THE UNIVERSITY OF CHICAGO

The Effects of Play on Parent-Child Dyads

By

Riley Maloney

June 2023

A paper submitted in partial fulfillment of the requirements for the Master of Arts degree in the Master of Arts Program in the Social Sciences

Faculty Advisor: Kristen Jacobson

Preceptor: Victoria Gross

Table of Contents

Abstract:

Play is a necessary component of development across many different species, humans particularly. Children's cognitive, social, emotional, and physical development are all positively influenced when engaging in play with their parent. However, there is a lack of direct empirical research pertaining to how play between parent-child dyads develops and its effects on the dyad and child's development, as well as the effects that age and gender differences across childhood have on the dyad. Most of the articles covering play between parent-child dyads are theoretical in nature. After presenting a theoretical framework of how play between parent-child dyads influences the child's development and the attachment of the dyad, I present the available empirical research on parent-child dyad play and the effects that it has on the dyad as well as the child's development. The present study examines 45 neurotypical parent-child dyads, with children aged 3-7-years-old. Significant positive correlations were found between the frequency of parent-child play and positive parent attitudes towards play, frequency of parent-child play and conflict between the dyad, parent attitudes towards play and frequency of digital-media usage by the child, effortful control and parent attitudes towards play, as well as closeness and effortful control. Unsurprisingly, negatively significant correlations were found between conflicts and closeness in the dyad as well as between conflict and negative affect in the child. Astonishingly, the only significant difference found between the age and gender of the child in the dyad was that 3-5-year-olds showed a significantly higher level of conflict than the dyads with 6-7-year-olds. Overall, the results imply that the more time that parent-child dyads spend correctly playing together, the more positive the influences there are on the parent-child dyad and the child's development. Furthermore, the results from this study exhibit that is necessary for more direct empirical and longitudinal research to be done on the effects of play on parent-child

dyads, as well as gender and age difference influences on their play, with a broader population and much larger sample-size.

INTRODUCTION

Play across Species

Play is an essential component of development across many different species. Research shows that rats and many types of primates engage in play early on in life (Pellis, Pellis, & Himmler, 2014). Across childhood, plays increases in complexity, leading to the development of skills which are applicable to other life functions (Pellis, Pellis, & Himmler, 2014). For example, play allows for more control and subtle reactions to uncontrollable, unexpected, or fear-inducing situations they will encounter past their juvenile years. Dogs similarly engage and benefit from play, which trains them for the unexpected in addition to increasing motor control and social cohesion (Sommerville, O'Connor, & Asher, 2017). Surprisingly, even invertebrates, such as wasps, engage in playful behavior (Dapporto, Turillazzi, & Palagi, 2006). Past research also demonstrates that play is an observable behavior in both solitary social species, including cetaceans (Cappiello, Dietrich, & Hill, 2017). Similar to rats and many species of primates, cetaceans engage in play that becomes more complex and later benefits them in life by increasing neural adaptation. Research has predicated as well that in studies of animal play which demonstrated cognitive and social development, that it can be assumed that human development shares a multitude of similar characteristics (Haight & Black, 2001).

Biology of Play

When many individuals think of play, they tend to only regard it as something with positive social and emotional benefits. While play does bring forth these benefits, it also engenders different positive biological effects. One of these positive biological effects is that play helps different species' prefrontal cortex obtain more control over different neural circuits in their brain (Pellis, Pellis, & Himmler, 2014). Increasing neural control is especially evident in

the context of play fighting, or rough-and-tumble play, as opposed to imaginative or other forms of play. It has also been suggested that play has a positive effect on the basal ganglia, allowing children to gain more cognitive flexibility (Kellman & Radwan, 2021). When deprived of the opportunity to engage in play, rats undergo serious cognitive deficits later in life, including a lack of cognitive flexibility (Pellis & Pellis, 2013). Rough and tumble play, in particular, induces the release and increase of chemicals such as BDNF in multiple areas of the brain such as the mid brain, the lower forebrain, and the orbitofrontal cortex. These chemical releases, in turn, promote growth and development in these brain areas (Gordon, Burke, Akil, Watson, & Panksepp, 2003). In addition, the peaks and troughs in activity that naturally occur during play amongst juveniles and children serve as scaffolding to coordinate brain and bodily development which researchers discovered through observing their engagement in appropriate behaviors (Graham & Burghardt, 2010).

Theory of Play

Play can be defined by five key criteria which posit that play must be: 1) be incompletely functional in the context which it appears; 2) be spontaneous, rewarding, or voluntary; 3) differ from other more serious behaviors; 4) be repeated, but not in an abnormal or unvarying form; and 5)be engaged in when there is no severe stress present (Graham & Burghardt, 2010). Play can exist in a latitude of forms, ranging from rough-and-tumble and tickling to something as mundane as a child playing a video game and it can exist in a multitude of forms (Burghardt, 2005). Play is an evolutionarily adaptive behavior (Burghardt & Pellis, 2019) in which players develop skills and ideas useful for functioning in broad contexts in the rest of their lives (Roopnarine & Davidson, 2015). As exemplified by Rubin & Smith (2018), play helps facilitate increased social skills, emotional skills, and cognitive flexibility. One of the most important

skills children learn through play is inhibitory control, which is an essential component in executive functioning (Henricks, 2016).

Cross-Cultural Differences and Similarities in Play

Play varies across cultures in terms of specific themes and characteristics. For example, while play is universal to children in every culture, the value their culture places on play varies widely. For instance, in Liberia, not much value is placed on play and therefore the parents do not play with children, the older children play with them (Russ, 2014). In another example involving the Yucatan Mayan culture, the value of play is much less than in other cultures of the world, due to physical and social resource restrictions. As a result of these restrictions, parents do not engage with children and believe they should not be stimulated. However, play still makes up a large part of these Yucatan children's time. Yucatan's children also engage in play differently, with the focus of their play being much more physical, involving motor play. These games tend to be passed down by the culture over generations. As well as this, their games and play traditionally include set rules which they follow. Traditionally, this play in young children is directed and facilitated by the older children in the village and is also public, allowing for participation and observation by any other children (Russ, 2014). In Euro-American families, play, especially pretend play, is highly supported and valued in culture and involves child and parent playing together, with the parent often providing the child with developmentally appropriate toys needed to teach the child different play themes, such as power and aggression, family relationship and nurturance, control and safety, exploration, and interaction (Russ, 2014). Despite these differences, there are also universals of play that transcend cultures. All cultures demonstrate some form of social play in institutionalized settings, e.g., sports games in schools. Moreover, children in all cultures actively engage and affect the course of play. This being said,

play includes universal themes and characteristics including an active and manipulative character, which means that the players actively try to impose their own strategies on the play or game, to see the changes they can create. This can include many things, such as pushing a button or choosing which type of play to engage in as well as who to engage in the play with (Henricks, 2016). Another universal characteristic and theme of play is order making. Order making involves the creation or upholding of different frameworks of rules for different types of play or games. Competitive games and types of play require commitment to this framework of rules and encourage fair play as well as increased social skills through sportsmanship, while devaluing single-mindedness such as refusal to play or cheating (Henricks, 2016). An additional universal characteristic and theme of play is instrumentalization. Play is universally instrumental in that engaging in it seeks to serve a purpose different from the completion of a different type of play or activity. Children either seek formal and tangible rewards and recognitions, such a candy or direct praise, or vaguer personal benefits, such as increased fitness, self-esteem, social regard, and improved skills (Henricks, 2016). Furthermore, play also includes the universal characteristic and theme of technical emphasis. Technical emphasis involves the players focusing and finding the best strategy for reaching their goals, whether they are game based or personally based. This universal theme and characteristic holds play as a process of development and advancement of skills, that is, learning better techniques and strategies leads to goals and success as well as higher forms of play (Henricks, 2016)

