THE INTERSECTION OF TOYS AND PLAY CATEGORIES FOR YOUNG CHILDREN

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Submitted to
The Department of Applied Psychology
in partial fulfillment of the requirements of the degree of

Doctor of Philosophy
in the field of
School Psychology

Northeastern University
Boston, Massachusetts
December 2022

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Abstract

The constructivist orientation conceptualizes children's play as a process through which children actively learn and express their knowledge of the world by engaging with objects and people. The objects are usually toys as children spend vast amounts of time playing with them. Developmental research has determined that as children grow, the complexity of their play increases. These perspectives suggest that children's knowledge and their developmental level influence what they do with toys. Conversely, the behavioral perspective suggests that toys themselves, and the stimuli provided by toys, influence children's play. These conflicting viewpoints indicate a need for research exploring how children play with toys. The present study sought to investigate the intersection of how young children use different types of toys to express their knowledge, as measured by qualitatively different categories of play. The investigation used data from the Project Play research, which conducted naturalistic play observations through administration of the Developmental Play Assessment (DPA; Lifter, 2000). Play activities from the sample of 289 typically developing children (8 to 60 months old) were analyzed. An analysis of covariance (ANCOVA) was employed to determine, controlling for age, whether there was an impact of DPA toy type (manipulative and social-conventional) and play categories (11 DPA categories) on how children play with toys. Post hoc analyses explored main effects and interactions. ANCOVA results detected an interaction between toy type and play category when controlling for age. Post hoc results supported both the behavioral and social-constructivist perspectives. ANOVA analyses by age group further specified some results followed developmental trajectories in children's play. Findings have implications for how school psychology research conceptualizes children's play with toys, as well as the selection of toys for assessments and interventions for young children.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

I wanted to express my deepest gratitude to the many people who supported my growth throughout the school psychology program.

First, I am immensely grateful to my advisor, Dr. Karin Lifter, for her continuous professional and personal mentorship. I could not have completed this project without her unconditional support and motivation, and dedication to helping me think and act as a researcher and practitioner. Thank you also to my dissertation committee members, Drs. Emanuel Mason, Jessica Hoffman, and Lori Book, for their time and commitment to developing this project. Thank you for helping me think bigger! I would like to thank the staff and faculty from the Northeastern School and Counseling Psychology programs for providing me with excellent training as a future psychologist, and for their support of my professional goals. Also, thank you to past and current Project Play team members for sparking my interest in understanding and assessing children's play. A special thank you to current team members for assisting with this project.

Further, I could not have reached this point in my studies without the support of friends and family. Thank you to my colleagues in both the school psychology and counseling psychology programs for your support and expertise as we learned to navigate and grow in the field and coursework together. To my parents: thank you for instilling in me a love for learning and the drive to pursue my goals. And to my husband, Harrison—thank you for your love, support, and encouragement throughout my journey to this point. Thank you to my friends and family from near and far for your support!

CHAPTER 1

Introduction

Children's play has captivated researchers from the twentieth century to the present day. Interest has spanned from conceptualizing and defining play, to understanding how children learn, develop, and express their understanding of the world through play. Consensus among researchers has concluded that play provides a window into children's development (e.g., Belsky & Most, 1981; Bloom & Tinker, 2001; Fenson et al., 1976; Fenson & Ramsay, 1980; Garvey, 1977; Lowe, 1975; Lifter & Bloom, 1989; Lifter et al., 2022; McCune, 1995; Nicolich, 1977; Smilanksy, 1968; Ungerer & Sigman, 1981; Watson & Fischer, 1977; Westby, 1980; and Zelazo & Kearsley, 1980). These researchers have described developments in children's play in terms of the emergence of increasingly complex categories of qualitatively different play activities. From analyses of these categories and their progress over time, researchers have made inferences about developments in cognition such as developments in object knowledge, mental representation and symbolic thought.

Research from the constructivist lens considers how children are active in their play, including that their engagement and effort are the driving influences for their play activities (e.g. Bloom & Tinker, 2001; Lifter & Bloom, 1998). Social constructivism in particular (e.g. Vygotsky, 1980) has been invoked by play researchers to further describe play as a dynamic process through which children learn and interact with objects through social scaffolding by caregivers and peers. The prevailing viewpoint from this constructivist perspective is that children's active engagement and developing knowledge about objects, people, and events determines what children do with toys (Lifter & Bloom, 1989). This perspective proposes that children of different developmental levels play differently with the same toys. In other words, it

is not the toys that determine what children do with them; rather it is the children's knowledge of objects, people, and events that determines what children will do with toys. For example, a young child is more likely to play with a dump truck as if it is simply a container for transferring objects from one container to another. An older child will load the truck with "garbage" and take it to a pretend dump in a complex sequence of events.

There is a substantial body of research, in contrast, that suggests that it is the toys themselves that influence children's play (e.g. Trawick-Smith et al., 2015). Specifically, these studies have highlighted how the physical and conventional characteristics of toys direct the play activities children engage in. For example, in the case of the dump truck, the play emphasized would be more likely focused on the "appropriate" uses of the toy— e.g., using the truck to convey "goods" from one place to another, as opposed to its potential use as a container for simple manipulative types of activities. This view is upheld by the behavioral perspective of play, which focuses on interventions in play: that is using play to teach play skills (e.g. Barton et al., 2020), and identifying targets for intervention bases on the characteristics of the toys and conventional play with those toys.

Both the constructivist and behavioral perspectives are appropriate and necessary in play research—both in describing children's developments and processes in play, as well as using play as a tool to support children in skill acquisition. Although there is research to support these two opposing perspectives, few studies have considered the influence of both toys and a child's unique knowledge and experiences on children's play. Accordingly, the present study will investigate how children's knowledge, as measured by qualitatively different categories of play, and the toys used, inform how they play with toys.

This chapter provides a brief overview of developments in play and an overview of research on children's play with toys. The Project Play research study, from which the observations for the current study will be drawn, will be described. Then, the purpose of the current study will be defined, including implications for research and practice. Finally, the research question and hypotheses will be proposed.

Overview of Developments in Children's Play

Definition of Play

Descriptive play research deriving from the constructivist lens has long defined play as children's engagement with objects—often, such objects in play are toys (Lifter & Bloom, 1998). Within this constructivist orientation, the current study uses the following definition of play:

> Play is the expression of intentional states—the representations in consciousness constructed from what children know about and are learning from ongoing events—and consists of spontaneous, naturally occurring activities with objects that engage attention and interest. Play may or may not involve caregivers or peers, may or may not involve a display of affect, and may or may not involve pretense (Lifter & Bloom, p. 164)

From this definition, play is conceptualized as driven by a child's intentional state—or their current contents of mind, and expressed spontaneous interactions with objects, or toys.

Summary of Developments in Play

Developments in the knowledge that children express in play is seen in the emergence of qualitatively different and more complex categories of play over time. Moreover, many studies have focused on determining developments in children's play along a developmental trajectory (e.g. Bloom & Tinker, 2001; Belsky & Most, 1981; McCune, 1995; Nicolich, 1977). Although terminology of play categories may differ or overlap, researchers have found similar trajectories

in how the play of typically developing children develops. The play categories, as defined by Lifter et al. (2022; see Table 2, Appendix A) note how play for typically developing children begins in infancy, with indiscriminative activities that are not specific to the particular toy, such as mouthing or banging. Play then develops to a discovery of how objects can be related to one another, based on how they are presented, and later on according to their physical attributes (i.e., presentation combinations; general combinations; specific physical). Children thereafter begin to play with toys based on their learned and social experiences (i.e., discriminative activities; learned combinations; pretend self; same action sequences; varied action sequences; substitutions; complex sequences; doll-as-actor; person-as-actor; fantasy play). It is understood that children attribute social meaning to toys through their everyday activities, which they then express in their play (e.g. Fleer, 2010).

Overview of Research on Toys

Definition of Toys

In order to have a clear understanding of what constitutes a toy, the current study defines toys as "any object—realistic or not, commercial or natural—that children use it their play," (Trawick-Smith et al., 2015).

Research on Play with Toys

The research on children's play with toys is extensive. Studies centered on young children's play with toys vary from focusing on how toys are used in play interventions, to describing how toys support different kinds of play based on their characteristics. Few studies have explored the connection between types of toys, and how they impact different kinds and quality of play for young children.

Many studies of play, including descriptive and intervention studies, define toys in terms of their conventional properties. For example, in their intervention study with children with autism spectrum disorder, Lydon et al., (2011) defined functional play as "use of toys in a conventional manner" (see Sidhu et al., 2020). Accordingly, many studies examining the effects of toys on play focus on how social, conventional, and physical characteristics of toys influence children's play (e.g. Trawick-Smith et al., 2010).

Studies have explored how children engage in symbolic play with toys that are realistic replicas versus non-realistic toys (e.g. Elder & Pederson, 1978; Trawick-Smith et al., 2015). Additional studies focused on the characteristics of toys consider toys in terms of the social quality they support (e.g., Trawick-Smith et al., 2015), or examining how children engage in specific play and cooperative behaviors with peers when given specific types of toys (Møller, 2015). In addition, a substantial amount of this work has focused on examining sex differences in play among boys and girls, and how children engage in increased play with gender-stereotyped toys that match their gender (e.g. Cherney & Dempsey, 2010; Zosuls et al., 2009). Limited research has aimed to develop methods for rating how specific toys influence the quality of children's play (Trawick-Smith et al., 2010; Trawick-Smith et al., 2015). Overall, such studies support the characteristics of toys as determining what children play with, and in what way.

Limitations of Studies on Toys

The literature base on children's play with toys presents with some limitations. Because many studies are focused on children's play with toys in terms of characteristics of toys, they do not explore how children explicitly use toys to express what they know and are thinking about. Also, because many studies are restricted to either examining a specific age group's play with one type of toy, or one specific play category, the occurrence of children's play with different

types of toys across age groups and various play categories is absent. These studies thus raise a fundamental question of whether the purpose and characteristics associated with a particular toy, or a child's knowledge and development, determine what the child does with toys. Thus, there is a need for studies that explore how toys are used in relation to the knowledge that is expressed with the toys.

The Current Study

Project Play

The current study analyzed the play behaviors of the sample of typically developing children (n = 289) from the cross-sectional segment of the Project Play database. Project Play was funded by the Institute for Education Sciences (IES). The goal was to further understand young children's play development through the assessment of the play activities of typically developing children and children with disabilities from ages 8 to 60 months. The Project Play studies observed play activities of young children through use of the Developmental Play Assessment (DPA; Lifter, 2000). The DPA is a play assessment tool that is used in naturalistic observations of children's play with four sets of toys. DPA sessions are videotaped for further analysis.

Initially, 15 play categories were devised for the DPA based on prior developmental research (Lifter, 2000). Project Play expanded these original categories to a new total of 27 play categories (see Lifter, et al., 2022). Trained research assistants then coded observed play behaviors from the DPA video recordings based on these 27 categories (Table 1, Appendix A). Recent Project Play investigations have collapsed and reduced these 27 categories to 14 play categories (Table 2, Appendix A).

Benefits of the DPA

There are many advantages to using the DPA for investigating how children demonstrate their knowledge in their play with toys. First, observations are conducted in a familiar setting (i.e., the home), and with a familiar adult (i.e., caregiver), thus providing a naturalistic and comfortable environment that promotes opportunities for the child to demonstrate their play abilities. Additionally, the DPA codes child-led, spontaneous play activities, therefore focusing specifically on play activities that the child is actively generating, in contrast to activities prompted or demonstrated by caregivers. Also, the large dataset of children's play of various ages provided in Project Play, provides opportunities to examine children's play and the use of toys in play of children spanning late infancy through age 5 years.

The DPA toys also present with numerous benefits for examining children's play with toys. Similar to other studies (e.g. Belsky & Most, 1981; McCune, 1995), the DPA toys include a collection of traditional (not electronic) toys common to early childhood classrooms. In terms of their characteristics, the 25 DPA toys represent a variety of toys, including building and construction toys, puzzles, kitchen wares, people figures, vehicles, and imaginative or pretend props. Another advantage is how the DPA toys are presented to children, and for what duration. The DPA presents approximately five to eight toys at a time, which coincides with prior research supporting the use of fewer toy options for play (e.g. Dauch et al., 2018). The 7 to 8-minute timeframe for each set also gives children a lengthy amount of time to engage with the toys of their choice.

Purpose of the Study

The purpose of the present study was to investigate the intersection of how children of various ages use toys to express their increasing knowledge about objects, people, and events, as

measured by their expression of qualitatively different categories of play. The study sought to determine if the children use toys in different ways to express various kinds of knowledge, or if they use specific types of toys to express different kinds of knowledge. In other words, is it the children's knowledge that overrides the characteristics of toys, or do the characteristics of the toys available for play determine how children will play with them?

To investigate this topic, the study used DPA observations from the Project Play database for the analysis of which type of toys young, typically developing children play with, and how they use these toys in their play. The present study focused on children's play in 11 categories, which were as follows: discriminative activities; presentation combinations; general combinations; learned combinations; pretend self; specific physical; simple sequences; substitution; other-as-actor; complex sequences; and fantasy play. Chapter 3 provides further details regarding how DPA data are coded, as well as changes in play categories (see Table 3).

For the purposes of this study, the DPA toys were grouped into two different toy types. Grouping these toys together allowed for ease of interpretation in terms of whether children demonstrate specific play categories in play with similar types of toys. Previous studies have categorized toys based on their perceived function (e.g. Møller, 2015). These groupings are often in relation to the intended play activities resulting from play with this toy type. For example, the assumed function of toys such as costumes, stuffed animals, and fantasy figures, are for pretend or imaginative play activities; therefore, these toys are often grouped as pretend props (e.g. Møller, 2015). Based on the literature, toys were sorted into two broad types: manipulative and social-conventional toys. The prescribed function of manipulative toys is to play with them according to their physical characteristics. For example, the intention for the puzzle is to fit the puzzle pieces into place, and the nesting cups and barrels to fit into one another. Conversely, in

order to play with social-conventional toys in their intended manner, children require social knowledge about people, events, and objects (e.g. Fleer, 2010). An example of this is pretending to eat using the spoon. In this scenario, the play reflects an understanding of how a spoon is used in everyday life. Table 4 in Chapter 3 includes a list of all manipulative and social-conventional DPA toys.

Implications for Research and Practice

The current study has numerous implications for research and practice with young children, particularly in the fields of school psychology and early childhood education and intervention. Although the study will derive its theoretical basis and hypotheses from the social constructivist, developmental orientations, addressing both the influence of toys and children's knowledge expressed in play could result in findings that provide support for the behavioral perspective. The findings have implications for researchers' understanding of young children's play in relation to which toys they use in play. Specifically, findings will explore whether the toys are used by children across categories of play or within specific categories of play.

Refining conceptualizations of children's play and their use of toys also has implications for advancing the science of school psychology. A major focus of school psychology research and practice is the development of evidence-based assessments that provide information on children's functioning in multiple domains. It is important for school psychologists to have optimal assessment instruments so that they can use assessment results to inform intervention recommendations, goals, and services. Results from the present study have implications for clarifying how play as a domain area is defined and conceptualized, and how children's developments in play can be observed and assessed through use of the DPA. Formal assessment of play is important because it provides a systematic measure of progress in play before, during,

and after intervention. This knowledge allows school psychologists and play interventionists to target specific play skills that the child is ready to learn in the context of the child's play abilities, rather than targeting skills that are too advanced or too basic for the child. It also allows for direct comparison of the child's play skills before and after intervention, providing a standardized measure of pre- and post- intervention skills.

The findings from the study regarding how children reflect developmentally different categories of play with particular DPA toys will help to inform whether school psychologists and early education professionals are selecting the appropriate toys for assessing children's play, particularly in the context of the DPA. These findings also have implications for which toys school psychologists consider in linking play assessment findings to the development of play intervention goals and strategies for young children developing with delays or disabilities. Specifically, findings may provide further guidance on which toys may help to promote young children's acquisition of qualitatively different play skills. Overall, the present study sought to contribute to the school psychology research base and practice by enhancing the evidence that informs the methodology, implementation, and interpretation of play assessments and interventions with young children.

Research Question and Hypotheses

To investigate the impact of children's knowledge and toy type on how young children play with toys, the following research question was developed:

1. Is young children's play with manipulative and social-conventional toys equally distributed across the 11 play categories?

This research question centers on whether manipulative and social-conventional toys are used equally across play activities, or whether their use is associated with specific play

categories. Findings will help to determine if it is indeed the characteristics of toys that drive children to play with toys in a particular way, or whether children's knowledge as examined through categories of play overrides the characteristics of toys.

The social constructivist perspective posits that children are active agents in their play activities, and that they express their knowledge of the world through their play (e.g. Lifter & Bloom, 1998). This perspective is also supported by research and findings that children's play is influenced by their cultural background and environment (e.g. Göncü & Gaskins, 2011; Göncü et al., 2000; Trawick-Smith, 2010). Developmental research on children's play also suggests that children are able to express their knowledge through different play activities with various toys depending on their developmental level (e.g. Belsky & Most, 1981; Lifter & Bloom, 1998; McCune, 1995). Therefore, the child's ability, knowledge and experiences are emphasized in guiding play activities more strongly than the physical characteristics of toys. Based on this perspective and prior findings, it is hypothesized that there will be no differences in the frequency of play for manipulative and social-conventional toys for each of the 11 DPA play categories. In other words, it is hypothesized that the children will demonstrate their knowledge through play activities—as captured by qualitatively different play categories—with both manipulative and social-conventional toys equally.

The alternative hypothesis is that manipulative toys and social-conventional toys are associated with specific categories of play. This finding would support the behavioral perspective, in that it is the characteristics and function of the toys that are leading the children to engage in specific play activities (Lifter et al., 2011). From this perspective, it is projected that play with manipulative toys will elicit play in categories that reflect children's play based on the

physical characteristics of the toys. Conversely, it is assumed that play with social-conventional toys would result in play activities dependent on the child's learned and social experiences.

CHAPTER 2

Review of the Literature

To support the need for the research examining the influence of toys on children's play, this chapter includes a review of relevant literature. The first section centers on a discussion of the different theoretical perspectives on children's play, including the social constructivist orientation that underlies the perspective of the present study. Included is an overview of developments in play. Then, a review of toy research is presented. A rationale for how the present study aimed to contribute to the play and toy literature base follows.

Theoretical Perspectives on Children's Play

The current study's research question and hypotheses are supported by the social-constructivist orientation. From this lens, play is defined as a child's spontaneous and active interactions with objects, or toys that engage attention and interest (Lifter & Bloom, 1998).

The Constructivist versus Behavioral Perspectives

Research on children's play and play development initiated from the constructivist orientation. Notably, Piaget (1962) focused on play as a means for children to assimilate new experiences, by incorporating novel information onto pre-existing knowledge about objects and events. Other theorists expanded upon this conception to include play as a means for children to also acquire new knowledge (e.g. Montessori, 1967). Researchers have used social constructivism (e.g. Vygotsky, 1980) to further describe play as a dynamic process through which children interact with objects (i.e., toys) and learn through their own explorations along with social scaffolding by caregivers and peers.

As summarized in Lifter and Bloom (1998), early empirical play research was exploratory in nature, and later broadened to focus on observing children's play in order to

understand what activities children engage in and how children learn through play. Progress in play was described in terms of qualitatively different categories of activities. In addition, constructivists found consistencies in children's play in terms of a developmental trajectory or developmental order to the categories. Studies originating around the early 1980s began to define these developmental steps in play (e.g. Belsky & Most, 1981; McCune, 1995). Explanations focused on developments in mental representation and the symbolic function as children re-presented events from their sociocultural activities in their play activities. In other words, the children's developments were expressed in increasingly complex categories of activities. What children did in play was based on their increasing developments in cognition, along with increasing experience in their social worlds. It was children's knowledge and experience that directed what they expressed in their play.

In contrast, the behavioral perspective is centered on teaching play in the service of skill advancement (Lifter et al., 2011). By examining what children do in play and teaching these play behaviors, play is viewed as a target activity to support a child's development, especially for children who are developing more slowly than their peers. Thus, play is viewed as a target for instruction, in contrast to the constructivist focus on examining how children play and develop through play. Many behavioral studies have focused on teaching play skills to children with delays (e.g. Barton et al., 2012; DiCarlo et al., 2003). The tendency within this perspective is to teach children to play with objects or toys (e.g., Barton et al., 2020), and usually in terms of "appropriate play" with toys. By and large, the children's knowledge of objects, people, and events, combined with developments in cognition, are not taken into account. Instead, the focus is on teaching play skills through a focus on conventional play with the toys at hand, such as the function or convention related to the toy itself. Studies have often conceptualized this kind of

play as “functional play” or “appropriate play” with objects or toys (e.g. Gonsiorowski et al., 2016; Groskreutz et al., 2011; Lang et al., 2014; Lee et al., 2017). Although studies may hold different definitions of what functional play is, numerous descriptive and intervention play articles define functional play as focused on the appropriate or conventional use of objects/toys (see the review by Sidhu et al., 2020). Some studies, however, have assessed children’s functional toy knowledge and skills as a prerequisite for teaching higher level play, such as symbolic substitutions with objects (e.g. Lee et al., 2019).

Despite this apparent conceptual conflict between the two traditions, both contribute to a broader conceptualization of play as a fundamental aspect of children’s development. The constructivist examination of the underlying mechanisms involved in how children play and develop provides opportunities to qualitatively examine play development trajectories and processes. This empirical work has been translated to the creation of play assessments, which, in turn, can be used by behavioral researchers to identify appropriate targets for play interventions, based on a developmental model (e.g. Kelly-Vance & Ryalls, 2005; Lifter et al., 2011). The intentionality model (see Bloom, 1993; Bloom & Tinker, 2001; Lifter & Bloom, 1998) provides one such example of a constructivist play theory that has provided the basis for an observational assessment of children’s play.

The Intentionality Perspective

In order to more comprehensively explain the cognitive processes involved in children’s play, the intentionality model was developed. The intentionality model is inclusive of work derived from Piaget in its focus on play as a means for children to demonstrate their current knowledge, and assimilate information. It also expands upon this view to define a more inclusive view of play—considering how a child’s knowledge impacts their play with objects, what object-

related activities they engage in, and how they acquire new knowledge about the world through object-related activities (Bloom & Tinker, 2001; Lifter & Bloom, 1998). Accordingly, Lifter and Bloom (1998) formulated the following definition of play:

> Play is the expression of intentional states—the representations in consciousness constructed from what children know about and are learning from ongoing events—and consists of spontaneous, naturally occurring activities with objects that engage attention and interest. Play may or may not involve caregivers or peers, may or may not involve a display of affect, and may or may not involve pretense (p. 164)

Paramount to this definition of play is an understanding of intentional states. Intentional states are both a child's thoughts and feelings, coined "psychological attitudes", regarding persons, objects, and events, or "propositional content" (Bloom & Tinker, 2001). Intentional states reflect a child's current contents of mind. As illustrated by this definition of play, intentional states drive children's activities with objects, and are expressed in children's object-related activities—children express what they know about the world through play. And it is through the object-related activities that children acquire new information about objects, people, and events, thus influencing and advancing their intentional states. Consequently, play is characterized by the dynamic process of children's active engagement with their environment, the effort they must expend in interpreting ongoing events, and how external input in turn influences children's internal cognition. This definition supports the position of play being its own domain, independent of social aspects related to play (Lifter & Bloom, 1998).

To more specifically illustrate how intentional states dynamically drive children's learning through play, Bloom and Tinker (2001) identified three key concepts: relevance, discrepancy, and elaboration. Relevance directs the child's attention based on pertinent

information gathered from the external input; such information is deemed relevant based on preexisting information in the child's intentional state. In other words, the child focuses on and has the cognitive capacity to interpret external information due to its relevance in relation to what they know. Discrepancy centers on the difference between the child's current cognitive capacity and their environment. This principle proposes that children learn when they resolve this difference, such as through play or other means of expression. It is through this tension to resolve discrepancy that children are motivated to engage with their environment, and relevance is derived. As children continue this cycle of learning through resolving discrepancy through their active engagement in play, and gleaning relevant information as dictated by their intentional states, so do their intentional states advance. This is conceptualized by the process of elaboration, or children continuously increasing the complexity of their actions in order to express their increasingly advancing intentional states.

Developments in Play

In general, there has been consensus among descriptive studies regarding how and when young children develop through their play with objects. Despite differences in terminologies, these studies have defined how children develop such play skills along a developmental trajectory from infancy through the preschool age period (e.g. Bloom & Tinker, 2001; McCune, 1995; Nicolich, 1977; Vig, 2007). Based on prior literature, including the intentionality perspective, the following section describes how children's intentional states develop through understanding thematic relations among objects in play, providing the basis for the Developmental Play Assessment (DPA; Lifter, 2000) developed for use in research through Project Play. Based on the literature and observations of children's play, the DPA play categories have been refined to 14 play categories (Table 2, Appendix A) that follow this developmental

trajectory (Lifter et al., 2022). These updated categories are described below within the context of developmental play research.

Indiscriminative Play

Infants' initial play with objects involve indiscriminative actions, including mouthing, and simple manipulations, such as banging, shaking, holding, and throwing (e.g. Belsky & Most, 1981). These actions are not specific to the characteristics of specific toys, and thus are observed to occur across use of objects. The DPA likewise calls this category indiscriminative activities (Lifter et al., 2022). Investigators have found that indiscriminative behaviors tend to decline around 9 months old, and an increase in discriminative, or object-specific play, emerges (Belsky & Most, 1981; McCall, 1974).

Manipulative Play

Discriminative play, or discriminative activities (Lifter et al., 2022), is characterized by the child acting upon an object in some form based on its physical or social characteristics (e.g. Belsky & Most, 1981). Examples include pushing a car, or hugging a baby doll. Children's object knowledge progresses from simple discriminative actions to more specific actions that indicate an understanding of the different ways that objects can be used based on their physical properties.

In terms of activities between objects, children first learn through play how objects can be taken apart, or separated, such as a child taking a block out of a container, and then constructed, such as a child placing a block on top of another block (Lifter & Bloom, 1998). Children then apply this knowledge to constructions, or putting objects together, in expected (given) or novel ways (imposed). For example, after being presented with a completed puzzle, a child may assemble the puzzle in this manner (i.e., presentation combinations). Similarly, in the

same scenario, the child may put a puzzle piece into a toy car, thus combining objects to form new relationships.

Within imposed relations, children can relate objects to one another in general or specific ways (Lifter & Bloom, 1998). A general relation would be a child using a container to hold a cup (i.e., general combinations; Lifter et al., 2022). In specific imposed relations, children relate objects to one another based on their physical properties (i.e., specific physical). An example of this activity is a child stringing beads on a string—the string is specifically able to hold the bead because the string is formed so that it can weave through the hole in the bead. The most advanced levels of play emerge when children transition specific activities to playing with inanimate objects (inanimate; e.g. a car) to objects that represent living things, such as people and animal figures (animate).

Pretend or Symbolic Play

Because the intentionality perspective derives from the social constructivist orientation, object play encompasses not only children's development in relating objects to one another, but also how children relate toys to themselves and others. This has been conceptualized as symbolic play (e.g. Lifter & Bloom, 1998; McCune, 1995). Children's developments in symbolic play demonstrate the transition from playing with objects based on their physical properties to play being directed by the child's knowledge of world and everyday activities, and mental representation of the activities (Belsky & Most, 1981).

In the presymbolic phase, children demonstrate their understanding of objects, in terms of their intended purpose, such as using a spoon to scoop food (McCune, 1995). These activities would be categorized as learned combinations for the DPA (Lifter et al., 2022). Once they establish this knowledge, children are able to transition to relating objects to themselves, such as

pretending to eat using a spoon (Fenson & Ramsey, 1980; McCune, 1995; Watson & Fischer, 1977); this is characterized as pretend self. Symbolic play emerges when children extend pretend play activities towards other people and objects, or have others enact play activities. An example of this is a child pretending to feed a caregiver or a doll using a spoon, or having the caregiver pretend to use the spoon to eat (i.e., person-as-actor). In other levels of symbolic play, children extend a symbolic play activity to multiple actors, thus creating a simple play sequence (i.e., same action sequence). For example, the child may "feed" themself using the spoon, then "feed" their caregiver and doll (McCune, 1995).

In the highest levels of symbolic play, children engage in play activities that depict the child's agency in directing the play based on their intentional states, and are less reliant on objects in play (e.g. McCune, 1995). An example of this is having objects as agents in enacting play behaviors. For instance, a child may "walk" a doll to open a car door and get in it, thus having the doll be the actor of the play (i.e., doll-as-actor; Lifter et al., 2022). Another example are substitutions, or having an object represent another object, (McCune, 1995), such as pretending that a spoon is a shovel (Elder & Pederson, 1978). Substitutions can also encompass pretending that an absent object is present in the play scenario, such as a child pretending to pour coffee from a coffee pot—in this example, the "coffee" is the substitution (i.e., substitutions). The research by Elder and Pederson (1978) found that children at 30 months were able to substitute an object (i.e., a spoon) for a physically similar object (i.e., a shovel), but had difficulty when prompted to substitute the object for a dissimilar one (e.g. a car). However, children at 36 and 42 months old were able to play with the object in a manner that represented a physically dissimilar object (Elder & Pederson, 1978). These results further support developmental trajectories in children's play, in that as children learn more about their everyday

world and objects, their reflection of their knowledge through their play with toys becomes less reliant on the physical characteristics or purposes affiliated with objects. This includes the incorporation of more imaginative, or fantasy play, such as using a wand to cast a spell. As children develop, their complexity in play activities is characterized by sequences in play, through which they demonstrate a series of multiple play actions (e.g. Nicolich, 1977). The DPA has characterized varied actions sequences for instances of extending different learned play activities to different objects within the same instance of time. Similarly, complex sequences also includes the linking multiple play activities together, including a substitution. Hence, complex sequences are representative of complicated and higher levels of sequential play.

