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The influence of the number of toys in the environment on toddlers' play

Carly Dauch¹, Michelle Imwalle¹, Brooke Ocasio¹, Alexia E. Metz^{*,2}

The University of Toledo, Occupational Therapy Doctoral Program, 2801 W. Bancroft, MS 119, Toledo, OH 43606, United States

A B S T R A C T

We tested the hypothesis that an environment with fewer toys will lead to higher quality of play for toddlers. Each participant ($n = 36$) engaged in supervised, individual free play sessions under two conditions: *Four Toy* and *Sixteen Toy*. With fewer toys, participants had fewer incidences of toy play, longer durations of toy play, and played with toys in a greater variety of ways ($Z = -4.448$, $p < 0.001$, $r = -0.524$; $Z = 2.828$, $p = 0.005$, $r = 0.333$; and $Z = 4.676$, $p < 0.001$, $r = 0.55$, respectively). This suggests that when provided with fewer toys in the environment, toddlers engage in longer periods of play with a single toy, allowing better focus to explore and play more creatively. This can be offered as a recommendation in many natural environments to support children's development and promote healthy play.

1. Introduction

Engagement in play begins in infancy and has beneficial effects on development. During play, children interact with the physical and social elements of the environment, allowing them to discover challenges and try new skills. This enhances child development, health, and well-being (Knox & Mailloux, 1997). Through play, children learn to interpret the world around them which in return enhances their cognitive, emotional, social, and physical skills (Brasic-Royeen, 1997; Kuhaneck, Spitzer, & Miller, 2010; Shannon, 1974; Smith & Pellegrini, 2013; Russ, 2004). Play-based learning promotes academic readiness and outcomes (Golinkoff & Hirsch-Pasek, 2008). Thus, it is important to optimize the environment in which children play (Schaaf & Burke, 1997).

1.1. Attention in toddlers

During toddlerhood, cognitive development flourishes through sensory and motor exploration. In his cognitive-developmental theory, Piaget (1952) posited that children acquire knowledge as they explore, manipulate, and imitate the environment around them. Likewise, in his psychosocial theory Erikson (1968) described toddlerhood as the period in which children become autonomous individuals as they use newly acquired cognitive and motor skills in order to make decisions. As cognitive, language, and motor skills improve, toddlers are able to engage in more sophisticated play. One cognitive skill that develops during early childhood and greatly influences engagement in age-appropriate tasks is attention. Attention allows an individual to gather information about and sustain engagement with a target. According to a model presented by Ruff and Rothbart (1996) control of attention shifts from being

* Corresponding author.

E-mail address: alexia.metz@utoledo.edu (A.E. Metz).

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² This author is the principal investigator with the role of study design, personnel training, statistical analysis, and composition of the final manuscript.

exogenous to endogenous across development. During infancy, target selection and maintenance of attention are dominated by the characteristics of external stimuli, such as proximity and novelty, and engagement is characterized by *looking*. In toddlerhood, target selection can reflect children's interest, curiosity, and goals. With advances in motor skills, object manipulation becomes an indicator of toddlers' engagement. Building on their past experiences, toddlers become capable of developing a plan of action for engaging with objects, and subsequently, maintaining fidelity to carrying out to their plans increases the length of time they sustain attention (Ruff & Lawson, 1990). Target selection and sustained attention, however, can be prone to distraction. In the presence of competing stimuli, toddlers spend more time on behaviors indicative of target selection than on object exploration and goal-directed actions, and their engagement can be disrupted (Kannas, Oakes, & Shaddy, 2006; Ruff & Capozzoli, 2003). Children under three years of age, remain vulnerable to distractions, particularly for objects that are near, novel, responsive, interesting, and/or personally meaningful (Lane & Pearson, 1982; Vaughn, Koop, & Krakow, 1984; Wachs, 1989).

In preschool, inhibitory control emerges in which children can intentionally override their orienting responses to sustain attention in the presence of distractions (Ruff & Lawson, 1990). This is facilitated by progression in cognitive skills such as language, problem solving, and memory, but remains effortful and metabolically taxing (Reynolds & Richards, 2008; Vaughn et al., 1984). In longitudinal studies Gaertner, Spinard, and Eisenberg (2008) and Graziono, Calkins, & Keane (2011) demonstrated that attention increases with age, but also that there is continuity of attentional skills. Children with better attentional skills at younger ages maintain this advantage later, suggesting that individual differences in attention may be present at a young age and stable across time. Because of the importance of attention in academic success, interventions have been developed to enhance attentional capacity. Wass, Scerif, and Johnson (2012) examined responsiveness of attentional control to intervention strategies. The researchers analyzed 37 studies of attentional control and working memory. They concluded that increasing attention in a substantial way is difficult; however, training studies have been more successful with young participants. This is significant because attentional control deficits are believed to cause cascade-like learning impairments in other areas; therefore, interventions targeting attentional control early in development may minimize the risk and/or impact of attention deficits later.

1.2. Play in toddlers

During the toddler phase, play is very distinctive (Knox, 2008). Young toddlers use their mobility to engage in independent play that allows them to move freely in their environment. Manipulation of objects is a common aspect of play (Pellegrini & Smith, 1998). Toddlers use pretend play and start to imitate others. They know what common objects are used for and tend to use those objects in play. They may engage in pretend use of the objects on their own, with others, and in combination with other things such as household items and toys. In later stages of toddlerhood, the same skills are utilized but in a more advanced and developed way. Toddlers become more social and interested in what their peers are doing which results in play alongside other children.