Developmental Changes in Type and Style of Play

In general, play is developmental and progressive (Sutton-Smith, 1997). Over the course of childhood, play increases in complexity in terms motor skills, cognitive skills, and social-emotional skills (Rubin & Smith, 2018). Motor skills shift from an emphasis on large motor

skills, such as first learning to crawl, walk, and run, to fine motor skills, such as picking up something small and giving it to someone else and vice versa, playing with playdough, drawing, and perhaps dialing on a play phone (Roach & Keats, 2018). Cognitive skills shift from learning concepts such as object permanence, to building and stacking games, more complex fantasy play and learning rules to games (Henricks, 2016). In addition, children eventually become more able to think abstractly, switching to more complicated and dramatic types of imaginative and symbolic play, including characters or themes which they did not previously understand or could not playfully embody or express (Henricks, 2016). As children gain and enhance their social-emotional and cognitive skills, the type of play they engage in over the years changes. Children gain more self-regulatory abilities as they progress, leading to more complex and social types of play such as fantastical and cooperative types of play with peers, now that they are more capable of regulating themselves through different situations and emotions (Pellegrini & Smith, 1998; Pellis & Pellis, 2007). As the child developmentally progresses, the type of direction in which the play takes place also progresses. Earlier in a child's life, the type of play in the dyad is parent-directed because the child is incapable or orienting the play. Eventually, the play becomes child-directed, as the child can now choose which type of play they want to engage in and are capable of leading themselves and the adult in this play (Flanders, Leo, Paquette, Pihl, & Séguin, 2009).

Parent-Child Play

Parent-child play has a direct impact on the development of a child. Particularly, parent-child play is central to the development of mental functions in children during the preschool years (Vygotsky, 1967). When parents and children are engaging in healthy play, it contributes positively to the cognitive, physical, social, and emotional well-being of the children (Ginsburg,

2007). Parent-child play is absolutely crucial to brain development, cognitive development, and optimal child development on a whole (Ginsburg, 2007). Parent-child play can also be child driven or parent driven. When it is child driven, children are given the opportunity to practice autonomous and self-advocacy skills in addition to decision making skills. When it is parent driven, children receive the nurturing and encouragement they need in addition to cognitive and emotional development except in cases where parent-child play is driven too much by the parents. At this point, the parent is taking away from the development of the child and potentially causing them stress by not allowing them to develop and practice the creativity, functions, and skills they need to optimally develop (Ginsburg, 2007).

The Function of Rough-and-Tumble Play

Rough-and-tumble play during early childhood serves as a critical function for healthy child development. Rough-and-tumble play allows for children to have opportunities to independently solve problems and autonomously self-correct based on the reactions from others engaged in this play with them, such as their parent. It also serves to increase motor control and social cohesion in children, while preparing them for unforeseen, uncontrollable, or fearful future life events (Sommerville, O'Connor, & Asher, 2017). Rough-and-tumble play allows children to operate spontaneously within a behavior that teaches them both complex physical and linguistic skills based on responses from others (Jarvis, 2006). This is also reaffirmed by Pellis & Pellis (2007) (StGeorge, et al., 2021), who establish that children's rough and tumble play is directly associated with children's emotional development and regulation, social development, and cognitive development.

Two particular cognitive skills that develop and progress over time through rough-and-tumble play are self-regulation and inhibitory control skills (Petersen & Flanders, 2005). As they engage in this form of play, they learn to follow norms and pay attention while dealing with feelings such an excitement, anticipation, or frustration. Rough-and-tumble play also allows for the progression and development of these cognitive skills as well as social skills through the child having to adapt and learn as the parent or older sibling changes rules to the rough-and-tumble play. As well as this, they increase their social-emotional skills through this type of play by learning from example when to switch off between leading and following, such as when to be soft and when to be rough, when to give and when to take, and when to engage and when to disengage (Jarvis, 2006). In particular, rough-and-tumble play helps with aggression regulation in children towards others as well as an understanding of dominance. In addition, rough-and-tumble play allows for an increase in neural control in children as well as having a positive effect on the basal ganglia, which is partly responsible for children's cognitive flexibility (Kellman & Radwan, 2021). Moreover, rough-and-tumble play serves as an activity which can help increase and bolster attachment in the child-parent dyad (StGeorge, et al., 2021).

Summarization of Empirical Articles on Play

Empirical studies exemplify that when rats are deprived of rough and tumble play, they produce higher levels of stress and performed marginally worse on cognitive tests than rats that have been allowed to engage in rough and tumble play (Einon & Morgan, 1977; Einon, 1980). The rats that were still raised with a parent but were not allowed to engage in rough and tumble play also performed marginally worse in spatial memory and response strategy tasks than rats that were allowed to engage in rough and tumble play.

In a recent empirical study on play in human populations, it has been established that social play as well as rough and tumble play have positive effects on children's emotional regulation (Hamamci & Dagal, 2021). Children that engage more often in rough and tumble play as well as social play perform marginally better on working memory tasks, emotional regulation tasks, and inhibitory control tasks than students who engage in rough and tumble and social play less and instead engage more often in solitary play or reticent behavior. In addition to these findings, Hamamci and Dagal also discovered that higher emotional regulation levels were excellent predictors of the type of play a child would engage in. Children with low levels of emotional regulation were much more likely to engage in solitary play and reticence behavior, while children with high levels of each, were far more likely to engage in rough and tumble and social play.