Social Knowledge and Meaning in Children's Play with Toys

The intentionality, constructivist lens provides a framework for understanding how children actively play with toys to express and develop their understanding of the objects, people, and events. Because this relies on the child's individual actions to drive play, it is thus assumed that the child's unique social and cultural contexts influence their play. As children learn through play, their social interactions and social knowledge are scaffolded by caregivers and peers (e.g. Lifter & Bloom, 1998). Further, play is shaped by a child's cultural environment, as children have been found to recreate aspects of their culture in play (e.g. Göncü & Gaskins, 2011). Accordingly, the intentionality perspective is inclusive of viewing children's play as a process embedded within their personal sociocultural experiences.

The Cultural-Historical Perspective

To further understand how children reflect their sociocultural experiences in play, the cultural historical perspective describes how children attribute social meaning to objects based on their sociocultural experiences. Even though the cultural-historical perspective diverges from

the intentionality perspective, its social constructivist focus on grounding play in a child's unique experiences contributes to the broader conversation of children expressing social knowledge through play.

Fleer (2010) summarized seminal theories of how children develop and attribute social meaning to objects. She noted Vygotsky's (1967) theory on imitation, wherein "children imitate familiar and important activities, and through imitative action in play generate a motive for playing with these actions to generate deeper social meaning about the rules that frame the play (and their social world)," (p. 22). The work by Leontiev (1978) expanded upon this work to explain how motives are derived from observing or engaging with external input, and imitation of activities results due to the social significance attributed to objects (Fleer, 2010). Accordingly, motives and imitation in play are dialectically related. Fleer (2010) provided an example of an infant using a spoon to "feed" a doll—the infant has engaged in being fed, and thus attributes social meaning to this activity, and is motivated to imitate this action through play. As the toddler's social experiences over time motivate increasingly advanced imitations and social rules, they likewise learn more about their social world through this play—similar to the intentionality principle of elaboration. This example illustrates how children develop their social worlds through play: attributing social meaning to objects and activities, and actively learning and expressing through play what they know about their social world.

Another aspect to consider is how children's social relationships to objects change over time (see Elkonin, 1999). Continuing with the above example, Fleer (2010) described how the infant's initial relation to the spoon (the object) is associated with the social aspects of eating, but transforms through social experiences over time to be associated with "caring activities in the preparation of meal times" (p. 24). She concluded that this cultural-historical perspective of play

posits that "the rules of everyday life and experiences of everyday practice shape how play is enacted," (p. 25), and following Elkonin's description, "[play is] not spontaneous, but rather formed as a result of the child's changing relations to society," (p. 122).

In comparing the intentionality and cultural-historical perspectives, there are notable differences in how children are motivated to play. The intentionality perspective describes play as a spontaneous activity that is driven by children's internal states (Bloom & Tinker, 2001; Lifter & Bloom, 1998). In contrast, the cultural-historical lens is limited to describing play as an intentional activity in which children recreate events from their everyday life because objects hold, as Elkonin noted, either an "objectivised social meaning... what it represents or what its purpose is, or its design function," or, meaning bestowed from the child onto the object in an imaginary situation (Fleer, 2010, p. 123). In other words, children are motivated to engage in play in response to the toys in their environment having social meaning. This contradicts the intentionality perspective, for which play can occur regardless of whether toys hold social meaning for the child, and activities are not solely a reflection of children's everyday experiences; when children engage in socially relevant play, it is driven by their social knowledge present in their intentional states, and not necessarily due to the social meaning assigned to toys.

Despite these contradictions, there are some striking connections between these two theories. Both perspectives describe play as a means for children to demonstrate their understanding of the world and of their personal experiences, as well as learn about the world through play activities. One could argue that the intentionality perspective is inclusive of the cultural-historical perspective in terms of the social context of play. Although the cultural-historical perspective indicates that children's motivation to engage in play is due to the social

meaning affiliated with toys in their external environment, this social meaning is reflective of the child's unique experiences embedded within their social and cultural context. As such, the precursor to toys holding social meaning is the child's representation of their world— which would be reflected by their intentional states. Hence, although the cultural-historical lens is limited in its scope of play activities, and the origin of motivations in play differ between this and the intentionality model, the cultural-historical perspective's focus on how the child's individual experiences within their sociocultural environment shapes their interactions with toys and their learning through play is aligned with the tenants of the intentionality model.

Summary

In sum, the constructivist and cultural-historical perspectives are centered on how a child's knowledge about object, people, and events influence how they play with toys within their sociocultural contexts, and how they assign social meaning to toys. Descriptive studies on children's play further support this perspective, and indicate that children's play follows a developmental trajectory (e.g. Belsky & Most, 1981; Lifter, 2000; Vig, 2007). From these theoretical foundations, it is thus understood that children's developmental and cognitive level, and knowledge embedded within their cultural context, drive their play with toys.

Children's Play with Toys

To fully understand the processes involved in how children play with toys, research on children's play with toys should also be examined. In contrast to constructivist-based research, most of the research on toys follows a behavioral perspective, suggesting that what children do in play is influenced by the characteristics of the toys themselves. The next section will focus on a review of toy research. Due to the vast literature base on children's toys, studies selected for

review primarily pertain to the children of the present study, namely infants, preschoolers, and kindergarten-aged children.

Defining Toys

To explore this sizable literature base related to toys and children's play, a cohesive definition of toys must be established. Trawick-Smith et al. defined toys as "any object—realistic or not, commercial or natural—that children use it their play," (2015). In conjunction with this description, they explained how toys can range from manufactured (common in industrialized countries), whereas "sticks, stones, and mud" are commonplace toys in other parts of the world. Parallel to previous theorists (e.g. Göncü et al., 2000; Sutton-Smith, 1986; Sutton-Smith, 2009), the investigators stated that the toys that children play with are directly influenced by and reflect the social, cultural, and historical aspects of their world (Trawick-Smith et al., 2015). This definition is in agreement with the intentionality play perspective due to its focus on toys as any object a child engages with, as well as its roots in conceptualizing toy play from the individual sociocultural context of the child (e.g. Göncü & Gaskins, 2011).

Research on Toys

Influence of Types and Characteristics of Toys

Prior research on children's play with toys has predominantly focused on the characteristics of toys, or the toy environment's impact on children's play and other factors. Although these studies are conducted to promote child-led play experiences, results are contextualized according to what the toys or toy environment provide in play and other domains. For instance, one study found that toddlers had a higher quality of play when presented with four toys versus 16 toys for free play (Dauch et al., 2018). Another study found that infants' play with

books and traditional toys resulted in a higher frequency and quality of parent-infant communication, in comparison to electronic toys (Sosa, 2016).

Many other studies that centered on the impact of specific characteristics of toys mostly fall into one of three categories: toys that promote individual versus social play, realistic versus non-realistic toys, and gender stereotyped versus non-stereotyped toys (see Trawick-Smith et al., 2010; Trawick-Smith et al., 2015). Additionally, there is a substantial body of research investigating the impact of electronic or interactive toys (e.g. Healey & Mendelsohn, 2019; Smirnova, 2011), and how a child's culture impacts their use of toys (Göncü & Gaskins, 2011; Göncü et al., 2000; Haight et al., 1999; Trawick-Smith, 2010).

Social versus Individual Toys. Toy studies that focused on social aspects of play examined whether certain toys promote solitary play or social play with others. Many of these studies are derived from Parten's (1932) levels of social participation, for which she coded children's social play according to the observed social interactions that occurred; these social parameters included "unoccupied and solitary", "cooperative play", and "pretend play" (Trawick-Smith et al., 2010). The results are comparable across studies, with pretend props and blocks typically resulting in higher frequencies of social interactions, whereas toys that are characterized as having cognition/problem-solving (e.g. puzzles) or artistic/creative (e.g. paints) properties lead to higher rates of solitary play (Trawick-Smith et al., 2010). Although this suggests that certain toys can elicit an independent or social play response from children, one recent study found no significant differences in children's social contact when playing with toys traditionally categorized as promoting individual versus social play (Hughes & Carter, 2002).

Realistic versus Non-Realistic Toys. Other studies have focused on the effects of toys on symbolic play based on whether they have realistic features. Toys were deemed realistic if

they were a replica of an actual item, such as a play telephone or cup, and non-realistic toys have no resemblance of a real-world item that could be used in an intended manner, such as a cardboard box (Trawick-Smith et al., 2010). Younger preschool-age children were more likely to engage in symbolic play with realistic toys than non-realistic toys; older preschoolers would transform non-realistic toys into imaginary items only when realistic toys were also available; and early elementary-aged children were observed to engage in high levels of symbolic play with non-realistic items (Elder & Pederson, 1978; Trawick-Smith et al., 2015). Although these findings suggest that realistic props are likely to promote symbolic play, for young children especially, many of these studies focused on the frequency of symbolic transformations instead of capturing the qualitative aspects of the symbolic play, such as play duration and complexity (Trawick-Smith et al., 2010).

Gender Stereotyped versus Non-Stereotyped Toys. Among the toy research studies, there is significant emphasis on whether gender stereotyped toys affect children's play and play preferences. A majority of these studies had panels of expert judges to identify such stereotyped toys (Trawick-Smith et al., 2010). Toys such as dolls, kitchen and food toys, and dress up clothes are often associated with being female stereotypic toys, whereas toys such as vehicles and construction toys are often labeled as male stereotypic toys (e.g. Cherney et al., 2003; Trawick-Smith et al., 2010; Zosuls et al., 2009). Studies have also found that gender stereotypical colors, such as pink and blue, can influence young children's gender stereotypical play behaviors (Cherney & Dempsey, 2010; Wong & Hines, 2015). Previous studies have found that infants as young as 18 to 21 months old begin to use gender labels and engage in increased gender stereotyped play (e.g. Zosuls et al., 2009). Further, results have almost unanimously discovered

that girls tend to prefer female stereotypic toys, and boys tend to prefer male stereotypic toys (Todd et al., 2017; Trawick-Smith et al., 2010).

Few studies have examined how gendered toys influence the complexity of children's play. One example by Cherney et al., (2003) found that in addition to children preferring to play with same-gender toys, boys and girls demonstrated more complex activities in their play when engaging with female stereotyped toys such as pretend props. Another study found that boys and girls ages 3 to 5 years old demonstrated the highest complexity in their play with a castle, which the boys considered to be a masculine toy, and the girls considered to be a feminine toy (Cherney & Dempsey, 2010). Also, significant increases in the multi-schemed play, for the girls, but not the boys, were detected, but not for the boys, suggesting that the girls' play was more complex and included multiple sequences (Cherney & Dempsey, 2010). This suggests that even though children may gravitate towards toys that are socially aligned with their gender, specific toys may elicit specific types of and complexities in play for all children. Findings also highlight how children's own gender stereotyping of toys can differ from expert and social conventions, as well as may influence their choice of toys for play.

Electronic and Interactive Toys. As we enter an ever-increasing technological world, there is a substantial growing body of research dedicated to examining how children's play is impacted when playing with electronic or interactive toys versus traditional toys. Overall, researchers in this area have concluded that traditional toys are superior to electronic toys for young children's development in play and other domains, because they afford more opportunities for children to actively engage in play (Healey & Mendelsohn, 2019; Smirnova, 2011). For example, Smirnova (2011) found that the play of children aged 5 to 5.5 years old with an interactive duck toy was mostly physical—the children played with and manipulated the duck in

the technical ways pertinent to its design, such as turning it on and off, and imitating the ducks' actions. The author stated that the interactive nature of the toy limited the children's creativity and expression in play.

Cultural Considerations

There is a growing body of research focused on examining the play of children from different cultural communities, and how a child's cultural background and context influence their play. For instance, the study by Göncü et al. (2000) compared the social play among samples of 14 children ages 12 to 24 months old from four different communities (San Pedro, Guatemala; Kecioren, Turkey; Dhol-Ki-Patti, India; Salt Lake City, United States). Types of play were also compared, including pretend play, object play, language play, physical play, and games. Significant differences in social play among cultural groups indicated cultural variations in occurrences of social play, and suggested that children's play activities reflected their cultural context (Göncü et al., 2000). Another study that examined the play activities of 4- and 5-year-olds in Puerto Rico observed the children to engage in play less common to Western samples, such as music, art play, humor, and rough play, and minimal object play (Trawick-Smith, 2010). The research study by Haight et al. (1999) compared the pretend play of children ages 30 to 48 months old from Irish American and Chinese communities. They found that children from both backgrounds incorporated objects (i.e., realistic "miniature" toys such as dolls, kitchen wares, and vehicles) into their pretend play, and that their pretend play was embedded within the social interactions they had with family members and friends. However, the social dimensions of these interactions varied, with Irish American children enacting pretend play more often with peers, and Chinese children participating in pretend play more often with caregivers (Haight et al., 1999).

Overall, these studies indicate that traditionally Western variables for assessing play, such as object play, may not be as culturally relevant for children from non-European or American backgrounds. Hence, differences in object play for children from these backgrounds may be due to cultural factors, and not inherent to differences in cognitive development or the influence of toys themselves. Findings also point to the importance of social context embedded within a child's culture for mediating play processes.

Measuring the Effects of Toys

The foregoing studies provide insights into how toys have been categorized according to their characteristics and how they influence children's play. Numerous studies also pinpoint how child characteristics such as gender (e.g. Cherney & Dempsey, 2010; Zosuls et al., 2009) and cultural background (e.g. Haight et al., 1999; Göncü et al., 2000) may impact the types of toys with which children choose to play. However, because these studies tend to focus on play without toys, one specific toy construct, or the frequency of limited categories of play, there is a need for evaluating how toys impact what children's play looks like and how elaborate it is. The following provides a detailed overview of select studies that have examined how specific toys impact children's quality of play.

Møller (2015). Møller explored how different toys impacted children's level of novelty, negotiations, and imagination in group play scenarios. The author first conducted a 1-month ethnographic pre-study, wherein she gathered interaction-based observations of the children's play from interviews, video recordings, photos, and field notes. Next, she devised an experimental play groups project with Danish kindergarteners that lasted for 8 weeks total. Teachers were asked to divide the students into six comparable groups; three groups of children (N = 15; 7 male) were assigned to play with creative-construction toys, and three groups to play

with social-fantasy toys (N = 15; 8 male). No more than five children were assigned to each group, with gender equally or almost equally distributed (e.g. 3 male/2 female; 2 male/ 3 female). Creative-construction toys included items such as LEGO sets, wooden blocks, and train tracks, whereas social-fantasy toys included costumes, fantasy figurines, and teddy bears. The children participated in two approximately hour-long play sessions per week, with toy sets changed every second week. The author and a second researcher coded the play session data (interviews, video recordings, photos, and notes) for play categories previously defined in the literature, and from this data also developed new play categories to be coded.

Significant differences between creative-construction and social-fantasy play groups were discovered in multiple play categories. Children in the social-fantasy group (M = 173, SD = 47.17) scored significantly higher for imagination than creative-construction (M = 74, SD = 20; $t(4) = -3.34$, $p = 0.029$). This indicated that costumes, and fantasy and plush toys did result in more imaginative play, or as defined by the study, the children constructed and engaged in their play scenario. Students in the social-fantasy group (M = 68, SD = 17.06) were also observed to communicate verbally or nonverbally the function of toys within their play scenarios at a significantly higher frequency than the creative-construction group (M = 28, SD = 10.21; $t(4) = -3.46$, $p = 0.026$). Further, the social-fantasy group (M = 68, SD = 22.07) were observed to more often negotiate and accept new rules and toy functions than the than creative-construction group (M = 42, SD = 13.45; $t(4) = 1.74$, $p = 0.156$). In contrast, the author observed the children in the creative-construction group played either alone or in smaller groups, with children establishing toy functions, and play goals and rules at the beginning of play scenarios. Accordingly, children appeared less likely to accept and incorporate novel ideas into their play. These findings therefore suggest that children are likely to engage in more imaginative play that encourages

communication and acceptance of new rules and toy functions when playing with objects such as costumes, fantasy, and plush toys (social-fantasy toys) in comparison to toys such as train tracks, and wooden and building blocks (creative-construction toys).

Trawick-Smith et al. (2010). Trawick-Smith and colleagues sought to develop a rating instrument that evaluates the impact specific toys have on young children's play activities, named the *Toy Effects on Play Instrument (TEPI)*. The authors constructed and modified the original scale through consultations with preschool teachers, and from rating five children's play with toys from videotaped observations. The result was an eight-item scale, with descriptions for rating each item on a five-point scale. Sixteen 3- and 4-year-old preschoolers of varying ethnic backgrounds were then recorded playing with toys during four, 30-minute spontaneous free play sessions. From these sessions, a total of 64 sub-clips of children playing with 23 toys were gathered. To assess for reliability, two of the authors completed TEPI ratings of toys from 38 randomly selected sub-clips. Reliability of the TEPI was established from high interrater reliability correlations (r = .81-.88, p < .01).

Next, an exploratory principal component factor analysis detected three distinct factors of the TEPI: Thinking and Learning (Items 1-4; r = .791 - .946); Creativity and Imagination (Items 5-6; r = .887, .917), and Social Interaction (Items 7-8; r = .612, .805). Validity of the instrument was assessed by comparing the mean sub-scores for these three factors from the principal investigator's TEPI ratings of five toys: blocks, a math game, puzzles, paints, and pretend props. Significant differences between mean sub-scores across toys for creativity/imagination (F(4, 56) = 22.05, p < .01), social interaction (F(4, 56) = 9.68, p < .01), and thinking/learning (F(4, 56) = 14.55, p < .01) indicated validity of the TEPI in detecting differing toy effects across these specific toys. Comparison of mean sub-scores between pairs of toys (via Tukey post hoc

analyses) further highlighted the validity of the instrument, as well as the utility of certain toys for promoting play and learning in different conceptual areas. Notably, for creativity/imagination, blocks ($M = 3.50$, $SD = 1.12$), paints ($M = 4.20$, $SD = .75$), and pretend props ($M = 4.58$, $SD = 1.02$) scored significantly higher than the math game ($M = 2.17$, $SD = .58$, $p < .01$) and puzzles ($M = 2.08$, $SD = .60$, $p < .01$). Respectively, blocks ($M= 3.46$, $SD = .82$) and pretend props ($M = 4.31$, $SD = .49$) scored significantly higher than the math game ($M = 2.50$, $SD = .13$, $p < .01$); paints ($M= 3.16$, $SD = .81$, $p < .01$); and puzzles ($M = 3.20$, $SD = .86$, $p < .01$) for social interaction. For thinking/learning, the math game ($M = 4.89$, $SD = .12$) had the highest mean sub-score, and was significantly higher than blocks ($M = 4.26$, $SD = .67$, $p < .01$); pretend props ($M = 4.02$, $SD = .09$, $p < .01$); and paints ($M = 3.22$, $SD = .98$, $p < .01$). Puzzles ($M = 4.59$, $SD = .82$); blocks ($M = 4.26$, S$D = .67$); and pretend props ($M = 4.02$, $SD = .09$) respectively all scored significantly higher than paints ($M = 3.22$, $SD = .98$, $p < .01$). Findings indicated that creative and imaginative play was most associated in play with pretend props, paints, and blocks; social interaction associated with blocks and pretend props; and thinking and learning associated with the math game and puzzles. Overall, the association of these toys with these categories of play were generally aligned with the researcher's hypotheses, and suggested an avenue for evaluating the types of play that specific toys may elicit.

Trawick-Smith et al. (2015). Expanding upon their initial research (see Trawick-Smith et al., 2010), Trawick-Smith et al. (2015) analyzed how toys impact the quality of preschooler's play, as well as any significant variations in play based on the children's gender, socioeconomic status (SES), and ethnicity (Euro American versus Latino). To create a naturalistic and culturally relevant observation scenario, the investigators selected nine toys (Bristle Blocks; Duplo Bricks; Lincoln Logs, Measure Up Cups; Rainbow People; Castle Bucket set; Shape, Model, and Mold

set; Tree Blocks; and Wooden Train set) from a list of parent and teacher nominations, and recorded the 60 three- and four-year-old children during free play. From these recordings, each toy was evaluated on a scale of 1 (lowest) to 5 (highest) for eight total play behaviors as defined by the Play Quality with Toys (PQT) measurement system. These eight defined play behaviors were as follows: thinking and learning; problem solving; curiosity and inquiry; sustained interest; creative expression; symbolic transformations; interacting; communicating and collaborating with peers; and autonomous play with the toy. The mean score generated from these eight items across all recorded segments represented the overall PQT score for each toy—the higher the PQT score for a toy, the higher the play quality affiliated with the toy.

The investigators found significant differences in play quality across all nine toys ($F(8, 4{,}512) = 27.26$, $p < .001$), notably due to two toys scoring statistically higher than all others (Duplo Bricks mean difference range = .24 – 1.03, $p < .05$; Rainbow People mean difference range = .27 – 1.07, $p < .05$), and one scoring much lower (Tree Blocks mean difference range = -.27 – -1.07, $p < .05$). They theorized that the Duplo Bricks and Rainbow People provided a higher play quality because both toys were relatively non-realistic, and thus did not prompt children to engage with them in a particular way. The children were observed to play with these toys in a variety of ways, especially in construction and symbolic play activities. An interaction between gender and toys ($F(8, 3{,}286) = 8.301$, $p < .001$) indicated that some toys afforded a greater play quality depending on the child's gender. Five toys (Bristle Blocks; Duplo Bricks; Lincoln Logs; Measure Up Cups; Rainbow People) resulted in a significantly higher play quality when played with by boys; one toy (Tree Blocks) resulted in a significantly higher play quality when played with by girls; and three (Sand Castle Buckets; Shape, Model, and Mold; Wooden Train) had similar play quality for both genders. This result is consistent with previous research

suggesting that the boys' and girls' preferences for toys is a separate construct from the influence on play quality provided by toys for both boys and girls.

An interaction between ethnicity and toys was also found ($F(18, 14{,}718) = 21.86$). In comparing the play between Latino and Euro-American preschoolers, three toys (Measure Up Cups, mean difference = .59; Rainbow People, mean difference = .1.10; Shape, Model, and Mold, mean difference = .30) resulted in significantly higher play quality when used by Latino children, while one toy (Tree Blocks, mean difference = 1.33) had a higher play quality for Euro-American children. Toys used by children of lower SES tended to have significantly lower play quality scores than children of mid-low to middle SES levels ($F(2, 2{,}891) = 15.87$, $p < .001$). A significant interaction between SES and toys indicated differences with toy play quality among children from a range of low to high SES ($F(15, 2{,}868) = 5.00$, $p < .001$).Two toys were found to have a higher PQT score when used by children from low or middle-low SES than those from a higher SES background (Sand Castle Buckets; Wooden Trains), as opposed to five toys resulting in a higher PQT when play with by children from middle SES backgrounds (Bristle Blocks; Lincoln Logs; Measure Up Cups; Rainbow People; Tree Blocks). The researchers attributed these differences to previous literature that reports children from non-Western cultural backgrounds and from lower SES presenting with differences in their play, which could be a function of limited access to toys.

Harris (2020). Harris, using data from the Project Play database, focused on how the different toys sets of the DPA (i.e., pink, green, black, and orange) influenced the expression of sequences (i.e., same action, varied action, and complex sequences) in the play of typically developing children aged 18-, 24-, 30-, and 36-months. Overall, the pink set resulted in a significantly lower frequency of sequences than the other toy sets. Significant differences were

detected between the pink set and the black and orange sets for variety of sequences. The 18-month group had significantly lower frequency and variety of sequences than the 30- and 36-month age groups. Because the presence of sequences was overall equal across toy sets, and increased with age, results appeared to support that the children's development and knowledge contributed to these differences in sequences, rather than the toys themselves. However, results could be associated with the children's familiarity with, or preference for, certain toys. The pink set in particular resulted in significantly different frequencies and varieties of sequences, which implies that the toys in this set differ from the other toy sets.

Rationale for the Current Study

Given the competing frameworks of the constructivist play theories and extant research on toys, there is an established tension regarding children's play with toys. In particular, this tension generates questions as to whether it is the purpose associated with a type of toy that elicits children to engage in play in a specific manner, or the child's knowledge about objects, people, and events that drives what the child does with toys. The former considers how society defines the social meaning and function of a toy based on its characteristics; the latter emphasizes the child's social and cultural experiences and knowledge as influencing how they engage with toys.

Limitations in the Literature

Despite the expansive toy literature's exploration of various factors related to children's play with toys, there are multiple limitations in this work. For instance, because many play intervention studies are solely focused on teaching appropriate play with toys (e.g. Lang et al., 2014), they fail the acknowledge alternative interactions with objects as an expression of children's cognition and social knowledge. Other studies, such as those that examine the role of

play environment factors in play quality (e.g. Dauch et al., 2018), lack specificity regarding how the children play with specific toys. Although studies comparing electronic versus traditional toys are helpful in promoting the use of traditional toys with children to support development (Healey & Mendelsohn, 2019; Smirnova, 2011; Sosa, 2016), they also fail to investigate how specific types of traditional toys influence children's play quality.

Additionally, many studies highlight how the social or functional characteristics of toys may result in specific toy preference or play behaviors among children. Studies of gender stereotyped and non-stereotyped toys have found that children are likely to play with gender stereotyped toys that match their gender background (e.g. Todd et al., 2017). Although this can be useful in selecting toys for play assessment and intervention, findings also suggest that boys' and girls' preferences for certain toys, or whether the toys are affiliated with a specific gender stereotype, is a separate construct from how the toys impact their overall quality of play (e.g. Cherney et al., 2003; Cherney & Dempsey, 2010; Trawick-Smith et al., 2015). Hence, how gender-stereotyped toys are labeled and selected, and whether they elicit specific play activities, is important to overall play research yet different from explorations of how children play with toys of various physical or social characteristics. Similarly, investigations focused on the impact of toys in supporting isolated or social play attribute the characteristics of toys leading children to either play alone or with others (Trawick-Smith et al., 2015). Yet, there is no indication as to how the children are playing with these toys, or the quality of this play. Findings from studies comparing the symbolic play of children from young preschool-aged to early elementary with realistic and non-realistic toys would suggest that realistic toys are effective in promoting symbolic play, especially for younger children (Trawick-Smith et al., 2015). Although this finding appears to be attributed to developmental differences in the attainment of symbolic play,

there is no discussion of other types of play in addition to symbolic play that realistic and non-realistic toys may promote across age groups.

Current research has built upon this foundation to more broadly measure how a variety of toy elements may impact children's play quality and complexity, and how toy play quality is impacted depending on a child's background (Trawick-Smith et al., 2015). This body of work would thus suggest that because specific toys can be used to potentially generate specific play activities, educators should be mindful of the types of toys available to their students. Factors such as the child's gender, ethnic background, and SES level may also warrant consideration when selecting certain toys for teaching play, or in providing toys in early childhood classrooms.

Despite these conclusions, many of these studies have limitations in their depictions of children's play with toys. First, these studies tended to focus on a specified age group of children, instead of examining the effects of toys for children of various ages and developmental levels. Studies that rated toys based on their impact on children's play quality during naturalistic observations of play, such as the TEPI (Trawick-Smith et al., 2010) and PQT (Trawick-Smith et al., 2015), were also problematic. By having observers rate toys on a scale of only three play categories (TEPI) or total a composite score of eight play categories (PQT), these studies do not explore the relationship between types of toys and the frequency and quality of play in specific play categories. For instance, a high rating for one toy in one or two play categories could result in a high overall play quality score, whereas another toy could have the same play quality score from lower ratings across all play categories. In other words, these ratings lack specificity in terms of which play activities, and their corresponding complexities, are promoted by certain types of toys. Although the study by Møller (2015) found differences in children's imaginative play when playing with social-fantasy toys and creative-construction toys, these findings were

contextualized within children's play with peers, which could have been a mediating factor. Further, children were only provided access to one particular set of toys that were thematically similar, in contrast to a variety of toys. In contrast, the study by Harris (2020) examined the connection between play sequences and the DPA toy sets, in which each set has a variety of toy types. However, results were only contextualized in terms of toy set, and did not take into account whether differences in expression of sequences could be attributed to different types of toys.

Overall, these areas of toy investigations emphasize how attributes related to a child or toy influence children's interest in, and quality of play with certain toys. However, these studies tended to focus on either the influence of a specific type of toy, or how toys influenced a specific type of play, for children within a particular age range. These studies suggest that there is a need to examine how specific types of toys are related to specific play categories. Also, investigating this relationship for young children of various ages will determine whether children play with certain types of toys in qualitatively different ways across their development, or if play with certain toys is restricted to play categories reliant on the child's level of development. Further, findings from research on children's cultural backgrounds imply that it is not the toys themselves, but cultural factors at play that influence children's engagement with objects (e.g. Göncü et al., 2000; Haight et al., 1999; Trawick-Smith, 2010; Trawick-Smith et al., 2015). This thus emphasizes a need for studies that also consider the impact of children's knowledge and development, as embedded within their sociocultural context, on how they play with toys.

The Current Study

Based on the relevant play and toy literature, there is a need for studies of children's play that consider both the influence of toys and a child's knowledge and sociocultural context on

their play activities. The current study aims to address gaps in the play and toy literature through analyses of DPA observations from Project Play. In contrast to other studies, the DPA conceptualizes children's play activities across 11 qualitatively different play categories with two broad types of toys: manipulative and social-conventional. The DPA play categories represent differences in development and knowledge about the world and objects, thus providing an avenue for exploring how children use toys to reflect their knowledge.