The play materials, most commonly toys, are an important feature in the play experience (Trawick-Smith, Wolff, Koschel, & Vallarelli, 2015). The developmental level of the child, the interest the child has in the toy, the availability of the toy, and the impact of cultural beliefs are key factors that aid in the selection of toys (DuBois, 1997). Incorporating the right toys at an early age may help promote development and, therefore, decrease the chances of developmental delays. Characteristics of the toy can encourage development in several domains, such as cognition, social skills, and fine and gross motor skills. Toys that include multiple parts, are lightweight with contrasting colors and textures, and offer multiple responses, often elicit the most successful play (Lane & Mistrett, 2008). Saracho and Spodek (1998) suggest a balance between familiar and novel toys, as well as careful monitoring that the number of toys in the environment promotes play. They propose that fewer toys may allow for deeper, sophisticated play, because of the opportunity to become creative with each object in the environment. Parents carefully consider what toys they provide their children. Pierce (1999) interviewed mothers regarding the toys and other play objects available to toddlers in their homes. Results indicated that mothers preferred to provide play items that they considered to be educational. Most toys came into the home as a result of mothers' purchases at a toy store. Play items also came into the home by family friends and relatives during gift giving events such as children's birthday or during holidays. National sales and spending data provide insight into the value placed on providing toys for young children. The Toy Association (2013) reported that in 2013, Infant/Toddler/Preschool toy sales in the United States rose 3%, totaling 3.1 billion dollars. For that same year, Statistica (2013) reported that an average of \$371 was spent on toys per child.

Manners of play, or the variety of different ways in which a child plays with a single toy, reflects perception, cognition, motor coordination, and ideation. With age, children become better able to initiate play on their own and begin to increase the creativity and sophistication in their play (Knox, 2008). However, growth in these areas is experience dependent and shaped by opportunities in the environment. The affordances of an object include all the opportunities it presents for interaction with it (Gibson, 1979). Affordances reflect the physical characteristics of an object. For example, a bucket has several affordances: the sides and bottom create a space that can be filled and emptied, or held to the face to speak into, or turned upside down to stand on; and the handle allows it to be picked up to be carried from place to place or swung from side to side. To be taken advantage of, affordances must be perceived. Acquiring perception requires exploration (Gibson, 1979; Thelen 1995). When exploring an object, manners of play may vary. A user may trial and adjust actions according to affordances discovered, progressing from simplistic interactions to sophisticated tasks (Thelen, 1995). In this way, discovery of affordances can promote development. Distraction away from exploration with a toy may limit the opportunity to explore its affordances, resulting in more simplistic play.

1.3. The effect of the environment on attention and play

Along with the specific toys that toddlers interact with, the environment can also be a factor that can influence children's

behaviors, including play (Wachs, 1989). Features of the environment that need to be taken into consideration include the influence of other individuals, sensory stimulation, other objects, and the flexibility and safety of the space (Skard & Bundy, 2008). The environment should allow a child to explore and to have fun within appropriate limits. While observing the play environment toddlers were placed in, Pierce (1999) found that mothers promoted independent play of their toddler by enclosing them in a safe area with a toy box or table. The toddler's toys were placed at eye level so the available toys for play could be seen. Mothers also incorporated novel objects into the environment and allowed their toddlers to explore new spaces. In addition to supportive features of the play environment, elements that might detract from engagement in play need to be considered. Although toddlers are able to sustain attention during play that is highly motivating and/or directed by others (Graziano et al., 2011; Reynolds & Richards, 2008), their play may be disrupted in environments that present distraction (Akshoomoff, 2002; Ruff & Lawson, 1990). This has been suggested through studies that have examined the effects of background television on play. Courage et al., Courage, Murphy, Goulding, and Setliff (2010) and Schmidt et al. (2008) demonstrated that infants and toddlers are distracted from toy play by background television resulting in shortened episodes of play. As much as individual toys can promote rich interactions and support development, an abundance of toys in the environment may create a similar distraction. Vlietstra (1979) reported that preschool children persisted in a task introduced by an adult longer when there were fewer distracting toys available. As object play is common for toddlers (Pellegriani & Smith, 1998) and parents strive to supply ample toys for children to play with (Arnold, Graesch, Ragazinni, & Ochs, 2012; Pierce, 1999), the presence of toys in children's microenvironment (Wachs, 1989) should be assessed for its effects on play. In a consumer satisfaction study, marketing researchers Bjorklund and Bjorklund (1979) examined the effects of the toy environment on toddlers' engagement in play. Within a counterbalanced research design, 24 toddlers engaged in free play for 10 min under three conditions: with three, 12, or 21 toys present. As their primary finding, the researchers reported that the toddlers engaged in longer periods of play in the three-toy condition, with no differences between the 12- and 21-toy conditions. The researchers did not analyze differences in the sophistication, as measured by manners of play, as a result of changes in the number of toys present. The researchers included toys from three distinct categories (responsive: those that emitted sounds and/or visual stimuli upon manipulation, organizational: those that were made of several components with specific spatial relationships to one another, and symbolic: those used for pretend play) as an independent variable in the study. They did report differences in the number of manners in which toddlers played with toys per contact according to toy category, finding that toddlers played with a greater variety of manners with toys in the organizational category. However, they did not report whether manners of play differed according to the number of toys in the environment as a main effect.

If the growth in the toy industry has resulted in an increase in the number of toys in the average home, this could present persistent distraction, influencing the quality of toddler play. The purpose of the current study was to further examine the effect of the number of toys in the environment on the quality of toddlers' play. Several modifications were made from Bjorklund and Bjorklund's methods. As Bjorklund and Bjorklund reported no differences in the duration of play between the 12- and 21-toy conditions, we used only two toy conditions: one with few toys (four) and one with many toys (16, between the levels used by Bjorklund and Bjorklund). We revised the category of toys to reflect contemporary toy sales figures (Little & King, 2010). Finally, we examined the effect of the number of toys in the environment on the sophistication of play as measured by the variety of manners of play. This study used a sample of toddlers, aged 18–30 months (two years plus/minus six months). Participants engaged in two different conditions of toy play: *Four Toy* and *Sixteen Toy*. Play was examined for a 15-minute portion of a free play session that lasted up to 30 min. We tested the hypothesis that an environment with fewer toys will lead to higher quality of play, as indicated by a) sustained play measured by fewer toy play incidences with longer durations and b) more variety in the manners of toy play.