Mother and Father Child Dyad Play/Differences

As previously mentioned, parent-child play has a massive impact on a child's development emotionally, physically, socially, and cognitively. In one study, it was found that mothers' and fathers' playfulness did not differ from one another and that both sexes, when having a higher level of playfulness, had children that were markedly less negative in emotion and affect (Menashe-Grinberg & Atzaba-Poria, 2017). However, there are still slight differences between the mother-child and father-child play dyads

Of the differences between these two types of dyads, perhaps the most noteworthy is the actual type of play in which they engage in and the frequency of this play. It's been established that mothers are far less likely to engage in rough-and-tumble play with children than fathers are, as fathers are thought to be "specialized" in this area of play (John, Haliburton, & Humphrey, 2013; Menashe-Grinberg & Atzaba-Poria, 2017; Mehall, Spinrad, Eisenberg, & Gaertner, 2009;

Bronstein, 1984). However, these mothers engage in far more joint play with their child than fathers do (Gardner, Ward, Burton, & Wilson, 2003). Results from this study show that the frequency in which mother-child dyads engage in joint-play as well as the time the child spent by themselves and not interacting with their mother was a highly accurate predictor of conduct issues later in the child's life. Moreover, it has also been discovered that mothers have higher levels of sensitivity (Kwon, Jeon, Lewsader, & Elicker, 2012), structuring (Lovas, 2005), and lower levels of intrusiveness than in typical father-son play dyads (Lovas, 2005). The impact that these factors of play and the levels of playfulness from the mother of father, especially the father, have on a child's level of negativity cannot be overstated. In turn, this level of negativity is an expectational early marker for severe behavioral difficulties and conduct problems later in the child's life (Keenan, Boeldt, Chen, Coyne, Donald, & Duax, 2011). In particular, results show that rough-and-tumble play and frequency of this play in a father-child dyad is highly associated with levels of physical aggression in the child towards others as well as their ability to regulate their own behavior (Flanders, Leo, Paquette, Pihl, & Séguin, 2009). Interestingly, the dominance dynamic plays a crucial part in these outcomes for the child. Results express that when children are more dominant than their fathers when engaged in rough-and-tumble play, they are more likely to express more conduct issues as well as more likely to engage in physically aggressive behaviors towards others. On the other hand, when fathers are more dominant and direct in rough-and-tumble play more often, this will lead to less physical aggression towards others and less conduct issues (Flanders, Leo, Paquette, Pihl, & Séguin, 2009). This type of father child play is also highly associated with the levels of peer competence these children have as well as their emotion-regulatory abilities (Carson & Parke, 1996). Results have also shown that children with father's that are more directive in nature during play as well as engage in more rough-and-tumble

play have children with a higher peer competence, whereas mothers with children that have a higher peer competence much less often attempt to play with their child through physical or rough means. In particular, Gerrits, Goudena, & van Aken (2005) gather from the results of their study that horizontal qualities such as mutual responsiveness, shared positive emotions, and balance of control were all evident in parent-child dyads that engaged in play together, with mutual responsiveness being higher in these dyads than during child-peer engagement in play. Current and past research into this topic evinces just how essential this parent-child play dyad is and how critical it is to a child's development.

Effects of Age and Gender on Parent-Child Dyad Play

Two of the largest influences on play are both the age and gender of the child in the dyad, as well as the age and gender of the parent. It has been made evident that when girls participated in more physical forms of play, they engaged far more often in nonstrenuous games with their parent, such as patty-cake or being bounced on their parent's knees, while boys tend to engage in more strenuous physical play with their parent, such as wrestling, playing sports, playing with just with a ball, and play fighting (MacDonald & Parke, 1986) (Jarvis, 2006). MacDonald & Parke (1986) also displays results showing that girls are more likely to play with a ball or wrestling than boys from birth until 12 months, while boys from birth to 12 months are more likely to engage in rolling around on soft surfaces of the parent. Fascinatingly, right around the age of 12 months, boys and girls tend to completely reverse.

Moreover, according to Marjanovič-Umek & Fekonja-Peklaj (2017), results illustrate that boys less frequently used symbolic transformations in play, initiated the type of play they wanted, and sustained the type of play they were engaged in more than girls were able to. One particular study confirms that toy preference is yet another play difference between boys and

girls, as boys tend to play more often with male-stereotyped toys at every age, while girls tend to spend an equal amount of time playing with both male- and female-stereotypes toys (Rotsztein & Zelazo, 2000). The results from this study can aptly be explained through different factors of parental reinforcement such as gender stereotypes. For instance, results show that fathers were more likely to play with their child when the child was playing with a toy stereotypically meant for their own sex, while less likely to engage in play with their child when the child was playing with a cross-gender stereotyped toy (Langlois & Downs,1980).

It has also been found that boys tend to engage in more fantastic and physical imaginary play, such as imaging themselves as superheroes, while girls more often tend to engage in imaginary play with more domestic and dramatic themes, such as playing house (Pellegrini & Smith, 1998) Research studies show that when the parent in the dyad engages in this imaginary and symbolic play with their child and pretends with them, the child's imagination and engagement in pretend play is promoted, leading them towards the zone-of-proximal development and enabling them to play at higher levels of cognition than they would alone (Doyla, 2010; Bornstein, Haynes, O'Reilly, & Painter, 1996).

As well as gender, age plays an extremely significant role in play engagement in parent-child dyads. As previously mentioned, the type and frequency of play that children engage in drastically change at around 12 months of age (MacDonald & Parke, 1986). Moreover, other studies show that the frequency of play engagement between the dyads drastically changes over time. The frequency of play engagement is typically low through the first year of a child's life, peaks during early childhood (3-6 years of age) and declines from there on out (MacDonald & Parke, 1986). Furthermore, these results also support a negative correlation between the age of the parent in the dyad and the amount of physical play that the dyad engage in together

(MacDonald & Parke, 1986). This can most likely be attributed to the fact that as parents age, the physical toll as well as the toll on their energy which is required to engage frequently in physical and rough-and-tumble play simply can become too great for the parent's aging body and mind.

Current Study:

I will be testing and studying the effects of play on the cognitive flexibility, creativity, and emotional affect of 3-7-year-old children. In addition, I will be examining the effects that play has on the parent-child dyad, as well as the influences that the child's age and gender have on the dyad and their play. Based on past studies performed, one can hypothesize that higher frequencies of play between parent-child dyads will result in higher surgency in the child, effortful control in the child, and lower conflict between the dyad. One can also hypothesize that higher frequencies of parent-child play will result in more positive parent attitudes towards play, which can be high and positive, or low and negative. The increased age and experience with their parent that the 6-7-year-olds have over the 3-6-year-olds will also result in the parents of the 6-7-year-olds reporting a higher level of conflict between parent and child, surgency in the child, effortful control in the child, and lower negative affect in the child, and decreased levels of parent attitudes towards play. Female children will also show reports of higher levels of closeness, lower levels of conflict, higher levels of digital-media usage, and a lower frequency in parent-child play. No single family or parent across the world raises their children in the exact same way or emphasizes the importance of play the same way. Across multiple countries, socioeconomic statuses, and multiple ethnicities, children and the way their play is facilitated and engaged with can vary greatly. As a partial result of this, some children end up with very high cognitive flexibility, while others end up with very low levels of cognitive flexibility. A lack or deficit in cognitive flexibility can have devastating effects on an individual. Not every

family knows exactly how to facilitate the growth of their child's creativity and cognitive flexibility and not every parent knows how interact and engage in play with their children, or the significance of these actions. What I want to study and learn from is just how much rough-and-tumble play and play in general between the parent-child dyad affects cognitive flexibility as well as the affect in young children and to what extent. Because engaging in rough-and-tumble play with children would be unethical and may endanger the subjects, we will be using tickling as a proxy for this type of play. Given the lack of empirical research pertaining to play's effect on executive functioning and cognitive flexibility as well as its evolutionary benefits, there are many exciting new possibilities that may come about with this study. One of these is the possibility that it may provide the necessary groundwork for a new way in which we teach our children in schools and how much time we allocate for play in their lives, whether it be at school or at home. In addition, just how we engage in different types of play and time we allocate for and engage in rough-and-tumble play may also be altered. The lack of direct empirical research on this question implies that there is much new ground to be covered in this exciting topic, which may entirely modify how we view play and may breed new innovative theories and studies and will cement rough-and-tumble play as an important part of everyday life for children. There is much that can be learned from this study and there are many possible widespread implications that it may beget.