The current study aimed to explore how young children express their knowledge of the world through play that is embedded within their sociocultural contexts. Examining the intersection of a child's knowledge, ability, and play with toys may uncover further evidence on children's play and cognitive development. Also, the findings have implications for guiding the selection of toys for play assessments and interventions. For instance, if a specific toy is found to be related to children enacting a particular play activity, then recommendations could be made for using this toy for assessing and teaching such play skills. Alternatively, if children's play activities are observed to reflect the child's individual knowledge, this has implications for potentially selecting toys based on the child's readiness to learn different activities. Findings could also reflect a combination of toy influences on play, coupled with children's agency in driving their play activities with toys. Hence, the current study planned to contribute to the broader play and toy literature base in investigating how toys and children's development and knowledge impact how children play with toys. Findings also sought to inform the provision of early intervention play assessment and intervention research and services by school psychologists and other early childhood professionals for young children.

CHAPTER 3

Methods

The observations for the present study were drawn from the Project Play research study. Funded by the Institute of Education Sciences (IES), Project Play examined the play development of 289 young children who were developing typically and 203 children who were developing with delays through naturalistic observations of their play. This chapter describes the methods for the current study.

Participants

Project Play focused on the recruitment of children from families living within the metropolitan area of a university in the northeastern part of the United States, spanning 8 to 60 months of age. Recruitment was achieved by communication through flyers, community events, email listservs, mailing lists, early intervention providers, and schools. Target ages were 8, 12, 18, 24, 30, 36, 42, 48, 54, and 60 months. Play observations were conducted within two weeks before or after the day of the target age. Although the majority of children participated in one visit, a subgroup was included in a longitudinal sample, in which they were observed at multiple target age intervals. Children were identified as either typically developing or developing with delays based on caregiver responses on the Child Family Background Form (CFBF).

The current study examined the play of the sample of typically developing (TD) children from the Project Play database. Participants thus included a total of 289 TD children, ranging from 8 to 60 months old. The parents/guardians identified their children as White (70%); of mixed racial/cultural backgrounds (14%); Asian (7%); Black (6%); and Latinx (3%). Thirteen percent had annual household incomes of less than $49,999; 33.2% between $50,000 to $99,999; and 53.8% greater than $100,000.

All Project Play visits occurred in familiar environments for the children and predominantly in their homes. In a few cases, children were observed in childcare centers, or their schools, as requested by the caregivers. Children participated in the play observations with a familiar caregiver.

Measures and Materials

This section provides a description of the measures and materials used by Project Play pertinent to the current study, including the Child and Family Background Form (CFBF) for caregivers and the Developmental Play Assessment, Research Edition (DPA-R) for children. New measures created to address the aims of the present study are also described.

Child and Family Background Form (CFBF)

The child and family background form (CFBF) is a survey developed by Project Play, based on the School Readiness Survey of the National Household Education Survey of 2007 (NHES-SR). For each visit, surveys were completed by the parent independently or through an interview with the examiners. The CFBF included three sections designed to obtain information related to family demographics and the child's environment: home and family background, educational background of the family, and medical and health background of the child. Questions centered on aspects such as the family and child's composition, race/ethnicity, parent education, parent employment, household income, and disability status.

Developmental Play Assessment, Research Edition (DPA-R)

The DPA (Lifter, 2000) is an assessment that consists of a 30-minute, naturalistic play observation of a child playing with toys with a familiar caregiver. The research version of this assessment, the Developmental Play Assessment, Research Edition (DPA-R) was administered. Examiners asked the caregivers to not show or tell the child how to play with the toys, but

instead to be responsive to the child's initiations. The child was presented with a total of four separate sets of toys for approximately seven to eight minutes each to total 30 minutes of observation. The presentation order of the toy sets was determined randomly for each observation. The examiner named each toy as it was placed in front of the child. Play observations were video recorded for later coding of play activities.

Play categories used by the DPA-R were expanded from the original 15 categories in the DPA (Lifter, 2000) to include additional observed play behaviors, for a total of 27 play categories (as depicted in Lifter et al., 2022). Table 1 (Appendix A) includes a listing and description of all play activities captured by the DPA-R. Children's play activities as captured by the 30-minute video recordings were coded using DPA-R Microsoft Excel coding sheets. Each participant's DPA-R coding sheet was used for analysis. The DPA-R coding sheet includes data on the frequency of play activities observed for each toy with which the child plays. Frequency counts are included that are specific to the play category observed. An example DPA-R coding sheet for the green set of toys is included in the procedures section (Figures 2-3).

Further analyses, however, reduced these 27 play categories to 14 play categories (Mason et al., in preparation). A reduction in play categories was based on high occurrence of categories, as well as variable or low detection of other categories, in addition to conceptual similarity among some categories. Table 2 includes a list and definitions of these 14 play categories (Appendix A). The present study excluded one category, and combined some categories for a total of 11 play categories that were examined. Indiscriminative Activities (IN) were not included in the present study's analyses primarily because the children applied very basic action schemes (e.g., mouthing, banging) across all the toys within this category. Single action sequences (SS) and varied action sequences (VS) were joined to form one category, named

simple sequences (QS). Both SS and VS account for instances where children are connecting the learned play activities together. The new category QS accounts for children linking the same or different play activities together. Complex sequences (CS) was retained as its own category because a substitution is included within the linked play activities observed. Hence, CS is qualitatively different from QS. Doll-as-actor (DA) and person-as-actor (PA) were also combined to form the category other-as-actor (OA). The categories DA and PA are similar in that the child is enacting play activities through another agent of play, be it another person (i.e., caregiver, observer), or a toy figure (i.e., person figure, animal figure).

Definitions of these play categories, and corresponding DPA-R codes, are presented in Table 3 below:

Table 3

DPA Categories, Definitions, and Examples for Current Study

Code	Play Category	Definition	Examples	Included DPA-R Codes
DS	Discriminative Activities	Child acts on single objects according to their particular characteristics.	• Hugs baby • Rolls a rollable bead	DS
PC	Presentation Combinations	Child puts objects together as they were presented to the child.	• Puts puzzle pieces into puzzle • Nests the nesting cups	PC
GC	General Combinations	Child creates new configurations of objects that are simple and non-specific (e.g. puts one object into another).	• Puts beads into the dumper of the dump truck, using the dumper as a container • Puts nuts and bolts into the coffee pot, using coffee pot as a general container	GC
LC	Learned Combinations	Child creates relationships between objects that represent conventional activities.	• Scoops into cup with spoon • Covers baby with blanket	LC

			• Puts a figure in the car for a ride	CA
PS	Pretend Self	Child relates objects to the self, indicating a pretend quality to the action.	• Brings empty cup to mouth to drink • Covers self with blanket to sleep	PS
SP	Specific Physical	Child creates a relationship between/among objects based on the physical characteristics of the objects.	• Stacks nesting cups • Puts beads on string • Connects train cars by their hooks • Organizes barrels in diamond shape	SP CP
QS	Simple Sequences	Child extends either the same learned action, or two or more different learned actions to different people or objects, linked in time.	• Pours from coffee pot into cup, pours from coffee pot into dishes • Puts one person in the car, then second person in car • Stirs spoon in cup; puts spoon on the dish; drinks from cup; puts the cup back on the dish • Opens the car door; walks person out of the car	SS MS
SB	Substitutions	Child uses one object to stand in place for another or references an imaginary object.	• Pretends “water” is in the coffee pot • Designates the girl doll as the mother—assigning role to the figure • Pretends a block is a “castle”	BT BN
CS	Complex Sequences	Child links learned actions together in time, including the integration of substitution elements.	• Creates a “bridge” out of toys available • Pushes truck with beads; drives to “trash can” container; unloads beads into container	BC MX
OA	Other-as-Actor	Child involves a person (caregiver, observer) or moves doll figures to act out play activities on objects.	• Child gives mother a cup so that she will take a drink	PA

			• Child moves figure to walk out of the car through the door • Child makes the dog bark at the cat	DA
FA	Fantasy Play	Play activities in which there is an element of fantasy (e.g. magic) in the activity.	• Child uses the wand to cast a spell	FA

DPA Toys

The DPA includes four separate toy sets which are each stored in a corresponding color-coded drawstring bag. Included in Appendices B-E are pictures of each toy set, as well as separate images of each toy. The DPA toys include objects that are typical to early childhood classrooms. In order to provide an open-ended play environment, the toys do not include any branding or characters that could potentially prompt more prescriptive toy play. The toys were selected to provide a range of play activities from simple manipulative activities to elaborate pretend and symbolic activities.

All told, there are 25 DPA toys in the four toy sets combined. Reference to a single "toy" may indicate one toy, or a grouping of toys that were chosen to be analyzed together. The pink set (Appendix B) includes five toys: a dump truck; beads and string; a wand; a farm puzzle; and a bear puppet. The green set (Appendix C) is comprised of seven toys: sticks, tubes, and discs; a baby doll; nesting cups; a blanket; a spoon; a mirror; and a comb. The black set (Appendix D) includes eight toys: a coffee pot; plates (2); spoons (2); cups (2); nuts and bolts; a train with three sections; barrels; and two people figures, a boy and a girl. And the orange set (Appendix E) has five toys: a car; three people figures, a man, woman, and baby; a cat and a dog; blocks; and a tool puzzle.

Care was given to ensure that any person-based toys matched the cultural background of the child to the best of the Project Play team's ability. As such, the DPA includes Asian, Black, Brown, and White options for the baby doll (Appendix B, Figure 3) boy and girl figures (Appendix D, Figure 6), and man, woman, and baby figures (Appendix E, Figure 3). Examiners asked caregivers how they would characterize their child's cultural background when coordinating the play observation visit so that the appropriate set could be used.

To facilitate interpretation of play categories observed with children's play with toys, the DPA toys were classified into two different toy types: manipulative and social-conventional. These two types were selected based on the play and toy literature's classification of toys based on their intended function (e.g. Møller, 2015). Manipulative toys are characterized as having a function according to their physical characteristics, such as stacking, or piecing together. Accordingly, examples of such toys in the DPA set include puzzles, blocks, and nesting cups and barrels. In contrast, social-conventional toys have a function that is derived from social and cultural experiences the children have experienced and remembered. For example, a child would understand how to play with a comb by combing the baby doll's hair based on their everyday experiences (e.g. Fleer, 2010). Similarly, the child would need social knowledge to cast a spell using the wand, or have a person figure "drive" the car. Accordingly, the social-conventional category includes toys such as everyday objects, vehicles, and pretend props that represent culturally-based experiences. Table 4 lists which DPA toys are included in the manipulative toy type category, and which are included in the social-conventional category. It is noted that spoons are listed once under the social-conventional toy category, but are represented in two DPA toy sets. This resulted in 24 different toys sorted by play type:

Table 4

DPA Toys Sorted by Toy Type

Manipulative Toys	Social-Conventional Toys
Beads/String	Bear Puppet
Farm Puzzle	Wand
Nesting Cups	Dump Truck
Sticks/Tubes/Discs	Baby
Barrels	Blanket
Nuts/Bolts	Spoon(s)
Blocks	Mirror
Tool Puzzle	Comb
	Pot
	Plates
	Cups
	Boy/Girl Figures
	Train
	Car
	Cat/Dog
	Man/Woman/Baby Figures

DPA Toy Type Survey

Although the decisions for how the DPA toys were sorted into the manipulative and social-conventional categories (as shown in Table 4) were based on characterizations in the literature, input from professionals in the early education field assisted in confirming this sorting. Previous play studies have used panels of practitioners or other adults to classify toys among various dimensions (e.g. Trawick-Smith et al., 2010). Some examples include categorizing toys as either social or isolation toys (e.g. Beckman & Kohl, 1984), and male and female gender stereotyped toys (e.g. O'Brien & Huston, 1985). One study (Cherney & Dempsey, 2010) had professionals from a play laboratory rate toys on a 1-7 Likert scale that captured whether toys were more masculine (1), neutral (4), or feminine (7). In a pilot study, 30 adults rated 20 toys based on 12 different functional dimensions, ranging from gender, physical, developmental, and

social functions; 100 psychology undergraduate students were then asked to rate 25 toys on these same dimensions (Miller, 1987). Raters were found to reliably categorize toys in terms of their functions and gendered characteristics.

The DPA Toy Type Survey (https://neu.co1.qualtrics.com/jfe/form/SV_9nUsXP3z0S8H4JE) was developed using Qualtrics software (https://www.qualtrics.com) to gather information from early education experts. The survey begins with a brief description of the proposed study and how this survey will assist in its aims. Then, the survey participant is provided with instructions—they are presented with pictures of toys, and asked to select which toy type group best describes it: manipulative or social-conventional. Definitions for manipulative and social-conventional toys are then described. Specifically, manipulative toys are defined as toys whose function is related to its physical characteristics. Social-conventional toys are defined as toys whose function is related to socio-cultural everyday experiences. Participants also have the option to add comments in a text box.

Next, individual images and the name of each of the 24 DPA toys are presented one at a time, and in a random order. The participant is prompted to select either manipulative toy or social-conventional toy via a forced multiple choice. The two toy type definitions are included on each question page for reference. Each page also has an optional comments section, so that panelists can provide clarifying information to their responses if they choose. At the conclusion of the survey, the participant has the option to relay any additional comments. It was anticipated that these comments could help to further specify sorting of toys into the two toy groups. Participants are also asked to provide some demographic and background information, such as their role in the early education field, number of years of experience in the field, and their gender.

An expert panel of five early education professionals were recruited to take the DPA Toy Type Survey. Recruitment primarily consisted of email requests to early education and intervention professionals. Professionals were sent the private Qualtrics survey link via email invitation. The toy type survey was distributed to early education professionals, including professors and practitioners. The demographic information for respondents is included in the table below.

Table 5

Demographics of Practitioner Respondents to Toy Categorization Survey

Respondent	Gender	Role	Years professional experience
1	Female	Preschool school psychologist	18
2	Female	[Preschool] school psychologist	14
3	Female	School psychologist working with preschool for over 15 years	25
4	Female	Pediatric physical therapist	39
5	Female	Occupational therapist	26

For the eight toys previously sorted into the manipulative toys category, all panelists confirmed these toys to be manipulative. One rater made a note regarding the tool puzzle, that this toy "could be used for both (as a few of these toys could be)." There was disagreement among panelists for some toys previously categorized as social-conventional. In the pink set, the truck was sorted as manipulative by two out of five (40%) and as social-conventional by three out of five (60%) panelists. For the green set, there was disagreement amongst panelists for the blanket (manipulative= 20%; social-conventional= 80%) and the comb (manipulative= 40%;

social-conventional= 60%). There was also disagreement for the spoon(s) (manipulative= 40%; social-conventional= 60%) which are included in both the green and black sets. Also included in the black set is the train (manipulative= 60%, social-conventional= 40%), for which there was no clear consensus. However, all three previously designated social-conventional toys in the orange set were sorted as such by all panelists.

All toys for which disagreements were noted (i.e., truck, blanket, comb, spoon, train) were excluded from the analysis. This was to ensure that all toys selected for the analysis had 100% consensus from raters that they fit the definition for social-conventional toys. This resulted in the following social-conventional toys to choose from for the analysis: two toys from the pink set (wand and puppet), two in the green set (baby and mirror), four toys in the black set (boy/girl, pot, cups, and plates), and three in the orange set (car, man/woman/baby, and cat/dog). Given that there was representation of two manipulative toys per toy set, the investigator selected two social-conventional toys from each toy set. In this way, the analyses would be balanced in terms of having eight toys in each category, and two toys per toy set within category. The two social-conventional toys from the pink and green sets, respectively, from the original designations were included. The investigator selected two toys for the black and orange sets, which were the pot and cups from the black set and the man/woman/baby figures and car from the orange set. These toys were selected based on the toy literature and so that there was not an overrepresentation of similar toys (e.g., people figures, animals) in the analysis. Because these toys were not randomly selected, however, although they were based on specifications in the literature, the analysis may be subject to bias. The table below lists the toys (see Appendix B, C, D, and E for images of the toys) used in the analysis.

Table 6

DPA Toys Used for Primary Analysis

Manipulative Toys	Social-Conventional Toys
Beads/String	Bear Puppet
Farm Puzzle	Wand
Nesting Cups	Baby
Sticks/Tubes/Discs	Mirror
Barrels	Pot
Nuts/Bolts	Cups
Blocks	Car
Tool Puzzle	Man/Woman/Baby Figures

Play Category by Toy Database (PCTD)

The Play Category by Toy Database (PCTD) was developed by the investigator to record the children's play activities that occurred when playing with DPA toys. This SPSS database was devised so that the frequency of play activities with specific toys could be recorded for all 24 DPA toys. The PCTD thus provided the opportunity to report the frequency of play behaviors within corresponding play categories for each of the 24 DPA toys. Then, the total frequency of play activities for the toys included in the manipulative and social-conventional toy type groups was totaled in the corresponding columns. Figure 1 (Appendix F) provides an example of the PCTD formatting for the Learned Combinations category. For visual purposes, this image was created in Microsoft Excel, but the data were inputted into the SPSS database. The entire database follows this format, with columns for each toy listed within each DPA play category.

Equipment and Software

Digital cameras were used to record the play observations. Video recordings converted to .mp4 format were then uploaded to an in-house server that is password-protected and maintained in a locked office. Recordings were also transferred to DVD digital copies, which were stored in locked cabinets. Apple computers were used to view and code the videos. Microsoft Excel spreadsheets were used to complete the DPA-R coding, including recording the type of play behaviors observed and at which intervals. These data were then transferred to SPSS for analysis.

The online software Qualtrics (https://www.qualtrics.com) was used to develop the DPA Toy Type Survey. Panelists received access to this survey through an email invitation that included a private webpage link.

Procedures

Play Observations

During the visits, informed consent was obtained from guardians prior to the administration of the DPA-R. Children who were cognitively able were included in assent procedures, which were then documented by the examiner. Children were administered the DPA-R by the primary investigator or a trained research assistant in the school psychology doctoral program. Following the play observations, caregivers were administered the CFBF.

For the DPA-R, the child was seated on the floor on a blanket (60 x 80”) with the caregiver. Caregivers were asked to not show or explain how to play with the toys, and were encouraged to allow the child to lead the play. The order in which the toy sets were administered was randomly determined. For all four toy sets, the examiner placed and named each toy in front of the child. The examiner provided a simple prompt (e.g. “Here are toys for you to play with”)

to the child if they did not engage with, or seemed disinterested with the toys. About every seven minutes, a new toy set was introduced.

At the end of the visit, families were given a gift card, and the child was presented with an age-appropriate toy as a gift. Afterwards, examiners developed a summary of the child's observed play behaviors, including play behaviors that the child was presently learning. This summary was mailed to families, along with signed copies of consent forms for their records. To protect the identity of participants and families, each participant was assigned a four-digit number that was used to label all measures and data. Any paper materials that included identifying information were stored in a locked file, and any electronic materials were password-protected.

Coding Play Observations

Recordings of play observations were coded by trained research assistants. Training of research assistants was comprised of reading background materials and literature for the project, viewing recordings of prior DPA-R administrations, assisting in coding with guidance, practice in coding, and then coding of videotapes to fidelity. Fidelity was established when coders met 85% agreement (Cronbach's alpha, intraclass correlation) with a trained coder's responses on three 30-minute play observation samples.

In order to determine the child's capabilities, only child-led, spontaneous play activities were captured. Accordingly, behaviors were not recorded if the child imitated another's behavior, or if the play was in response to prompting by others (i.e., the caregiver or examiner). The DPA-R excel coding spreadsheet includes color-coded sections for recording instances of the 27 play categories previously defined by Project Play (see Appendix A, Table 1) observed in each corresponding toy set (pink, green, black, and orange). An example of the DPA-R coding

sheet for the Green toy set is included in Appendix F (Figures 2-3). The coding sheet has space for coders to briefly describe the play behavior observed and the toy(s) used, followed by the corresponding play category code (Appendix F, Figure 2). To streamline the coding process, common play behaviors and their respective play category are noted in all coding sheets. After documenting the play behavior, the coder then recorded the frequency of the behavior within one-minute intervals of observation. Coders used a designated letter key to record frequency counts; which indicated whether the play behavior was an independent observation (*i*), occurred within a sequence of play behaviors (*s*), occurred as a substitution (*b*), or occurred with a substitution within a sequence (q). The frequency of play behaviors characterized as substitutions or within a sequence were also recorded in corresponding sections (Appendix F, Figure 3).

Once all of the child's play behaviors were coded, the total frequency of play behaviors within a play category across all four toy sets was calculated. For example, to calculate the frequency of Learned Combinations (LC), the coder would total the number of LC occurrences observed with toys from the Pink, Green, Black, and Orange sets. Continuing with LC as an example, if a child stirs the spoon in the cup in the Green set three times, this would result in a frequency of three, and a variety of one. If the child is also observed to use the coffee pot to pour into a cup (Black set) once, then the child's total LC frequency would increase to four with a variety of two.

Extracting Data for the PCTD

Data from the DPA-R were transferred to the PCTD by the investigator. Table 3 describes the 11 play categories, and notes which DPA-R categories correspond to the play categories used for the present study. The 11 play categories that were examined were as follows: discriminative activities (DS); presentation combinations (PC); general combinations

(GC) learned combinations (LC); pretend self (PS); specific physical (SP); simple sequences (QS); substitution (SB); complex sequences (CS); other-as-actor (OA); and fantasy play (FA). Depicted in this order, the DPA play categories generally follow the developmental trajectory in complexity, as indicated by Project Play.

Frequency data for these 11 play categories, as provided by the DPA-R, were transferred to the PCTD. In order to do so, each participant's DPA-R coding sheet was examined. Because the current study's research question centered on how children express their knowledge through play with toys, data were only included if the play behavior was associated with DPA toy play. If there were values from the DPA-R coding sheet that did not indicate which toy was used to enact the play behavior, they were excluded from the PCTD. However, if necessary for contextualizing findings, these supplementary data were reported.

Data were also analyzed so that play behaviors were only counted towards one play category. This process allowed there to be an independence in observations of the dependent variable (frequency of play), and allowed for easier interpretation of the data. Most importantly, this process ensured that children's play was being captured at the most complex level. For example, substitutions was counted only as substitutions, and not learned combinations. For instance, if the child pretended to stir a spoon in a cup filled with "juice", while this activity may have been coded as both a learned combination and substitution, it was extracted as a substitution only. Also, play activities that were a part of a simple sequence were included as frequency counts in the simple sequences (QS) category. Similarly, play activities that were a part of a complex sequence were included as frequency counts in the complex sequences (CS) category. Substitutions, simple sequences, and complex sequences are constructed of simpler play categories. Therefore, play activities were counted in only one category and not multiple, but

could be representative of multiple categories of play. Nevertheless, because play activities were only counted once, the independence of observations assumption was met for the analysis.

To demonstrate how DPA-R frequency data were translated to the PCTD, the data in Figure 4 (Appendix F) present an example of the coding process. Specifically, this example focuses on inputting learned combinations (LC) data from one participant into the PCTD for the Green Toy Set. The resultant PCTD data are shown in Appendix F (Figure 5). First, for the sticks, tubes, and discs, there was one occurrence of LC; however, because this play activity was also part of a substitution, one occurrence would be added only to the substitutions category. Two different CA play behaviors were observed with the blanket and the baby, with CA now conceptualized as a LC behavior. For the play behavior "covers baby/blanket," there were three independent observations and four observations included in sequences, and for "baby/blanket," there were two sequences observations. Because these play behaviors occurred with both toys, frequency counts are reported for both the blanket and the baby. Hence, there are a total of 3 LC behaviors for the blanket, and 3 for the baby. The other six counts would be included in the appropriate sequences sections. The comb and the mirror had one CA "s" observation each, respectively. All observed sequence behaviors would be counted in the sequences category. Overall, the PCTD reflects this child's LC frequency data are as follows: baby = 3; blanket = 3. Once all the child's frequency data were inputted, the total frequency of play behaviors for manipulative toys and social-conventional toys were totaled for each play category.

The investigator extracted data from the coding sheets for the 289 typically developing children to the PCTD database. Although the majority of codes were directly gathered from coding sheets, missing details on some codes resulted in the investigator and three graduate assistants (GAs) going back to the original video files for clarification. Specifically, the

investigator labeled particular codes that needed clarification, and instructed the GAs to include a comment in the coding file of which toys were used for which play activities and frequencies. A common example needing video clarification was the LC play activity labeled "cup/baby's or obs.' mouth" for the green toy set. Independent observations of this play activity were unclear as to whether the child used both the cup and baby, or whether they used just the cup directed to the caregiver, for example. Most marked codes were clarified through checking the video file. However, a small number of codes were incomplete due to either not being checked or the video file being corrupted. For these codes, the investigator used context clues within the coding sheet to estimate which toys were being used.

Inter-observer Agreement

To ensure that data were being correctly extracted from the coding sheets to the PCTD database, inter-observer agreement was assessed. One graduate student was trained by the examiner to extract data from coding sheets to the PCTD. Specifically, the graduate researcher was oriented to the DPA-R coding sheets, and taught the play category code substitutions for the current study. Training included teaching the graduate student how to extract data using select samples, and establishing fidelity in data extraction when assistants met 85% agreement with the investigator's responses on two samples. Each instance of a rating for a play category within a toy (e.g., frequency count for PC for the farm puzzle) was considered one rating for comparison. Inter-observer agreement was calculated by diving the number of agreements by the sum of agreements and disagreements, and then multiplying by 100 to obtain a percentage. Inter-observer agreement for data extraction was conducted for 19% of cases. Cases were randomly selected through a random number generator. Interrater reliability was 86.99% when comparing percentage of case agreements between the investigator and graduate research assistant.

Study Design and Data Analyses

The present study aimed to discover how young, typically developing children express their knowledge through their play with toys. In comparison to previous research that has focused on how specific toys elicit particular play behaviors for children, this study sought to examine whether children use manipulative and social-conventional toys equally across play activities, or whether their use is associated with specific play categories. The study was descriptive in nature, in that observational data of typically developing, young children's play was compared and analyzed. The current study examined the following research question through the data analytic plan described below.

The independent variables for the study were toy type and play category. The dependent variable was the frequency of play behaviors. Quantitative methods were used to analyze data. Specifically, the study used a two-way ANCOVA design. This design allowed for comparison as to whether there were significant differences in children's frequency of play activities between the types of DPA toys used and play categories demonstrated, as well as if there was an interaction between these two variables that was resulting in significantly higher or lower play activity frequencies. The ANCOVA was also chosen because the variance in results attributed to developmental differences in play and toy use among the sample is accounted for by including age as a continuous covariate. Hence, interpretation of findings is in the context of controlling for age. If a significant effect was found, including an interaction between toy type and play category, or main effects of toy type and/or play category, post hoc analyses were used to further contextualize and describe the intersection of toy type and play categories.

Research Question: Is young children's play with manipulative toys and social-conventional toys equally distributed across the 11 play categories?

The present study's hypotheses are derived from the social-constructivist orientation. Theory and research from the social constructivist perspective supports the notion that children actively drive their play with objects, and they express their knowledge and current mental representations through play with toys (e.g. Bloom & Tinker, 2001; Lifter & Bloom, 1998). It is likewise understood that children's play is embedded in their social and cultural environment, and thus the child's individual experiences influence how they play with toys (e.g. Fleer, 2010; Göncü et al., 2000). In other words, from this perspective it is not the characteristics of toys that elicit certain play activities, but rather the children's knowledge that influences how they interact with toys. Additionally, developmental research indicates that as children age, they learn and express higher levels of play, as depicted by qualitatively different categories of play (e.g. Belsky & Most, 1981; Lifter, 2000; Lifter & Bloom, 1998; Lifter et al., 2022; McCune, 1995). Hence, children's knowledge and developmental level guide how they play with toys. Based on these empirical findings, it was hypothesized that specific toy types will not be associated with particular categories of play. Instead, it was predicted that, controlling for developmental level (i.e., age), children will express their knowledge, as demonstrated by the play categories, with manipulative and social-conventional toys equally.

The alternative hypothesis would confirm support for the behavioral perspective—that manipulative and social-conventional toys are associated with specific play categories, thus attributing influences in play to the function or characteristics of certain toys (e.g. Lifter et al., 2011). Based on the prescribed function of these toy types, this perspective would assume that manipulative DPA toys will be associated with DPA play categories that reflect an understanding

of how toys can be played with according to their physical characteristics, such as presentation combinations (PC); general combinations (GC); and specific physical (SP). Because the function of social-conventional toys is grounded in children expressing learned and social knowledge, it was predicted that these social-conventional toys will be affiliated with DPA play categories that are related to learned experiences (i.e., discriminative activities (DS); learned combinations (LC)), symbolic and pretend play (i.e., pretend self (PS); substitutions (SB); other-as-actor (OA); fantasy play (FA)), and sequences of such play behaviors (i.e., simple sequences (QS); complex sequences (CS)).

Analyses. To address this question, first the means and standard deviations for the frequency of play with manipulative toys and social-conventional toys in each of the 11 play categories, for all participants (n = 289), were calculated and reported. These numbers provided an avenue for comparing trends in the data for the whole sample, and across toy types and play categories.

