-82. https://doi.org/10.1007/BF00288155

Ter Bogt, T. F. M., Engels, R. C. M. E., Bogers, S., & Kloosterman, M. (2010). "Shake it baby, shake it": Media preferences, sexual attitudes and gender stereotypes among adolescents. *Sex Roles, 63*, 844-859. https://doi.org/10.1007/s11199-010-9815-1

Toca Boca AB. (2018). Toca Hair Salon 3 [Computer software]. Tocaboca.com

Toca Boca AB. (2018). Toca Tailor Fairy Tales [Computer software]. Tocaboca.com/app/toca-tailor-fairy-tales/

Tucker, S. I., & Johnson, T. N. (2016). I thought this was a study on math games: Attribute modification in children's interactions with mathematics apps. *Education Sciences, 7*, 50-70. 10.3390/educsci7020050

Twenge, J. M., & Campbell, W. K. (2018). Associations between screen time and lower psychological well-being among children and adolescents: Evidence from a population-based study. *Preventative Medicine Reports*, *12*, 271-283.

United States Equal Employment Opportunity Commission [EEOC]. (1978). *The Pregnancy Discrimination Act of 1978.* https://www.eeoc.gov/laws/statutes/pregnancy.cfm

Vainapel, S., & Shamir, O., Tenenbaum, Y., & Gilam, G. (2015). The dark side of gendered language: The masculine-generic form as a cause for self-report bias. *Psychological Assessment*, *27*(4), 1513-1519. 10.1037/pas0000156

Vaismoradi, M., Turunen, H., & Bondas, T. (2013). Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nursing & Health Sciences, 15*(3), 398-405. 10.1111/nhs.12048.

Valkenburg, P. M., & Peter, J. (2007). Preadolescents' and adolescents' online communication and their closeness to friends. *Developmental Psychology, 43*, 267-277. https://doi.org/10.1037/0012-1649.43.2.267

Vealey, R. S., Chase, M. A., (2016). Best Practice for Youth Sport. Champaign, IL: Human Kinetics.

Vokey, M., Tefft, B., & Tysiaczny, C. (2013). An analysis of hyper-masculinity in magazine advertisements. *Sex Roles, 68*, 562-576. https://doi.org/10.1007/s11199-013-0268-1

Wasserman, B. D., & Weseley, A. J. (2009). ¿Qué? Quoi? do languages with grammatical gender promote sexist attitudes? *Sex Roles, 61*(9), 634-643. 10.1007/s11199-009-9696-3

Welch, A. (2018, August 6). *Health experts say parents need to drastically cut kids' screen time.* CBS News. cbsnews.com/news/parents-need-to-drastically-cut-kids-screen-time-devices-american-heart-association/

Welch, C. (2018, July 25). *Netflix is adding over 100 new user profile icons.* The Verge. https://www.theverge.com/2018/7/25/17611904/netflix-profile-icons

West, C., & Zimmerman, D. H. (1987). Doing gender. *Gender and Society, 1*(2), 125-151. https://doi.org/10.1177/0891243287001002002

Williams, M. (2015, May 19). *Where are all the women? Why 99% of construction site workers are male.* The Guardian. https://www.theguardian.com/careers/careers-blog/2015/may/19/where-are-all-the-women-why-99-of-construction-site-workers-are-male

Wolff, P., & Holmes, K. J. (2011). Linguistic relativity. *Advanced Review, 2*, 253-265. https://doi.org/10.1002/wcs.104

Wood, J. T., & Fixmer-Oraiz, N. (2016). *Gendered lives: Communication, gender, and culture* (12th ed.). Boston, MA: Cengage Learning.

Wong, W.I., & Hines, M. (2015). Effects of gender color-coding on toddlers' gender-typical toy play. Arch Sex Behavior, 44, 1233-1242. Doi:10.1007/s10508-014-0400-5

World Health Organization [WHO] (2018). Nurturing care for early childhood development: A framework for linking survive and thrive to transform health and human potential. http://docplayer.net/145386528-Nurturing-care-for-early-childhood-development.html

Yan, Z. (2005). Age differences in children's understanding of the complexity of the internet. *Journal of Applied Developmental Psychology, 26*(4), 385-396. https://doi.org/10.1016/j.appdev.2005.04.001

Zosuls, K. M., Ruble, D. N., Tamis-LeMonda, C. S., Shrout, P. E., Bornstein, M. H., & Greulich, F. K. (2009). The acquisition of gender labels in infancy: Implications for gender-typed play. *Developmental Psychology, 45*(3), 688-701. https://doi.org/10.1037/a0014053

Appendix A:

Tables and Figures

Table 1

Masculine, Feminine, and Gender Neutral Stereotypes BSRI (Bem, 1974)

Masculine Items	Feminine Items	Neutral Items
Acts as a leader	Affectionate	Adaptable
Aggressive	Cheerful	Conceited
Ambitious	Childlike	Conscientious
Analytical	Compassionate	Conventional
Assertive	Does not use harsh language	Friendly
Athletic	Eager to sooth hurt feelings	Happy
Competitive	Feminine	Helpful
Defends own beliefs	Flatter-able	Inefficient
Dominant	Gentle	Jealous
Forceful	Gullible	Likable
has leadership abilities	Loves children	Moody
Independent	Loyal	Reliable
Individualistic	Sensitive to the needs of others	Secretive
Makes decisions easily	Shy	Sincere
Masculine	Soft spoken	Solemn
Self-reliant	Sympathetic	Tactful
Self-sufficient	Tender	Theatrical
Strong personality	Understanding	Truthful
Willing to take a stand	Warm	Unpredictable
Willing to take a risk	Yielding	Unsystematic

Bem, S. L. (1974). The measurement of psychological androgyny. *Journal of Consulting and Clinical Psychology, 42*(2), 155–162. https://doi.org/10.1037/h0036215

Table 2

Randomized application list "Top Paid"