2. Method

This study was approved by the Institutional Review Board of the University of Toledo. This study used an experimental counterbalanced design. Each participant experienced two conditions of toy play that were presented in random order. Each session was video recorded to maintain fidelity to the procedure and for offline data analysis.

2.1. Participants

The population for this study included a convenience sample of toddlers between the ages of 18 and 30 months. To be eligible for participation in this study, toddlers had to be healthy per caregiver report, and the caregivers of the toddlers had to be of adult age. Toddlers were recruited through word of mouth, by flyers and social media postings, and at community child care facilities.

Parents/caregivers were asked to complete questionnaires to provide information about the child's age, gender, and race and the family's socioeconomic status. The questionnaire also included questions about the number and ages of siblings in the home, whether there were dedicated play space(s) for the toddler in the home, the estimated number of toys accessible to the toddler, with whom the toddler played with, and the toddler's favorite toys. Socioeconomic status (SES) of each family was determined by using the Hollingshead Four Factor Index of Social Status (Hollingshead, 1975) which ranges from a low score of 8 to a high score of 66.

2.1.1. Battelle developmental inventory

To establish that participants had typical developmental status, each toddler was assessed using the Battelle Developmental Inventory (Newborg, Stock, & Wnek, 1988). The Battelle Developmental Inventory (BDI) is a standardized assessment that tests for developmental strengths and weaknesses in children from birth to eight years of age in five domains: personal-social, adaptive, motor, communication, and cognitive. Each domain consists of test items that can be further categorized into a variety of skill areas to

Table 1
Participant Characteristics.

Characteristic, n = 36	
Age (months)	23.8 ± 3.9, (range, 18–30)
Gender	Male, n = 9; Female, n = 27
Race	White, n = 34 Black or African American, n = 1 White, Black or African American, n = 1 Not of Hispanic, Latino, or Spanish Origin, n = 34 Of Hispanic, Latino, or Spanish Origin n = 2
*Family socioeconomic status score	48 ± 12
*Battelle z score	Personal-Social 1.1 ± 0.8 Motor 0.6 ± 0.8 Cognitive 1.1 ± 0.9
Siblings	None, n = 17 One, n = 12 Two or more, n = 7
Relative age of siblings	Younger only, n = 3; Older only, n = 4 Both younger and older, n = 12
Dedicated play space	Yes, n = 32 No, n = 4 (where n = 2 reported “plays anywhere”)
Number of toys available in home	87 ± 64 (n = 31), minimum = 10, maximum = 300 “A lot” (n = 5)
Play partners	Parents, n = 35 Siblings, n = 15 Pets, n = 5 Other children, n = 4 Grandparents, n = 3 Other adults, n = 2
Favorite toys	Vehicles, n = 11 Blocks, building blocks, n = 11 Dolls, n = 13 Kitchen, n = 12 Books, n = 7 Coloring and painting, n = 9 Characters, n = 6 Gross motor equipment, n = 6 Puzzles, n = 5 Playdough, n = 4 Electronics (phone, TV, tablet), n = 3

Note: * Battelle scores less than –1 would indicate a potential developmental delay, ** (Hollingshead, range is 8–66).

facilitate specific skill testing. In consideration of families’ time commitment, participants were assessed on three of the five domains, including: personal-social, motor, and cognitive. These domains were selected as being pertinent to a child’s capability to engage in self-directed, exploratory object play.

2.1.2. Participant demographics

A total of 36 participants completed the study. Participants’ age was 23.8 ± 3.9 months with 9 males and 27 females. The majority of participants were White and not of Hispanic Origin (n = 34). A total of 17 were only children with the remaining having one (12) or more (7) siblings. Of those with siblings, most (12) had both older and younger siblings. According to standard deviation scores obtained from the Battelle Developmental Inventory, all participants had typical development of personal-social, motor, and cognitive skills. Responses to the questionnaire indicated that all participants had robust experience with play; where 32 reported having a dedicated play space in their home and two reported the children can “play anywhere” and all reported multiple play partners and an abundance of toys in the home. All caregivers identified themselves as either the mother or the father of the participant. Socioeconomic status of the families in this study, measured by the Hollingshead’s four factor index (1979), reflects middle class. Table 1 presents demographic description of the participants who completed the study. Two participants began but did not complete the study because of scheduling difficulties. Their partial results are not included in analysis. Though not reported, their demographic characteristics fell within the range of those who did complete the study.

2.2. Toys

Thirty-two different sit-and-play, gender neutral toys were used in this study. A checklist written on behalf of the [American Occupational Therapy Association \(2011\)](#) to aid parents in toy selection was used to vet each toy for its appropriateness. Toys represented four categories: *educational* (toys that may teach a concept such as shapes, colors, or counting), *pretend* (toys that suggest themed play scenarios for ‘as if’ play), *action* (toys that can be activated through manipulation or toys that encourage exploration/

activity on the part of the toddler i.e. building, stacking, opening, twisting), and *vehicles* (toys that have wheels that promote play through the toddlers ability to push the toy). There were eight toys in each of these categories. Finally, toys were designated as battery operated or not.