The data were analyzed through a two-way, or factorial analysis of covariance (ANCOVA). The first factor was toy type, with 2 levels: manipulative and social-conventional toys, with the second factor being play category, with 11 levels (DS, PC, GC, LC, PS, SP, SQ, SB, CS, OA, FA). The covariate was age, measured in months, and the dependent variable was frequency of play across play categories. The reason for selecting an ANCOVA was to control for any effects of age. Due to the nature of play activities developing with age, as shown by developmental play research (e.g. Belsky & Most, 1981; Lifter & Bloom, 1998; Lifter et al., 2022) and the DPA (Lifter, 2000), it was hypothesized that as children age, they will incorporate higher levels of play into their play activities. As such, some higher-level play activities will be absent or occur at lower frequencies for the younger children in the sample. Controlling for the

effects of age in the analysis thus accounted for these developmental differences. The ANCOVA would determine if, controlling for age, there were significant differences in the frequency of play between types of toys, and between play categories. This analysis would also detect whether there is an interaction present between toy type and play category that is resulting in significantly higher play behaviors.

An *a priori* power analysis was conducted using G*Power software (Faul et al., 2007) to determine the sample size needed for the ANCOVA to detect a significant effect with a power of 0.80 at an alpha level of 0.05. This analysis indicated that the sample size of 289 was sufficient for these conditions to be met, with the actual power calculated to be 0.83 for this sample size. However, a recent study by Shieh (2019) argued that this method of power analysis (Cohen, 1988) may underestimate the necessary sample size, because it does not take into consideration properties of the covariate itself, such as the number of covariates, and the magnitude of the correlation between the covariate and the dependent variable.

Multiple assumptions for conducting an ANCOVA have already been met. For instance, the dependent variable (frequency of play) and the covariate (age) are measured continuously. Also, both independent variables each have at least two independent groups, with toy type having two levels, and 11 levels for play category. Because play activities are counted into only one play category for each toy, the independence of observations has been met.

Next, the data were examined to ensure that the data met the remaining assumptions for ANCOVA. The distribution of all variables was plotted to assess for normality. Next, a grouped scatterplot was plotted to test for whether the covariate was linearly related to the dependent variable for each combination of the groups of independent variables. Another assumption that was analyzed in SPSS was the homogeneity of regression slopes, or whether the above linear

relationships between the covariate and dependent variable were equal. There should also be homoscedasticity, or the variance of the error within each combination of independent variable groups should be the same. This was achieved through examining a plot of the studentized residuals against the predicted values for each group. Once this assumption was met, homogeneity of variances was inspected (e.g. Levene's Test of Equality of Variances), with the assumption being that the variances of the residuals being equal between these groups. Studentized residuals were also examined for any unusual or outlier values. Lastly, for all groups, residuals should be normally distributed. This assumption was assessed through plots, as well as statistical test (e.g. Shapiro-Wilk test). When these assumptions were not met, a nonparametric alternative was considered.

Secondary analyses were employed when significant main effects or an interaction were detected. Post hoc tests, including testing for simple effects, were conducted if the interaction between toy type and play category was found to be significant. These post hoc tests were used to describe the interaction between toy type and relevant play categories. When a significant main effect was found for play category, post hoc tests were employed to determine the play category, or categories, to which the significant effect could be attributed. If assumptions for ANCOVA were not met, the appropriate non-parametric post hoc tests were considered. Depending on the data limitations, post hoc methods included Quade's (1967) rank analysis of covariance test (RANCOVA), the methods developed by Puri and Sen (1969), or the McSweeney and Porter (1971) method (Cangür et al., 2018).

CHAPTER 4

Results

ANCOVA

Assumptions

Assumptions for the ANCOVA analysis (Tabachnick & Fidell, 2013) were checked before conducting the analysis. As described in the methods, multiple assumptions were already met prior to the analysis. These assumptions included the dependent variable and covariate being measured continuously, the independent variables each having at least two independent groups, and the independence of the observations. Other assumptions were examined.

First, the distribution of all variables was plotted to assess for normality. Visual inspection of plots suggested that the dependent variable (play frequency) was not normally distributed for each independent variable level. Although this could skew the interpretation of the data, the large number of cases for each level of the independent variable (i.e., more than 30 cases) suggested that there were sufficient data to allow for interpretation of abnormally distributed data; in other words, the central limit theorem could be applied.

To examine the relationship between the dependent variable of play frequency with the covariate of age for each combination of independent variable and its levels (i.e., toy type with two levels and play category with 11 levels), two grouped scatterplots were made. Visual inspection supported the conclusion that play frequency was linearly related to age for both toy type and play category. Accordingly, this assumption of linearity between the covariate and dependent variable was considered to be met.

Remaining assumptions were not met, however (see Tabachnick & Fidell, 2013). First, there was not homogeneity of regression slopes, as determined by a comparison between the

two-way ANCOVA model with and without interaction terms ($F(21, 6314) = 53.56$, $p < .001$). The linear relationship between age and play frequency was not equal across groups. Homoscedasticity, or the error variance within each combination of independent variable groups, was examined through grouped scatterplots of the studentized residuals against the predicted values for each group. Visual inspection suggested that homoscedasticity was not met because studentized residual points were not randomly scattered across predicted values. Also, Levene's Test of Equality of Variances (Levene, 1960) was significant ($p = .000$), which indicated that variances of residuals between groups were not equal; as such, homogeneity of variances was not met. Upon examining studentized residuals for any unusual values, a total of 139 cases of outlier values were detected. Given the nature of the dataset, however, it is understood that there may be some cases where a participant demonstrated a high frequency of particular play activities with manipulative or social-conventional toys. The investigator decided to keep all outliers in the dataset. No leverage or influential points (assessed via Cook's distance; Cook & Weisberg, 1982) were detected. Visual inspection of residual plots and Shapiro-Wilk tests ($p < .001$) indicated that all studentized residuals were not normally distributed.

ANCOVA Analysis

The ANCOVA analysis was conducted to determine whether there was a significant interaction between toy type (manipulative and social-conventional) and play category (11 categories; For definitions and examples of categories, please refer to Table 3 in Chapter 3, p. 42). An interaction effect was found between toy type and play category ($F(10, 6335) = 162.094$, $p < .001$, partial $\eta^2 = .204$). This indicated that there were significant differences of the adjusted means within play categories for both toy types and/or across play categories for both toy types. Because an interaction between toy type and play category was found, simple main effects were

further explored. Bonferroni post hoc pairwise comparisons were conducted to further explore significant main effects. Results are included in Table 7 below and illustrated in Figure 1.

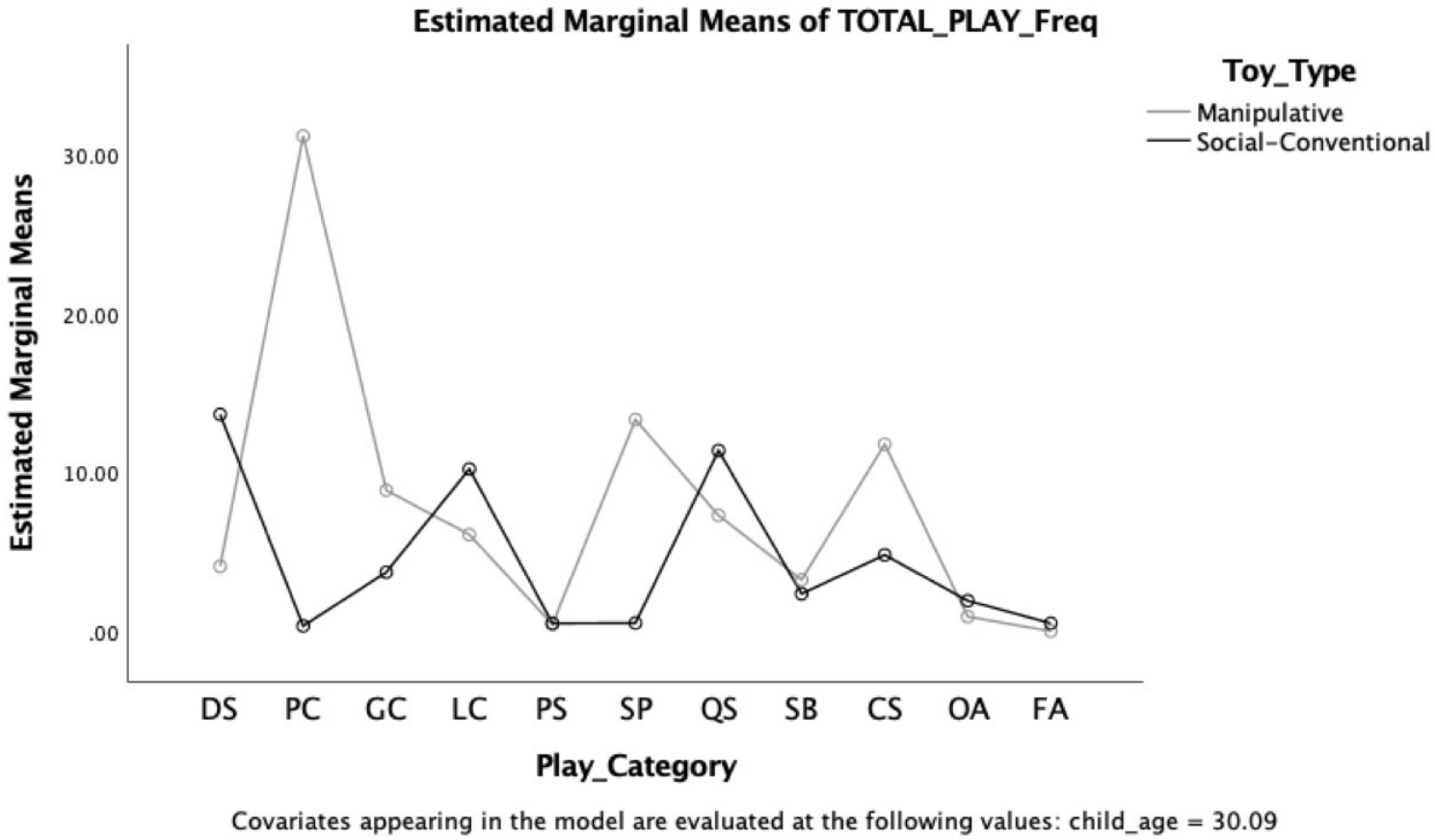
Table 7

ANCOVA Pairwise Comparisons of Toy Type Within Each Play Category

Play Category	Higher Adjusted Mean	Lower Adjusted Mean	*df*	Error	F	*p*	η_p^2	Mean Difference
DS	Social-Conventional	Manipulative	1	6335	124.511	<.001	.019	9.574
PC	Manipulative	Social-Conventional	1	6335	1294.533	<.001	.170	30.872
GC	Manipulative	Social-Conventional	1	6335	36.250	<.001	.006	5.166
LC	Social-Conventional	Manipulative	1	6335	23.223	<.001	.004	4.135
SP	Manipulative	Social-Conventional	1	6335	223.116	<.001	.034	12.817
QS	Social-Conventional	Manipulative	1	6335	22.682	<.001	.004	4.087
CS	Manipulative	Social-Conventional	1	6335	66.095	<.001	.010	6.976

Figure 1

ANCOVA plot for simple main effect of toy type within each play category



First, simple main effects of toy type were investigated. Simple main effects were found for toy type within seven play categories. Pairwise comparisons indicated that adjusted means were significantly higher for play with manipulative toys than social-conventional toys for the presentation combinations (PC), general combinations (GC), specific physical (SP), and complex sequences (CS) play categories. Conversely, adjusted means were significantly higher for play with social-conventional toys than manipulative toys for the discriminative activities (DS), learned combinations (LC), and simple sequences (QS) play categories.

A simple main effect was also revealed for play category. There were significant differences for the adjusted means between play categories for manipulative ($F(10,6335) = 216.072$, $p = .000$, partial $\eta^2 = .254$) and social-conventional ($F(10,6335) = 65.538$, $p < .001$, partial $\eta^2 = .094$) toys. Pairwise comparisons were then explored between each play category for manipulative and social-conventional toys. Results are presented in Table 8 and Figure 2 below.

Table 8

ANCOVA Pairwise Comparisons of Toy Type Across Play Categories

Manipulative Toys				Social-Conventional Toys			
Higher Adjusted Mean	Lower Adjusted Mean	Mean Difference	*p*	Higher Adjusted Mean	Lower Adjusted Mean	Mean Difference	*p*
DS	PS	3.661	.001	DS	PC	13.332	<.001
	OA	3.170	.012		GC	9.952	<.001
	FA	4.087	<.001		LC	3.443	.003
PC	DS	27.114	<.001		PS	13.166	<.001
	GC	22.325	<.001		SP	13.149	<.001
	LC	25.118	<.001		SB	11.308	<.001
	PS	30.775	<.001		CS	8.862	<.001
	SP	17.872	<.001		OA	11.744	<.001

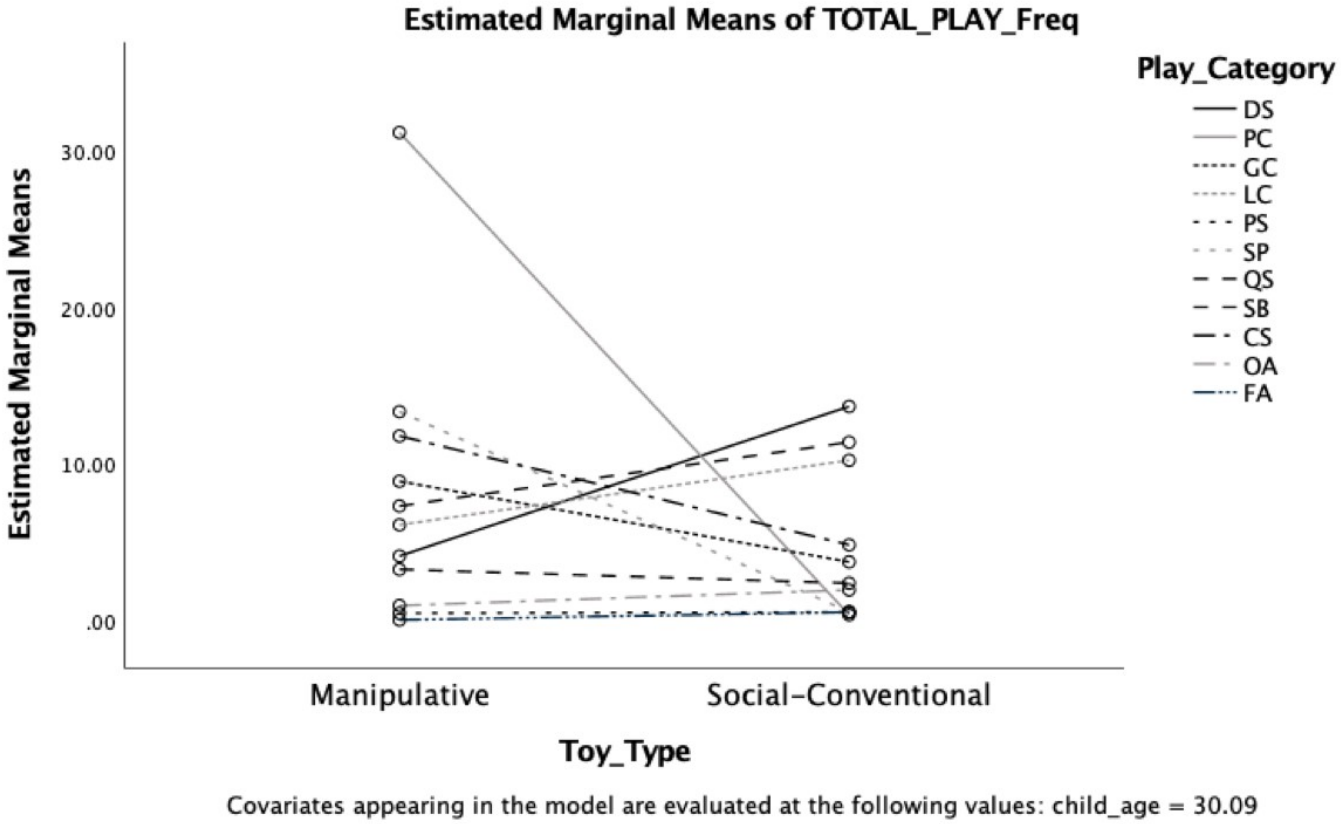
	QS	23.910	<.001		FA	13.163	<.001
	SB	27.969	<.001	GC	PC	3.381	.005
	CS	19.426	<.001		PS	3.215	.010
	OA	30.284	<.001		SP	3.197	.011
	FA	31.201	<.001		FA	3.211	.010
GC	DS	4.789	<.001	LC	PC	9.889	<.001
	PS	8.450	<.001		GC	6.509	<.001
	SB	5.644	<.001		PS	9.723	<.001
	OA	7.958	<.001		SP	9.706	<.001
	FA	8.875	<.001		SB	7.865	<.001
LC	PS	5.657	<.001		CS	5.419	<.001
	SB	2.851	.049		OA	8.301	<.001
	OA	5.166	<.001		FA	9.720	<.001
	FA	6.083	<.001	QS	PC	11.048	<.001
SP	DS	9.242	<.001		GC	7.668	<.001
	GC	4.453	<.001		PS	10.882	<.001
	LC	7.246	<.001		SP	10.865	<.001
	PS	12.903	<.001		SB	9.024	<.001
	QS	6.038	<.001		CS	6.578	<.001
	SB	10.097	<.001		OA	9.460	<.001
	OA	12.412	<.001		FA	10.879	<.001
	FA	13.329	<.001	CS	PC	4.471	<.001
QS	DS	3.204	.010		PS	4.304	<.001
	PS	6.865	<.001		SP	4.287	<.001
	SB	4.059	<.001		OA	2.882	.043
	OA	6.374	<.001		FA	4.301	<.001
	FA	7.291	<.001				
SB	FA	3.232	.009				
CS	DS	7.689	<.001				
	GC	2.900	.040				
	LC	5.692	<.001				

PS	11.349	<.001
QS	4.484	<.001
SB	8.543	<.001
OA	10.858	<.001
FA	11.775	<.001

Std. error= .858

Figure 2

ANCOVA plot for simple main effect of toy type across play categories



First, several differences between play categories for manipulative toys were significant. The adjusted mean for manipulative toy play for presentation combinations (PC) was significantly higher than all other play categories. Additionally, adjusted means for manipulative toy play for specific physical (SP) and complex sequences (CS) were significantly higher than most play categories. Adjusted means for manipulative toy play for discriminative activities (DS), general combinations (GC), learned combinations (LC), and simple sequences (QS) were significantly higher than some play categories. Lastly, the adjusted mean for manipulative toy play for substitutions (SB) was higher in comparison to manipulative toy play for fantasy play (FA). For play with social-conventional toys, adjusted means were significantly higher for five play categories (discriminative activities, general combinations, learned combinations, simple sequences, and complex sequences) when compared to many other categories. As shown in Table 8, adjusted means for categories discriminative activities, learned combinations, and simple sequences were higher in comparison to most play categories. The adjusted mean for general combinations was significantly higher than the adjusted means of four categories (presentation combinations, pretend self, specific physical, and fantasy play).

ANOVA by Age

The ANCOVA analysis and assumption tests indicated that age played a factor in the relationship between toy type and play category. The investigator explored further whether the simple main effects discovered varied across age groups. To investigate, an ANOVA examining the potential interaction between toy type and play category was conducted for each of the 10 age groups: 8, 12, 18, 24, 30, 36, 42, 48, 54, and 60 months.

Results of the ANOVA tests were all significant. As shown in Table 9 below, interactions between toy type and play category were significant for each of the 10 age groups (p <.001).

Plots for each age group (see Appendix G) also suggest the presence of an interaction between toy type and play category across and within play categories. Given these significant results, simple main effects and subsequent pairwise comparisons were explored for each age group.

Table 9

Interaction between Toy Type and Play Category by Age

Age (in months)	*df*	Error	F	*p*	η_p^2
8	10	792	4.959	< .001	.059
12	10	770	15.647	<.001	.169
18	10	902	56.664	<.001	.386
24	10	550	17.023	<.001	.236
30	10	572	37.076	<.001	.393
36	10	506	24.698	<.001	.328
42	10	550	23.823	<.001	.302
48	10	550	18.285	<.001	.250
56	10	440	16.722	<.001	.275
60	10	506	29.551	<.001	.369

Simple Effect of Toy Type by Age

First, simple main effects were explored for toy type. Table 10 (Appendix A) includes all simple main effects of toy type for each age group. An effect of toy type was significant for the play category of discriminative activities (DS) across all age groups. Specifically, pairwise comparisons indicated that the adjusted mean for DS play activities with social-conventional toys was significantly higher than DS play activities with manipulative toys. Additionally, the adjusted mean for presentation combinations (PC) play activities with manipulative toys was significantly higher than PC play activities with social-conventional toys for all 10 age groups.

Other toy type main effects identified were present in only some age groups. General combinations (GC) activities with manipulative toys were significantly higher than GC activities with social-conventional toys for the 12, 18, 24, and 30-month-old participant groups. Also, beginning with 18-month-olds and ending with 42-month-olds, learned combinations (LC) and simple sequences (QS) activities with social-conventional toys were significantly higher than LC and QS activities with manipulative toys, respectively.

For two play categories, significant differences between manipulative and social-conventional toy play emerged in one age group and continued to the oldest age group, the 60-month-olds. The first example is for specific physical (SP) activities; SP manipulative toy play emerged as significantly higher in comparison to social-conventional toy play for 18-month-olds and continued to the 60-month-olds. For the second example, complex sequences (CS) activities were significantly higher for manipulative versus social-conventional toy play for the 42, 48, 54, and 60-month-old age groups.

Simple Effect of Play Category by Age

Simple main effects were next examined for play category for each of the age groups. This analysis explored whether there were significant differences between different play categories with manipulative and social-conventional toys, respectively.

8-month group. Beginning with the 8-month-old group, a simple main effect for manipulative toys was found to be significant ($F(10, 792) = 3.742$, $p < .001$, partial $\eta^2 = .045$). However, pairwise comparisons indicated no significant differences between play categories for manipulative toys. A simple main effects for social-conventional toys was also significant ($F(10, 792) = 16.363$, $p < .001$, partial $\eta^2 = .171$). Pairwise comparisons indicated that the adjusted mean

for DS was significantly higher than all other play categories for social-conventional toy play (see Table 11, Appendix A).

12-month group. For the 12-month-old group, simple effects were significant for manipulative ($F(10,770) = 30.879$, $p < .001$, partial $\eta^2 = .286$) and social-conventional toys ($F(10,770) = 4.181$, $p < .001$, partial $\eta^2 = .052$). Results in Table 12 (Appendix A) show that manipulative toy play for presentation combinations and general combinations was significantly higher in comparison to all other play categories. Social-conventional toy play for discriminative activities was higher than most categories.

18-month group. Table 13 (Appendix A) includes information on toy type pairwise comparisons for the 18-month-old group (manipulative: ($F(10,902) = 86.642$, $p < .001$, partial $\eta^2 = .490$); social-conventional: ($F(10,902) = 22.867$, $p < .001$, partial $\eta^2 = .202$). Parallel to the 12-month-olds, presentation combinations and general combinations manipulative toy activities were significantly higher than all other play activities with manipulative toys. While discriminative social-conventional activities were significantly higher than all other categories, general combinations, learned combinations, and simple sequences were significantly higher than some categories.

24-month group. In the 24-month-old group (Table 14, Appendix A) for manipulative toys ($F(10,550) = 23.356$, $p < .001$, partial $\eta^2 = .298$), presentation combinations and general combinations were again significantly higher in comparison to all other categories. Also, simple sequences manipulative toy play was significantly higher than pretend self and fantasy play manipulative toy play. For social-conventional toys ($F(10,550) = 11.683$, $p < .001$, partial $\eta^2 = .175$), discriminative, learned combinations, and simple sequences were found to be significantly higher than most other categories.

30-month group. The manipulative toys ($F(10,572) = 45.852$, $p < .001$, partial $\eta^2 = .445$) pairwise comparisons for the 30-month-old group had various significant mean differences between play categories (see Table 15, Appendix A). Higher adjusted means were found for presentation combinations in comparison to all play categories, and the following play categories in comparison to some categories: discriminative activities, general combinations, learned combinations, specific physical, and complex sequences. A simple main effect for social-conventional toys ($F(10,572) = 24.147$, $p < .001$, partial $\eta^2 = .297$) was also significant, with higher adjusted means between discriminative activities, learned combinations, and simple sequences activities and some play categories.

36-month group. The 36-month group (Table 16, Appendix A) for manipulative toys ($F(10,506) = 29.146$, $p < .001$, partial $\eta^2 = .365$) had higher means for presentation combinations versus all other categories. In addition, specific physical was significantly higher than most categories, and complex sequences was significantly higher than fantasy play manipulative toy play. For social-conventional toy play ($F(10,506) = 12.003$, $p < .001$, partial $\eta^2 = .192$), discriminative activities, learned combinations and simple sequences were higher than most play categories.

42-month group. Manipulative toy play ($F(10,550) = 31.988$, $p < .001$, partial $\eta^2 = .368$) for the 42-month-olds was significantly higher for presentation combinations versus all other categories (Table 17, Appendix A). Also, specific physical and complex sequences manipulative toy play was higher in relation to most play categories. For social-conventional toys ($F(10,550) = 12.538$, $p < .001$, partial $\eta^2 = .186$), discriminative activities, learned combinations, simple sequences, and complex sequences activities has significantly higher adjusted means in comparison to many categories.

48-month group. Significant main effects for manipulative ($F(10,550) = 28.153$, $p < .001$, partial $\eta^2 = .339$) and social-conventional ($F(10,550) = 8.154$, $p < .001$, partial $\eta^2 = .129$) toy play were found for the 48-month-old group. As shown in Table 18 (Appendix A), between all categories, presentation combinations manipulative toy activities were significantly higher. Other manipulative toy play activities that were significantly higher than some other categories included specific physical, simple sequences, and complex sequences play categories. Categories with some instances of significantly higher social-conventional toy play included discriminative activities, learned combinations, simple sequences, and complex sequences.

54-month group. Simple main effects were also found for the 54-month manipulative ($F(10,440) = 26.227$, $p < .001$, partial $\eta^2 = .373$) and social-conventional ($F(10,440) = 6.065$, $p < .001$, partial $\eta^2 = .121$) toy play. In terms of manipulative toy play, the following categories had some to many instances of significantly higher adjusted means: presentation combinations, specific physical, simple sequences, and complex sequences (see Table 19, Appendix A). For social-conventional toy play, the following categories had some to many instances of significantly higher adjusted means: discriminative activities, learned combinations, and simple sequences.

60-month group. Simple main effects were also significant for the 60-month-old group (manipulative: $F(10,506) = 47.911$, $p < .001$, partial $\eta^2 = .486$; social-conventional: $F(10,506) = 6.407$, $p < .001$, partial $\eta^2 = .112$). As depicted in Table 20 (Appendix A), manipulative toy play was significantly higher for presentation combinations, specific physical, simple sequences, and complex sequences activities in relation to some other activities. Also, social-conventional toy play was significantly higher for discriminative activities, learned combinations, and simple sequences in relation to some other play categories.

Summary of Results

In summary, the results revealed that when controlling for age, there was an interaction between toy type and play category. Simple main effects were found for both toy type and play category. Pairwise comparisons resulted in manipulative toy play being significantly higher than social-conventional toy play within presentation combinations, general combinations, specific physical, and complex sequences play categories. Social-conventional was significantly higher than manipulative toy play within discriminative activities, learned combinations, and simple sequences categories. Across play categories for manipulative toy play, eight categories (e.g., discriminative activities (DS), presentation combinations (PC), general combinations (GC), learned combinations (LC), specific physical (SP), simple sequences (QS), substitutions (SB), complex sequences (CS)) were significantly higher in in comparison to other play categories. Similarly, five categories (discriminative activities (DS), general combinations (GC), learned combinations (LC), simple sequences (QS), complex sequences (CS)) had social-conventional play that was significantly higher in comparison to other categories. Four categories (pretend self (PS), substitutions (SB), other-as-actor (OA), fantasy play (FA)) had equal means within manipulative and social-conventional toy play.

ANOVA analyses by age group further specified the emergence, disappearance, and stability among these trends as children develop. Manipulative toy play was significantly higher than social-conventional play for presentation combinations, and manipulative presentation combinations was significantly higher than all or most play categories across age groups. Social-conventional discriminative activities was significantly higher than manipulative discriminative activities, and social-conventional discriminative activities was significantly higher than all or most play categories across age groups. Some categories had significant manipulative (i.e., DS,

GC) or social-conventional (i.e., GC, LC, QS, CS) emerge within and/or across categories, but then disappear as children age. Other categories had significant manipulative play (i.e., SP, QS, CS) or social-conventional play (i.e., LC, QS) emerge within and/or across categories beginning at a later age and enduring up to 60 months old.

CHAPTER 5

Discussion

The purpose of this study was to evaluate whether type of toy influences the kind of play children express. The results revealed that there may be an interaction of toy type with the category of play the child expresses; however, this interaction was not consistent across age groups, but rather appeared to be a function of age. The results appear to support both the behavioral perspective and the constructivist perspective, but they differed at different ages. The following discussion is organized in terms of difficulties in classifying toys, results that support the behavioral perspective, and those that support a social-constructivist developmental perspective. These results are discussed in terms of the toys and categories as a whole, and then according to the different age groups examined.