App Name	Developer	Star Rating	Price	Category	Age Range
1. Peppa Pig Holiday	Entertainment One	3.4	2.99	Education	0-5
2. Pepi Hospital	Pepi Play	4.2	2.99	Education	4-8
3. Toca Life: Pets	Toca Boca AB	4.5	2.99	Education	4-8
4. Toca Hair Salon 3	Toca Boca AB	4.4	2.99	Education	4-8
5. Wild Kratts World Adventure	PBS KIDS	3.9	3.99	Education	4-8
6. Sight Words Ninja	Innovations Investments	4.4	1.99	Education	4-8
7. Sago Mini Babies	Sago Mini	4.1	2.99	Education	4-8
8. Dr. Panda Restaurant	Dr. Panda Ltd.	4.6	1.99	Games:Family	4-8
9. Little Kitten Adventures	Fox and Sheep	4.3	3.99	Entertainment	4-8
10. Sago Mini Road Trip	Sago Mini	4.1	2.99	Education	4-8

Table 3

Randomized application list "Top Free"

App Name	Developer	Star Rating	Price	Category	Age Range
1. Batman: Gotham's Most Wanted!	Story Toys Ent. Ltd.	4.2	free	Entertainment	4-8
2. Todo Math	Enuma, Inc.	4.8	free	Education	3-8
3. Barbie Fashion Closet	Mattel, Inc.	3.9	free	Entertainment	4-8
4. Dr. Panda Trucks	Dr. Panda Ltd.	4.5	free	Education	4-8
5. My Little Pony Rainbow Runners	Budge Studios	4.5	free	Entertainment	4-8
6. Strawberry Shortcake Bake Shop	Budge Studios	4.4	free	Entertainment	4-8
7. Dr. Panda Candy Factory	Dr. Panda Ltd.	3.4	free	Education	4-8
8. Toca Tailor Fairy Tales	Toca Boca AB	3.9	free	Entertainment	4-8
9. Olaf's Adventures	Disney	3.6	free	Entertainment	4-8
10. Ever After High: Baby Dragons	Mattel, Inc	4.7	free	Entertainment	4-8

Table 4

Protocol Questions For Discovering Gendered Instances

Does the description say boy or girl?
Are pronouns used?
Is there an option to chose a between gendered characters?
Are there gender indeterminant characters?
Are there examples of girls as caregivers?
Are there examples of boys as protectors?
What verbal cues are boy and girl characters using?
What nonverbal cures are girl and boy characters using?
Do girl characters have friendly expressions?
Do boy characters have hidden or vague expressions?
What roles do girls play? Are they dominant or submissive roles?
What roles do boys play? Are the dominant or submissive roles?
In what settings are the games taking place in?

Table 5

Themes	Codes
1. Boys will be Boys	*Activeness without violence, competitive, exploration, encouraged/expected dirtiness, unreadable expressions, physical, sports related*
2. Blue Side of Life	*Presence of blue collar careers, in a position of authority, leadership, interest in STEM, focus on self, main/lead male character is learning, characters in work clothes*
3. Mommy in Training	*Nurturing, role of caretaker, cleaning, cooking, baking, role of mom, conservative, learning of basic home needs*
4. Power of Motivational Friendship	*Spending time with friends, sharing, positive/supportive communication, protection of friends (with no risk), sleepovers, tea time or meals with friends*
5. Pink Side of Life	*Presence of pink collar careers, secondary role, jobs in a nurturing field*
6. The Risk Taker	*Risky/dangerous behavior, leadership in intense situations, quick, aggressive(not violent), flying, swinging from trees, interaction with wild animals,*
7. Muscles Make the Man	*Strength, defined muscles, exaggerated muscles, violence, use of weapons, violent sounds (slicing or pounding), masked facial expressions, challenging language*
8. The Material Diva	*Focus on clothes, luxury items, home decor, luxury travel*
9. Read My Lipstick	*Focus on appearance, use of makeup, changing of hair (color, style, length), use of accessories, exaggerated/sexualized body positions/stances/poses, large breast, small waist, revealing clothes, seductive facial expressions*
10. Who Are You?	*Gender unknown, gender is purposely hidden, education driven, open,multiple roles, multiple environments, use of animals*

Table 6

Themes by Number of Instances

Themes	Units of Analysis
Boys will be Boys	26
Blue Side of Life	23
Mommy in Training	18
Power of Motivational Friendship	20
Pink Side of Life	23
The Risk Taker	17
Muscles Make the Man	16
The Material Diva	10
Read My Lipstick	18
Who Are You?	50

Table 7

Traditional masculine characters and apps

Characters	Application
1. George Pig	Peppa Pig: Holiday
2. Daddy Pig	Peppa Pig: Holiday
3. Caucasian boy with brown hair white shirt	Toca Hair Salon 3
4. Caucasian boy with long black hair and sunglasses	Toca Hair Salon 3
5. Hispanic elderly man with grey and white hair and glasses	Toca Hair Salon 3
6. Caucasian boy with short black hair and a black shirt	Toca Hair Salon 3
7. Light skin boy with curly black hair and headphones	Toca Hair Salon 3
8. Caucasian male with curly red hair and artistic handle bar mustache	Toca Hair Salon 3
9. Physical therapist in blue track suit	Pepi Hospital
10. Light skin business man at dentist office	Pepi Hospital
11. Caucasian elderly man with white hair and beard in assisted living	Pepi Hospital
12. Light skin boy with blonde hair working in the vet office	Toca Life: Pet
13. African American male as a scientist in the lab	Toca Life: Pet
14. Light skin male with big brown eyes and dark brown hair. (only male in game)	Toca Tailor Fairy Tales
15. Chris Kratt	Wild Kratts World Adventure
16. Martin Kratt	Wild Kratts World Adventure
17. Jack the Rabbit	Sago Mini Babies and Sago Mini Road Trip
18. Harvey the dog	Sago Mini Babies and Sago Mini Road Trip
19. Olaf	Olaf's Adventures