METHODS

Sample:

The population studied for this study is constituted by 45 parent-child dyads, with children ages 3-7. For the purposes of the study, we studied children whose development is typical, and who were not diagnosed with significant mental disorders. Our sample contained 20

female participants (44.4%) and 25 male participants (55.6%). The mean age of all the children is 4.53 years old. The mean age of the male participants is 4.52 years old, while the mean age of the female participants is 4.55 years old. 35 participants (78%) were aged 3-to-5 years old, while 10 participants (22%) were aged 6 to 7 years old. Of the 3-to-5-year-old participants, 19 were male (42.4%) and 16 (57.6%) were female.

Subjects who had a significant mental health diagnosis, such as autism spectrum disorder or different neurodevelopmental disorders, or a medical diagnosis such as epilepsy, that would make tickling dangerous were excluded. Adults were also given the PHQ-9, in order to test for exclusionary criteria such as a 10 or higher in depression or an answer that they have thoughts of hurting themselves, on the basis that they most likely have moderate/severe depression. Parents were also asked if their child had been diagnosed with a neurodevelopmental disorder, diagnosed with Autism Spectrum Disorder, diagnosed with cerebral palsy, or diagnosed with epilepsy. If the answer was yes to any of these questions, that dyad was excluded from the study. Subjects were also required to have a parent who was willing and accustomed to tickling the child.

Procedure:

The procedure, which was approved by University of Chicago Biological Sciences Division IRB committee, started with parents signing informed consent documents and being made aware they would be paid for participation. These visits took 1.5 – 2 hours to complete. After the parent finished the questionnaires, the tablet was taken back and the REDCap questions were reviewed, and we ensured that all the questions were answered. We then logged into REDCap to address any anomalies and input the details of the visit. Next, the consent forms were placed in the participant folder and the video were transferred to the corresponding participant

folder on Box. Lastly, the HRV data was saved to the corresponding participant folder on the desktop.

Parent self-report measures:

The parent was given a tablet containing a link to REDCap, with which they completed the following questionnaires: BASC-3, Parent-Rating Scale, Parent Bonding Inventory, Child-Parent Relationship Scale Short Form (CPRS-SF), and the Children's Behavior Questionnaire Very Short Form (CBQ-VSF). All data from these self-report measures was collected through REDCap.

Child Measures:

After taking the parent through the consent process at the beginning of the visit, a portable one lead EKG device was placed on the child on the right superior pectoralis major at the midclavicular line of the opposite side. The purpose of this was to collect the child's heart rate variability data throughout the entire duration of the visit. After this, baseline heart rate measures were established with the child by having the child sit in a chair with their feet touching the ground, eyes closed, legs at 90 degrees, palms facing upwards resting on their lap, for 3-5 minutes. Next, the child's heart rate variability was measured while having them engage in a cognitive task, connecting dots on an iPad, for 3-5 minutes. Next, the children's cognitive flexibility and executive function were measured through different NIH Toolbox Assessments. First the child was walked through the NIH Toolbox Dimensional Change Card Sort Test Ages 3-7 v2.1. After being walked through, they completed the test on their own. Next, 1-2 minutes of rest were included to measure recovery rate before following the next assessment. Following this, they were walked through the NIH Toolbox Flanker Inhibitory Control and Attention Test Ages 3-7 v2.1. After being walked through, they then completed the test on their own. Again, 1-

2 minutes of rest were taken before the next assessment. After this, they were then walked through the NIH Toolbox List Sorting Working Memory Test Ages 3-6 v2.1. After being walked through, they then completed the test themselves. Again, 1-2 minutes of rest were included between this assessment and the next. After these tests, the children were then walked through the NIH Toolbox Picture Vocabulary Test Age 3+ v2.1. After being walked through this, they then completed it on their own. All of the results from these tests were saved on the NIH Toolbox app to the child's respective profile. In addition, before and after each play condition was administered, the child completed a verified Likert Scale, which was used to measure their emotional affect through using a smiley face scale ranging from angry, scored as a 1, to Super Happy, scored as a 5. Finally, following the 4-5-minute rest after the final play condition, the child was again instructed to sit in a chair with their feet touching the ground, eyes closed, legs at 90 degrees, palms facing upwards resting on their lap, for 3-5 minutes, in order to measure a final recovery rate.

Parent-Child Play Protocol:

The play protocol involved three different conditions. For all of these conditions, the child was blindfolded and their interactions with their parent were recorded. In addition, each of these conditions were implemented in the same exact order for every parent-child dyad. The first condition was a control condition in which the parent stimulated the child's right forearm with their hand, gently stroked across their skin at 20 cm/s, for 2 minutes. Following this, 4-5 minutes of rest were implemented before the next condition to measure the recovery rate. The second condition was knismeses, which involved the parent tickling their child on the sole of the right foot by stroking this area with a feather. The tickling lasted for two minutes which was timed, or less, if the child expressed discontent sooner, but such discontent was recognized with the second

request to stop by the child as a first such comment was often part of the play. Following this, 4-5 minutes of rest were implemented before the next condition to measure the recovery rate. The third condition was gargalesis, which involved the parent tickling their child on the ribs with their hands, which created a deeper muscular form of tickling. This form of tickling was for one minute, unless the child expressed discontent several times. Following this, 4-5 minutes of rest were implemented before the next condition to measure the recovery rate.

RESULTS

For each participant, I computed the mean rating for each subscale in the Parent Play Questionnaire, including frequency of parent-child play, frequency of digital media use, and parent attitudes towards play. After checking the Cronbach Alpha scores of these subscales, I dropped items 11, 12, 14, and 15 from the parent attitudes towards play. The original Cronbach's Alpha of the subscale was .793. After removing these items, the Cronbach's Alpha was raised to .848. Subsequently, I computed the mean rating for each subscale in the Child-Parent Relationship Scale, including conflict and closeness. After checking the Cronbach Alpha scores of these subscales, I dropped item 14 from the Conflict subscale. Originally, the Cronbach's Alpha was .77. After removing item 14, the Cronbach's Alpha was raised to .801. Following, I computed the mean rating for each subscale in the Children's Behavior Questionnaire Very Short Form (CBQ-VSF), including surgency, negative affect, and effortful control. After checking the Cronbach's Alpha of these subscales, it became evident that the Cronbach's Alpha score for the surgency subscale was decidedly lower than optimum, at .594. However, this did not warrant dropping any items, as the increase in Cronbach's Alpha would not be significant enough.

