Busy Toy Designs Reduce the Specificity of Mothers' References to Toy Parts During Toy Play With Their Toddlers

L'utilisation de jouets « chargés » sur le plan visuel réduit la spécificité des références effectuées par les mères sur les parties de ces jouets en situation de jeu avec leur enfant

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Abstract

When a parent is playing with a toy with his or her child, might a toy's "busy" visual design negatively impact the specificity and quality of the parent's talk? In this study, 24 mother–toddler (*M* = 23.5 months) dyads played with both (a) unmodified visually busy commercial toys and (b) modified visually "simple" versions of these commercial toys. Our focus was on the specificity of mothers' 552 references to the main parts of the toys (i.e., the rings of a stacking ring toy and the blocks of a nesting block toy), which was found to be impacted by the toys' visual design. That is, with simple toys, mothers produced a significantly greater proportion of specific references (e.g., *the blue ring*) than non-specific references (e.g., *this/that one*). Indeed, the proportion of specific references was three times greater in play with the simple toys than with the busy toys. Busy toys also reduced the number of references to parts of the toy overall and children's exposure to vocabulary such as colour terms used within specific references. These results underscore that the visual design of toys is an important aspect to consider, particularly in contexts where the goal may be to foster adult–child language and a child's exposure to more information-rich vocabulary terms during toy play with an adult.

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Abrégé

Dans une situation de jeu, est-ce que l'utilisation d'un jouet ayant une apparence « chargée » pourrait affecter de façon négative la spécificité et la qualité des échanges entre un parent et son enfant? Dans la présente étude, 24 dyades mère-enfant (*M* = 23,5 mois) ont joué avec (a) des jouets commerciaux non modifiés, dont l'apparence était « chargée », et (b) des versions modifiées et simplifiées sur le plan visuel de ces jouets. Notre attention s'est portée sur la spécificité des 552 références effectuées par les mères sur les parties principales des jouets (c.-à-d. les anneaux d'un jouet d'anneaux à empiler et les cubes d'un jouet de cubes à empiler); celles-ci se sont avérées affectées par l'apparence visuelle des jouets. Plus spécifiquement, les mères produisaient une proportion beaucoup plus importante de références spécifiques (p. ex. l'anneau bleu) que de références non spécifiques (p. ex. ceci ou cela) lors du jeu avec des jouets dont l'apparence était simplifiée. En effet, la proportion de références spécifiques était trois fois plus élevée dans les situations de jeu avec des jouets dont l'apparence était simplifiée que dans les situations de jeu avec des jouets « chargés » sur le plan visuel. L'utilisation de jouets ayant une apparence « chargée » a également réduit le nombre total de références aux parties des jouets, ainsi que la fréquence d'exposition des enfants à des mots de vocabulaire permettant de décrire les caractéristiques des jouets (p. ex. les termes utilisés dans les références spécifiques pour décrire les couleurs). Ces résultats soulignent l'importance de considérer l'apparence visuelle, et ce, particulièrement dans les contextes où l'on cherche à encourager les échanges entre un adulte et un enfant, ainsi que dans les situations de jeu où l'on cherche à augmenter l'exposition d'un enfant à un vocabulaire riche en informations.

This study is the result of a personal experience of the first author. One day, while visiting with a family whose young toddler-age son had recently been diagnosed with severe autism, she was in the kitchen watching him play with a toy. The toy was bright, with neon-coloured pieces that made a sound when they were inserted into corresponding slots. As he was playing, she wanted to join in by saying something about one of the pieces, except she could not figure out what to say. Like the other pieces of the toy, the piece she was trying to talk about was curvy-shaped and its colour was a difficult-to-name shade of pink (a fuchsia-red-pink). As she struggled to describe both its colour and shape, and resorted to an unsatisfying "*that one*," his mom noticed and said, "*We call that the hammery-thing*." The irony of this situation was immediately apparent to her. Here was a child struggling with acquiring his first words and for whom it might have been especially beneficial to have a toy that made it easy for an adult to talk about its parts in a clear way. But the design and appearance of the parts of this particular toy made naming any part of this toy very difficult—indeed, almost impossible. As it happens, this toy was made by a popular toy brand and representative of newer toy designs that are often described on their packaging as "stimulating" or "educational." From this experience came the motivation for this study and the main question it pursued: Might a toy's visual design (e.g., unusual colours; large number of different, complex designs and patterns all visible at once) negatively impact the specificity, and thus clarity, of mothers' references to a toy's main parts?

Children develop physically, linguistically, cognitively, and socially through play, and play specifically allows a parent to scaffold the experience according to the child's developmental needs (Vygotsky, 1967). In particular, play has been argued to foster language development in at least four ways: Play can (a) require symbolic thinking, (b) involve social interaction (primarily with parents), (c) expose children to a large amount of language, and (d) keep children engaged in the learning process if it is a child-led activity (Weisberg, Zosh, Hirsh-Pasek, & Golinkoff, 2013). Within the past decade, researchers have begun to focus on examining the effect of toys' design features on parent–child talk during play with toys. Although this research is limited in scope, first studies have demonstrated that certain features of toys do indeed affect the quality of associated parent–child talk, as will be discussed next.