Classification of Types of Toys

Results from the Toy Type Survey were mixed. Consensus was reached by all raters for the eight manipulative toys that were identified by the investigator as guided by research (e.g., Møller, 2015). However, a comment by one rater regarding the tool puzzle poses the broader question on how some toys have both manipulative and social-conventional features. The tool puzzle's conventional design is to be played with based on its physical features; that is, taking the pieces out and putting them back in their designated spot. Yet, the fact that the pieces have tools on them could lead children to apply their knowledge and experiences in play and thus use the puzzle pieces as tools in their play. Anecdotally, many children did indeed use the tool puzzle pieces in a social-conventional way (e.g., using the wrench piece to "fix" the car wheels). Further, although most social-conventional toys were similarly rated, there was a lack of consensus among some toys, including the train, truck, blanket, comb, and spoon. This lack of

consensus could again be related to some toys having both manipulative and social-conventional qualities. Indeed, previous research (e.g., Fleer, 2010; Trawick-Smith et al. (2015) notes that the toys children play with are influenced by and reflect the social, cultural, and historical perspectives of their world. It is reasonable to assume that this perspective is reflected in how adults categorize toys.

One study (Trawick-Smith et al., 2010) evaluated differences between groups of toys based on realistic or non-realistic properties. The study demonstrated age difference in the use of such toys; younger preschool age children were more likely to engage in pretend play with realistic toys whereas the older preschoolers were more likely to engage in pretend play with the nonrealistic toys. The present study did not use those groupings. Similar to the present study, however, age differences did impact the use of toys, with the older children tending to use both groups of toys in the more complex categories of play.

Effects of Toy Type on Play Activities Expressed

Results from the ANCOVA analysis rejected the null hypothesis, suggesting that there was an interaction between toy type and play category when controlling for age. When controlling for age, differences within and between play activities with manipulative and social-conventional toys were revealed. Examination of simple main effects, however, provides more clarity regarding which play categories account for this interaction. The effect of toy type on play activities expressed support the behavioral perspective and the social-constructivist perspective, as discussed below.

Support for the Behavioral Perspective

Support for the behavioral perspective (e.g., Lifter et al., 2011) comes from the significant differences within and between the play categories in terms of some categories being

heavily weighted by manipulative play and other categories predominantly consisting of social-conventional play.

Play Categories in which Manipulative Toy Play was Salient. Foremost, there was a significant effect for manipulative toy play being markedly higher than social-conventional toy play within four categories: presentation combinations, general combinations, specific physical, and complex sequences. It is the children's use of presentation combinations, general combinations, and specific physical categories, especially earlier in the period under study, that appear to support the behavioral perspective: characteristics of the toys appear to drive what children do with them (e.g., Lifter et al., 2011). Further, the results revealed that manipulative toy play for presentation combinations was significantly higher than manipulative toy play for all other categories. Similarly, manipulative toy play for general combinations and specific physical was significantly higher than some other categories. These results make sense in supporting the behavioral perspective for which activities are heavily dependent on the perceptual and physical characteristics of the objects (Lifter et al., 2022). For instance, presentation combinations is based on putting objects together based on the way in which they were presented to the child (Lifter, 2000); it thus follows that manipulative toys, such as puzzles, nesting cups, and those toys that come in containers, have physical and perceptually salient characteristics that allow for the child to put them back together as presented. General combinations also is based on physical properties of the toys. Because general combinations is defined as children putting objects together in general ways, there is an inherent dependence on the physical characteristics of the objects that are available for play (Lifter, 2000). Children are expressing simple schemes in these categories (presentation combinations and general combinations), and these toys lend themselves to the expression of simple schemes. Somewhat differently, specific physical requires objects to

be related to one another based on their physical characteristics, therefore priming the child to combine manipulative toys in this way. Examples include stringing beads on the string or stacking the nesting cups (Lifter, 2000). The difference for specific physical, however, is that the child has to problem-solve, through trial-and-error activities, how the toys go together. For example, the relationship between the beads and the string is not apparent in the arrangement of the toys, nor is the relationship of stacking the nesting cups from the presented nest of cups. The physical characteristics afford the possibility of the arrangement, but the child has to work out how the toys go together. As such, presentation and general combinations emerge earlier, and specific physical emerges later on in children's play development.

In addition to the categories presentation combinations, general combinations, and specific physical, manipulative toy play was significantly higher than social-conventional toy play for complex sequences. (It must be kept in mind that this category did not emerge until the children were 42-months-of-age, on average, and represents the expression of considerable cognitive change) This result showed that when controlling for age, children substituted manipulative toys within play sequences significantly more than substituting social-conventional toys within play sequences. In addition, manipulative toy play for complex sequences was significantly higher in comparison to manipulative toy play for most categories. On the face of it, these results appear to support the behavioral perspective. It is possible, however, that children are more likely to impart their own knowledge and play onto manipulative toys because these toys can provide more of a "blank slate" than a social-conventional toy. If the child is using an object for their own play scheme, a manipulative toy like a bead may be easier for the child to use as a substitute object in their sequence rather than a social-conventional toy because it lacks an assigned social function. Examples from the present study include pretending the nuts and

bolt are food, or a bead is an animal. This perspective is similar to one proposed by Trawick-Smith et al. (2015). They theorized that higher play quality was associated with two toys (i.e., Duplo Bricks and Rainbow People) due to their relatively non-realistic physical appearance. As such, the children were not prompted to engage in play in a particular manner.

Another possible explanation for this result may be because some manipulative toys have physical features that are similar to social-conventional objects, thus prompting children to use them in both present (pretending an object represents another) and imaginary (using an object to pretend that something is there that is not) substitutions. For example, the children often used manipulative toys in imaginary substitutions within complex sequences, such as pretending there was water or food in a barrel or nesting cup. Present substitutions with manipulative toys such as using the sticks to "drum" on the nesting cups and using the tube as a straw were also reliant on the physical characteristics of the toys.

This observation many explain why manipulative toy play for complex sequences was significantly higher than manipulative toy play for other play categories. Elder and Pederson (1978) and Trawick-Smith et al. (2015) noted that older preschool children would transform non-realistic toys into imaginary items only when realistic toys were also available, which supports the observation in the present study. Although this result supports the behavioral perspective, the observation that these activities occurred for the older children in the study might provide support for the constructivist position, to be discussed later.

Play Categories in which Social-Conventional Toy Play was Salient. Simple main effects for toy type for social-conventional toys also align with the behavioral perspective. Results revealed that social-conventional toy play was significantly higher than manipulative toy play within the following three categories: discriminative activities, learned combinations, and

simple sequences. This result showed that children more often played with toys that had a social or conventional function in discriminative and learned ways instead of manipulative toys. Additionally, children would play with social-conventional toys more often through sequences of play (simple sequences). For these three categories (discriminative activities, learned combinations, and simple sequences), social-conventional toy play was significantly higher in comparison to most categories. Also across play categories, general combinations and complex sequences emerged as significantly higher than other categories. These results support the behavioral perspective, which posits that social-conventional toys prompt children to play with them in ways that align with their conventional function, such as having a person figure drink from a cup.

Support for the Developmental Social-Constructivist Perspective

Support for the developmental social-constructivist perspective comes from two sources: those play categories in which differences between manipulative and social-conventional toys were not apparent and those play categories in which the dominance of one type of toy appeared to shift with age.

Play Categories with an Equivalence Between Toys. For the ANCOVA and ANOVA analyses, manipulative and social-conventional toy play were equal within four play categories: pretend self, substitutions, other-as-actor, and fantasy play. Children related objects to themselves (pretend self), created substitutions with toys (substitutions), related toys to others and figures (other-as-actor), and engaged in fantasy activities (fantasy play) equally among manipulative and social-conventional toys. Accordingly, this result implies that it is not the toy type, but rather the child's internal knowledge and experiences that are guiding their play. As

such, this result lends support for the intentionality perspective and social-constructivist lens (e.g., Bloom & Tinker, 2001).

Play Categories in which Toy Prevalence Shifted in Development. Play with manipulative toys dominated for general combinations when general combinations emerged beginning at 12 months, but this kind of play persisted only to 30 months. Starting with 36 months, the occurrence of manipulative and social-conventional toy play for this category was equivalent. Also, general combinations manipulative toy play was significantly higher than all other manipulative toy play categories from 12 to 24 months, significantly higher than some play categories for 30 months, and then no differences were detected from 36 months onward.

General combinations is a category of play that appears early in development and then declines following 18 months (Lifter et al, 2022). It is a category that helps children develop an understanding of objects, to include the permanence of objects (Piaget, 1954), which occurs in the second year of life. The results of the present study suggest that with the continued occurrence of this category in development, children overcome the strictly physically-based relationships to include the use of social-conventional toys, and integrating their experiences and developments in cognition, in working through their understanding of objects and events. This shift in usage from strictly manipulative toys to a balance between toys provides support for the intentionality model in children's play (Bloom & Tinker, 2001; Lifter & Bloom, 1998) – that children bring their knowledge of objects, people, and events to what they do with the toys available for play.

In terms of trends that begin at a certain age and span up to 60 months old, learned combinations and simple sequences social-conventional toy play was significantly higher than some categories beginning at 18 and 24 months, respectively. Significant differences within

these categories began at 18 months and extended to 42 months, showing that social-conventional toy play for learned combinations and simple sequences was significantly higher than the respective learned combinations and simple sequences manipulative toy play for this age span. Beyond 42 months of age, children began to combine manipulative and social-conventional toys equally in learned ways and in sequences. This is in line with previous developmental research, which posits that as children learn more about their everyday world and objects, combined with developments in cognition, the demonstration of their knowledge through their play with toys becomes less reliant on the physical characteristics or purposes affiliated with objects (e.g., Elder & Pederson, 1978). More specifically, these categories represent a cognitive shift from relating objects to one another (e.g., presentation and general combinations) to children having a mental representation of objects and reflecting this knowledge through their play (e.g., learned combinations). Soon after this development, children begin to sequence these conventional play activities into more elaborate and socio-culturally based play schemes (e.g., simple sequences). As their cognition and understanding of the world increases, children then incorporate new representations of objects (e.g., substitutions), figures and other children or adults as agents in play (e.g., other-as-agent), and fantastical elements (e.g., fantasy play) into various sequences of play (e.g., complex sequences; see Lifter et al., 2022).

Conclusion: Integration of Perspectives in Describing Children's Play with Toys

As described above, the results provide support for both the behaviorist and constructivist perspectives in attempts to explain children's use of different groups of manipulative and social-conventional toys. The significant effects found within and across play categories for children's play with manipulative and social-conventional toys, when controlling for age and when examining each age group, suggested support for the behavioral perspective.

However, the results also revealed shifts in use of toys as a function of development. It might be the case that the youngest children are aided by the physical characteristics of the toys in developing understanding of objects, in general. Studies have demonstrated that toddlers spend "immense amounts of brief, time-distributed, variable interactions with objects" (Herzberg et al., 2021, p.1). As children move into the second and third years of life, they begin to develop mental representations of objects, people, and events (Piaget, 1954), and the eventual use of symbols in their play (Piaget, 1962). These developments contribute to children's understanding of the social-conventional quality of toys. Also, the disappearance of some significant interactions between toy type and play category (i.e., manipulative toy play for general combinations) as children develop suggested support for children imparting their own knowledge and experience into play with manipulative and social-conventional toys, thus supporting the intentionality perspective and social-constructivist lens (Bloom & Tinker, 2001). The emergence and disappearance of some categories of play, as well as play categories associated with specific toy type use as children develop was congruent with other research that has demonstrated changes in play development as a function of cognitive changes (see Lifter et al., 2022). Specifically, children's cognitive development as reflected through play follows a trajectory from indiscriminate activities, to understanding relationships between objects, and then to having mental representations of objects based on their learned experiences and knowledge. As children begin to have more complex understanding of the world, they shift from using objects in solely conventional ways to imparting their own knowledge onto objects regardless of their prescribed conventions. Accordingly, the emergence of children's play with both manipulative and social-conventional toys among various play categories as they age could be associated with such

cognitive changes in children's understanding of objects and using them to reflect their world experiences.

Limitations and Future Directions

Several limitations were present in this study and inform future research. First, the methodology and results from the toy type survey suggest a need for improvement. Foremost, information was obtained from only five professionals. Gathering information from a much larger number of early education researchers and practitioners would better inform consensus on the classification of toys. Also, given that there was a lack of consensus for some toys, future surveys may consider redefining social-conventional toys or determining whether a third toy type category would better represent toys that overlap in having manipulative and social-conventional qualities.

Limitations were also found in data extraction procedures. A small portion of data codes may have had missing play frequency counts due to missing clarifying information from video data. The overall data set in the present study may slightly under or overestimate some frequency of play for specific toy types and play categories.

Additionally, because four out of eight social-conventional toys were selected by the investigator instead of randomly, although based on the literature (e.g., Møller, 2015), there was potential bias in the social-conventional toy type analysis. Future use of the PCTD database may benefit from exploring inclusion of other toys for the social-conventional toy group to see whether results are impacted. This would also help if there was very high or low frequency of play with certain social-conventional toys. As noted by a previous Project Play study exploring children's play using the DPA (Harris, 2020), differences in frequency of sequences with the pink set versus the other three toy sets suggested that children may have higher frequency of play

with some toys based on familiarity or preference. A future investigation could consider an in-depth analysis comparing children's play activities among just manipulative and social-conventional toys respectively. This investigation would further pinpoint whether certain play category activities were significantly associated with a specific manipulative or social-conventional toy (e.g., comparing play activities among the eight manipulative toys for each age group).

In addition, because several assumptions were not met, the analysis should be interpreted with caution. Future studies may consider alternative designs or modifications to increase the likelihood of assumptions being met for the ANCOVA.

Finally, although interpretation of results provided support for both behavioral and social-constructivists perspectives, it is possible that other factors were present that would change interpretation. Equal adjusted means within some categories (e.g., pretend self, substitutions, other-as-actor, fantasy play) for manipulative and social-conventional toy play may have been due to minimal frequency of these play activities across age groups. While this does not exclude the possibility of children's knowledge guiding their play rather than the toys, the low frequency of these play activities suggests that further exploration of specific toy play within and across these categories should be explored as opposed to broader analyses. Similarly, significant effects for complex sequences could possibly be due to higher frequencies of complex sequences in comparison to other categories, especially for social-conventional play.

Implications for Research and Practice for School Psychologists

The findings have salient implications for play research. By acknowledging the influence of both the physical characteristics of toys and children's knowledge on play, future play research could expand upon this work and be inclusive of both behavioral and social-

constructivist theories in better understanding how children play. This is especially pertinent for studies exploring developmental trajectories in play, in that the current findings suggest that reliance on physical characteristics or attributed functions of toys appears more prevalent in younger children for some play activities. Overall, the findings suggest that focusing on the physical characteristics of toys and the child's knowledge and experiences, along with a child's developmental age, may provide play researchers with comprehensive information regarding developments in children's play with objects.

The results also have implications for researchers and practitioners, including school psychologists, for development and administration of play assessments. First, the findings suggest that assessments of children's play should provide a balanced set of toys – manipulative and social-conventional – so that children have the opportunity to express their knowledge in relating objects to one another based on their physical characteristics and based on their personal experiences. Additionally, given that some results highlighted changes in children's play activities with types of toys over time, play assessments should be conducted through use of developmentally based play assessment instruments such as the DPA (Lifter et al., 2022). Doing so allows for opportunities to capture a child's progress in play along a developmental trajectory, which can inform appropriate play intervention goals (e.g., Kelly-Vance & Ryalls, 2005; Lifter et al., 2011). The Lifter et al. (2022) Developmental Play Assessment for Practitioners (DPA-P) also includes specifications for accounting for culture in the use of toys.

The results also provide implications for play interventions, especially in intervening with children with delays (e.g. Barton et al., 2012; DiCarlo et al., 2003). Because some results for the earliest categories to develop supported the behavioral perspective, it might be best to begin with more manipulative toys that provide a substantial amount of perceptual support to assist the child

in understanding relations between objects. However, for children who are more developmentally advanced, the selection of manipulative versus social-conventional toys may not be as important.

For any kind of assessment or intervention in play, it is important to include attention to cultural aspects on what and how toys are used. Research is underway to include cultural specifications in children's play (e.g., Göncü et al., 2000; Haight et al., 1999; Trawick-Smith, 2010; Trawick-Smith et al., 2015).

In conclusion, the present study contributes to the research base on the influence of toys in children's play. Toys do appear to make a difference in what children do with them, but more research is needed to tease out the impact of age, and accordingly experience and development, in how children's knowledge and experience influences what they do with toys.

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Appendix A: Tables

Table 1

Original DPA-R Code Definitions and Examples

Code	Category	Definition	Examples
IS	Indiscriminate Actions on single objects	Applies a general action to one object	Mouths a puzzle piece
IT	Indiscriminate Actions on two or more objects	Applies a general action to two or more objects	Taps/bangs an object with a stick
DS	Discriminative Actions on Single Objects	Differentiates among objects, preserving their physical or conventional characteristics	Turns car wheel
TA	Take-Apart Combinations	Separates configurations of objects	Takes pieces out of puzzle
DP	Dumping/Shaking Out/Knocking Over	Dumps, shakes objects out of a container, or knocks down combinations of objects	Turns container of beads over to dump contents
PC	Presentation Combinations	Re-creates combinations of objects according to their presentation configuration	Puts puzzle pieces into puzzle
GC	General Combinations	Creates combinations of objects that result in simple, non-specific configuration	Puts the doll figure on the puzzle
GV	Giving	Transfers an object to the caregiver or observer within the context of play	Gives wand to caregiver to hold while he explores the other objects
LU	Lining Up	Places one object next to another	Lines up cups, one after another, without the creation of a particular pattern
GA	Gathering	Gathers various objects together into his/her lap, into a pile, or into his/her hand	Reaches out and scoops objects toward self
PS	Pretend Self	Relates objects to the self, indicating a pretend quality to the action	Brings empty cup to mouth to drink
SP	Specific Physical	Creates relationships between or among objects based on the physical properties of the objects	Connects trains
CP	Creating Patterns	Arranges objects in such a way that something more is created than the juxtaposition of the objects	Takes the blocks and arranges them into a diamond pattern

CA	Child-as-Agent	Extends familiar actions to the baby, people, or animal figures	Brushes the baby's hair with a comb
LC	Learned Combinations of Objects	Creates relationships between or among objects that represent conventional activities of the culture	Fixes a toy car with a wrench
BC	Building Constructions	Assembles a series of objects to create a construction	Assembles a series of blocks, stating "it is a house".
SS	Single Scheme Sequences	Applies the same action to two or more people figures, animal figures, objects, and/or self and a person	Pours from the coffee pot into a series of receptacles (cups, dishes)
BT	Substitution +	Uses one object to represent another object	Says a red bead is an "apple"
BN	Substitution -	Pretends an object is present that is not	Pretends "water" is in the coffee pot
PA	Person-as-Agent	Uses the people (e.g. caregiver; research assistants) to act out play activities with objects	Gives mother a cup so that she will take a drink
DA	Doll-as-Agent	Uses the people figures to act out play activities with objects or other people figures	Has the dog bark at the cat
FA	Fantasy Play	Play activities in which there is a fantastic, or unrealistic element	Picks up the wand and casts a spell on a participant
TR	Taking on a role	Takes on some kind of role or assigns a role to the caregiver to act out	Holds wand; says she's a fairy; and jumps around the room, pretending to fly
MS	Multi-scheme Sequence: Simple	Plays out everyday events or connects a series of activities in a logical order	Stirs spoon in cup; puts spoon in barrel; drinks from cup; puts cup back on saucer
MX	Multi-scheme Sequence: Complex	Links a series of actions together in time, and adds instances of substitution, building constructions, or creating patterns	Pushes truck with beads; drives to "trash can"; unloads beads into container
MR	Multi-scheme Sequence: Role	Links a series of actions together in time, but also takes on a role during this play activity	Says she is a doctor and then uses the mirror to examine caregiver's ears, stomach, back, etc.

Note. The 27th play category of Social Engagement (SQ) was not included as a code in the DPA-R because its presence was variable, and likely congruent with the Person-as-Agent category (see Lifter et al., 2022).

Table 2

DPA Categories, Definitions, and Examples

Code	Play Category	Definition	Examples	Included DPA-R Codes
IN	Indiscriminative Activities	Child acts on one or more objects in ways that are not particular to the characteristics of the objects	• Banging • Throwing	IT IS
DS	Discriminative Activities	Child acts on single objects according to their particular characteristics.	• Hugs baby • Rolls a rollable bead	DS
PC	Presentation Combinations	Child puts objects together as they were presented to the child.	• Puts puzzle pieces into puzzle • Nests the nesting cups	PC
GC	General Combinations	Child creates new configurations of objects that are simple and non-specific (e.g. puts one object into another).	• Puts beads into the dumper of the dump truck, using the dumper as a container • Puts nuts and bolts into the coffee pot, using coffee pot as a general container	GC
LC	Learned Combinations	Child creates relationships between objects that represent conventional activities.	• Scoops into cup with spoon • Covers baby with blanket • Puts a figure in the car for a ride • Uses blocks to build a house	LC CA
PS	Pretend Self	Child relates objects to the self, indicating a pretend quality to the action.	• Brings empty cup to mouth to drink • Covers self with blanket to sleep	PS
SP	Specific Physical	Child creates a relationship between/among objects based on the physical characteristics of the objects.	• Stacks nesting cups • Puts beads on string • Connects train cars by their hooks	SP CP

SS	Same Action Sequences	Child extends same learned action to different people or objects, linked in time.	• Pours from coffee pot into cup, pours from coffee pot into dishes • Puts one person in the car, then second person in car	SS
VS	Varied Action Sequences	Child extends two or more different learned actions to people or objects, linked in time.	• Stirs spoon in cup; puts spoon on the dish; drinks from cup; puts the cup back on the dish • Opens the car door; walks person out of the car	MS
SB	Substitutions	Child uses one object to stand in place for another or references an imaginary object.	• Pretends "water" is in the coffee pot • Designates the girl doll as the mother—assigning role to the figure • Pretends a block is a "castle"	BT BN
CS	Complex Sequences	Child links learned actions together in time, including building constructions, which integrate substitution elements.	• Creates a "bridge" out of toys available • Pushes truck with beads; drives to "trash can" container; unloads beads into container	BC MX
DA	Doll-as-Actor	Child moves doll figures as if they are capable of acting on objects and/or other dolls.	• Child moves figure to walk out of the car through the door • Child makes the dog bark at the cat	DA
PA	Person-as-Actor	Child involves a person (caregiver, observer) to act out play activities on objects.	• Child gives mother a cup so that she will take a drink	PA
FA	Fantasy Play	Play activities in which there is an element of fantasy (e.g. magic) in the activity.	• Child uses the wand to cast a spell	FA

Table 10

Simple Main Effect of Toy Type Within Each Play Category by Age Group

Play Category	Higher Adjusted Mean	Lower Adjusted Mean	Age (in months)	*df*	Error	F	*p*	η_p^2	Mean Difference
DS	Social-Conventional	Manipulative	8	1	792	39.070	<.001	.047	2.378
			12	1	770	5.492	.019	.007	3.306
			18	1	902	63.059	<.001	.065	14.929
			24	1	550	13.456	<.001	.024	8.692
			30	1	572	41.389	<.001	.067	14.630
			36	1	506	18.610	<.001	.035	10.292
			42	1	550	22.572	<.001	.039	14.269
			48	1	550	9.924	.002	.018	10.692
			54	1	440	5.847	.016	.013	8.619
			60	1	506	6.424	.012	.013	9.792
PC	Manipulative	Social-Conventional	8	1	792	10.676	.001	.013	.054
			12	1	770	151.007	<.001	.164	17.333

			18	1	902	482.293	<.001	.348	41.286
			24	1	550	124.706	<.001	.185	26.462
			30	1	572	262.626	<.001	.315	36.852
			36	1	506	178.044	<.001	.260	31.833
			42	1	550	160.731	<.001	.226	38.077
			48	1	550	132.553	<.001	.194	39.077
			54	1	440	105.539	<.001	.193	36.619
			60	1	506	195.381	<.001	.279	54.000
GC	Manipulative	Social-Conventional	12	1	770	19.286	<.001	.024	6.194
			18	1	902	32.194	<.001	.034	10.667
			24	1	550	12.292	<.001	.022	8.308
			30	1	572	8.787	.003	.015	6.741
LC	Social-Conventional	Manipulative	18	1	902	5.431	.020	.006	4.381
			24	1	550	7.348	.007	.013	6.423
			30	1	572	10.932	.001	.019	7.519
			36	1	506	8.005	.005	.016	6.750

			42	1	550	6.109	.014	.011	7.423
SP	Manipulative	Social-Conventional	18	1	902	6.416	.011	.007	4.762
			24	1	550	7.436	.007	.013	6.462
			30	1	572	50.427	<.001	.081	16.148
			36	1	506	31.627	<.001	.059	13.417
			42	1	550	42.990	<.001	.072	19.692
			48	1	550	37.445	<.001	.064	20.769
			54	1	440	61.076	<.001	.122	27.857
			60	1	506	92.141	<.001	.154	37.083
QS	Social-Conventional	Manipulative	18	1	902	4.420	.036	.005	3.952
			24	1	550	8.536	.004	.015	6.923
			30	1	572	9.984	.002	.017	7.185
			36	1	506	16.845	<.001	.032	9.792
			42	1	550	6.758	.010	.012	7.808
CS	Manipulative	Social-Conventional	42	1	550	15.760	<.001	.028	11.923
			48	1	550	18.251	<.001	.032	14.500

54	1	440	37.764	<.001	.079	21.905
60	1	506	71.682	<.001	.124	32.708

Table 11

Simple Main Effect of Toy Type Within Each Play Category for 8-Month-Old Children

Social-Conventional			
Higher Adjusted Mean	Lower Adjusted Mean	Mean Difference	*p*
DS	PC	3.595	<.001
	GC	2.703	<.001
	LC	3.595	<.001
	PS	3.541	<.001
	SP	3.595	<.001
	QS	3.595	<.001
	SB	3.595	<.001
	CS	3.595	<.001
	OA	3.595	<.001
	FA	3.595	<.001

Std. error= .381

Table 12

Simple Main Effect of Toy Type Within Each Play Category for 12-Month-Old Children

Manipulative				Social-Conventional			
Higher Adjusted Mean	Lower Adjusted Mean	Mean Difference	*p*	Higher Adjusted Mean	Lower Adjusted Mean	Mean Difference	*p*
PC	DS	14.583	<.001	DS	PC	6.056	.001
	GC	7.250	<.001		PS	5.500	.006
	LC	15.471	<.001		SP	6.028	.001
	PS	16.833	<.001		QS	5.528	.005
	SP	15.917	<.001		SB	6.056	.001

	QS	16.750	<.001	CS	6.056	.001
	SB	17.306	<.001	OA	6.056	.001
	CS	17.333	<.001	FA	6.056	.001
	OA	17.333	<.001			
	FA	17.333	<.001			
GC	DS	7.333	<.001			
	LC	8.222	<.001			
	PS	9.583	<.001			
	SP	8.667	<.001			
	QS	9.500	<.001			
	SB	10.056	<.001			
	CS	10.083	<.001			
	OA	10.083	<.001			
	FA	10.083	<.001			

Std. Error= 1.411

Table 13

Simple Main Effect of Toy Type Within Each Play Category for 18-Month-Old Children

Manipulative				Social-Conventional			
Higher Adjusted Mean	Lower Adjusted Mean	Mean Difference	*p*	Higher Adjusted Mean	Lower Adjusted Mean	Mean Difference	*p*
PC	DS	36.452	<.001	DS	PC	19.762	<.001
	GC	24.214	<.001		GC	13.357	<.001
	LC	35.667	<.001		LC	9.762	<.001
	PS	40.310	<.001		PS	18.048	<.001
	SP	36.190	<.001		SP	19.429	<.001
	QS	37.405	<.001		QS	11.929	<.001
	SB	41.095	<.001		SB	19.762	<.001
	CS	41.310	<.001		CS	20.000	<.001

	OA	41.357	<.001		OA	19.357	<.001
	FA	41.524	<.001		FA	20.000	<.001
GC	DS	12.238	<.001	GC	PC	6.405	.038
	LC	11.452	<.001		SB	6.405	.038
	PS	16.095	<.001		CS	6.643	.024
	SP	11.976	<.001		FA	6.643	.024
	QS	13.190	<.001	LC	PC	10.000	<.001
	SB	16.881	<.001		PS	8.286	<.001
	CS	17.095	<.001		SP	9.667	<.001
	OA	17.143	<.001		SB	10.000	<.001
	FA	17.310	<.001		CS	10.238	<.001
					OA	9.595	<.001
					FA	10.238	<.001
				QS	PC	7.833	.002
					SP	7.500	.004
					SB	7.833	.002
					CS	8.071	.001
					OA	7.429	.005
					FA	8.071	.001

Std. Error= 1.880

Table 14

Simple Main Effect of Toy Type Within Each Play Category for 24-Month-Old Children

Manipulative				Social-Conventional			
Higher Adjusted Mean	Lower Adjusted Mean	Mean Difference	*p*	Higher Adjusted Mean	Lower Adjusted Mean	Mean Difference	*p*
PC	DS	23.115	<.001	DS	PC	12.308	<.001
	GC	11.692	<.001		PS	11.577	<.001
	LC	20.962	<.001		SP	11.577	<.001

	PS	26.346	<.001		SB	10.962	<.001
	SP	19.538	<.001		CS	8.577	.018
	QS	18.308	<.001		OA	11.346	<.001
	SB	25.269	<.001		FA	12.077	<.001
	CS	25.154	<.001	LC	PC	11.923	<.001
	OA	26.077	<.001		PS	11.462	<.001
	FA	26.500	<.001		SP	11.462	<.001
GC	DS	11.423	<.001		SB	10.846	<.001
	LC	9.269	.006		CS	8.462	.021
	SP	7.846	.054		OA	11.231	<.001
	SB	13.577	<.001		FA	11.962	<.001
	CS	13.462	<.001	QS	PC	15.077	<.001
	OA	14.385	<.001		GC	8.615	.017
	FA	14.808	<.001		PS	14.615	<.001
QS	PS	8.038	.041		SP	14.615	<.001
	FA	8.192	.032		SB	14.000	<.001
					CS	11.615	<.001
					OA	14.385	<.001
					FA	15.115	<.001