Table 8

Hyper-Masculine characters and apps

Characters	Apps
1. Chris Kratt	Wild Kratts World Adventure
2. Martin Kratt	Wild Kratts World Adventure
3. Batman	Batman: Gotham's Most Wanted!
4. Robin	Batman: Gotham's Most Wanted!
5. Army Man	Pepi Hospital
6. Emergency Transport Driver	Pepi Hospital
7. Hispanic man with long brown hair and full beard	Toca Hair Salon 3
8. African American boy with curly blonde hair in athletic wear	Toca Hair Salon 3
9. African American male with full facial hair and comb over	Toca Hair Salon 3
10. Light skin boy with curly hair and athletic dress	Toca Hair Salon 3
11. Caucasian male with curly blonde hair and full facial hair	Toca Hair Salon 3
12. African American male in police officer uniform	Toca Life: Pets
13. Olive skin boy with blonde hair and athletic wear playing soccer	Toca Life: Pets
14. Caucasian boy with athletic wear playing in the water	Toca Life: Pets
15. Olaf	Olaf's Adventures

Table 9

Traditional feminine characters and apps

Characters	Application
1. Light skin girl with big brown eyes and braided brown hair (only girl in game)	Toca Tailor Fairy Tales
2. Peppa Pig	Peppa Pig: Holiday
3. Mummy Pig	Peppa Pig: Holiday
4. Strawberry Shortcake	Strawberry Shortcake Bake Shop
5. Jinga the cat	Sago Mini Babies and Sago Mini Road Trip
6. Robin the bird	Pepi Hospital
7. Cafe cashier	Pepi Hospital
8. Front desk/ Receptionist	Pepi Hospital
9. Nurse/ Pharmacist on floor 2	Pepi Hospital
10. Pregnant woman in pink dress	Pepi Hospital
11. Labor and delivery nurse in pink scrubs	Pepi Hospital
12. MRI attendant in blue scrubs	Pepi Hospital
13. Elderly lady in assisted living	Pepi Hospital
14. Young girl with cats with pink pig tails	Pepi Hospital
15. Young African American girl with braids	Toca Life: Pets Toca Life: Pets
16. Young girl Pink hair in two buns	Toca Hair Salon 3
17. Young girl with long curly brown hair	Toca Hair Salon 3 Toca Hair Salon 3
18. African American female with a dark brown afro	Toca Hair Salon 3

Table 10

Hyper-feminine characters and apps

Characters	Application
1. Braebyrn	Baby Dragons: Ever After High
2. Apple White	Baby Dragons: Ever After High
3. Barbie with blonde hair	Barbie Fashion Closet
4. Barbie with long brown hair	Barbie Fashion Closet
5. Barbie with brown pigtails	Barbie Fashion Closet

Table 11

Gender indeterminate characters and apps

Characters	Application
1. Little Kitten	Little Kitten Adventures
2. Dr. Panda	Dr. Panda Restaurant/Dr. Panda Candy Factory /Dr. Panda Trucks
3. Hippopotamus	Dr. Panda Restaurant/Dr. Panda Candy Factory /Dr. Panda Trucks
4. Monkey	Dr. Panda Restaurant/Dr. Panda Candy Factory /Dr. Panda Trucks
5. Elephant	Dr. Panda Restaurant/Dr. Panda Candy Factory /Dr. Panda Trucks
6. Pig	Dr. Panda Restaurant/Dr. Panda Candy Factory /Dr. Panda Trucks
7. Rhinoceros	Dr. Panda Restaurant/Dr. Panda Candy Factory /Dr. Panda Trucks
8. Tally	Todo Math
9. Twilight Sparkle	My Little Pony Rainbow Runners
10. Fluttershy	My Little Pony Rainbow Runners
11. Robot Assistant	Pepi Hospital
12. Injured Robot	Pepi Hospital
13. Purple Monster in dentist office	Pepi Hospital
14. Light blue eye doctor	Pepi Hospital
15. Green three eyed alien	Pepi Hospital
16. Snowman with a blue pot on their head	Toca Life: Pets
17. Blue dolphin in red shirt	Toca Life: Pets
18. All cats, dogs, turtles, sloths, etc.	Toca Life: Pets

Figure 1

Thematic Map of Gender Stereotypes in Childs Mobile Applications

Note: Figure 1 does not list all instances of gender for each theme. This was done as there is not enough space in the given document to accurately list all recorded instances.

Appendix B**:**

Game Experiences

Game Experiences for "Top Free" Games

Batman: Gotham's Most Wanted

The player enters the game and receives an eight-chapter story read aloud. While eight chapters exist, players can only access one for free. The remaining seven chapters must be purchased. The application offers four interactive games, each with eight levels. The developers make only one of the four activities available for free. The eight different levels vary in difficulty, with level one being the easiest and level eight being the most difficult. The first and only activity played featured Batman flying through the skyline of Gotham City after the Joker, who leaves explosives behind. The player must guide Batman around the explosives by gliding their finger across the screen. If Batman flies into an explosive, black smoke appears on the screen and weakens Batman. If the player hits an explosive three times, the level restarts. The player has unlimited lives, meaning they can continue to play indefinitely. Progression to each level does not introduce new elements. The explosive balls begin to increase in number, left in patterns such as an 'L' shape, and they begin to spin. The player also experiences an increase in speed from one level to the next. To go further in this app, the user must purchase add-ons (Version 2.1.1; StoryToys Entertainment Limited, 2018).

ToDo Math

This application prompts the player to select an age range between pre-kindergarten and second grade upon opening the program. The lessons vary based on the player's selection. This application has over 50 games available; however, this study only discusses five. Lessons available include tracing numbers and shapes, counting, time, money, identifying patterns, and

grocery shopping. The application separates lessons into categories such as counting, basic operations, reasoning, time and money, and measurement and data. One activity in the app, called number tracing, shows the individual two oranges; the user must then trace an outline of the number two. The player has unlimited tries to get the answer correct. With each correct answer, the player receives a gold star. Another activity available, grocery shopping with an animal friend, includes a crocodile walking with a cart, stopping at a shelf and telling the player they need an onion. The player then drags and drops the onion into the cart. The more stars the player earns, the more monster characters they collect. This application does not have a loss system, as the player has unlimited tries and the game always rewards correct answers (Version 5.4.3; Enuma, Inc., 2018).