A Pearson Correlation coefficient was computed to assess the relationships between frequency of parent-child play, frequency of digital media use, parent attitudes towards play,

closeness, conflict, surgency, negative affect, and effortful control. There was a strong positive correlation between frequency of parent-child play and parent attitudes towards play, $r(43) = .55$, $p < .001$. There was a medium positive correlation between frequency of parent-child play and conflict, $r(43) = .307$, $p < .05$. A medium positive correlation was found between frequency of parent-child play and effortful control, $r(43) = .359$, $p < .05$. There was a medium positive correlation found between frequency of digital-media use and parent attitudes towards play, $r(43) = .374$, $p < .05$. A medium positive correlation was found between effortful control and parent attitudes towards play, $r(43) = .309$, $p < .05$. There was a medium negative correlation between conflicts and closeness, $r(43) = -.353$, $p < .05$. A strong positive correlation was observed between conflict and negative affect, $r(43) = .539$, $p < .01$. A medium strong correlation was found between closeness and effortful control, $r(43) = .45$, $p < .01$.

Following this, an independent samples t-test was performed to compare frequency of parent-child play, frequency of digital-media use, parent attitudes towards play, closeness, conflict, surgency, negative affect, and effortful control, between male and female participants. There was no significant difference between male and female participants in any of these variables. Afterwards, an independent samples t-test was performed to compare frequency of parent-child play, frequency of digital-media use, parent attitudes towards play, closeness, conflict, surgency, negative affect, and effortful control, between 3-5-year-old participants and 6-7-year-old participants. It was observed that 3-5-year-old participants ($M = 1.99$, $SD = .68$) had significantly higher conflict than 6–7-year-old participants ($M = 1.49$, $SD = .59$); $t(43) = -2.11$, $p < .05$. No other significant differences were found in these variables between 3-5-year-olds and 6-7-year-olds.

Figure 1. Correlations Between All Variables

Variable	Frequency of Parent-Child Play	Frequency of Digital-Media Usage	Parent Attitude Towards Play	Conflict	Closeness	Surgency	Negative Affect
Frequency of Parent-Child Play							
Frequency of Digital-Media Usage	.211						
Parent Attitude Towards Play	.550**	.374*					
Conflict	.307*	-.007	-.118				
Closeness	-.054	-.138	.317	-.353*			
Surgency	.034	.258	-.024	.223	.233		
Negative Affect	.085	.217	.138	.539**	-.153	.275	
Effortful Control	.359*	.175	.309*	-.087	.450**	.277	.086

Note.
Correlation is significant at the 0.01 level. *=p<0.05
Correlation is significant at the 0.05 level. **=p<0.01

Figure 2. Bar Graph of Mean Differences of Variables Between Age Groups

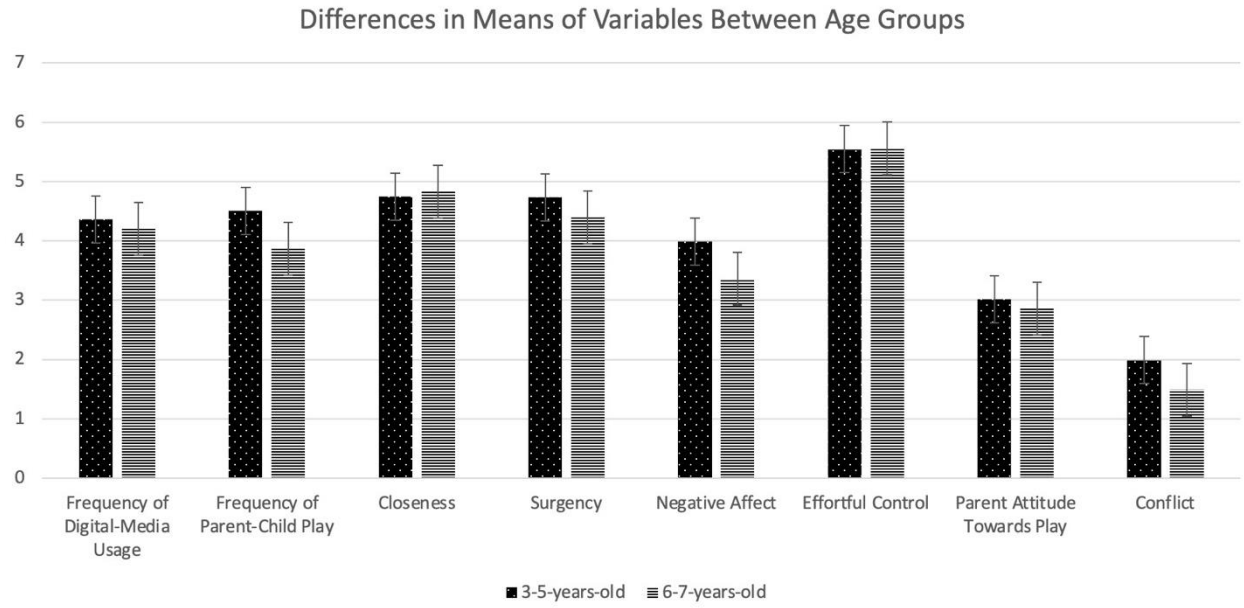
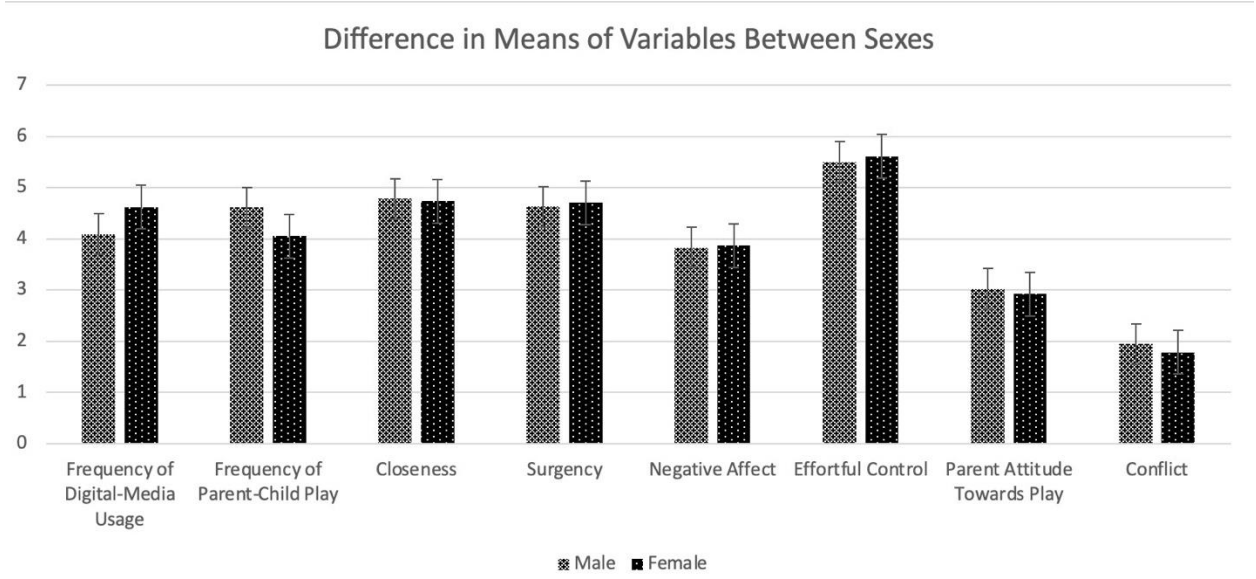