Std. Error= 2.370

Table 15

Simple Main Effect of Toy Type Within Each Play Category for 30-Month-Old Children

Manipulative				Social-Conventional			
Higher Adjusted Mean	Lower Adjusted Mean	Mean Difference	*p*	Higher Adjusted Mean	Lower Adjusted Mean	Mean Difference	*p*
DS	PS	9.667	.001	DS	PC	23.148	<.001
	OA	8.926	.005		GC	21.074	<.001
	FA	9.815	.001		LC	8.333	.015

PC	DS	28.333	<.001		PS	23.630	<.001
	GC	28.037	<.001		SP	23.481	<.001
	LC	29.556	<.001		QS	11.296	<.001
	PS	38.000	<.001		SB	20.111	<.001
	SP	21.037	<.001		CS	17.222	<.001
	QS	32.185	<.001		OA	22.296	<.001
	SB	35.037	<.001		FA	24.444	<.001
	CS	29.519	<.001	LC	PC	14.815	<.001
	OA	37.259	<.001		GC	12.741	<.001
	FA	38.148	<.001		PS	15.296	<.001
GC	PS	9.963	<.001		SP	15.148	<.001
	OA	9.222	.003		SB	11.778	<.001
	FA	10.111	<.001		CS	8.889	.006
LC	PS	8.444	.012		OA	13.963	<.001
	OA	7.704	.041		FA	16.111	<.001
	FA	8.593	.010	QS	PC	11.852	<.001
SP	LC	8.519	.011		GC	9.778	.001
	PS	16.963	<.001		PS	12.333	<.001
	QS	11.148	<.001		SP	12.185	<.001
	SB	14.000	<.001		SB	8.815	.007
	CS	8.481	.012		OA	11.000	<.001
	OA	16.222	<.001		FA	13.148	<.001
	FA	17.111	<.001				
CS	PS	8.481	.012				
	OA	7.741	.039				
	FA	8.630	.009				

Std. Error= 2.274

Table 16

Simple Main Effect of Toy Type Within Each Play Category for 36-Month-Old Children

Manipulative				Social-Conventional			
Higher Adjusted Mean	Lower Adjusted Mean	Mean Difference	*p*	Higher Adjusted Mean	Lower Adjusted Mean	Mean Difference	*p*
PC	DS	29.542	<.001	DS	PC	12.583	<.001
	GC	27.792	<.001		GC	9.833	.002
	LC	26.458	<.001		PS	12.667	<.001
	PS	31.500	<.001		SP	12.583	<.001
	SP	18.417	<.001		SB	9.792	.003
	QS	25.875	<.001		CS	8.208	.035
	SB	27.333	<.001		OA	10.750	<.001
	CS	23.583	<.001		FA	12.292	<.001
	OA	30.500	<.001	LC	PC	12.125	<.001
	FA	32.083	<.001		GC	9.375	.005
SP	DS	11.125	<.001		PS	12.208	<.001
	GC	9.375	.005		SP	12.125	<.001
	LC	8.042	.044		SB	9.333	.006
	PS	13.083	<.001		OA	10.292	.001
	SB	8.917	.011		FA	11.833	<.001
	OA	12.083	<.001	QS	PC	15.750	<.001
	FA	13.667	<.001		GC	13.000	<.001
CS	FA	8.500	.022		PS	15.833	<.001
					SP	15.750	<.001
					SB	12.958	<.001
					CS	11.375	<.001
					OA	13.917	<.001
					FA	15.458	<.001

Std. Error= 2.386

Table 17

Simple Main Effect of Toy Type Within Each Play Category for 42-Month-Old Children

Manipulative				Social-Conventional			
Higher Adjusted Mean	Lower Adjusted Mean	Mean Difference	*p*	Higher Adjusted Mean	Lower Adjusted Mean	Mean Difference	*p*
PC	DS	33.500	<.001	DS	PC	18.846	<.001
	GC	32.115	<.001		GC	15.769	<.001
	LC	29.577	<.001		PS	19.500	<.001
	PS	38.423	<.001		SP	17.731	<.001
	SP	17.269	<.001		SB	13.808	<.001
	QS	29.038	<.001		OA	17.885	<.001
	SB	31.385	<.001		FA	18.154	<.001
	CS	15.577	<.001	LC	PC	15.923	<.001
	OA	38.115	<.001		GC	12.846	.001
	FA	38.846	<.001		PS	16.577	<.001
SP	DS	16.231	<.001		SP	14.808	<.001
	GC	14.846	<.001		SB	10.885	.017
	LC	12.308	.003		OA	14.962	<.001
	PS	21.154	<.001		FA	15.231	<.001
	QS	11.769	.006	QS	PC	16.846	<.001
	SB	14.115	<.001		GC	13.769	<.001
	OA	20.846	<.001		PS	17.500	<.001
	FA	21.577	<.001		SP	15.731	<.001
CS	DS	17.923	<.001		SB	11.808	.005
	GC	16.538	<.001		OA	15.885	<.001
	LC	14.000	<.001		FA	16.154	<.001
	PS	22.846	<.001	CS	PC	10.577	.026
	QS	13.462	<.001		PS	11.231	.011
	SB	15.808	<.001				<.001
	OA	22.538	<.001				<.001
	FA	23.269	<.001				<.001

Std. Error= 3.003

Table 18

Simple Main Effect of Toy Type Within Each Play Category for 48-Month-Old Children

Manipulative				Social-Conventional			
Higher Adjusted Mean	Lower Adjusted Mean	Mean Difference	*p*	Higher Adjusted Mean	Lower Adjusted Mean	Mean Difference	*p*
PC	DS	36.077	<.001	DS	PC	13.692	.003
	GC	33.731	<.001		GC	12.000	.024
	LC	32.769	<.001		PS	13.962	.002
	PS	39.038	<.001		SP	13.769	.003
	SP	18.385	<.001		FA	13.231	.006
	QS	26.346	<.001	LC	PS	11.500	.041
	SB	34.885	<.001	QS	PC	19.308	<.001
	CS	12.769	.010		GC	17.615	<.001
	OA	37.615	<.001		PS	19.577	<.001
	FA	39.346	<.001		SP	19.385	<.001
SP	DS	17.692	<.001		SB	15.038	<.001
	GC	15.346	<.001		OA	16.115	<.001
	LC	14.385	.001		FA	18.846	<.001
	PS	20.654	<.001	CS	PC	11.808	.030
	SB	16.500	<.001		PS	12.077	.022
	OA	19.231	<.001		SP	11.885	.028
	FA	20.962	<.001		FA	11.346	.049
QS	PS	12.692	.011				
	FA	13.000	.008				
CS	DS	23.308	<.001				
	GC	20.962	<.001				
	LC	20.000	<.001				
	PS	26.269	<.001				

QS	13.577	.004
SB	22.115	<.001
OA	24.486	<.001
FA	26.577	<.001

Std. Error= 3.394

Table 19

Simple Main Effect of Toy Type Within Each Play Category for 54-Month-Old Children

Manipulative				Social-Conventional			
Higher Adjusted Mean	Lower Adjusted Mean	Mean Difference	*p*	Higher Adjusted Mean	Lower Adjusted Mean	Mean Difference	*p*
PC	DS	32.095	<.001	DS	PC	13.143	.014
	GC	29.952	<.001		PS	13.429	.010
	LC	24.905	<.001		SP	13.238	.013
	PS	36.810	<.001	LC	PC	15.143	.001
	QS	20.952	<.001		GC	13.286	.012
	SB	28.429	<.001		PS	15.429	.001
	OA	33.905	<.001		SP	15.238	.001
	FA	36.952	<.001		OA	12.333	.033
SP	DS	23.238	<.001		FA	13.619	.008
	GC	21.095	<.001	QS	PC	15.286	.001
	LC	16.028	<.001		GC	13.429	.010
	PS	27.952	<.001		PS	15.571	<.001
	QS	12.095	.041		SP	15.381	.001
	SB	19.571	<.001		OA	12.476	.028
	OA	25.048	<.001		FA	13.762	.007
	FA	28.095	<.001				
QS	PS	15.857	<.001				
	OA	12.952	.017				

	FA	16.000	<.001
CS	DS	25.476	<.001
	GC	23.333	<.001
	LC	18.286	<.001
	PS	30.190	<.001
	QS	14.333	.004
	SB	21.810	<.001
	OA	27.286	<.001
	FA	30.333	<.001

Std. Error= 3.565

Table 20

Simple Main Effect of Toy Type Within Each Play Category for 60-Month-Old Children

Manipulative				Social-Conventional			
Higher Adjusted Mean	Lower Adjusted Mean	Mean Difference	*p*	Higher Adjusted Mean	Lower Adjusted Mean	Mean Difference	*p*
PC	DS	50.875	<.001	DS	PC	12.917	.049
	GC	45.583	<.001		PS	13.458	.030
	LC	43.292	<.001	LC	PC	13.667	.024
	PS	54.292	<.001		PS	14.208	.014
	SP	16.500	.001		SP	13.250	.036
	QS	35.167	<.001	QS	PC	20.583	<.001
	SB	46.208	<.001		GC	17.167	<.001
	CS	13.167	.039		PS	21.125	<.001
	OA	52.000	<.001		SP	20.167	<.001
	FA	54.375	<.001		SB	17.958	<.001
SP	DS	34.375	<.001		FA	19.500	<.001
	GC	29.083	<.001				
	LC	26.792	<.001				

	PS	37.792	<.001
	QS	18.667	<.001
	SB	29.708	<.001
	OA	35.500	<.001
	FA	37.875	<.001
QS	DS	15.708	.003
	PS	19.125	<.001
	OA	16.833	<.001
	FA	19.208	<.001
CS	DS	37.708	<.001
	GC	32.417	<.001
	LC	30.125	<.001
	PS	41.125	<.001
	QS	22.000	<.001
	SB	33.042	<.001
	OA	38.833	<.001
	FA	41.208	<.001

Std. Error= 3.863

Appendix B: Pink Toy Set

Figure 1

Pink set

Figure 2

Dump truck

Figure 3

Beads and string

Figure 4

Wand

Figure 5

Farm puzzle

Figure 6

Bear puppet

Appendix C: Green Toy Set

Figure 1

Green set

Figure 2

Sticks, tubes, and discs

Figure 3

Baby doll

Figure 4

Nesting cups

Figure 5

Blanket

Figure 6

Spoon, mirror, and comb

Appendix D: Black Toy Set

Figure 1

Black set

Figure 2

Coffee pot, plates, spoons, and cups

Figure 3

Nuts and bolts

Figure 4

Train

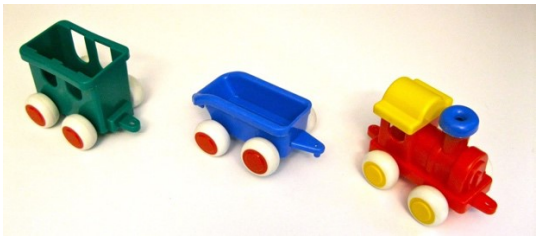

Figure 5

Barrels

Figure 6

People figures: Boy and girl

Appendix E: Orange Toy Set

Figure 1

Orange set

Figure 2

Car

Figure 3

People figures: Man, woman, and baby: Black and White

Figure 4

Cat and dog

Figure 8

Blocks

Figure 9

Tool puzzle

Appendix F: Data Figures

Figure 1

PCTD Database: Learned Combinations

	LC																											
	Manipulative Toys									Social-conventional Toys																		
Participant	Farm Puzzle	Beads/ String	Sticks/ Tubes/ Discs	Nesting Cups	Barrels	Nuts/ Bolts	Tool Puzzle	Blocks	Total	Truck	Wand	Puppet	Baby Doll	Spoon	Blanket	Comb	Mirror	Train	Boy/ Girl	Pot	Cups	Plates	Spoons	Car	Man/ Woman/ Baby	Cat/ Dog	Total

Figure 2

DPA-R Coding Sheet: Green Toy Set, Part 1

Coder (g):	JB	Order (g):	3	Time Start (g):	15:45	Time End (g):	24:16	Interactant (g):	Mother	Location (g):	Home
Date Coded (g):	20130508	Order 2 (g):		Time Start 2 (g):		Time End 2 (g):		Interactant 2 (g):		Location 2 (g):	

GREEN	ANTICIPATED ACTIONS / Time (min. intervals)	2LT	Frequency 15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25							i	s	b	q	Notes
																			28	9	1	0	
sticks, tubes, & discs in container	TA: disc, stick, tube, lid/container	TA								iiii									4	0	0	0	
	dumps stick container	DP																	0	0	0	0	
	lid/sticks container	PC																	0	0	0	0	
	disc, stick, tube/container	PC																	0	0	0	0	
	stick, tube/disc	SP										i							1	0	0	0	
	spins disc/stick	DS									iii	ii							5	0	0	0	
	slides disc/stick	DS									ii								2	0	0	0	
	disc/stick as "lollipop"	LC								b									0	0	1	0	
	builds scooter	BC								i	i								2	0	0	0	
	waves stick	DS										i							1	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
cups	TA: cup/nest	TA																	0	0	0	0	
	nests cup/cup	PC																	0	0	0	0	
	stacks cup/cup	SP																	0	0	0	0	
	knocks over cup stack w/hand	DP																	0	0	0	0	
	cup/own mouth	PS																	0	0	0	0	
	cup/baby's, obs.'s mouth	CA																	0	0	0	0	
	gives cup to CG to drink	PA																	0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
baby	TA: diaper/baby	TA																	0	0	0	0	
	diaper/baby	PC																	0	0	0	0	
	hugs, kisses baby	DS			i	i													2	0	0	0	
	places toy for baby to play with	DA																	0	0	0	0	
	sits baby	DS							i										1	0	0	0	
	rocks baby	DS				i			i										2	0	0	0	
	lifts baby in air and says "woo!"	DS				iii													3	0	0	0	
	moves arms	DS					i												1	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	

		2LT	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	i	s	b	q	
spoon	spoon/own mouth	PS																	0	0	0	0	
	spoon/baby's, obs.'s mouth	CA																	0	0	0	0	
	stirs spoon/cup	LC																	0	0	0	0	
	scoops spoon/cup	LC																	0	0	0	0	
	spoon/cup (cup as container)	GC																	0	0	0	0	
	spoon/cup (where "belongs")	LC																	0	0	0	0	
	gives spoon to CG to eat	PA																	0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
blanket	spreads, folds blanket	DS		i			s												1	1	0	0	
	covers self/blanket	PS																	0	0	0	0	
	covers baby/blanket	CA		i			sss	sii											3	4	0	0	
	baby/blanket	CA					ss												0	2	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
comb, mirror	looks in mirror	DS																	0	0	0	0	
	comb/own hair	PS																	0	0	0	0	
	comb/baby's, obs.'s hair	CA			s														0	1	0	0	
	holds mirror for baby, obs. to see self	CA			s														0	1	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	

Figure 3

DPA-R Coding Sheet: Green Toy Set, Part 2

Subs. +	lollipop (stick/disc)	BT								i									1	
																			0	
																			0	
																			0	
																			0	
																			0	
																			0	
																			0	
																			0	
																			0	
Subs. –																			0	
																			0	
																			0	
																			0	
																			0	
																			0	
																			0	
																			0	
																			0	
																			0	

GREEN	ADDITIONAL ACTIONS		Frequency																i	s	b	q	Notes
	Time (min. intervals)	2LT	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	0	0	0	0	0	0	5	0	0	0	
	mouths 1 object	IS																	0	0	0	0	
	taps, bangs 1 object	IS																	0	0	0	0	
	shakes 1 object	IS																	0	0	0	0	
	throws object	IS																	0	0	0	0	
	swishes hands through objects	IS																					
	touches 2 objects together	IT																	0	0	0	0	
	taps, bangs 2 objects together	IT																	0	0	0	0	
	lines up objects	LU																	0	0	0	0	
	gathers objects	GA																	0	0	0	0	
	gives object to CG/obs	GV		i	i			i		ii									5	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	
																			0	0	0	0	

GREEN	SEQUENCES OF ACTIONS				Frequency																e	v	Notes/Exact Start Time
	Time (min. intervals)	2LT	Social	Parts	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	0	0	0	0	0	0	3	0	
	scoops spoon/cup, feeds baby	MS																			0	0	
	combs baby's hair, mirror for baby to see self	MS		2			e														1	0	
	spreads blanket, baby/blanket, covers baby/blanket	MS		3					e												1	0	
	baby/blanket, covers baby/blanket	MS		2					e												1	0	
																					0	0	

Figure 4

DPA-R Coding Sheet: Green Toy Set, Select Example Data

GREEN	ANTICIPATED ACTIONS Time (min. intervals)	2LT	Frequency 15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25
sticks, tubes, & discs in container	**TA: disc, stick, tube, lid/container**	**TA**								iiii		
	dumps stick container	**DP**										
	lid/sticks container	**PC**										
	disc, stick, tube/container	**PC**										
	stick, tube/disc	**SP**										i
	spins disc/stick	DS									iii	ii
	slides disc/stick	DS									ii	
	disc/stick as "lollipop"	LC								b		
	builds scooter	BC								i	i	
	waves stick	DS										i

blanket	**spreads, folds blanket**	**DS**		i			s		
	covers self/blanket	**PS**							
	covers baby/blanket	**CA**		i			sss	sii	
	baby/blanket	CA					ss		
comb, mirror	**looks in mirror**	**DS**							
	comb/own hair	**PS**							
	comb/baby's, obs.'s hair	**CA**			s				
	holds mirror for baby, obs. to see self	**CA**			s				

Figure 5

PCTD Database: DPA-R Data Transfer Example, Learned Combinations

										LC																	
	Manipulative Toys									Social-conventional Toys																	
Participant	Farm Puzzle	Beads/ String	Sticks/ Tubes/ Discs	Nesting Cups	Barrels	Nuts/ Bolts	Tool Puzzle	Blocks	Total	Truck	Wand	Puppet	Baby Doll	Spoon	Blanket	Comb	Mirror	Train	Boy/ Girl	Pot	Cups	Plates	Spoons	Car	Man/ Woman/ Baby	Cat/ Dog	Total
0088													3		3												

Appendix G: ANOVA Figures

Figure 1

ANOVA plot for simple main effect of toy type within each play category for 8-month-old children

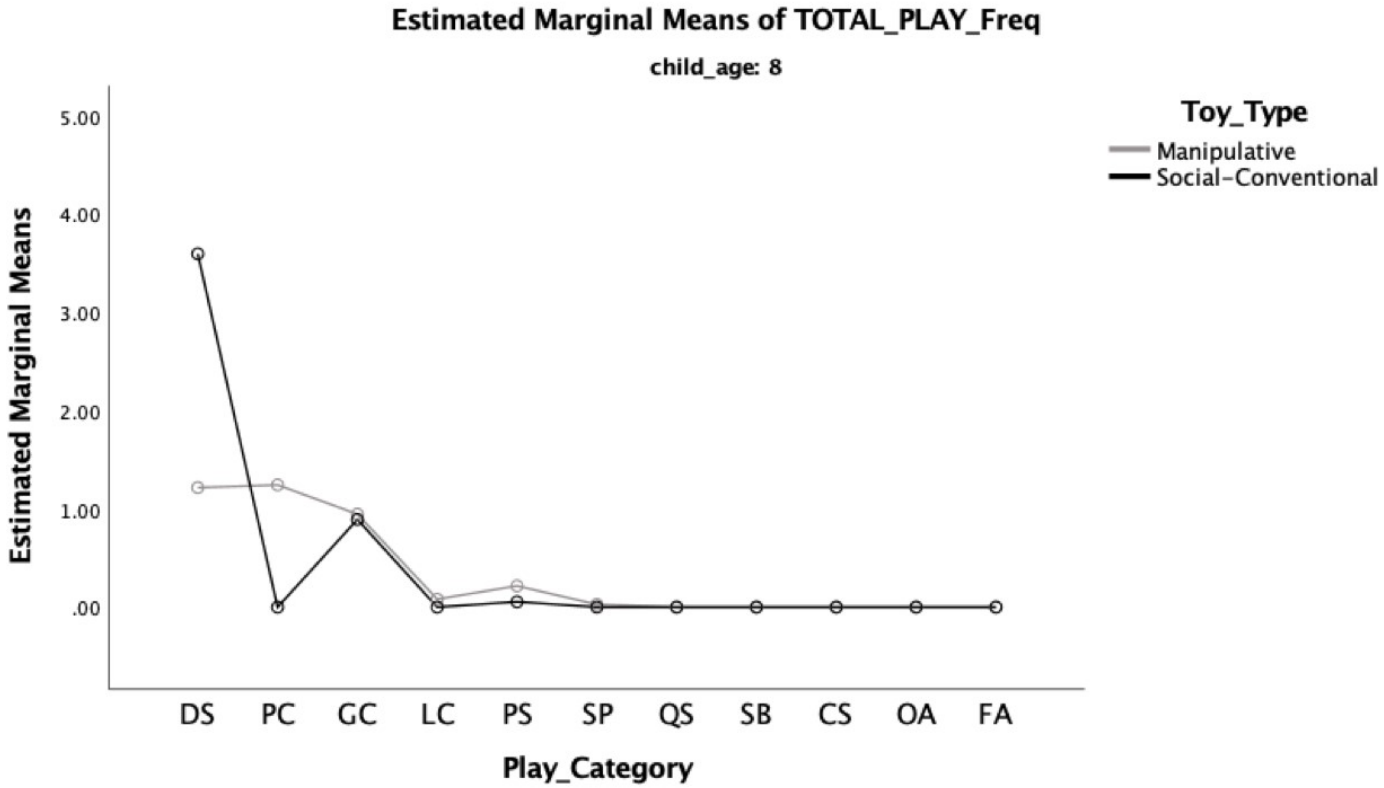

Figure 2

ANOVA plot for simple main effect of toy type within each play category for 12-month-old children

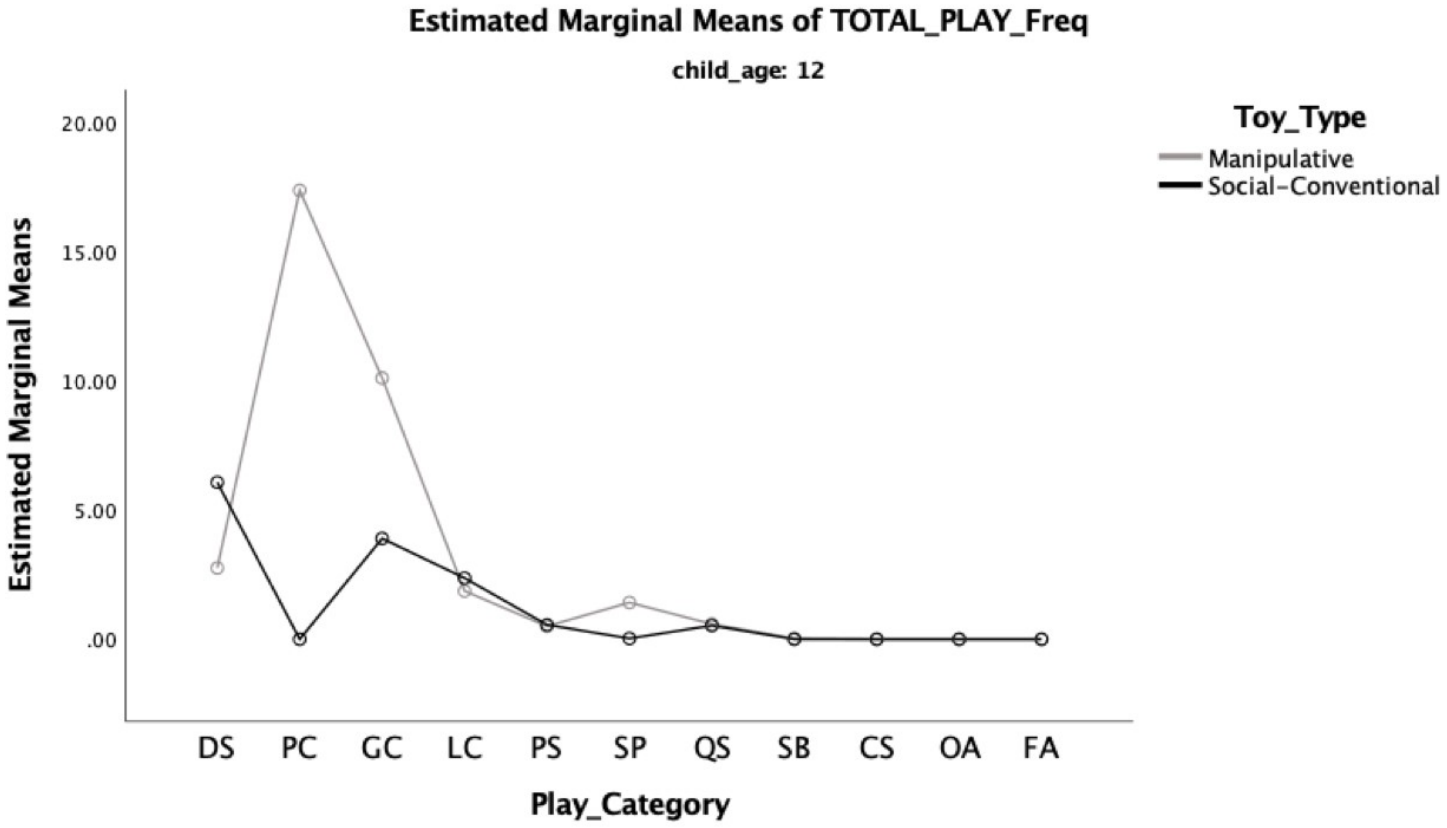

Figure 3

ANOVA plot for simple main effect of toy type within each play category for 18-month-old children

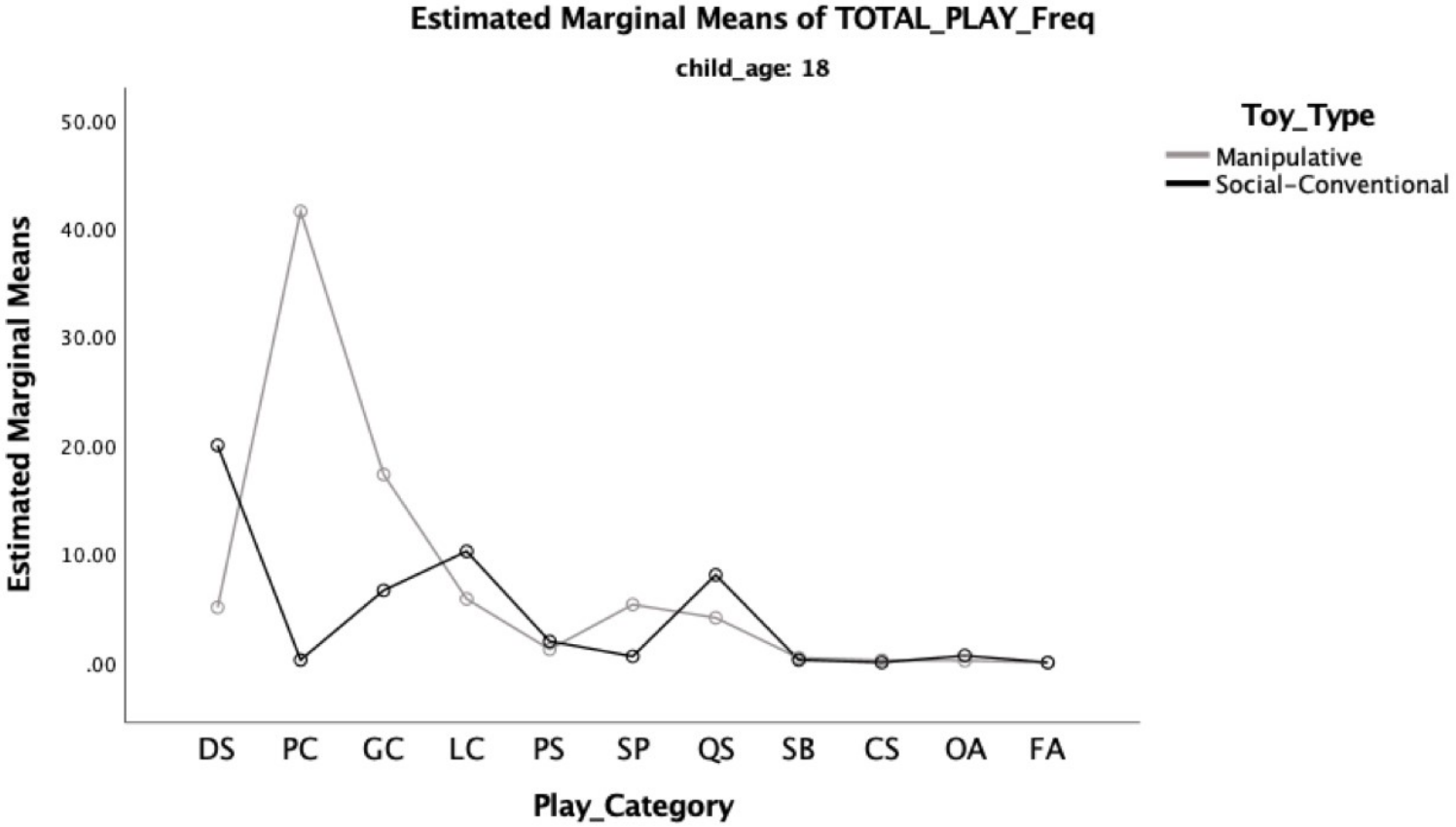

Figure 4

ANOVA plot for simple main effect of toy type within each play category for 24-month-old children