Barbie Fashion Closet

Barbie Fashion Closet gives the player the choice of nine different Barbie characters. However, six of the characters require payment to unlock. The game includes only female characters, each slender with long hair. One of the free characters is Caucasian with blonde hair, and the second is African-American with dark brown hair. The application experience does not change based on the character chosen. When the player picks their Barbie, they enter a closet with several different outfit choices. The outfits range from blouses to jeans, dresses, casual, business, and vacation wear. Once Barbie dresses in the chosen outfit, the player can then style Barbie's hair. Options include wearing her hair up, down with curls, and adding colors such as pink, blue, or purple. After doing Barbie's hair, the player can add makeup. The makeup available contains eyeshadow, lipstick, and costume makeup like butterflies on her face. The next step involves taking Barbie to a chosen location and photographing her. The free locations available consist of a pink bedroom, the beach, and a vet office. The other locations require

payment. After selecting the location, the player picks Barbie's stance for a photograph, which the game saves to a photo album in the application and becomes available to share to social platforms like Facebook (Version 1.70; Mattel, 2020).

Dr. Panda Trucks

Dr. Panda Trucks brings the player into a construction area. The player has four different trucks with which they can interact. The user drives the trucks by guiding a finger around the screen in the direction of choice. The first truck, a wrecking ball driven by a panda bear in a yellow construction hat, rotates with a red lever that the player can move left to right, causing the truck to rotate in the indicated direction. The wrecking ball can be used to knock over a variety of structures such as a pyramid of blocks, stacks of barrels, and a building. In order to knock these structures over, the player hits a red button with an image of the truck on it. The player hits this button until partially or completely destroying the structure. Users drive the second truck available, a dump truck, to a supply distribution and fill it with one of three building materials, either brick, concrete blocks, or wood. After collecting the chosen material, players drive over to the workspace and unload the materials. The materials stack themselves into structures.

Structures can only be built on the building pad in the center of the worksite. A pig in overalls and a hard hat drives a bulldozer, the third truck. The bulldozer's plow extends to collect the fallen items and pushes them away from the surface. It can also be used to knock over structures, similar to the wrecking ball. An elephant drives the final truck, a crane that it controls with a red lever to rotate and spin around the workspace. A yellow button makes picking up the blocks easy. This also helps the player stack blocks to customize buildings. Besides constructing and destroying buildings, the player can drive around and launch the characters and trucks over

pits of mud and water. Other items in the game do not offer much interaction, but if the player drives over a water drain, water lifts the driver (Version 1.78; Dr. Panda Ltd., 2018).

My Little Pony Rainbow Runners

The application opens with six My Little Pony characters as options for play. The game makes two of the six characters free, Fluttershy and Twilight Sparkle. The other four ponies, Rarity, Pinkie Pie, Applejack, and Rainbow Dash, require purchase. The purpose of this application centers on rescuing the ponies' world of Ponyville one obstacle at a time. A powerful force attacks Ponyville and seems to steal all of the color. The ponies restore the color by running and collecting gems. They spread their rainbow through the "power of friendship." The game offers words of encouragement throughout the levels, such as "You are the best." For each level, the pony has three lives, represented by hearts at the top of the screen. If the pony gets hurt three times by an obstacle, like a thorn bush, the player must start the level over. At the end of each level, the color returns to that part of Ponyville and the ponies can move to the next level (Version 1.5; Budge Studios, 2017).

Strawberry Shortcake Bake Shop

In Strawberry Shortcake's Bake Shop, Strawberry Shortcake and her kitten greet the player when they enter the shop. The player receives an order to fill from one of Strawberry Shortcake's friends. For every order filled properly, the player earns a star. The player views a scroll screen of different desserts to make. However, the game only makes one dessert available for free. The other four require additional in-app purchases. For example, one cake order may be a Very Berry Shortcake with blueberries. The player would select the Very Berry Shortcake recipe, enter the kitchen counter space, and mix their dry ingredients. The dry ingredients include flour, salt, sugar, and baking powder. To mix the dry ingredients, the player drags and drops

them into a blue bowl with strawberries on it. After mixing the dry ingredients, the player adds a stick of butter. In a separate green bowl, the player cracks an egg by dragging and dropping, and pours milk by tilting the screen. The player may choose how they want to stir the ingredients together, using either a whisk or an electric mixer. The player operates both items by moving a finger in a circular motion over the bowl. After mixing the milk and egg, the player pours the wet ingredients into the blue bowl. Next, the player adds food coloring to the batter. Seven colors exist to choose from: orange, blue, pink, red, purple, yellow, and green, but only orange can be used for free. The other six require in-app purchase. The player stirs the ingredients one more time after selecting the color before pouring them into the pan. The player can pick the color of the oven used to bake the cake, either blue or red, although the functions of the two ovens remain the same. After baking the cake, the user adds whipped cream and can choose from five fruits to enhance their cake. The player should pick the fruit that matches the request of the order placed. Then, the player can decorate their cake with different sprinkles, statues, or candles. Two different sprinkles remain available for free; rainbow and pink. The three toppers to pick from include a princess and two different strawberry people. All candles require in-app purchase. Upon completion of the decorating, the player eats it by tapping on the screen. Finally, the player saves the recipe to their cookbook. With most of the ingredients locked, the game limits players to one cake recipe and therefore prevents game progress (Version1.7; Budge Studios, 2013).