Figure 3. Bar Graph of Mean Differences of Variables Between Sexes



DISCUSSION

Based upon these results, my hypothesis that a higher frequency in parent-child play would result in a more positive parent attitude towards play, higher effortful control in the child, and lower levels of conflict between the dyad was confirmed. These results could possibly be expounded by the fact that when parents are in the presence of and are interacting with their children, they are forming a stronger bond. Therefore, the more often the parent-child play, the stronger the bond and the more positive the attitude towards play, which would concur with previous studies stating the importance of parent-child play on child development and dyad bonds (Ginsburg, 2007). The results displayed that a higher frequency in parent-child play positively influences effortful control in children may possibly be explained by the fact that when children engage in play with their parents, they are learning key lessons in inhibiting behaviors and actions and utilizing their attentional resources through scaffolding and modeling from their parent. These finding are concurrent with Hamamci & Dagal (2021) and Hendricks (2016).

Among other significant findings, many correlations were found between the variables. Results showed a strong positive correlation between frequency of parent-child play and parent attitudes towards play. This suggests that the more time a dyad engages in play, the more positive the parent's attitude towards playtime activities with their child. The implication of this being that it's especially important for parents to make time to play with their children if they want to actively enjoy it. A medium positive correlation was also found between Frequency of parent-child play and conflict, suggesting that as parents and children spend more time directly interacting, there are more opportunities for conflict to arise. This also reinforces the importance of children and their parent playing together properly. Additionally, a medium positive

correlation was found between frequency of parent-child play and effortful control, suggesting that an increase in play between the dyad has significantly positive effects on a child's ability to develop their effortful control skills and executive function. A medium positive correlation was found between frequency of digital-media use and parent attitudes towards play.

A medium negative correlation was found between conflict and closeness. As the closeness increases between a parent-child dyad, the level and number of conflicts decrease, and vice-versa. Furthermore, a strong positive correlation was observed between conflict and negative affect. This might be explained by the fact that when a child is exposed to more conflict in their life, especially with a figure in their life as important and influential as their parent their general affect will worsen, and their negative affect will increase. This also reinforces the importance of a parent's responsibility to work to ameliorate outstanding conflicts between the dyad and proactively work to prevent future conflict between them and their child. Lastly, a medium strong correlation was found between closeness and effortful control. Like frequency of parent-child play, closeness between parent and child also positively influences a child's ability to develop effortful control skills and executive function. More than likely, as the closeness between parent and child increases, so do the parent skills and time spent with the children and vice versa.

The analysis did not support my theory that a higher frequency in parent-child play would result in significantly higher reports of closeness between child and parent, surgency in the child, lower negative affect in the child, or lower conflict between parent and child. However, the analysis did show that a higher frequency of parent-child play showed a positive medium correlation with conflict. This might possibly be elucidated by the fact that when there is a higher frequency of parent-child play, there is inherently more time spent together between the dyad.

When there is more time spent together, there is more time for conflict to arise. This increase in time spent with each other could account for the finding that a higher frequency in parent-child play results in a significantly higher level of conflict.

The analysis partially disproved my hypothesis that the older age group of 6-7-year-olds would report higher conflict between parent and child than the 3-5-year-olds and lower parent attitudes towards play. In fact, the 3-5-year-olds group showed a statistically significant higher level of conflict than the 6-7-year-old group. Parent attitudes towards play were slightly lower for the 6-7-year-olds, however it was statistically insignificant. These results can possibly be clarified in part by children naturally being more difficult to interact and play with at a younger age, as they have less agency, require more attention, and have a harder time communicating wants, needs, and feelings to their parent. This, in turn, can lead to more conflict and frustration between the parent and the child. This would also explain why the level of conflict between the 6-7-year-old parent-child dyads is lower than the 3-5-year-old parent-child dyads. It would be beneficial for future researchers to investigate how to improve communication between younger parent-child dyads both in play and everyday life, to decrease the likelihood of parent attitudes towards play decreasing too much at a younger age, a time during which play between the dyad is paramount in the child's development. While the finding that 6-7-year-old parent-child dyads displayed lower parent attitudes towards play was statistically insignificant, it would be beneficial for future researchers to further investigate the way play between dyads develops over age. Moreover, they should investigate how to contrive a way to increase parent attitudes towards play as their children age, given how important play and parent-child play is in a developing child.

Having stated this, the results did not support my hypothesis that the parents of the 6-7-year-olds would report higher surgency in the child than parents of 3-5-year-old parents. This might partially be explained by different outlooks and expectations that the parent of a 3-5-year-old child will have for their child as opposed to a 6-7-year-old child. However, it did support my theory that they would report higher effortful control and lower negative affect in the child than the parents of the 3-5-year-old participants. However, these differences were not statistically significant. These results can partially be explained through a previous study which found that parents that engaged in play more often have children with lower negative affect (Menashe-Grinberg & Atzaba-Poria, 2017). As children with playful parents get older, their overall time spent engaged in play with their parent increases, therefore, their negative affect is further lowered. The increase in effortful control between 3-5-year-olds and 6-7-year-olds might again be explained through Hamamci & Dagal (2021) and Hendricks (2016), which found that higher frequencies of parent-child play led to higher levels of inhibitory control, effortful control, and executive function.

The analysis between sexes partially confirmed my hypotheses that female children would show higher levels of closeness, lower levels of conflict, higher levels of digital-media usage, and a lower frequency in parent-child play. Results showed that female children showed slightly lower levels of conflict and closeness than male children, as well as a higher frequency of digital-media usage. These results, however, are statistically insignificant. Further investigating these results with a larger population more equally spread by sex in addition to measures or items gathering info on differently sexed siblings of the children, as well as how their parents raise and/or play with them differently would be advantageous in further understanding these results. My hypothesis that parent-child dyads with female children would

report lower frequencies of parent-child play was partially correct due to parent-child dyads with female children reporting a lower overall mean of frequency of play between the dyad, however this result was statistically insignificant.