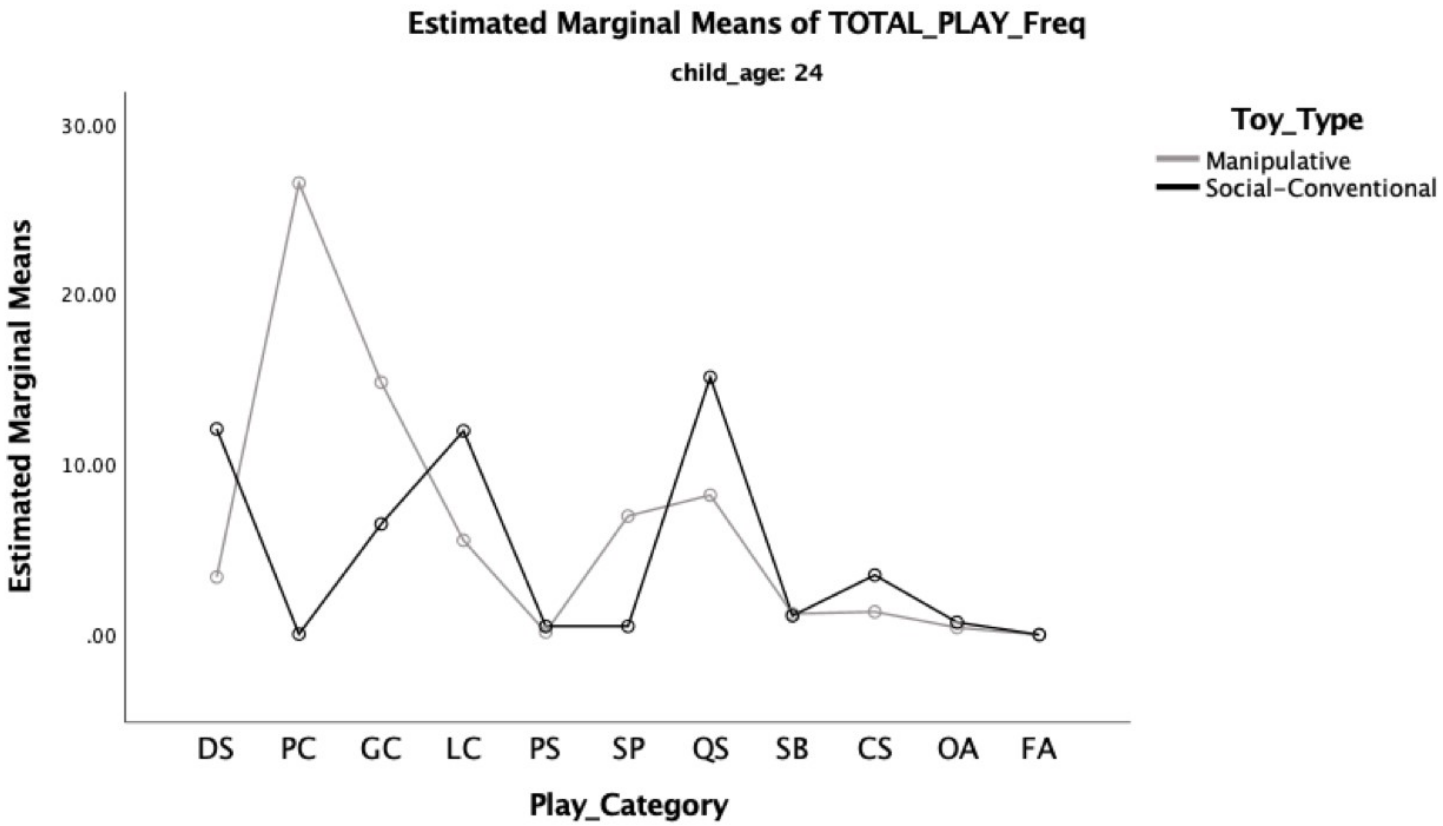

Figure 5

ANOVA plot for simple main effect of toy type within each play category for 30-month-old children

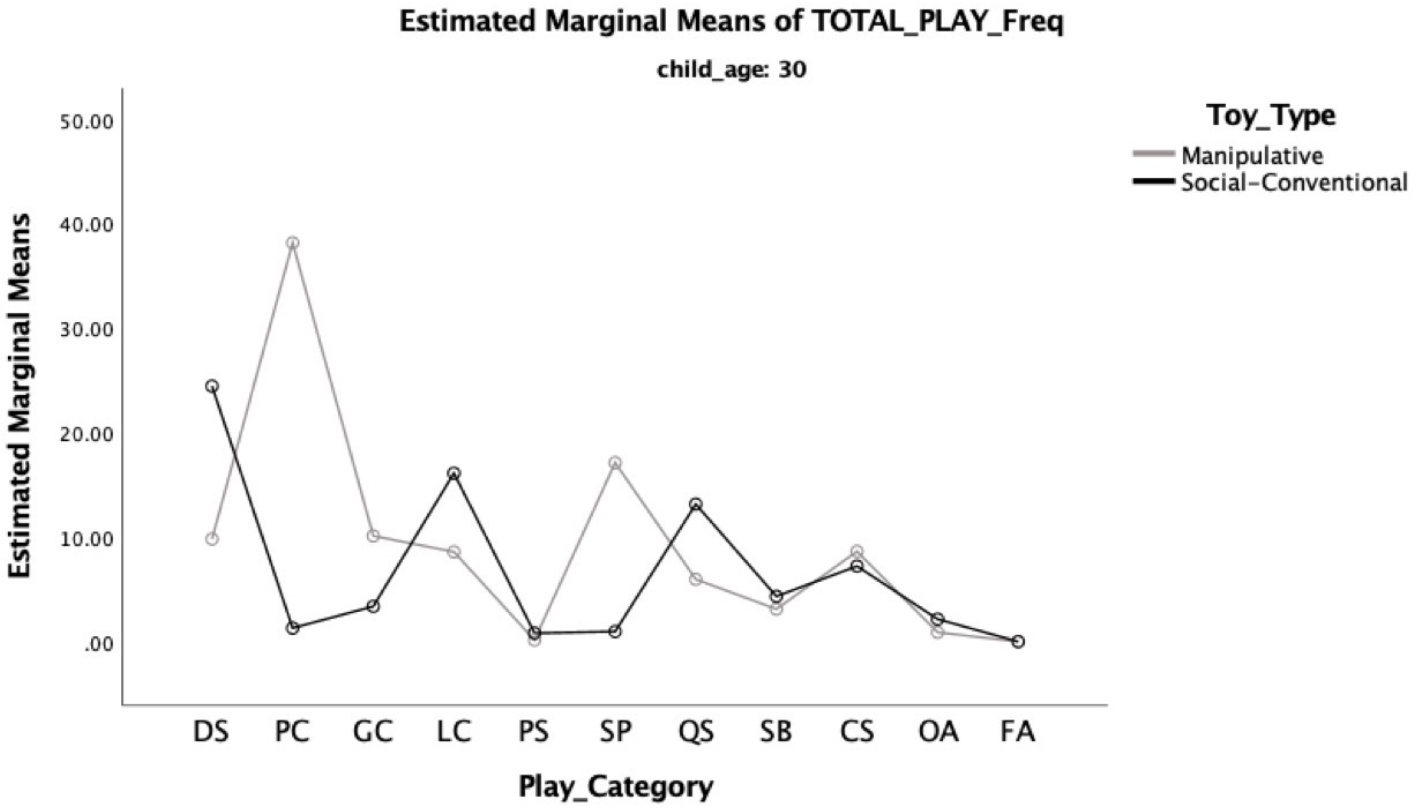

Figure 6

ANOVA plot for simple main effect of toy type within each play category for 36-month-old children

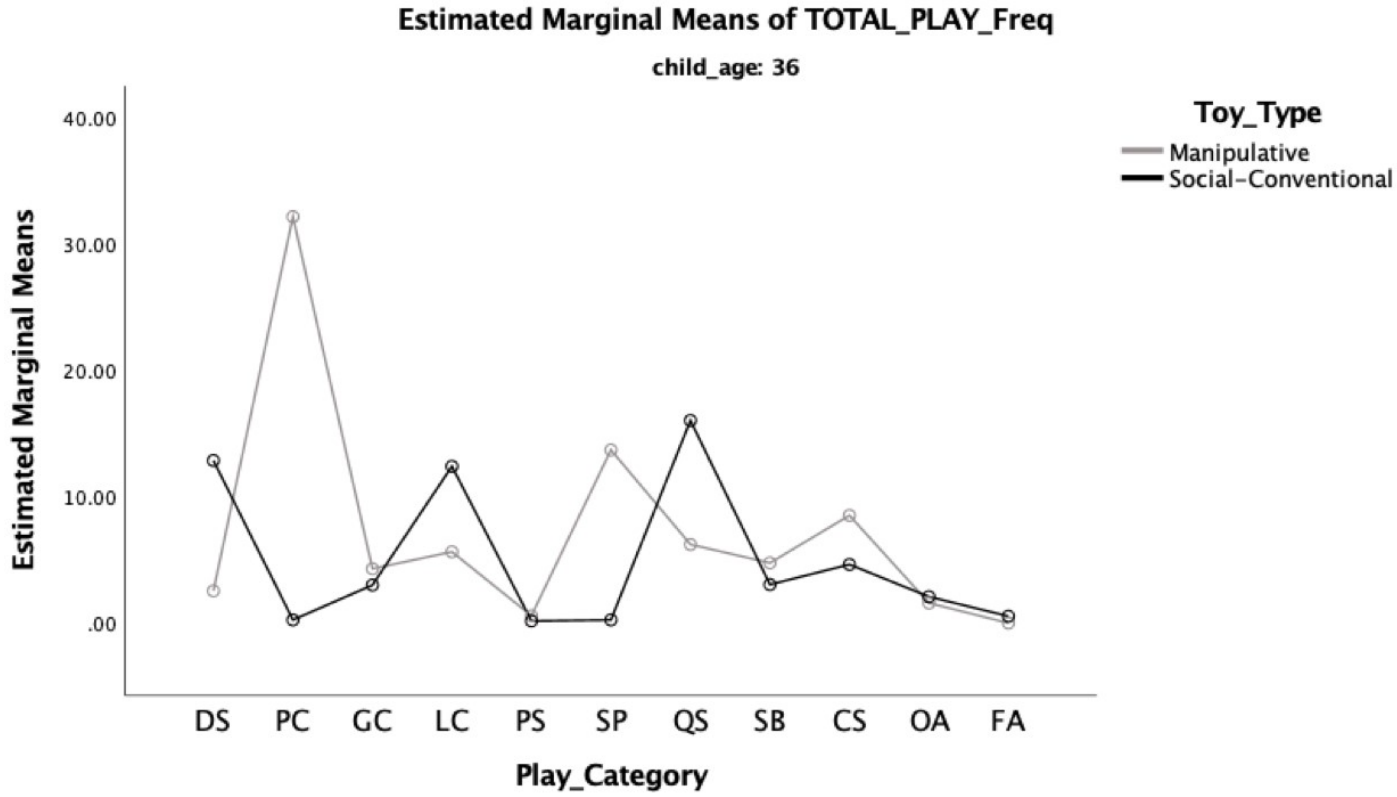

Figure 7

ANOVA plot for simple main effect of toy type within each play category for 42-month-old children

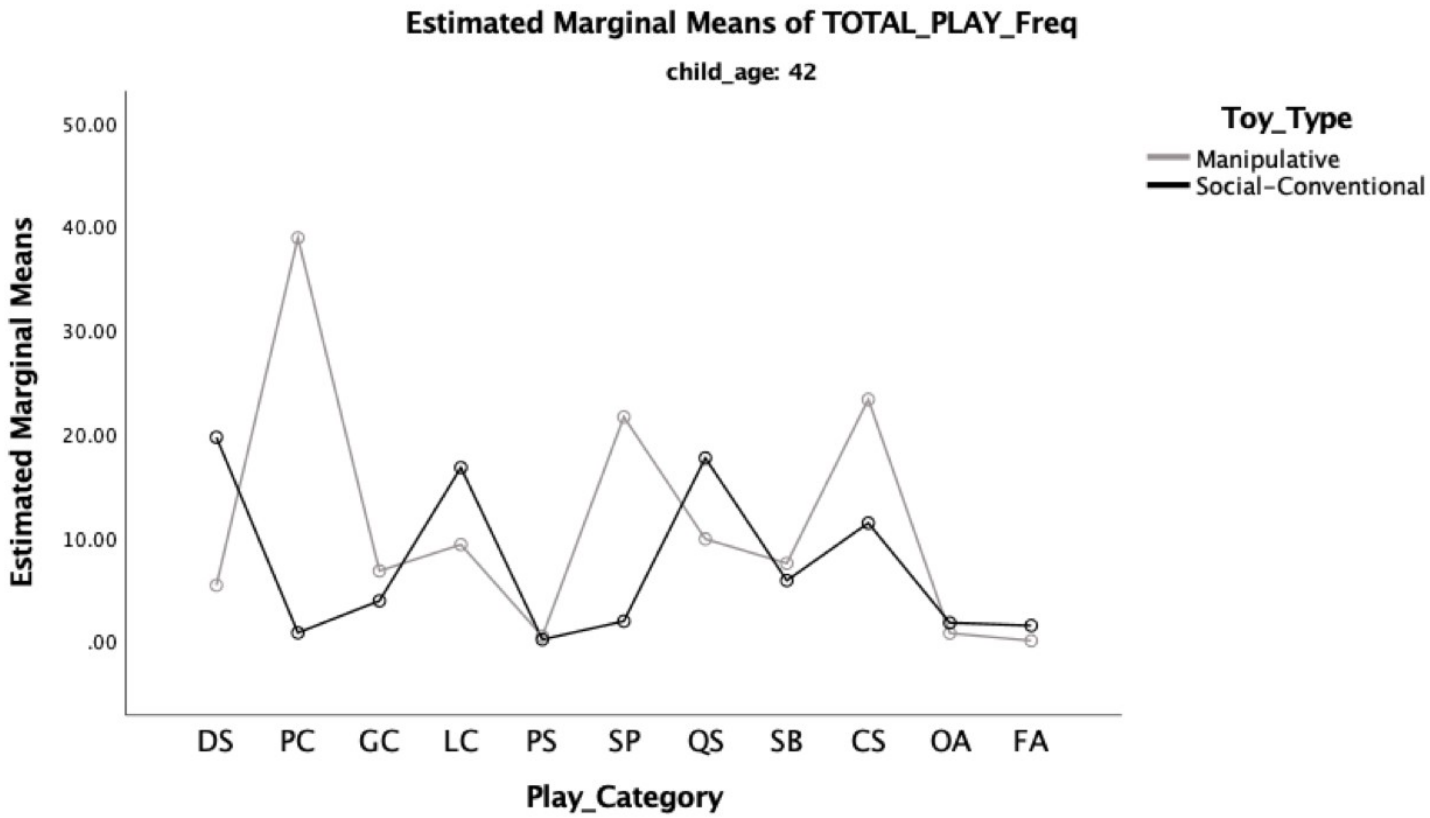

Figure 8

ANOVA plot for simple main effect of toy type within each play category for 48-month-old children

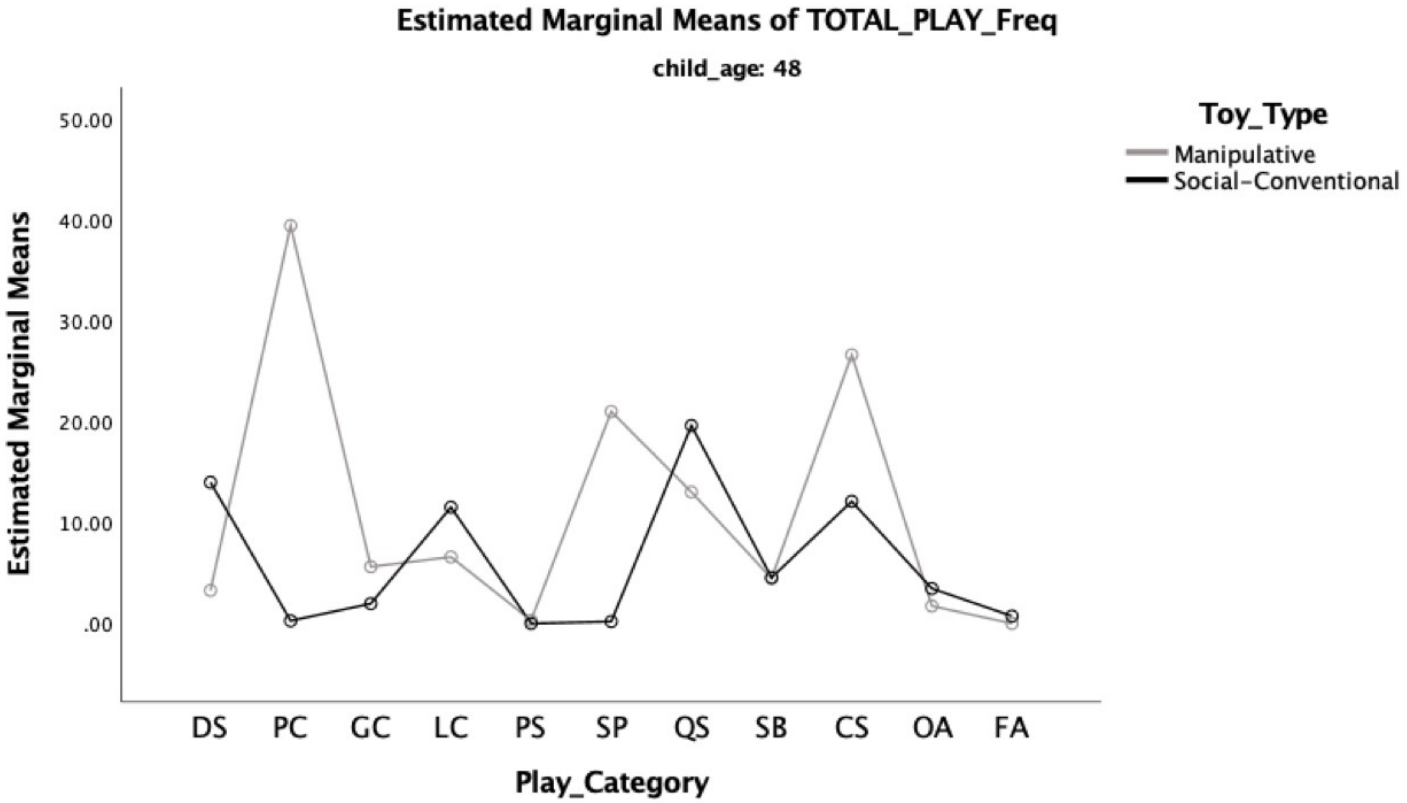

Figure 9

ANOVA plot for simple main effect of toy type within each play category for 54-month-old children

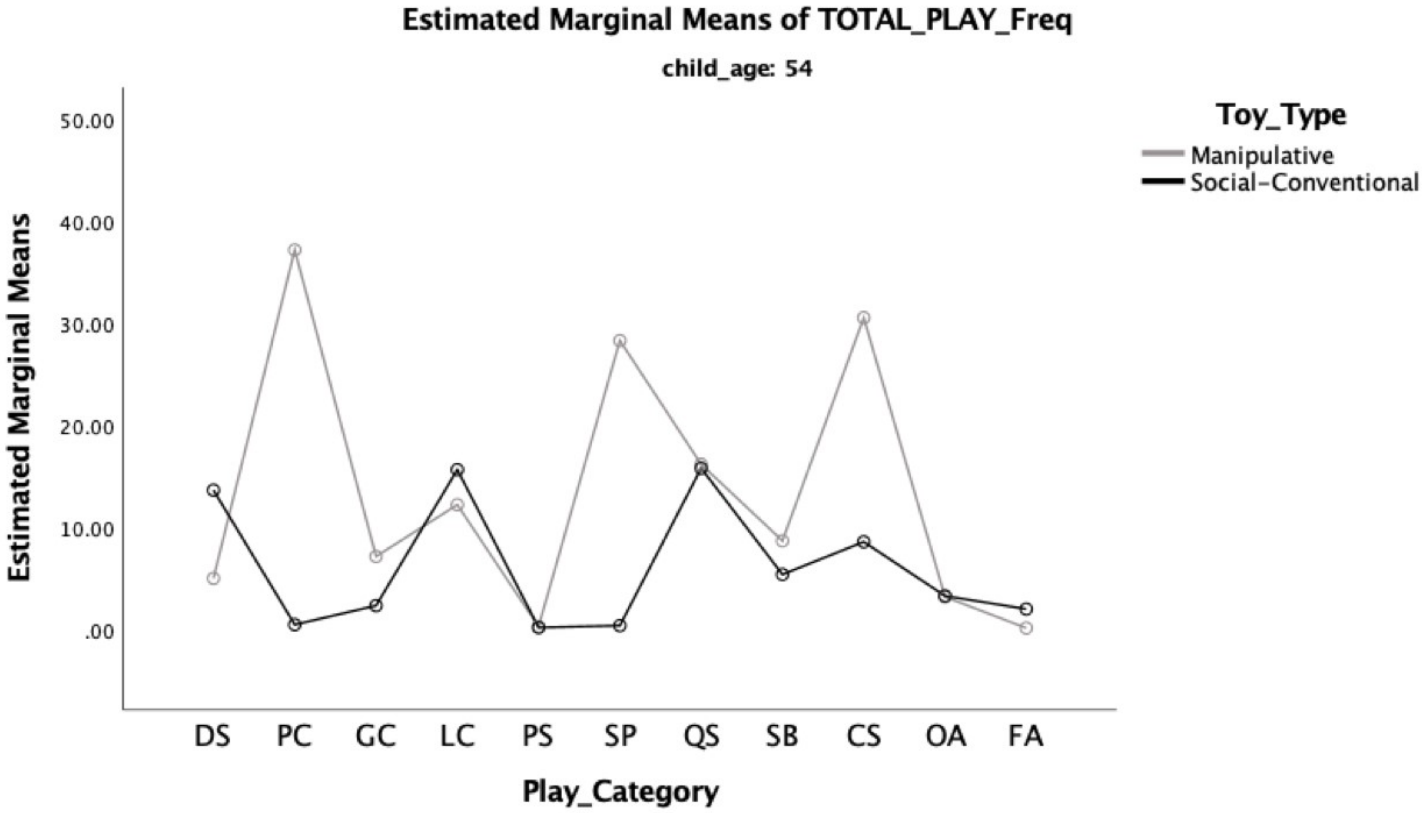

Figure 10

ANOVA plot for simple main effect of toy type within each play category for 60-month-old children

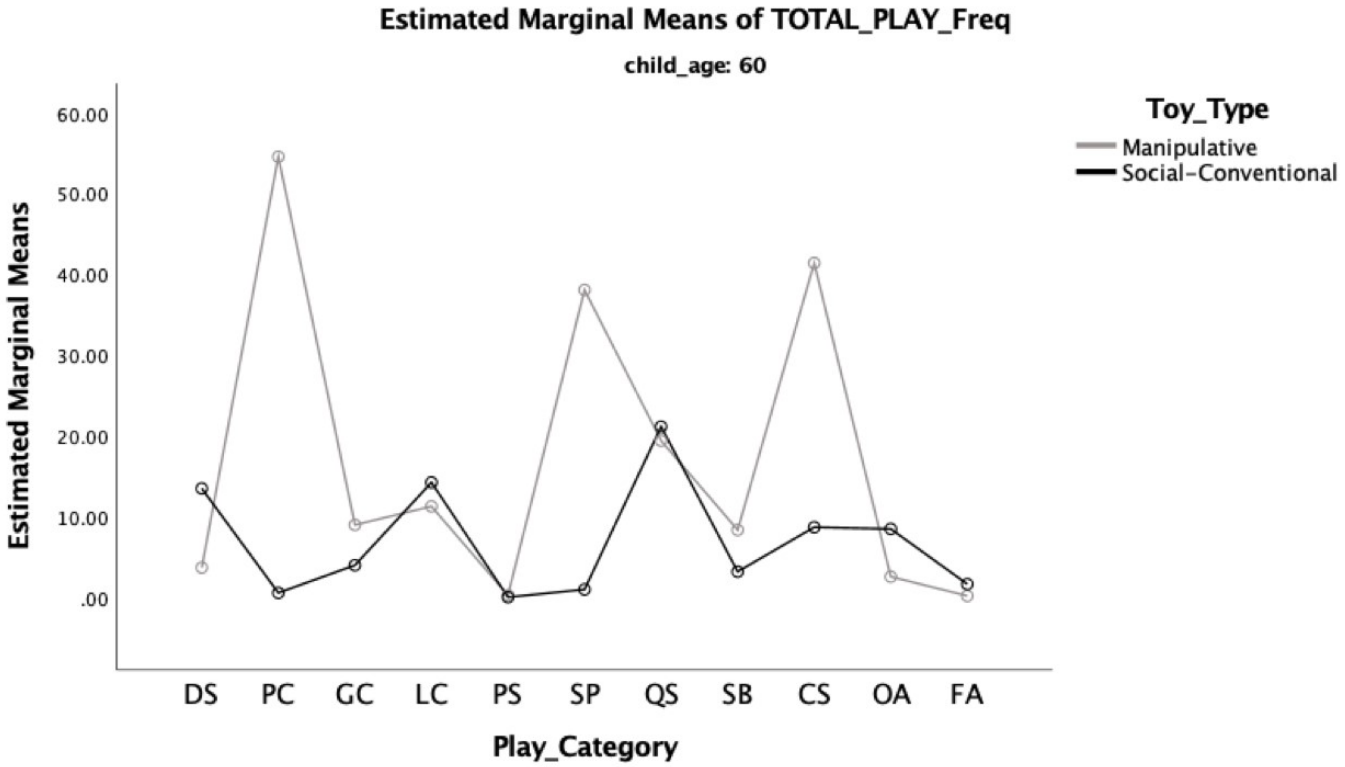

Figure 11

ANOVA plot for simple main effect of toy type between play categories for 8-month-old children

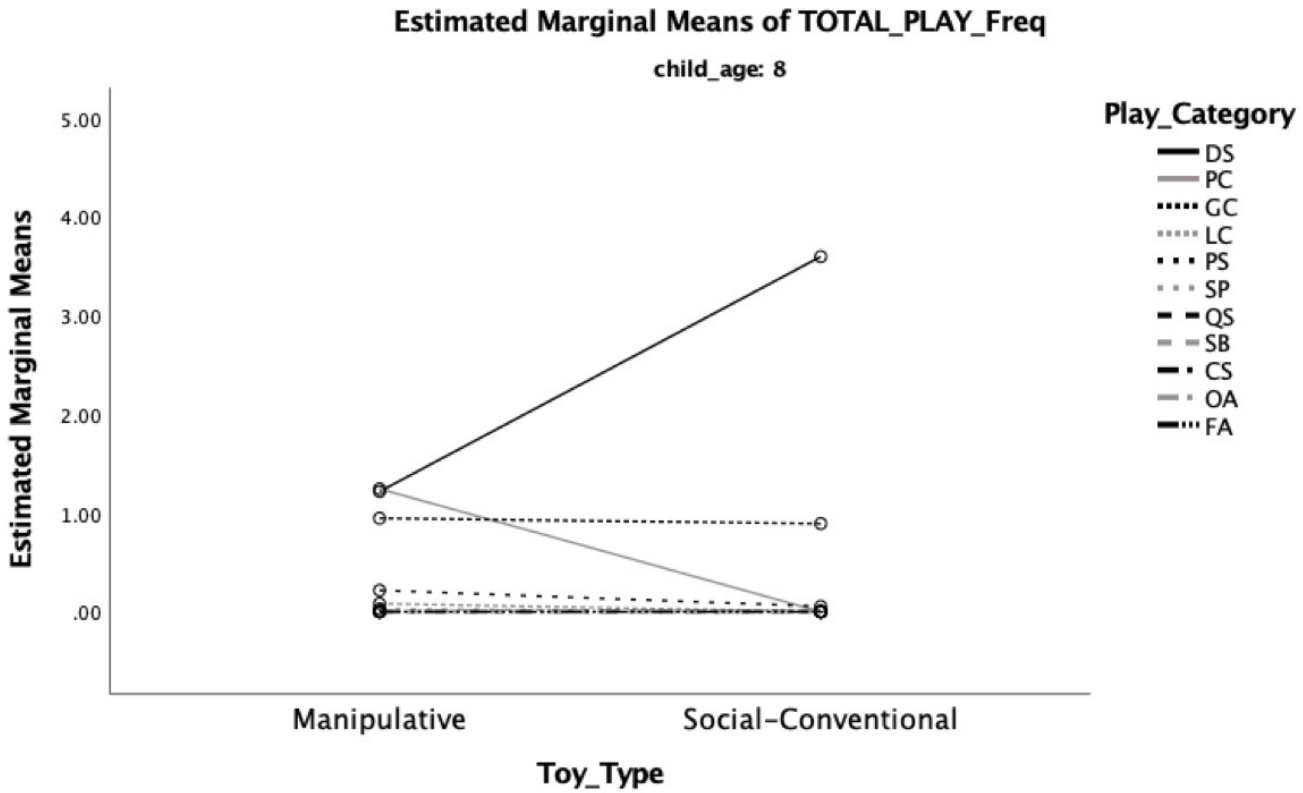

Figure 12

ANOVA plot for simple main effect of toy type between play categories for 12-month-old children