Dr. Panda Candy Factory

When entering the application, the player arrives in a small factory of four buildings. Of these buildings, two remain locked, requiring in-app purchases to interact with them. One building does not contain opportunity for interactive play, and the player can enter the fourth by tapping the conveyor belt. The available building, the production facility for Dr. Panda's candy,

contains a spinning surface with six square, clear candies. These candies can be picked up and moved to two workstations. The workstation on the left offers four flavor choices represented by four items. Flavor choices include winter mint, represented by an icy square with snowflakes; sweet, indicated by a pink heart; tart, represented by a lemon; and spicy/hot, denoted by a pepper. The player drags and drops their chosen flavor into the blender and clicks the 'On' button, adding the flavor to the candy. Players can add as few as one flavor and as many as all four. Next, the player clicks a green button, moving them to a 'melting pot' that they turn on by moving a finger in a circle of a red wheel. This melts the candy down into a liquid. Once in a liquid stage, the player pours the candy into a mold, which comes in four different shapes: a star, a heart, a circle, and a triangle. Once the candy hardens in the mold, the candy moves back to the spinning surface. The workstation on the right contains a sink filled with water. The candy drops into the water, and the player can add four different food colorings to change the color of the candy. The colors available include red, blue, yellow, and green. The player can add more than one color to the candy; for example, if the player uses both red and blue, the candy turns purple. The next step at this workstation involves adding color flakes. However, the game does not make it clear whether these flakes have flavors, as it does not offer indicators. Players can add two of the six to each candy. Upon completing the six candies in the factory, they load into one tray and try to zoom down a tube to land on a plate in a candy shop. In the candy shop, Dr. Panda stands behind the counter with three friends, a hippo, a pig, and a cat. The four characters are gender indeterminate. The characters eat the candies and react with positive facial expressions. The player can repeat this as many times as desired. No rewards, winning, or losing occurs in this application (Version 1.02; Dr. Panda Ltd., 2018).

Toca Tailor Fairy Tales

Players enter the game and get the choice between a male and a female character. This application allows players to tailor clothes for the characters. The male character has brown shaggy hair and appears in random clothing each time the player selects him. The random clothing ranges from pants to shorts and a skirt, and from a short sleeve shirt to a long, puffy sleeved shirt. The female character has long brown hair with a braid and also appears in the randomized clothing. Once the player chooses a model to dress, the player begins to customize the clothing worn. Shirts can change in length, shape, and sleeve type. To change the length, the player drags the area up and down as desired; for example, the sleeve length varies from a tank top to short sleeve, elbow length, three-quarter, and full length. The player can then change the style. For example, the sleeve can be round and puffy, straight and fitted, and have ruffled ends or a triangle cut. The top can change from a V-neck to a scoop neck, straight neck, or collared shirt. Bottoms change from shorts to pants, capris, a slim skirt, and a puffy skirt. Once the player picks the outfit style, they can change the colors or patterns. The game offers twelve different colors: dark blue, light blue, dark green, light green, red, pink, yellow, light brown, dark brown, cream, and orange. Four different patterns also exist: dark floral, yellow floral, stripes, and a diamond pattern. Players can also add belts, buttons, and stitches to the clothing. The colors, patterns, and clothing options do not change based on the male or female character selection. The player can repeat the process as many times as desired. This application contains no rewards or consequences. The characters do not speak. However, they do have a range of facial expressions from smiling to crossing their eyes. The player can take a photo of their creation, which the game saves to a photo album that can be shared to social platforms such as Facebook or Instagram (Version 1.0.5; Toca Boca AB, 2018).

Olaf's Adventures

This app has four different adventures, one free with download and the remaining three requiring additional purchase. The free adventure takes the player to a snowy landscape. Olaf introduces himself and the premise of the adventure: collecting all ten missing snowflakes for Queen Elsa. This includes completing different tasks as presented. To collect the snowflakes, the player guides Olaf around in the snow. The player finds one snowflake by sliding down a snow hill on Olaf's stomach. Another snowflake appears by instructing Olaf to smell a patch of flowers. Three snowflakes can be won by playing Olaf in a snowball fight. Each time the player hits Olaf with a snowball, a scale on the side shows how close the player is to winning. Olaf can also play music when tapping on icicles hanging from a tree. Playing music on the icicles enough times helps Olaf find one snowflake. Olaf can dodge snow thrown by the monster named Marshmallow. To play this activity, the player taps on Marshmallow, causing the snow monster to begin launching large snowballs at Olaf. The player must tap on the screen to help Olaf run away from the flying snow. When Olaf cannot dodge the snow, he falls down. A timer on the side tells the player how much longer they must protect Olaf from Marshmallow. Once the timer finishes, Olaf collects two snowflakes. The player collects the last two snowflakes by instructing Olaf to lean against a tree, causing a pile of snow to fall on him. After collecting all ten snowflakes, the player can move on to the other levels. The other levels require purchase, so this study did not collect data from them (Version 2.1; Disney Publishing Worldwide Applications, 2015).

Baby Dragons: Ever After High

To begin the game, the player picks a dragon egg from the dragon nursery. Seven dragon eggs exist to choose from; however, only one comes free with the application download. The available dragon egg, a female dragon named Braebyrn, has a trainer named Apple White.

Clicking on the name below the egg pulls up details about the dragon, such as a lightning bolt as her dragon magic, fairest flip as her flying trick, and identifies her favorite food as cupcakes. Braebyrn has a white, gold, and pink coat with large blue eyes. The player, who takes on the role of Apple White, must keep their baby dragon happy, nurtured, trained, and active. The player's main goal centers on filling their dragons 'Happyometer' all the way to the top by doing what their dragon wants or needs. Braebyrn's camp area serves as her own space to relax and interact with the player. The baby dragon tells its trainer (the player) when she wants something. For example, a thought bubble with a fork and knife appears above the dragon when it feels hungry. This cues the player to feed their dragon. To feed Braebyrn, the player drags and drops a cupcake off the tree in the camp. Each time the player meets the dragon's needs, they collect orbs, necessary for leveling up. With each new level, the dragon receives a free gift. Players can "buy" clothes and decorations for their dragon with gems won by completing games and adventures. Symbols on the bottom of the screen represent each activity; for example, a video game controller signifies games, a couch stands for decor shopping, and a crown symbolizes clothes shopping. Buying decorations like flowers and waterfalls to fill the camp space make the dragon happy. Braebyrn can play four different games with her trainer to perfect her skills. One game focuses on flying. In this game, the player uses their finger to guide Braebyrn through the sky to collect as many gems as possible in 30 seconds. Flying through a cloud slows Braebyrn down but does not hurt her. The gems collected in this game serve as the reward. The next game centers on fire breathing. Set in an arena type space, balloons, piñatas, and presents launched into the air serve as targets. To destroy them, the player holds their finger over them until they explode. This game lasts for 30 seconds. The more items the player destroys, the more gems the player wins at the end. Another game available in the arena setting includes a game of fetch,

which involves the player throwing the ball and Braebyrn bringing it back. The game awards gems at the end. The final game takes place in a beach setting. In this game, a circle of hollowed-out coconut halves hides different items like a starfish or sunglasses. The player must match the objects together by uncovering pairs of objects (Version 2.82; Mattel, 2017).