2.3. Conditions

2.3.1. Playroom

The data collection sessions took place in one of two locations. Efforts were made to ensure similarity in the two locations. The first location was a playroom on a metropolitan university campus. The second location was a spare room in a private home in a small, rural town two hour's drive from the university. The room was volunteered for use by the occupying family who were hosting one of the researchers. Both rooms had dimensions within two feet of 10 × 10, a window with a pull-down shade, carpeting, and overhead lighting. Both had a toddler-sized table (18.5" in height), a toddler-sized chair (16" in height), an adult-sized chair (26.5" in height), a 27" high shelf, and no other furnishings or decorations. The table was located in the middle of the room with the chairs placed around it. The shelf was located in a corner of the room. The playroom had a small waiting area, both the playroom and the waiting area were within a suite of offices. Windows into the waiting area had blinds for privacy. From the waiting area, the playroom could be seen through a mirrored observation and heard through an overhead speaker with a volume dial in the waiting room. The spare room was off of a hallway with other bedrooms used by the researcher and resident family. Bedroom doors were pulled shut, and no members of the family were home during data collection.

2.3.2. Conditions

There were two conditions for toy play: *Four Toy* and *Sixteen Toy*. In the *Four Toy* condition, one toy from each category was randomly selected. No more than one toy was designated as battery operated. In the *Sixteen Toy* condition, four toys from each category were randomly selected. No more than four toys were designated as battery operated. No toys were repeated for both conditions. Toys that were indicated as being a participant's favorite would have been excluded for that participant and replaced with a random selection from the same category; however, this did not occur.

2.4. Procedures

Each participant and his/her caregiver attended three individual sessions. The initial visit lasted approximately an hour. During the initial session, informed consent was obtained from the caregiver, and the caregiver completed the questionnaire. The caregiver was oriented to the study protocol, including the scheduling of data collection sessions at a time of day that their toddler was well rested, fed, and toilet or freshly diapered, as appropriate to the child. Further, researchers requested caregiver assistance in helping the toddler feel comfortable with the procedures. Finally, the toddler was assessed using the Battelle Developmental Inventory.

Two individual data collection sessions followed, which were scheduled at the same time of day and within two weeks of one another. The first session involved random presentation of one of the conditions for toy play, which resulted in the presentation of the other condition during the second session. The caregiver was asked to remain on site during data collection and was able to view the session (either in the room or from outside of it: through the observation window at the playroom or a partially open door at the spare room). Each toddler was asked for verbal assent with the statement "would you like to play today?". Assent was documented by the researcher.

Upon arrival for data collection sessions, the caregiver was asked to assist in helping the toddler feel comfortable before separation for the session occurred. In the event of separation distress, the caregiver was asked to join the toddler in the room during the session and to abide by research protocol. During each of the data collection sessions, a researcher was present in the playroom in order to provide supervision for the toddler. The session began with a two minute adjustment period in which the researcher interacted with the toddler in a friendly manner. Once comfortable, the toddler was informed that he/she could play with toys in the room however he/she would like to. If the toddler approached the researcher to engage in play, the researcher participated in the reciprocal interaction, following the toddler's lead. However, the researcher did not approach the toddler to engage in any play behavior. The researcher redirected the toddler to a different activity if he/she was destructive with any of the toys or engaged in any behavior that put him/her at risk for injury. Caregivers were also instructed to follow this protocol for interacting with their children if they were in the room during the data collection period. Sessions were limited to a maximum of 30 min. A five-minute and two-minute warning were given as time diminished. Once time expired, the toddler was escorted from the playroom by the researcher or by the caregiver. Upon preference, the caregiver would direct the toddler to assist in cleanup of the playroom. As an acknowledgment of appreciation for participation in the study, a coloring book and package of crayons were offered at the end of the last session. Parents were entered into a raffle for a \$50 gift card to a multi-location general department store.

2.5. Measurements

Each session was video recorded from multiple angles to allow researchers to rate the quality of play for each toddler. After the two-minute acclimation period, all sessions lasted at least 15 min, but duration beyond that was variable (averaging 20.5 ± 6 min). Therefore, the quality of play was quantified for 15 min. In each of the two conditions (*Four Toy* and *Sixteen Toy*), we measured three dependent variables. The first dependent variable was the number of incidences of toy play. Acts of destructive play were not included, but each incidence was separately noted. Toy play incidents were operationalized to include observable engagement such

as physical contact/manipulation of a toy and focused attention to play (i.e. eyes directed toward the toy or other physical elements/people that the toddler brought into the play scenario). The second dependent variable was the duration of each toy play incident. The beginning of an incident occurred when a toddler purposefully touched a toy. For an incident to end, a toddler's attention must be distracted away from the toy and refocused to another element in the room. The third dependent variable was the number of manners of play with each toy. Unique verbs were used to describe the manners of play (Bjorklund & Bjorklund, 1979). A manner of play was anything the child did to engage in play with the toy, for example actions such as drumming, dumping, exploring, pretending, matching, gathering, or inserting. The average number of verbs were recorded for each session. Two raters assessed 10% of the videos. Interrater reliability was measured using a linearly weighted Kappa statistic (κ). Agreement was excellent, with κ ranging from 0.89 to 0.99.

2.6. Data analysis

The dependent variables demonstrated skew and kurtosis, particularly the measurement of duration of incidences; therefore, outcomes were compared between the two conditions using Wilcoxon Signed Rank Tests. Effect size is reported as the r value. To assess the effect of condition according to age, we calculated change in the dependent variables (moving from the Sixteen Toy to the Four Toy condition) and assessed change scores for correlation with participants' age in months using Spearman's correlation. To assess whether quality of play was characteristic for participants, we assessed correlation of the dependent values under the two conditions using Spearman's correlation. For the consideration of multiplicity, α was adjusted to 0.017 for all analyses.