There were several limitations included in this study. The first limitation being that there was not enough time in the data collection visits to do both pre- and post-testing of children's working memory, inhibitory control, and cognitive flexibility after the dyad engaged in rough-and-tumble play, with tickling used as a proxy. I believe that future studies would greatly benefit from including both assessments and comparing the results. Another limitation to this study is that we did not ask the participants to specify which type of digital media that they were watching with their child or whether their child was watching by themselves or with others. It would be beneficial for continued research to ask parents to specify the type of media they are consuming and their Motion Picture Rating, as well as coding them into different categories, such as educational, action, comedy, fictional, non-fictional, etc. Additionally, the research study being cross-sectional was limiting, as the effects of play and other variables in the dyad relationship were not as comprehensively examined and powered as they could be in a longitudinal study. It would be beneficial for future researchers to continue this avenue of research longitudinally, to gain a more comprehensive understanding of the development of parent child dyads and play, and how they evolve and co-evolve. Lastly, this research study was statistically underpowered. It was a pilot study for a larger forthcoming study. It would be advantageous in the future to increase the number of participants from 45 to 500 to ensure more accurate and powered results.

CONCLUSION

The current research aimed to identify the importance of play and its frequency in parent-child dyads and their effects on children's affect, surgency, digital-media usage, level of closeness, and level of conflict, as well as their differences between sexes and age groups. Based upon past research performed, I hypothesized:

1. Higher frequencies of play between parent-child dyads will result in higher surgency in the child, more positive parent attitudes towards play, higher levels of effortful control in the child, and lower conflict between the dyad.

2. The increased age and experience with their parent that the 6-7-year-olds have over the 3-5-year-olds will also result in the parents of the 6-7-year-olds reporting a higher level of conflict between parent and child, surgency in the child, effortful control in the child, lower negative affect in the child, and decreased levels of parent attitudes towards play.

3. Female children will also show reports of higher levels of closeness, lower levels of conflict, higher levels of digital-media usage, and a lower frequency in parent-child play.

Based upon my findings, my first hypothesis was partially confirmed. Higher frequencies of parent-child play resulted in children express higher levels of surgency, effortful control, lower levels of conflict, and higher parent attitudes towards play. These results suggest that the more often a parent plays with their child, the more beneficial it is to the dyad. However, it should be noted that these results were not statistically significant. Furthermore, predicated on my findings, my second hypothesis was partially disproved. The 3-5-year-old group showed a statistically higher level of conflict in the child than the 6-7-year-old group. While statistically insignificant, dyads in the 3-5-year-old group also reported lower surgency, as opposed to what I hypothesized. The 6-7-year-old group did, however, lower negative affect and decreased levels

of parent attitudes towards play, like I originally hypothesized. However, these results were also statistically insignificant. Lastly, my third hypothesis was found to be partially disproved. Results did show that the female children group reported lower levels of conflict, higher levels of digital-media usage, and a lower frequency in parent-child play, however these results were statistically insignificant. Additionally, the female children group reported lower levels of closeness, as opposed to what I hypothesized. These results, however, were statistically insignificant as well.

Based on these conclusions, future studies should consider repeating the study with certain modifications. Firstly, a larger and more diverse population would be significantly beneficial in increasing the statistical power of the findings. Secondly, it would be advantageous to run a longitudinal study, as opposed to a cross-sectional study, to gain a more complete comprehension and assessment of the development of parent-child dyads and play, and how they evolve and co-evolve. Thirdly, when having the parent-child dyad engage in rough-and-tumble-play, with tickling as a proxy, pre- and post-testing should be administered to accurately assess its effects. Future research is also needed to determine the differences between male and female parent-child dyads, and why the female group showed both lower levels of conflict and closeness. This research has shown that play and the relationship in parent-child dyads are deeply connected and influence each other significantly. It also emphasizes the importance that both play and the parent-child relationship have on a child's overall development, as well as their development of a multitude of specific essential life skills, whether they be socio-emotional, or cognitive. While this study and its results display the differences between types of parenting and parent-child relationships, it does not properly exemplify which styles of parenting and parent-child play are most beneficial for the child and the parent-child dyad. An interesting line of study

based off this research study which would be beneficial for researchers to investigate, would be to determine which parenting styles and types of play most critically positively influence these cognitive and socio-emotional skills and their development in children, as well as overall improve the relationship of the parent-child dyad.

References

Bornstein, M. H., Haynes, O. M., O'Reilly, W. A., & Painter, K. M. (1996). Solitary and collaborative pretence play in early childhood: Sources of individual variation in the development of representational competence. Child Development, 67(6), 2910–2929. doi:10.2307/1131759.

Bronstein, P. (1984). Differences in mothers' and fathers' behaviors toward children: A cross-cultural comparison. *Developmental Psychology, 20*(6), 995–1003. https://doi.org/10.1037/0012-1649.20.6.995

Burghardt, G. M. (2005). *The genesis of animal play: Testing the limits.* MIT Press.

Burghardt, G. M., & Pellis, S. M. (2019). New directions in studying the evolution of play. In P. K. Smith & J. L. Roopnarine (Eds.), *The Cambridge handbook of play: Developmental and disciplinary perspectives.* (pp. 11–29). Cambridge University Press.

Carson, J. L., & Parke, R. D. (1996). Reciprocal negative affect in parent–child interactions and children's peer competency. *Child Development, 67*(5), 2217–2226. https://doi.org/10.2307/1131619

Dapporto, L., Turillazzi, S., & Palagi, E. (2006). Dominance interactions in young adult paper wasp (Polistes dominulus) foundresses: A playlike behavior? *Journal of Comparative Psychology*, *120*(4), 394–400. https://doi-org.proxy.uchicago.edu/10.1037/0735-7036.120.4.394

Doyla, G. (2010). Vygotsky in action in the early years. London: Routledge

Einon, D. F., & Morgan, M. J. (1977). A critical period for social isolation in the rat. *Developmental Psychobiology*, *10*(2), 123–132. https://doi.org/10.1002/dev.420100205

Einon, D. (1980). Spatial memory and response strategies in rats: Age, sex and rearing differences in performance. *Quarterly Journal of Experimental Psychology*, *32*(3), 473–489. https://doi.org/10.1080/14640748008401840

Flanders, J. L., Leo, V., Paquette, D., Pihl, R. O., & Séguin, J. R. (2009). Rough-and-tumble play and the regulation of aggression: An observational study of father-child play dyads. *Aggressive Behavior*, *35*(4), 285–295. https://doi.org/10.1002/ab.20309

Gardner, F., Ward, S., Burton, J., & Wilson, C. (2003). The role of mother-child joint play in the early development of children's conduct problems: A longitudinal observational study. *Social Development, 12*(3), 361–378. https://doi.org/10.1111/1467-9507.00238

Gerrits, M. H., Goudena, P. P., & van Aken, M. A. G. (2005). Child-parent and child-peer interaction: Observational similarities and differences at age seven. *Infant and Child Development*, *14*(3), 229–241. https://doi.org/10.1002/icd.377

Ginsburg, K. R., and the Committee on Communications, & and the Committee on Psychosocial Aspects of Child and Family Health. (2007). The importance of play in promoting healthy child development and maintaining strong parent-child bonds. *Pediatrics*, *119*(1), 182–191. https://doi.org/10.1542/peds.2006-2697

Graham, Kerrie & Burghardt, Gordon. (2010). Current Perspectives on the Biological Study of Play: Signs of Progress. The Quarterly review of biology. 85. 393-418. 10.1086/656903.