The games and the adventures in the application remain separate. To complete an adventure, the player clicks the compass icon on the bottom of the screen. This takes them to a story-like landscape with different storybook conquests. The player chooses from four different adventures as desired. However, completing an adventure requires no interaction from the player. Instead, the player waits on the same screen from one to two minutes until their dragon completes the task and then receives gems. The player bears the responsibility for socializing their dragon by having teatime with their friends. Dragons can also be socialized by buying small critter friends to have with them in their camp. Items are purchased with small pink gems earned through task completion. Finally, the player needs to make sure their dragon gets plenty of rest by building their dragon a bed out of hay (Version 2.82; Mattel, 2017).

Game Experience for "Top Paid" Games

Peppa Pig Holiday

Peppa Pig Holiday introduces the player to Peppa, George, Mummy, and Daddy Pig. The Pig family includes two female characters and two male characters, and a male British voice narrates the application. The player chooses from six activities. Some of these activities involve helping the family prepare for their vacation and others include events during their vacation. The available activities incorporate airport luggage and security, swimming, getting ready for the beach, filling ice cream orders, filling pizza orders, and decorating postcards. The first activity centers around the family's time in the airport. In this section of the app, the player follows

verbal instructions of placing luggage on the luggage belt. For example, the male voice instructs the player to “place four blue bags on the belt” or “place three large luggage pieces on the belt.” Once the player completes the instruction correctly, they click the green button and receive their next task. The player has unlimited tries to complete the ten instructions. The male voice remains supportive with different positive messages after each round like “keep going” or “perfect.” The next part of the airport experience involves luggage and the x-ray machine used by airport security. An airline attendant places a bag into the x-ray machine, and an item appears. The player must help Peppa match the items shown in the bag with the items floating above her. The player does this ten times with unlimited tries. Once completed, the family boards their plane for their vacation. The next activity encompasses going to the beach. First, the player helps Peppa get ready by picking one of five swimsuit options. The options, all the same style and cut, vary only in color: red, yellow, purple, blue, or green. The player chooses whatever color they want Peppa to wear. After they select a swimsuit, they help Peppa pick other beach accessories like floaties, sunglasses, and hats. The items available include red heart-shaped sunglasses, orange wing floaties, an orange waist floatie, a pirate’s hat, and a captain’s hat. The player can choose as many items as they wish, but they may only select one hat. The player then puts sunscreen on Peppa by moving their finger in a circular motion. After helping Peppa get ready for the beach, they must help George. George has five swimsuit color options as well: blue, green, red, yellow, and pink. Once in his swimsuit, the player helps George pick beach accessories; his options include the same orange floaties, rainbow sunglasses, a pirate hat, and a captain's hat. Then the player applies sunscreen to George. Once dressed, Peppa and George need help packing a beach bag with all their toys. They can pack twelve different items for the beach: a blue towel, a pink towel, two beach balls, two shovels, two sand buckets, a dinosaur, a teddy bear, a toy boat, and a

racket. On the beach, the player clicks various items to interact with them. For example, if the player clicks the beach ball, Peppa throws it to George, who throws it back to Peppa. Daddy Pig opens and closes the beach umbrella when the player touches it. When the player taps the crab, it pinches Daddy Pig. By tapping the beach bag, Mummy Pig picks up different items from the bag and puts them back. Finally, if the player taps the beach bucket, George makes a sandcastle. The next game, 'swimming race,' offers a multiplayer option as well as individual play. To begin, the player chooses a character by dragging and dropping them into a circle. The four characters jump into the pool. To make a character swim faster, the player taps the circle on the side of the screen. In individual play, the app controls the remaining three characters. Once someone wins, the app reverts back to the home screen to pick a different activity. No celebratory sound or reward appears. The next activity, decorating postcards, allows the player to choose from five different postcard scenes: a small vacation house, a town street, a Chinese celebration, a beach, and a road sign. To decorate these postcards, the player has different stickers that match the themes of the postcards. For example, they have beach balls, the family in their swimsuits, a Chinese dragon, and a koi fish. The player can also pick different sayings to put on the cards like "Wish you were here!" or "Having a lovely time!" The player can use as many stickers or sayings as they wish. When finished, they return to the home screen for their next activity, called 'Ice Cream.' In this game, the player must fill ten ice cream orders correctly before the time on the clock runs out. The image of the ice cream order appears on the right side of the screen, and the player must pick the correct cone, ice cream flavor, and toppings. Doing this correctly ten times wins the game. The next activity, 'Let's Make Pizza,' features Peppa and George in a kitchen. The first step involves mixing the water and flour. The player stirs the ingredients by moving their finger in a circle over the bowl and then kneads the dough by moving their finger

over it. Next, the player rolls the dough with a rolling pin. Once ready to bake, the player adds tomato sauce to the dough. Then, the player slices topping ingredients with their finger, onions, peppers, tomato, and pineapple, and adds them to their pizza. The toppings also include cheese, peanut butter, strawberry jam, corn, spinach, herbs, bananas, mushrooms, carrots, apples, cucumbers, and radishes. They then cook their pizza and slice it into fourths for the Pig family to eat. Once the player completes all the activities, the family boards the plane home. This application does not have extra in-app purchases, so once the player purchases the app, they have full access to all activities. No winning or losing occurs in this game, just completing the vacation tasks (Version 1.2.9; Entertainment One Ltd., 2003).