3. Results

Participating toddlers were supervised in object play for up to 30 min. All participants played for at least 15 min beyond the two-minute acclimation period, with an average of 20.5 ± 6 min. During the study, only a single incident of destructive toy play occurred, and the participant was easily redirected. We tested the hypothesis that an environment with fewer toys will lead to higher quality of play, as indicated by a) sustained play measured by fewer toy play incidences with longer durations and b) more variety in the manners of toy play. There was a significant difference in the quality of toddlers' play between the two toy conditions. As measured by sustained play and variety of manners of play, toddlers had greater quality of play in the Four Toy condition compared to the Sixteen Toy condition (Fig. 1). In the Four Toy condition, toddlers had fewer incidents of play (9.8 ± 5.5 vs. 19.6 ± 9.3 incidences, $Z = -4.448$, $p < 0.001$, $r = -0.524$) which lasted longer (117 ± 156 vs. 56 ± 42 s, $Z = 2.828$, $p = 0.005$, $r = 0.333$). They also played with toys in a greater variety of manners in sessions held under the Four Toy condition (an average of 11 ± 4 vs. 7 ± 2 manners, $Z = 4.676$, $p < 0.001$, $r = 0.551$). The differences in averages for the measured variables in the Four Toy condition compared to the Sixteen Toy condition represented 50% fewer play incidences, 108% longer duration of play incidences, and 63% more manners of play. In the Four Toy condition, participants played with an average of 3.1 ± 1.1 (range: 1–4) of the available toys, and in the Sixteen Toy condition, they played with 8.6 ± 3.5 (range: 3–15) of the available toys. The distribution of number of toys played with by condition is depicted in Fig. 2. To test for order effects, the dependent variables were compared for participants' first and second sessions. There were no significant differences ($Z = -0.252$, 0, -0.452 ; $p = 0.80$, 1, 0.65, for incidences, duration, and manners of play, respectively). The effect of the condition of toy play did not vary with age. There was no correlation with the change in the quality of play under the Four Toy condition, as compared to the Sixteen Toy condition with participants' age in months ($r_s = -0.223$, $p = 0.191$; $r_s = -0.324$, $p = 0.053$; $r_s = -0.166$, $p = 0.322$ for incidences, duration, and manners of play, respectively). Similarly, there was no within subject correlation of quality of play under the two conditions ($r_s = 0.173$, $p = 0.313$; $r_s = -0.003$, $p = 0.998$; $r_s = 0.384$, $p = 0.021$ for incidences, duration, and manners of play, respectively).

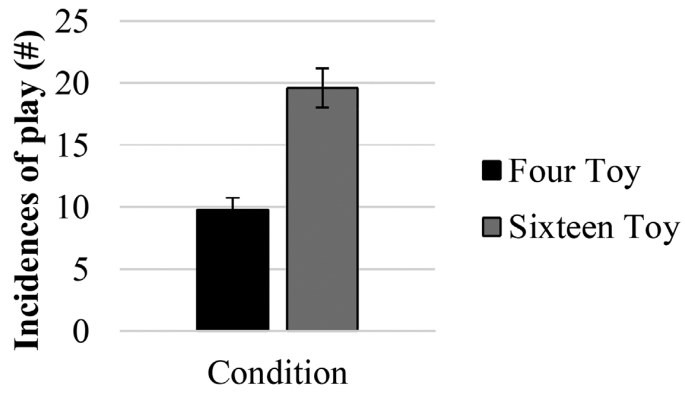
4. Discussion

This study sought to determine if the number of toys in toddlers' environments influences the quality of their play. The hypothesis that fewer toys in children's environments would improve the quality of play, measured by three variables, was supported.

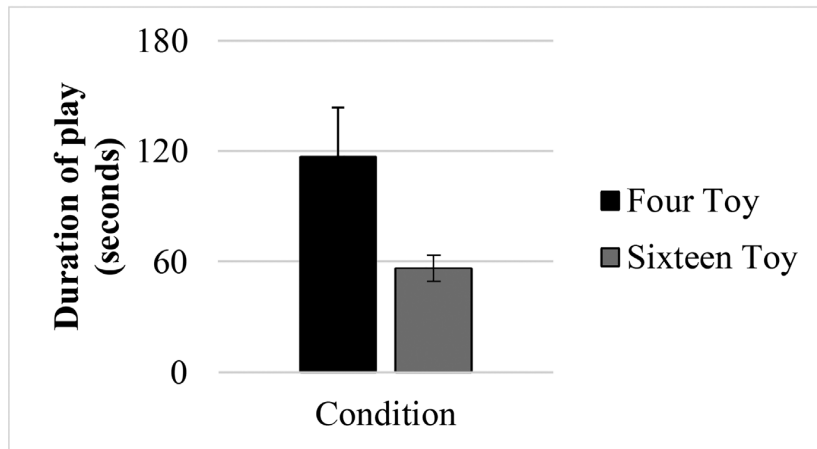
Participants in this study engaged in more incidences of toy play when presented with the Sixteen Toy condition, moving more frequently from toy to toy. On average, they played with just over half of the toys in the environment (8.6 ± 3.5 out of 16 toys), with some toddlers interacting at least once with as many as 15 toys and no toddlers playing with only one or two toys. In the Four Toy condition, participants still explored most of the toys available to them (3.1 ± 1.1 out of 4 toys, with half of participants playing at least once with all four toys) but switched between the toys less resulting in fewer toy play incidences. Taken by itself, the difference in the number of incidents of play in the Four Toy condition may not be a sufficient indicator of the quality of play. Instead, it may reflect toddlers' innate curiosity and desire to explore their environments (Berlyne, 1979). Surveying nearly all the toys present may have allowed participants to feel comfortable in the environment and form some initial preferences about what they would like to try (Vaughn, Koop, & Krakow, 1984). However, when paired with the other two variables, the higher number of incidences of play in the Sixteen Toy condition did seem to interfere with duration and depth of play. That quality of play was subject to the play environment is supported by the lack of within subject correlation of the measurements under the two conditions, indicating that participants play under one condition was independent of their play under the other condition. This suggests that the other toys present may have created a source of external distraction (Wachs, 1989), provoking the participants to abandon play with a toy at hand to explore another.