Gordon, N. S., Burke, S., Akil, H., Watson, S. J., & Panksepp, J. (2003). Socially-induced brain ‘fertilization’: Play promotes brain derived neurotrophic factor transcription in the amygdala and dorsolateral frontal cortex in juvenile rats. *Neuroscience Letters*, *341*(1), 17–20. https://doi.org/10.1016/S0304-3940(03)00158-7

Haight, W. L., & Black, J. E. (2001). A Comparative Approach to Play: Cross-Species and Cross-Cultural Perspectives of Play in Development [Review of *Play and Exploration in Children and Animals*, by T. G. Power]. *Human Development*, *44*(4), 228–234. https://www.jstor.org/stable/26763521

Hamamci, B., & Balaban Dagal, A. (2021). Self-regulation and play: How children's play directed with executive function and emotion regulation. *Early Child Development and Care*, 1–11. https://doi.org/10.1080/03004430.2021.1990906

Henricks, T. S. (2016). Reason and rationalization: A theory of modern play. American Journal of Play, 8(3), 287–324.

Hill, H. M., Dietrich, S., & Cappiello, B. (2017). Learning to play: A review and theoretical investigation of the developmental mechanisms and functions of cetacean play. *Learning & Behavior*, *45*(4), 335–354. https://doi-org.proxy.uchicago.edu/10.3758/s13420-017-0291-0

Jarvis, P. (2006). "Rough and tumble" play: Lessons in life. *Evolutionary Psychology, 4,* 330–346.

John, A., Halliburton, A., & Humphrey, J. (2013). Child–mother and child–father play interaction patterns with preschoolers. *Early Child Development and Care*, *183*(3–4), 483–497. https://doi.org/10.1080/03004430.2012.711595

Keenan, K., Boeldt, D., Chen, D., Coyne, C., Donald, R., Duax, J., Hart, K., Perrott, J., Strickland, J., Danis, B., Hill, C., Davis, S., Kampani, S., & Humphries, M. (2011). Predictive validity of DSM-IV oppositional defiant and conduct disorders in clinically referred preschoolers. *Journal of child psychology and psychiatry, and allied disciplines*, *52*(1), 47–55. https://doi.org/10.1111/j.1469-7610.2010.02290.x

Kellman, J., & Radwan, K. (2021). Towards an expanded neuroscientific understanding of social play. *Neuroscience and Biobehavioral Reviews*. https://doi-org.proxy.uchicago.edu/10.1016/j.neubiorev.2021.11.005

Kwon, K.-A., Jeon, H.-J., Lewsader, J. T., & Elicker, J. (2012). Mothers' and fathers' parenting quality and toddlers' interactive behaviours in dyadic and triadic family contexts. *Infant and Child Development, 21*(4), 356–373. https://doi.org/10.1002/icd.1746

Langlois, J., & Downs, C. (1980). Mothers, fathers, and peers as socialization agents of sex-typed play behaviours in young children. Child Development, 51(4), 1237–1247. doi:10.2307/1129566.

Lovas, Gretchen. (2005). Gender and patterns of emotional availability in mother-toddler and father-toddler dyads. Infant Mental Health Journal. 26. 327 - 353. 10.1002/imhj.20056.

MacDonald, K., & Parke, R. D. (1986). Parent-child physical play: The effects of sex and age of children and parents. *Sex Roles: A Journal of Research, 15*(7-8), 367–378. https://doi.org/10.1007/BF00287978

Marjanovič-Umek, L., & Fekonja-Peklaj, U. (2017). The roles of child gender and parental knowledge of child development in parent-child interactive play. *Sex Roles: A Journal of Research, 77*(7-8), 496–509. https://doi.org/10.1007/s11199-016-0734-7

Mehall, K. G., Spinrad, T. L., Eisenberg, N., & Gaertner, B. M. (2009). Examining the Relations of Infant Temperament and Couples' Marital Satisfaction to Mother and Father Involvement: A Longitudinal Study. *Fathering*, *7*(1), 23–48. https://doi.org/10.3149/fth.0701.23

Menashe-Grinberg, A., & Atzaba-Poria, N. (2017). MOTHER-CHILD AND FATHER-CHILD PLAY INTERACTION: THE IMPORTANCE OF PARENTAL PLAYFULNESS AS A

MODERATOR OF THE LINKS BETWEEN PARENTAL BEHAVIOR AND CHILD NEGATIVITY. *Infant mental health journal*, *38*(6), 772–784. https://doi.org/10.1002/imhj.21678

Pellegrini, A. D., & Smith, P. K. (1998). The development of play during childhood: Forms and possible functions. Child Psychology and Psychiatry Review, 3(2), 51–57. doi:10.1111/1475-3588.00212.

Pellis, S. M., & Pellis, V. C. (2007). Rough-and-Tumble Play and the Development of the Social Brain. Current Directions in Psychological Science, 16(2), 95–98. https://doi.org/10.1111/j.1467-8721.2007.00483.x

Pellis, S. M., Pellis, V. C., & Himmler, B. T. (2014). How play makes for more adaptable brain: A comparative and neural perspective. *American Journal of Play*, *7*(1), 73–98.

Pellis, S., Pellis, V., & Recorded Books, I. (2013). *The playful brain: Venturing to the limits of neuroscience*. Oneworld Publications. http://rbdigital.oneclickdigital.com

Peterson, Jordan & Flanders, Joseph. (2005). Play and the regulation of aggression.

Roach, L., & Keats, M. (2018). Skill-based and planned active play versus free-play effects on fundamental movement skills in preschoolers. *Perceptual and Motor Skills*, *125*(4), 651–668. https://doi-org.proxy.uchicago.edu/10.1177/0031512518773281

Rotsztein, B., & Zelazo, P. R. (2000). The development of sex-typed toy preferences and symbolic play behaviour. Washington, DC: Poster presented at the annual meeting of the American Psychological Association

Rubin, Kenneth & Smith, Kelly. (2018). Play in Human Development. 10.4135/9781506307633.n625.

Russ, S. W. (2014). *Pretend play in childhood: Foundation of adult creativity*. American Psychological Association. https://doi-org.proxy.uchicago.edu/10.1037/14282-000

Sommerville, R., O'Connor, E. A., & Asher, L. (2017). Why do dogs play? Function and welfare implications of play in the domestic dog. *Applied Animal Behaviour Science*, *197*, 1–8. https://doi-org.proxy.uchicago.edu/10.1016/j.applanim.2017.09.007

StGeorge, Jennifer & Campbell, Linda & Hadlow, Taylor & Freeman, Emily. (2021). Quality and Quantity: A Study of Father–Toddler Rough-and-Tumble Play. Journal of Child and Family Studies. 30. 10.1007/s10826-021-01927-1.

Sutton-Smith, B. (1997). *The ambiguity of play.* Harvard University Press.

Vygotsky, L.S. (1967). Play and Its Role in the Mental Development of the Child. *Journal of Russian and East European Psychology, 5*, 6-18.

Vygotsky, L. S., & Cole, M. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.