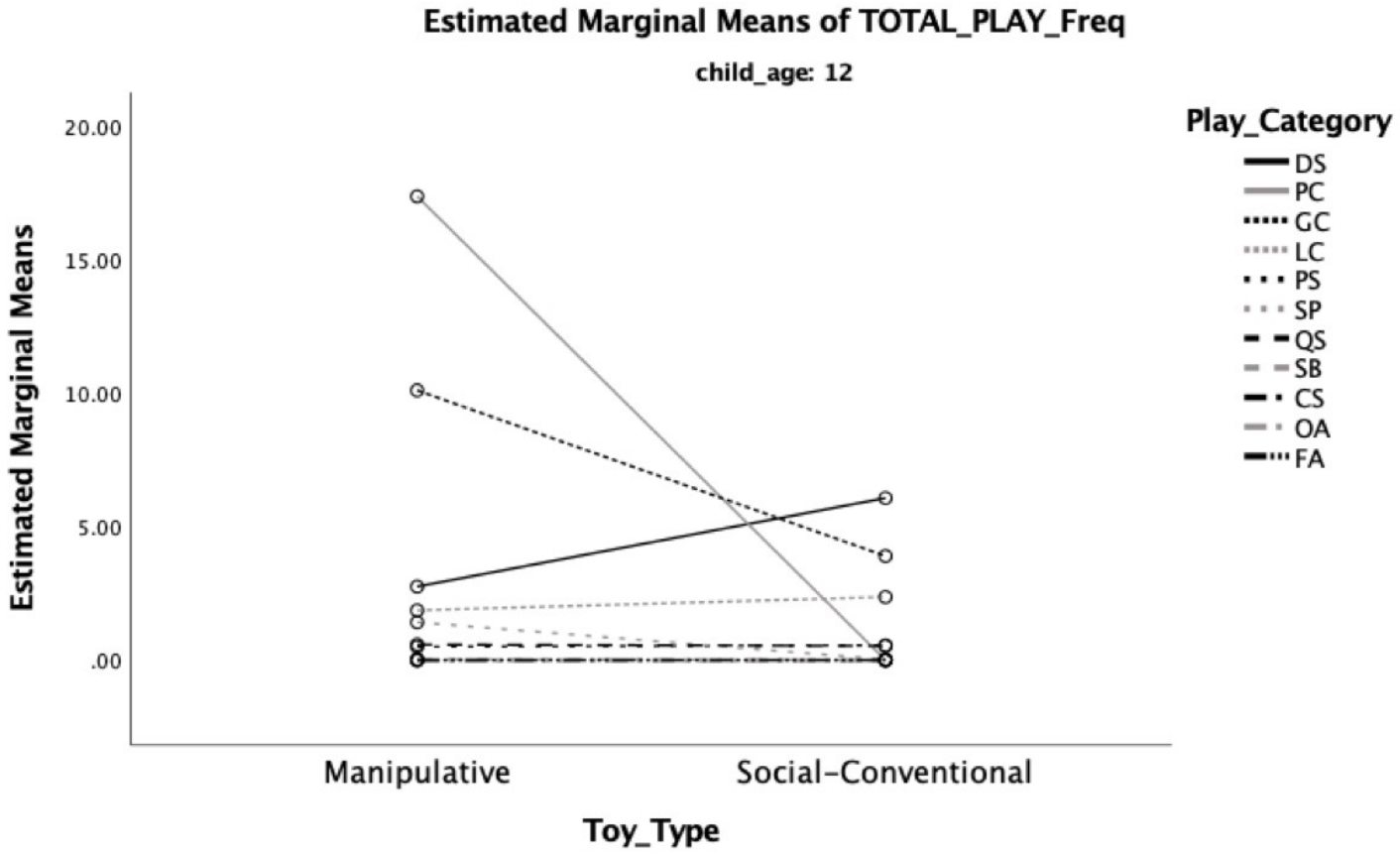

Figure 13

ANOVA plot for simple main effect of toy type between play categories for 18-month-old children

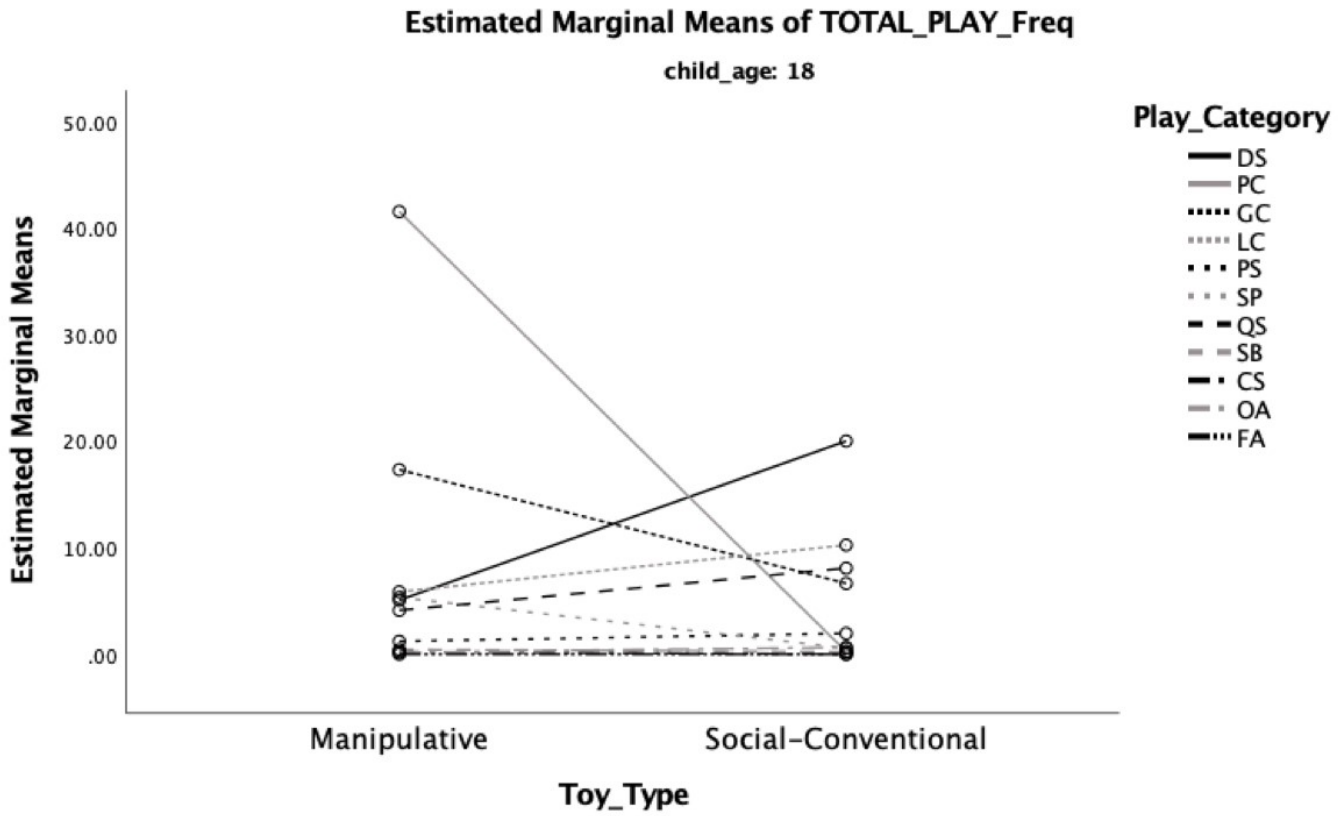

Figure 14

ANOVA plot for simple main effect of toy type between play categories for 24-month-old children

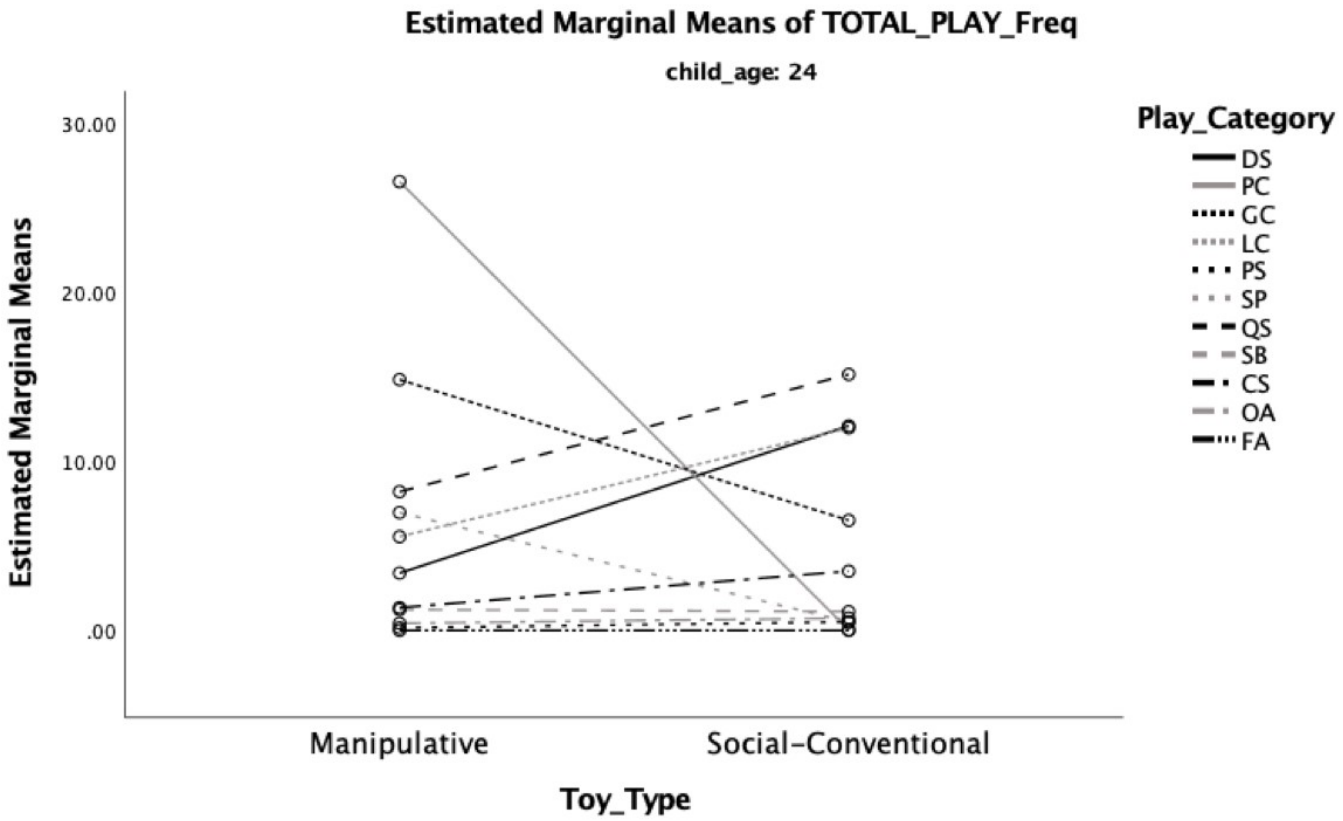

Figure 15

ANOVA plot for simple main effect of toy type between play categories for 30-month-old children

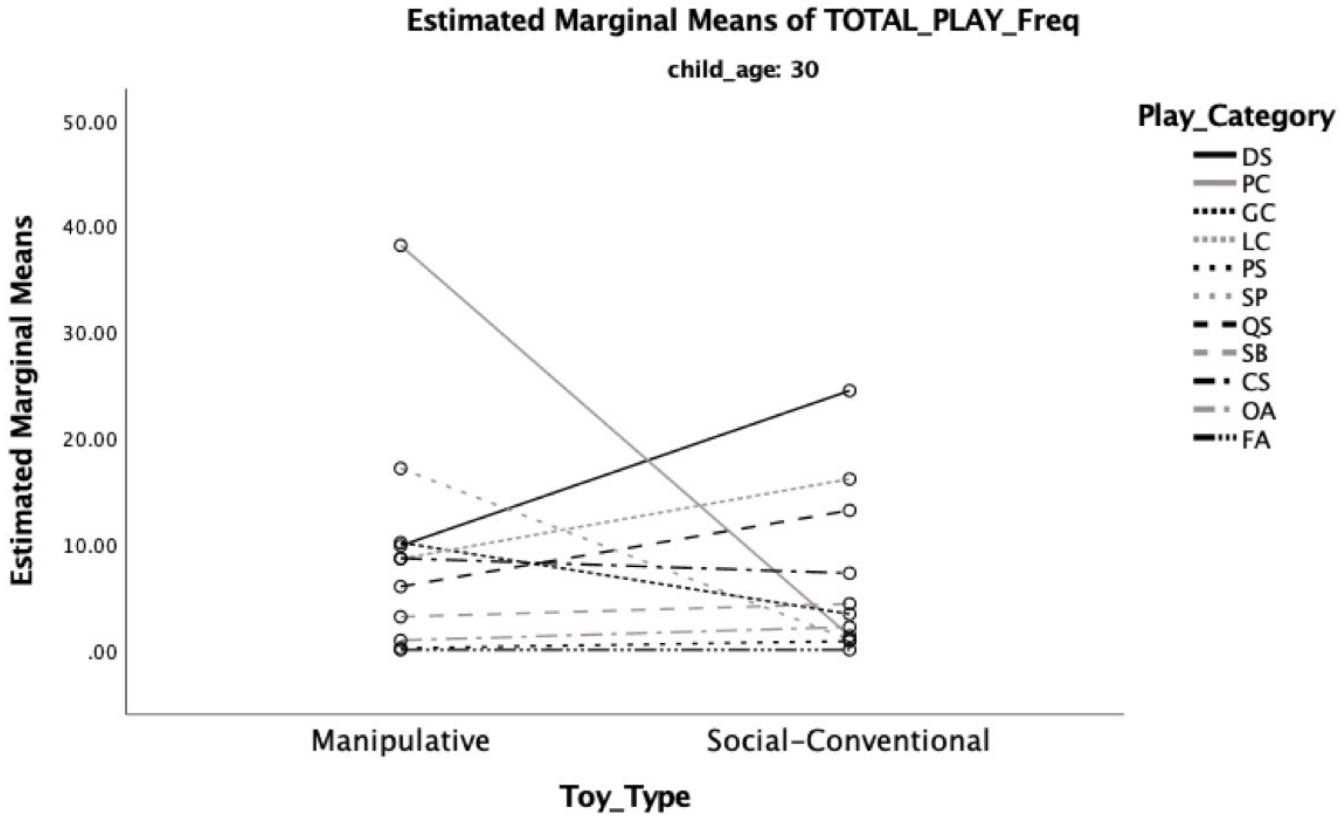

Figure 16

ANOVA plot for simple main effect of toy type between play categories for 36-month-old children

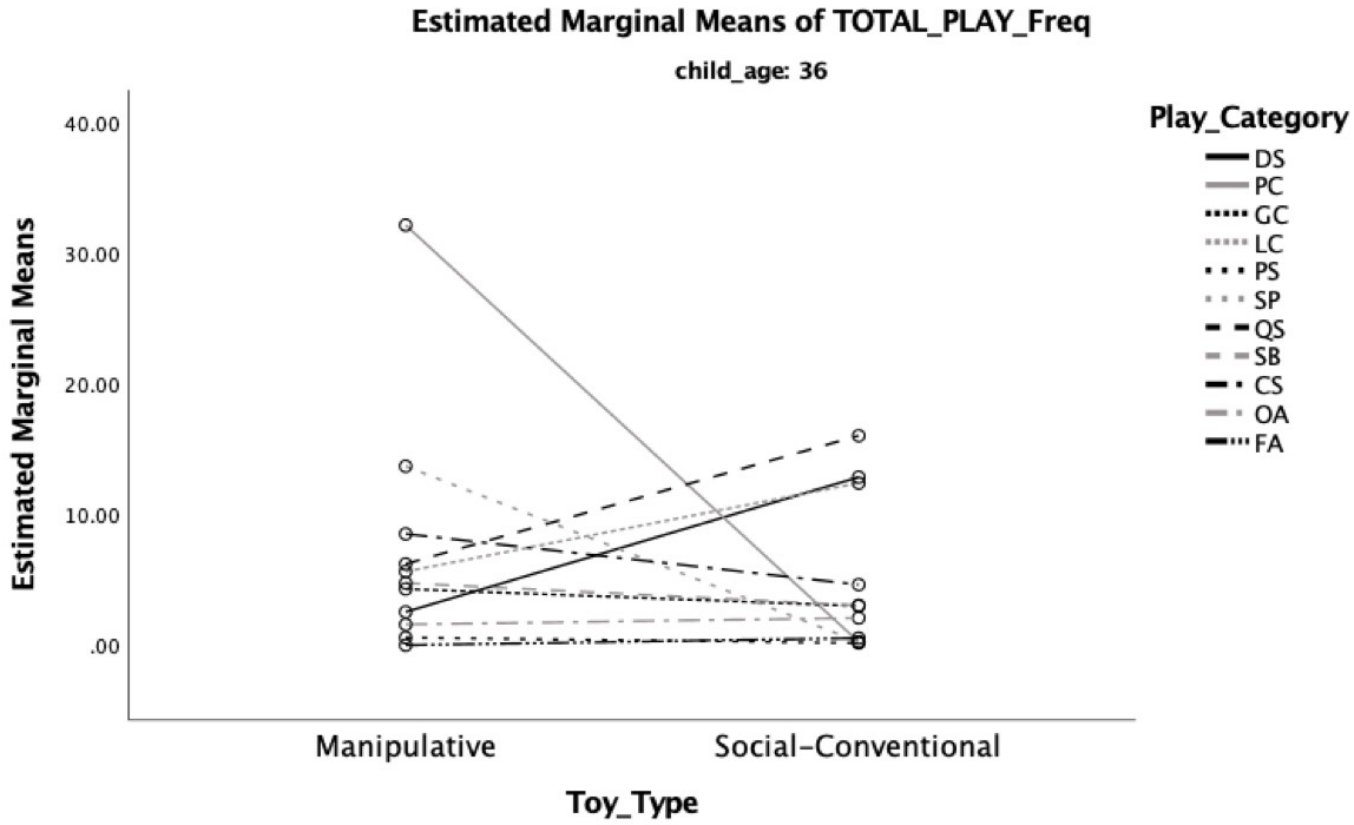

Figure 17

ANOVA plot for simple main effect of toy type between play categories for 42-month-old children

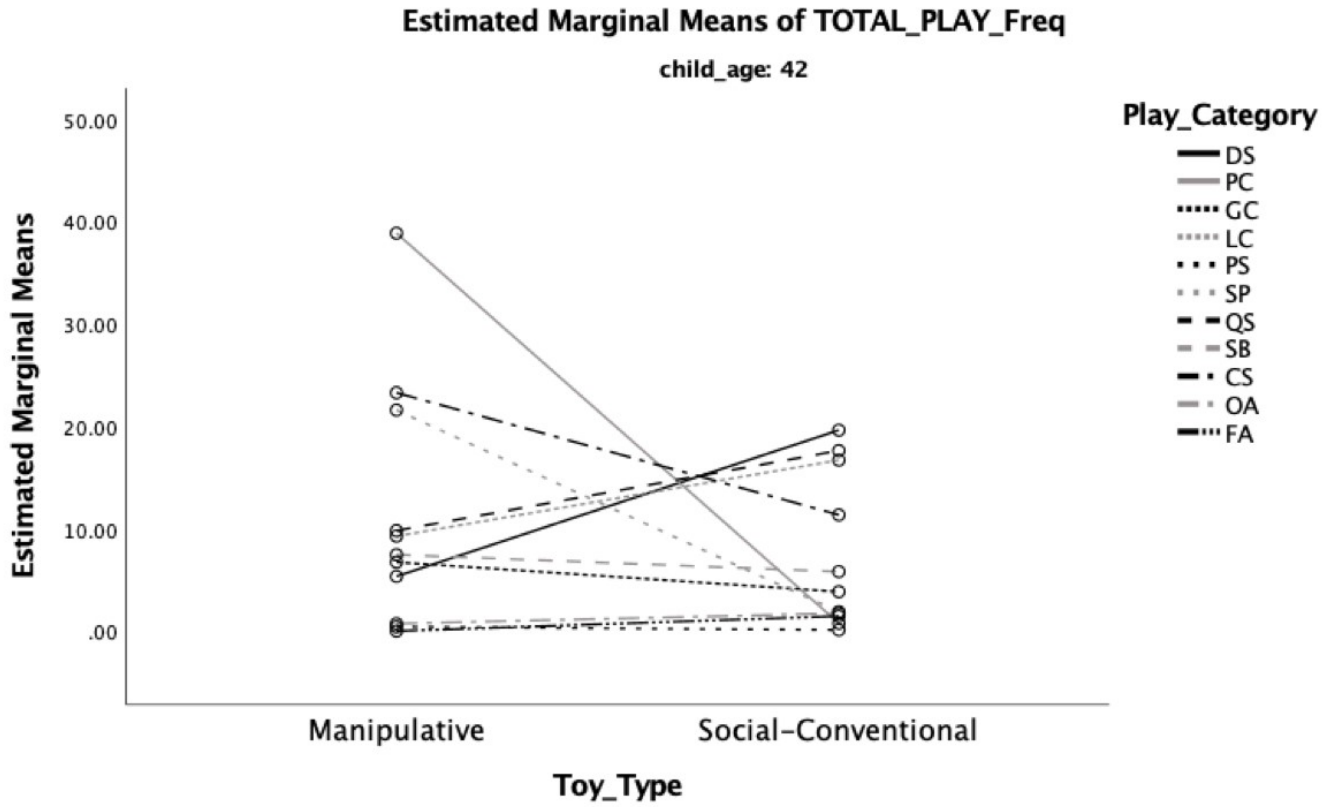

Figure 18

ANOVA plot for simple main effect of toy type between play categories for 48-month-old children

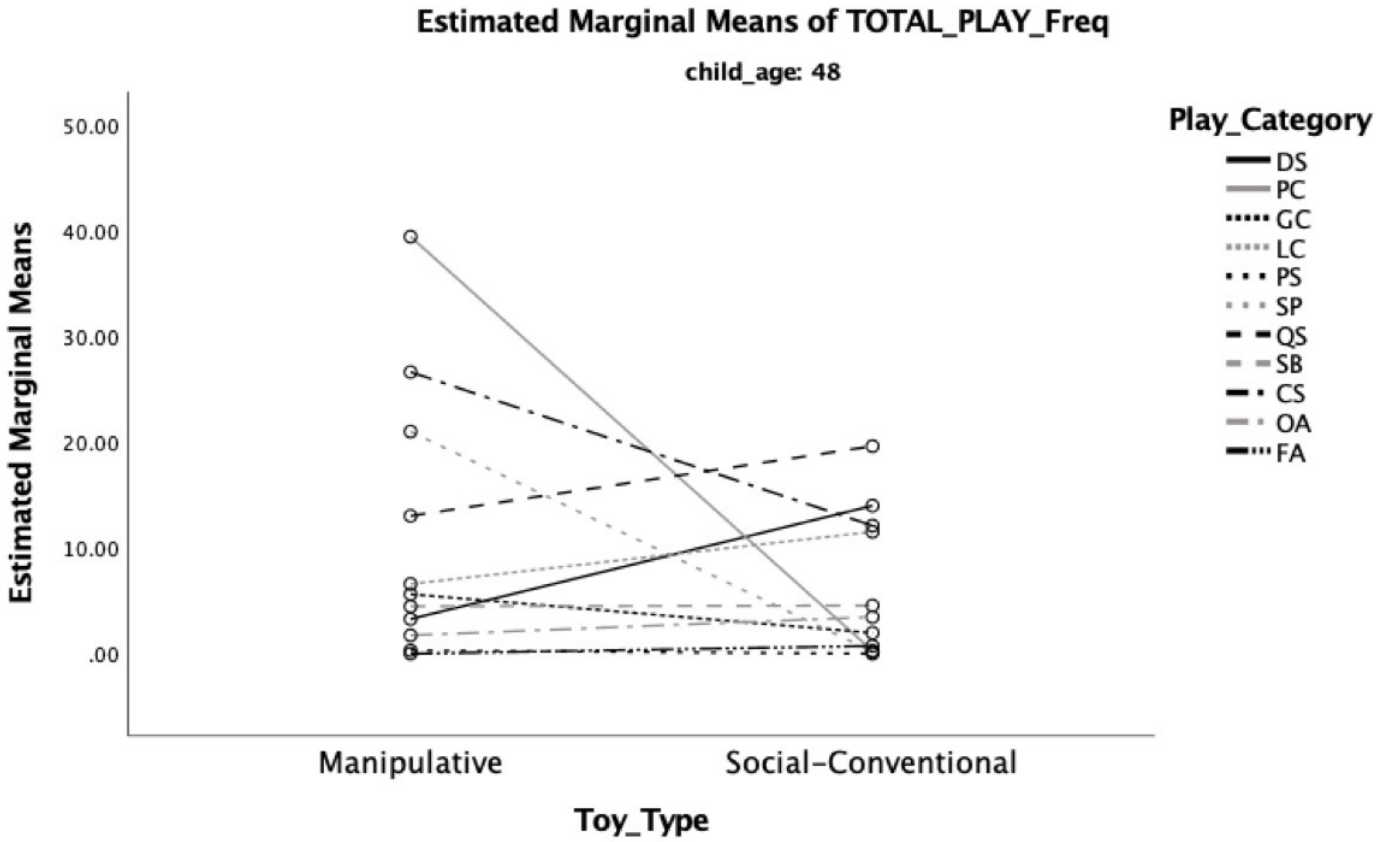

Figure 19

ANOVA plot for simple main effect of toy type between play categories for 54-month-old children

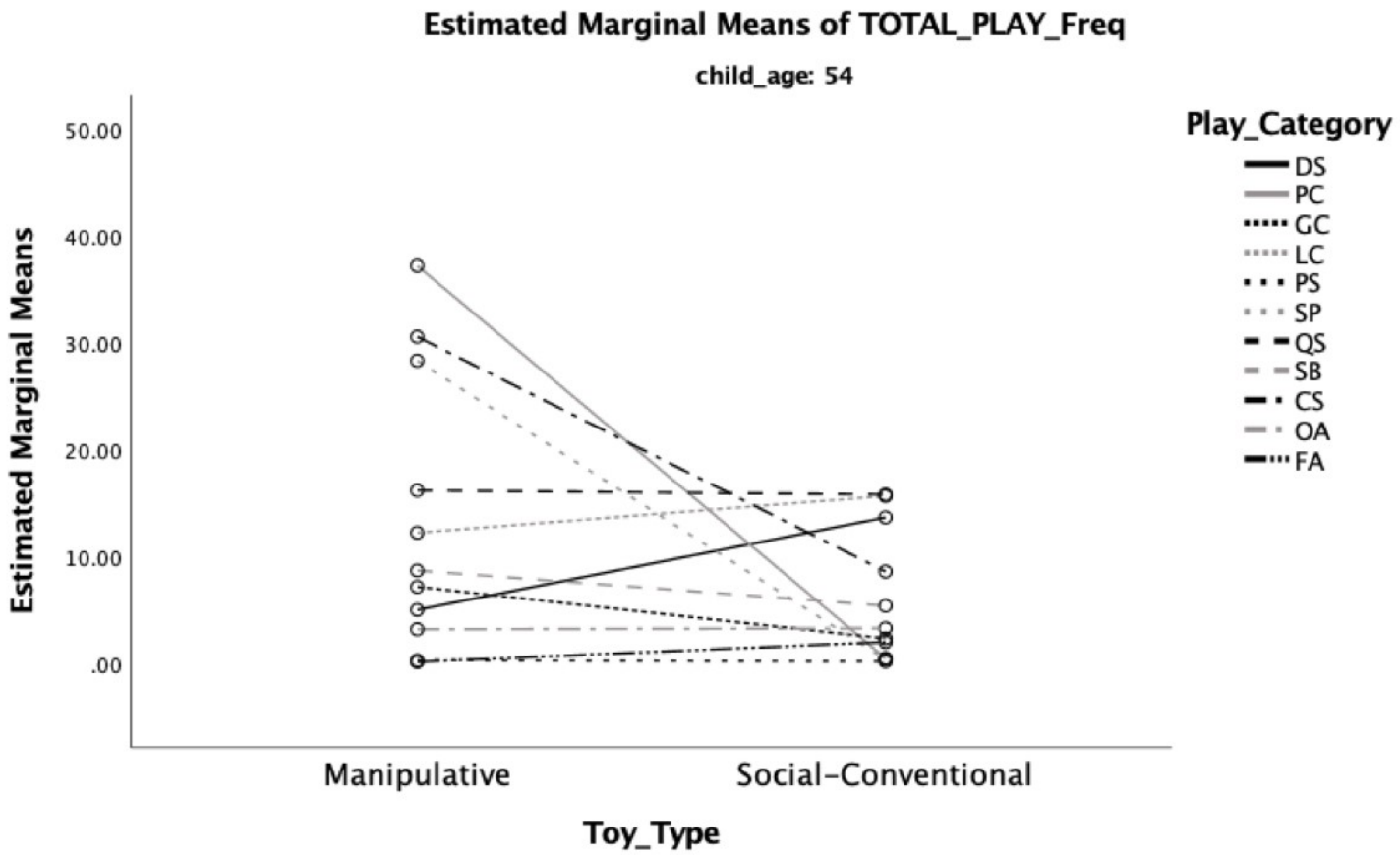

Figure 20

ANOVA plot for simple main effect of toy type between play categories for 60-month-old children