During toddlerhood, children develop, but may not have mastered, higher level control over attention, with emerging skills of

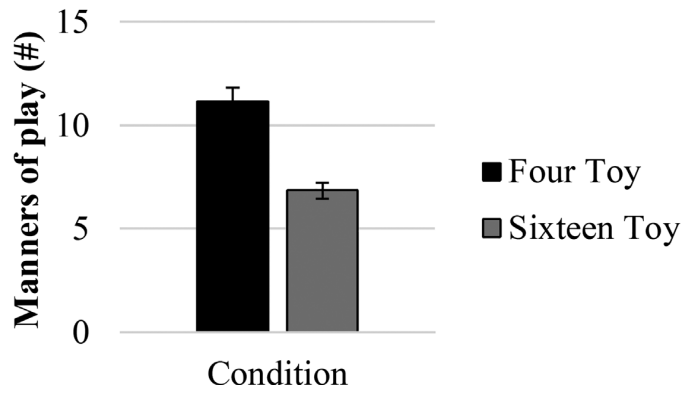
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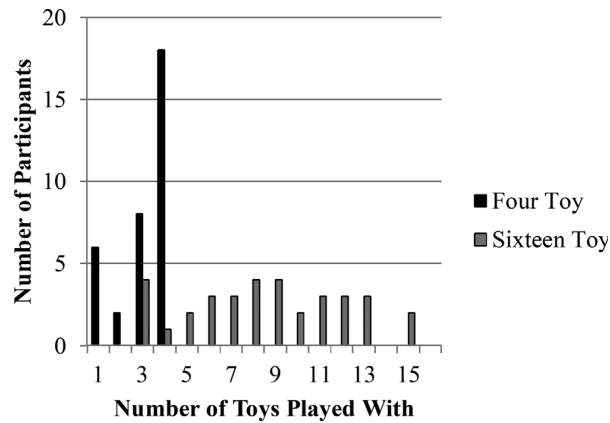
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Fig. 1. Quality of Play.

Three measures were used to assess the quality of play under two conditions. All variables differed significantly at $\alpha < 0.017$, with medium to large effect sizes, $n = 36$. A. The mean number of incidences of toy play in the two toy conditions; B. The mean duration of toy play incidences in the two toy conditions; and C. The mean number of manners of play per toy in the two toy conditions.

**Fig. 2.** Exploration of the toys in the environment.

This histogram depicts how many of the available toys participants engaged with during their sessions under two toy-play conditions ($n = 36$).

self-selection of targets to focus on and inhibition of orienting to distraction (Ruff & Lawson, 1990; Ruff & Rothbart, 1996). Their attention, and therefore, their play may be disrupted by factors in their environments that present distraction (Akshoomoff, 2002; Ruff & Lawson, 1990; Vaughn, Koop, & Krakow, 1984; Wachs, 1989). The results of the present study suggest that an abundance of toys may create such a distraction. With fewer toys present, participants engaged in longer epochs of play. Incidents of play in the Four Toy condition lasted twice as long as in the Sixteen Toy condition, similar to the findings of Bjorklund and Bjorklund (1979). The mean durations of play with and without distractions in this study are similar to findings regarding sustained attention (Courage et al., 2010; Schmidt et al., 2008) where background television disrupted toddlers' play. Individual differences in attention may be consistent across time (Graziano et al., 2011; Vaughn, Koop, & Krakow, 1984). Yet, Wass et al. (2012) reported that young children can benefit from attention training. Therefore, an environment that presents fewer distractions may provide toddlers the opportunity to exercise their intrinsic attention capabilities.

Play with toys in a variety of manners reflects exploration and discovery of their affordances. Participants exhibited approximately one and a half times as many manners of play when presented in the Four Toy condition than in the Sixteen Toy condition. The result is consistent with contemporary motor learning theories (Gibson, 1979; Thelen, 1995) in which an observed performance reflects the dynamic interaction of the individual and his/her environment. This provides merit to Saracho and Spodek's (1998) suggestion that children are more likely to play in more sophisticated, advanced ways with fewer toys present. Sustained play with a toy may allow for more opportunities for trial and error to learn about the toy's characteristics. Deeper exploration may lead to increased imaginative play, supporting expression and affective development (Russ, 2004). Exploration enhances physical skill development by encouraging skills such as bilateral coordination, fine motor coordination, refined pinch patterns, and even pre-writing skills (Feldman, 2007; Knox, 2008; Shannon, 1974). Increased exploration encourages the development of cognitive skills including pretending, cause and effect, problem-solving, and various other executive function skills (Russ, 2004; Schaaf & Burke, 1997). These forms of learning represent the adaptation that takes place within children when they interact with their environments during play (Law, Cooper, Stewart, Rigby, & Letts, 1996).

Caregivers of participants in this study reported that the toddlers had many toys available to them at home (see Table 1). The average number of toys in participants' environments was nearly 90 toys, with some parents unable to quantify and simply reporting 'a lot'. The questionnaire did not ask them to specify how many toys were available to the toddlers at any one time. However, it seems as though there would usually be many toys available. In a study of 32 middle class American families, Arnold et al. (2012) reported that family homes had an average of 139 toys visible to researchers, with most homes having at least 100 and some as many as 250. Their data reflected a 30% increase in the total amount of objects per child. Large collections of toys tended to be organized for display, but most toys were accessible for children's play. They also observed that utilization patterns of shared spaces in homes were child-centered. They felt their findings reflected market data in which there are \$24 billion in toy sales annually, with \$3.1 billion specifically for infant and preschool toys. Families spend an average of \$240 on toys and games each year, and grandparents spend \$500 yearly for gifts for grandchildren. The U.S. represents 3.1% of the world's children but 40% of the toy market. This study's findings were significant when comparing four to sixteen toys in the environment. The participants may regularly be exposed to many more toys than this at home, suggesting that potential disruption in play created by an abundance of toys may be even more apparent within a naturalistic environment. On the other hand, the toys and the setting in the study's environment may have been novel, spurring more exploration and task-switching than may occur the participants' own homes. Still, the high number of toys at home

may also suggest that toy play is valuable to the families who participated in this study. The participants likely had a rich history of play experience with a variety of toys. Play of children living in toy-impooverished environments may be differently affected by the conditions used in this study. Trawick-Smith et al. (2015) reported that preschoolers from families with lower socioeconomic status demonstrated lower quality play with popular age-appropriate toys.