Pepi Hospital

Pepi Hospital has four separate levels represented by the different floors of the hospital building. To begin, the player clicks on a level. The first level, going from bottom to top, takes the player to the garage of the hospital. Here, an ambulance waits with an injured passenger and a driver. The passenger has an arm wound and needs medical attention. To interact with characters, the player uses their finger to drag or guide the character around the screen. The screen goes from left to right, showing more of the setting and environment. The application includes several characters, including both male and female patients, male and female hospital workers, and gender indeterminate characters such as monster-like beings. If a character needs medical attention, a floating thought bubble above their head indicates the type of care they need. For example, a male soldier requires dental work, so a bubble with a tooth drill in it appears above his head. The player must guide them to the right section of the hospital by using the elevator. When the soldier receives his dental care, his facial expression changes to one of relief. In the hospital, the player interacts with various items around the hospital, such as the printer,

exercise balls, skeletons, and food. The player changes the outfits of the characters by tapping clothing hanging on the wall. The available clothing includes different colored scrubs. Only the gender indeterminate have the ability to speak, using an unknown or made-up language. Once all the sick or injured characters receive care, the player can simply interact with the items around the hospital. No add-on purchases exist in this application, nor does it contain awards or winning in this virtual hospital environment (Version 1.0.32; Antanas Marcelionis, 2018).

Toca Hair Salon 3

Toca Hair Salon 3 takes place in a virtual hair salon. The player assumes the role of the hairdresser and has free will to cut, style, color, and accessorize the client's hair. The application includes more than 40 unique clients to choose from, ranging in age, sex, gender, ethnicity, hair texture, and style. The player selects their clients by clicking on a square photo of them on the home screen. Once they select a client, the player moves into the salon and begins their client's transformation. In the salon, the player keeps complete control over the appearance of the character. Traditional hair stylist tools such as combs, brushes, razors, clippers, and shears all become available to cut and style the hair. Players can also make the hair longer by using a bottle of cream. The player may curl, crimp, blow dry, and straighten the client's hair. The app also allows for hair dyeing, offering natural colors like black, brown, and blonde in addition to alternative colors like purple, pink, and blue. Multiple colors can be used to reach the desired look. On top of these traditional hair treatments, the player has the ability to add facial hair to any of the clients. After adding facial hair, they can shave or trim it to the desired length and style, such as a beard, mustache, or goatee. This feature remains available regardless of the gender of the client. Next, the player accessorizes and dresses their client. Accessories include hairclips, hats, bows, buttons, and sunglasses. The clothing options vary from several different

styles like activewear to graphic t-shirts, floral prints, dresses, and leather jackets. The final step involves taking a picture of the client to save it to the scrapbook within the application. All characters stay nonverbal but react through sounds or facial expressions like smiles and looks of uncertainty or confusion. No in-app purchases come with this application, and it does not involve winning. The player can style as many clients as they desire (Version 1.2.7; Toca Boca AB, 2018).

Sago Mini Road Trip

Mini Road Trip features six vacation or adventure destinations with popular Sago friends. For this application, the player controls Jinja the Cat. The home screen of the application gives the player the choice of three road trip spots (at a time) with a specific friend. For example, if Jinja wants to go to the beach, it may be with Robin the Bird, but if he would like to go to the city, it would be with Jack the Rabbit. The six destinations and three available friends appear randomly to create different adventures. The friends that Jinja can travel with include Harvey the Dog, Jack the Rabbit, and Robin the Bird. To begin the game, the player chooses a destination. Then, Jinja needs help packing his suitcase with items for vacation. The player packs clothing items like a swimsuit, a jacket, a pair of socks, and underwear. The player can also pack items like miscellaneous food items (cake, apple toast, etc.), a beach ball, sunglasses, or flippers. After packing Jinja's suitcase, the player picks a car for the road trip. The player can pick between 20 unique cars, ranging from emergency vehicles (police car or ambulance) to sports cars, a monster truck, a hotdog car, or a chicken-shaped car. Jinja then begins the drive to the chosen destination. To drive, the player touches the front of the screen to move forward. This drives Jinja through a hilly landscape with minor obstacles like mud or water puddles and larger items blocking the road like boxes, giant beach balls, and giant cupcakes. None of these obstacles slow down the

car, and they do not cause damage. During the drive, Jinja can stop for a car wash or to get gas. When Jinja stops to get gas, the player taps the nozzle and begins to fill the gas tank. The screen counts to 100 and the gas fill up finishes. To wash the car, the player taps the sponge and spreads bubbles over the car, then rinses it with the hose. The game counts the ten-mile road trip down by mile markers. At the end of the road trip, confetti bombs explode, and Jinja jumps out of the car to greet his friend, at which point the app takes a photo. This application has no time restraints, no rules, and no in-app purchases (Version 1.4; Sago Sago Toys Inc, 2018).

Wild Kratts World Adventure

In this application, the player assumes the role of the Wild Kratts brothers, Chris and Martin. The brothers explore the world, learning about different animals and ecosystems. In the game, the brothers not only learn about but also help the animals. The app includes six games, each of which has ten levels. As the player progresses in levels, the difficulty increases. The first game, Orangutan Swing, requires the player to help the brothers, dressed in orangutan suits, swing from branch to branch, collecting food to feed the babies. If they do not grab the branch at the right time, the player falls down and gets injured, causing them to start the level over. Additionally, an angry male orangutan tries to stop the player from finishing. If the orangutan grabs the player, they lose the level and must start over. The second game, called Frogfish Hunt, involves Chris and Martin in a submarine mimicking a Frogfish. To win the level, the player must eat as many of the other fish as possible. The bigger the fish, the more points the player earns. No obstacles in this game can hurt the player. Lemur Stink Fight, the third game, asks the player to choose which brother they would like to be. After that, the brothers face off in a 'match' and begin using their tails to stink at each other. If the player gets hit with the stink, it weakens them. If they get hit enough times, they die; the one left standing wins the game. The