4.1. Limitations

Several limitations need to be taken into consideration when generalizing the results of this study. The use of a convenience sample of participants resulted in limited geographic, socioeconomic, and ethnic representation. The study's sample was also comprised of mostly female participants. Future research should attempt to include a greater representation of geographic location, socioeconomic status, and gender. The results of this study can only be generalized to healthy, typically developing toddlers. Future studies could address at risk populations in a variety of age groups to determine if a high number of toys in the environment can pose as a distraction in these populations.

4.2. Future research

In the present study, toys were randomly assigned so that no two participants played with the same set of toys. Future research could include providing the same toys to all participants, randomly assigning toys to the two conditions of play. This would better gauge if quality of play is affected by the number of toys in the environment or by a specific toy. This study was conducted in a cross sectional manner with each participant experiencing each condition only one time. Future studies should explore longitudinal effects of play in environments with more and fewer toys, as well as repeated exposure to the same toys. This study was conducted in a university research setting. The effect of the number of toys in children's naturalistic environments will need to be separately tested. Similarly, studies will be needed to examine the effect of the number of toys available in peer group settings. In addition, populations that have developmental disabilities or high risk factors should be included in this topic of investigation in order to further generalize the effects of toys in the environment on the quality of play and to guide best practices with these populations. In the present study, all toys were three dimensional and designed for physical interaction, as well, few were battery operated. Future studies could include electronic toys with lights and sounds and virtual platforms such as apps operating on smart phones and/or tablets to study their effects on engagement in play.

4.3. Implications for professionals in early childhood

Child care providers, educators, health and rehabilitation professionals, and social service providers are positioned to support and promote children's participation in play. Toys are the tools of play, and these professionals can make recommendations to shape the environment in the most appropriate manner to enhance toy play. Following from the findings of this study, one recommendation may be to opt for having fewer toys available in a play environment for any one play session. When there is an abundance of toys, small collections can be rotated into play while the majority is stored away, providing opportunities for novelty without creating the distraction posed by having too many toys available. This may enhance opportunities for the development of creativity, imagination, and skill development. Professionals can collaborate with parents, agencies, and communities to enhance play across settings.

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References

- Akshoomoff, A. (2002). Selective attention and active engagement in young children. *Developmental Neuropsychology*, 22, 625–642.
- American Occupational Therapy Association (2011). *How to pick a toy: checklist for toy shopping*. [Retrieved April 20, 2012, from <http://www.aota.org/Consumers/consumers/Youth/Play/Toy.aspx?FT=.pdf>].
- Arnold, J. E., Graesch, A. P., Ragazinni, E., & Ochs, E. (2012). *Life at home in the twenty-first century*. Los Angeles: UCLA.
- Berlyne, D. E. (1979). Curiosity and learning. *Motivation and Emotion*, 2(2), 97–175.
- Bjorklund, G., & Bjorklund, R. (1979). *An Exploratory study of toddlers' satisfaction with their toy environments*. [Retrieved June 5, 2012, from <http://www.acrwebsite.org/search/view-conference-proceedings.aspx?Id=9584>].
- Brasic-Royeen, C. (1997). Play as occupation and as an indicator of health. In B. Chandler (Ed.). *The essence of play* (pp. 1–16). Bethesda, MD: American Occupational Therapy Association.
- Courage, M. L., Murphy, A. N., Goulding, S., & Setliff, A. E. (2010). When the television is on: The impact of infant-directed video on 6- and 18-month-olds' attention during toy play and on parent-infant interaction. *Infant Behavior & Development*, 33, 176–188.
- DuBois, S. A. (1997). Playthings: Toy use, accessibility, and adaptation. In B. Chandler (Ed.). *The essence of play* (pp. 107–130). Bethesda, MD: American Occupational Therapy Association.
- Erikson, E. H. (1968). *Identity, youth, and crisis*. New York: Norton.
- Feldman, R. S. (2007). *Child development*. Upper Saddle River, NJ: Pearson Education, Inc.
- Gaertner, B. M., Spinard, T. L., & Eisenberg, N. (2008). *Focused attention in toddlers. measurement, stability, and relations to negative emotions*. *Infant child development*.
- Gibson, J. J. (1979). *The ecological approach to visual perception*. Boston, MA: Houghton Mifflin.
- Golinkoff, R. M., & Hirsch-Pasek, K. (2008). *Why play = learning. encyclopedia on early childhood development*. [Retrieved from <http://www.child-encyclopedia.com/play/according-experts/why-play-learning>].

- Graziano, P. A., Calkins, S. D., & Keane, S. P. (2011). Sustained attention development during the toddlerhood to preschool period: Associations with toddlers' emotion regulation strategies and maternal behaviour. *Infant and Child Development*, 20(6), 389–408.
- Hollingshead, A. B. (1975). *Four factor index of social status*. New Haven, CT: Department of Sociology, Yale University.
- Kannass, K. N., Oakes, L. M., & Shaddy, D. J. (2006). A longitudinal investigation of the development of attention and distractibility. *Journal of Cognition and Development*, 7(3), 381–409.
- Knox, S., & Mailloux, Z. (1997). Play as treatment and treatment through play. In B. Chandler (Ed.). *The essence of play* (pp. 175–206). Bethesda, MD: American Occupational Therapy Association.
- Knox, S. (2008). Development and current use of the revised Knox preschool play scale. In L. D. Parham, & L. S. Fazio (Eds.). *Play in occupational therapy for children* (pp. 56–71). (2nd ed.). St. Louis, MO: Mosby Publishers.
- Kuhaneck, H. M., Spitzer, S. L., & Miller, E. (2010). *Activity analysis, creativity and playfulness in pediatric occupational therapy: Making play just right*. Jones & Bartlett Publishers.
- Lane, S. J., & Mistrett, S. (2008). Facilitating play. In L. D. Parham, & L. S. Fazio (Eds.). *Play in occupational therapy for children* (pp. 72–95). (2nd ed.). St. Louis, MO: Mosby Publishers.
- Lane, D. M., & Pearson, D. A. (1982). The development of selective attention. *Merrill-Palmer Quarterly*, 28(3), 317–337.
- Law, M., Cooper, B., Stewart, D., Rigby, P., & Letts, L. (1996). The person-environment-occupational model: A transactive approach to occupational performance. *Canadian Journal of Occupational Therapy*, 63, 9–23.
- Little, & King, L. L. C. (2010). *The transformational toy manufacturing industry*. [Retrieved from http://www.littleandking.com/white_papers/toy_manufacturing_industry_today.pdf].
- Newborg, J., Stock, J. R., & Wnek, L. (1988). *Battelle developmental inventory*. Rolling Meadows, IL: The Riverside Publishing Company.
- Pellegrini, A. D., & Smith, P. K. (1998). The development of play during childhood: Forms and possible functions. *Child Psychology and Psychiatry Review*, 3(2), 51–57.
- Piaget, J. (1952). *The origins of intelligence in children*. New York: International Universities Press.
- Pierce, D. (1999). Maternal management of the home as a developmental play space for infants and toddlers. *American Journal of Occupational Therapy*, 54, 290–299.
- Reynolds, G. D., & Richards, J. E. (2008). *Attention and early brain development. encyclopedia on early childhood development*. [Retrieved from <http://www.child-encyclopedia.com/brain/according-experts/attention-and-early-brain-development>].
- Ruff, H. A., & Capozzoli, M. C. (2003). Development of attention and distractibility in the first 4 years of life. *Developmental Psychology*, 39(5), 877–890.
- Ruff, H. A., & Lawson, K. R. (1990). Development of sustained, focused attention in young children during free play. *Developmental Psychology*, 26(1), 85–93.
- Ruff, H. A., & Rothbart, M. K. (1996). *Attention in early development: Themes and variations*. New York: Oxford.
- Russ, S. W. (2004). *Play in child development and psychotherapy: Toward empirically supported practice*. Mahwah, NJ: Lawrence Erlbaum.
- Saracho, O. N., & Spodek, B. (Eds.). (1998). *Multiple perspectives on play in early childhood education*. SUNY Press.
- Schaaf, R. C., & Burke, J. P. (1997). What happens when we play? A neurodevelopmental explanation. In B. Chandler (Ed.). *The essence of play, a child's occupation* (pp. 79–105). Rockville, MD: American Occupational Therapy Association.
- Schmidt, M. E., Pempek, T. A., Kirkorian, H. L., Frankenfield-Lund, A., & Anderson, D. R. (2008). The effects of background television on the toy play behavior of very young children. *Child Development*, 79, 1137–1151.
- Shannon, P. D. (1974). Occupational choice: Decision-making play. In M. Reilly (Ed.). *Play as exploratory learning* (pp. 285–316). Beverly Hills, CA: Sage Publications.
- Skard, G., & Bundy, A. C. (2008). Test of playfulness. In L. D. Parham, & L. S. Fazio (Eds.). *Play in occupational therapy for children* (pp. 72–95). (2nd ed.). St. Louis, MO: Mosby Publishers.
- Smith, P. K., & Pellegrini, A. (2013). *Learning through play. Encyclopedia on early childhood development*. Retrieved from <http://www.child-encyclopedia.com/play/according-experts/learning-through-play>.
- Statista (2013). *Average amount spent per child on toys by country*. [Retrieved from: <https://www.statista.com/statistics/194424/amount-spent-on-toys-per-child-by-country-since-2009/> 6/6/17].
- The Toy Association (2013). *Annual U.S. sales data*. [Retrieved from: <http://www.toyassociation.org/ta/research/data/annual/toys/research-and-data/data/annual-us-sales-data.aspx> 6/16/17].
- Thelen, E. (1995). Motor development: A new synthesis. *Science Watch*, 50(2), 79–95.
- Trawick-Smith, J., Wolff, J., Koschel, M., & Vallarelli, J. (2015). Effects of toys on the play quality of preschool children: Influence of gender, ethnicity and socio-economic status. *Early Childhood Education Journal*, 43, 249–256.
- Vaughn, B. E., Koop, C. B., & Krakow, J. B. (1984). The emergence and consolidation of self-control from eighteen to thirty months of age: Normative trends and individual differences. *Child Development*, 55, 990–1004.
- Vlietstra, A. G. (1979). Effects of adult-directed activity, number of toys, and sex of child on social and exploratory behavior in young children. *Merrill-Palmer Quarterly*, 26(3), 231–238.
- Wachs, T. D. (1989). The nature of the physical microenvironment: An expanded classification system. *Merrill-Palmer Quarterly*, 35(4), 399–419.
- Wass, S. V., Scerif, G., & Johnson, M. H. (2012). Training attentional control and working memory—Is younger, better? *Developmental Review*, 32(4), 360–387.