fourth game, Spider Monkey Climb, requires the player to help a baby spider monkey climb through the trees to collect fruit. On the way up, spiders and snakes that can hurt the spider monkey jump out. To avoid getting hurt, the spider monkey should wait until they do not see them. If the spider monkey gets hurt, the game starts over. In the fifth game, Dolphin Trash Dash, Chris dresses in a dolphin-like suit, swimming behind a boat polluting the waters. Chris needs help picking up the trash. This game focuses on keeping the ocean clean for the wildlife and doing it safely. In the game, Chris can be hurt by getting hit with trash or by being attacked by a shark. To help him, the player uses their finger to guide Chris around the dangers. If Chris gets hurt, the game starts over. Finally, in the sixth game, called Woodpecker Drill Down, Martin acts as a woodpecker searching for bugs in a tree and competing with a real woodpecker. Whoever gets the bug first wins the round. The player must help Martin search for the bugs by going up and down the tree and tapping on the screen. This application also hosts an educational aspect, represented by a light bulb the player can click on. This button takes them to information about animals and environments around the world (Version 2.1; PBS Kids, 2015).

Sight Word Ninja

Sight Word Ninja does not have any characters and focuses on literacy advancement. The application mimics the once popular Fruit Ninja application. Words begin to fly against a dark background, and the player must 'slice' through as many words as possible in two minutes using their finger. The more words the player slices through, the more stars they earn. The words come from a lower elementary school reading level, and parents can change the reading level by going to the settings gear. The different levels range from preschool to second grade. Some of the words in the game include what, seven, happy, of, and, there, and long. The game contains countless levels and randomizes the words. The difficulty can be changed in the settings as well,

from easy to medium or hard, and the time length can be adjusted from a minute to as long as five minutes. This game can be easily customized to meet the player's needs and requires no in-app purchases (Version 2.0; Innovative Investments Limited. 2018).

Sago Mini Babies

Sago Mini Babies contains four baby characters from which the player can choose, such as Jinja the Cat, Harvey the Dog, Jack the Rabbit, and Robin the Bird. Once they select a character, the player enters a nursery setting filled with other infants, toys, bottles, and caretakers. In the nursery, the player completes a number of caregiving tasks. For example, an octopus holding bottles offers the player the responsibility of feeding the baby the proper amount to make their character happy, indicated by a smile or burp. If the player sits in the task too long without interacting with their character, the baby becomes upset and begins to cry. The next experience involves play time with blocks. In this portion of the game, the character learns the shapes and colors of the play blocks. When the character does not get the blocks they want, they begin to cry. The next playtime activity allows the player to play outside on the swing. The swing enables the character to bounce. The player pushes the swing with their finger. If the swing goes too high, the character shows a frustrated look. In the next activity, bath time, the character does not like bath time. The player can cover their character in soap and rinse them off until clean. The next activity requires changing the character's dirty diaper. The player must remove the soiled diaper and use baby wipes to clean up the baby before placing a new diaper on them. The final activity involves feeding the character a series of different fruits and veggie-based baby food. If the character does not like the food choice, they spit out the food. If they enjoy the food, then they smile. The game includes no rewards/winning or time restrictions, nor does it make in-app purchases available (Version 1.2; Sago Sago Toys Inc., 2016).

Dr. Panda Restaurant

In Dr. Panda's Restaurant, the player holds the responsibility for learning the basic functions of the restaurant. The first step includes helping the character, either a monkey, a rhino, a cat, or a hippopotamus, get seated. Once the character sits down, a thought bubble appears over their head indicating what food they would like. The player clicks this, causing the screen to change to a kitchen setting. In the kitchen, the player learns how to make a variety of dishes such as soup, cookies, orange juice, and fruit kabobs. When ready to eat, the dish appears on the table. The characters smile, and confetti falls from the ceiling. After the character finishes eating, the player clears the dishes, washes the table, and resets the place settings. Finally, the player learns how to wash the dirty dishes by rubbing soap and water over them in the kitchen sink. The player can seat as many customers as they wish with no time restraints and no in-app purchases (Version 2.6; Dr. Panda Ltd., 2018).

Little Kitten Adventures

Little Kitten Adventures features a kitten named Crumbs who has been invited to a friend's costume party. In order for Crumbs to get to the party safely, he needs help from the player to effectively pack their backpack. Along the way to the party, Crumbs faces several obstacles like an overly friendly pig, a dog with fleas, and a construction site. The items Crumbs needs sit around the laundry room. Part of the adventure requires the player to assist Crumbs in picking a costume. The accessories available include multiple hats, shoes, bows and bowties, glasses, wigs, and full-body costumes. The hat selection includes a pirate hat, witch hat, cowboy hat, leprechaun hat, Viking's helmet, and baseball cap. The different shoes include bunny slippers, panda slippers, clogs, and traditional Chinese slippers. Glasses available include pink sunglasses, rainbow glasses, space goggles, and mustache glasses set with a nose. The wig

options feature an afro, red pigtails, long brown curls, and a comb over. The bow collection features multiple colored bows/bowties from red to blue and yellow. Finally, the full body costumes available include a unicorn, princess, police officer, firefighter, bumblebee, pirate, superhero, lion, dinosaur, and a safari outfit. Once the player finishes packing the backpack and picking a costume, Crumbs goes to the party. The player clicks the back door to send Crumbs on the way. To get past the first obstacle, a pig in a mud puddle, Crumbs must pull out a stuffed pig friend for the pig to play with. Next, Crumbs must pick the correct direction, so he pulls out a map. Crumbs gets hungry on the way and eats a snack. For the next obstacle, a construction site, Crumbs puts on a hardhat for protection. Crumbs walks over a fence and needs balloons to float safely across a broken section. After this, Crumbs must put on sandals to cross the beach without burning his paws. Finally, Crumbs makes it to the costume party and enjoys time with friends. The obstacle portion of the game uses an auto-video, in which the player does not have control and does not interact; they simply watch. The player can then repeat the process as many times as desired with no time restrictions (Version 2.9; Squeakosaurus ug & co. kg., 2018).