Considering that the phrase "batteries not included" is a common disclaimer on many current toys, it is not surprising that the majority of studies on this topic have focused on how electronic features of toys may influence the quality of parent–child talk interactions during play. In one direct comparison between the interactions afforded by electronic and traditional toys, Wooldridge and Shapka (2012) observed parent and child (16 to 24 months) dyads playing with both electronic and traditional toys in a controlled laboratory playroom. The toys included three traditional toys (i.e., a shape sorter, plastic animals, and a picture book) and an electronic version of each. The play sessions were recorded and coded using the 3-point rating scale Parents Interacting with Children: Checklist of Observations Linked to Outcomes (PICCOLO; Roggman, Cook, Innocenti, Jump Norman, & Christiansen, 2009). for parental affection, responsiveness, encouragement, and teaching. With the traditional set of toys, significantly higher levels of parental responsiveness, teaching, and encouragement were observed. The largest difference was seen for parental teaching: on average, the set of electronic toys resulted in parent teaching ratings that were over 2.5 times lower than for traditional toys. The authors attributed these results to a shift in the parents' conceptualization of their role from "supporting the child's play" to "letting the toys do the talking."

Similar reductions in the quality features of parent talk have been found in other studies (e.g., Radesky & Christakis, 2016; Sosa, 2015). Sosa (2015) recorded parent and child (10 to 16 months) dyads playing with a set of electronic toys (e.g., baby cellphone), traditional toys (e.g., shape sorter), and books (e.g., book of farm animals) in their homes over 3 days. The most profound differences were observed for the electronic toys versus the other two traditional toy sets. The results suggested a diminishing of the quality of the parent–child interaction. Namely, during play with the electronic toy set, parents produced fewer conversational turns, attentive responses, and fewer words—especially content-specific words. Books surpassed traditional toys with respect to these measures, but to a lesser degree than both books and traditional toys compared to electronic toys. In a brief overview of eight studies involving electronic toys up to December 2015, Radesky and Christakis (2016) concluded that electronic toys reduce parents' verbal and non-verbal contributions during play and that although electronic toys may engage the child, they disengage the parent.

In addition to findings regarding impacts on the overall quality of the parent–child interaction, technological affordances on toys have been found to usurp the original purpose of a toy. Zosh et al. (2015) compared parent and child (20 to 27 months) interactions when playing with electronic versus traditional shape sorters. Although similar amounts of talk occurred overall with the two types of shape sorters, the quality of the talk differed in significant ways. Parents playing with the electronic shape sorter

produced less spatial language (e.g., shape names, place referentials such as *here* and *there*, locations, directions) and talked more about the non-shape related features and functions of the toy (e.g., pushing its buttons). The authors concluded that the additional electronic features detracted from the toy's intended purpose of fostering a better understanding of spatial concepts. Similarly, a study of parent–child pretend play found less pretense to be produced and the interaction to be more parent-directed when playing with an electronic toy house (Bergen, Hutchinson, Nolan, & Weber, 2009).

In the realm of books, rather than toys, certain features of electronic books (e.g., button consoles) have also been shown to reduce story-related talk and increase behavioural directions from parents during reading, impacting children's storyline comprehension (Parish-Morris, Mahajan, Hirsh-Pasek, Golinkoff, & Collins, 2013). Even certain non-electronic features like pop-ups in traditional books have been shown to distract children from learning new words and remembering the storyline (Tare, Chiong, Ganea, & DeLoache, 2010). It should be noted, however, that studies directed specifically towards parent and child talk during the sharing and reading of e-books versus traditional books has moved towards identifying, in a more nuanced manner, the particular features of e-books that can serve to enhance or impair different outcomes including vocabulary learning, decontextualized talk, and comprehension of the story (e.g., Bus, Takacs, & Kegel, 2015; Guernsey & Levine, 2015).

Most of the research on more current toys and the impact of their "bells and whistles" has focused on electronic versions of toys and books. Our study, however, explores another potentially influential aspect of the design of these toys, namely their *visual design features*. Even apart from technological features, such as sounds produced, newer toys are often designed with lots of colour, texture, and pattern features to stimulate a child's play, learning, or imagination. For example, the *Whoozit® Tip Top Tower Block™* toy, used in the current study, is accompanied by the manufacturer's description:

> Young children gain new skills and talents almost overnight. During this phase of dynamic development, Manhattan Toy's research-proven Whoozit collection of toys stimulates fundamental learning skills. Our Whoozit is featured on our tip top tower blocks, a stacking set that's a puzzle, too. Each side features a pattern: numbers, characters, shapes and stars; plus rattling rings (http://www.amazon.com/Whoozit-Tip-Top-Tower-Block/dp/B00157D4UA).

Although there may be a growing movement towards simpler and more traditional toys underway (Hirsh-Pasek & Golinkoff, 2006; Hirsh-Pasek & Zosh, 2017), a stroll down any big toy store aisle will readily confirm a "more is more" marketing approach to many toys, especially those often labelled as educational. Providing many features to stimulate a child is often presented as a positive attribute of a given toy to potential purchasers. We will henceforth refer to a toy with many such stimulating visual design features as a *busy toy* and contrast this with a *simple toy*.

In the current study, we sought to explore the effect of the visual design of a busy toy versus a simple toy on one important linguistic feature of a parent's talk while playing with his or her toddler: the specificity of a parent's verbal references to the main parts of the toy. Specificity in verbal referencing is vital to the smooth flow of a dyad's mutual understanding and interaction during play. A child must be able to understand easily and clearly what a parent is referring to for vocabulary acquisition to proceed smoothly (for a review, see Trueswell et al., 2016). This will be especially the case when a toy has multiple parts and if the intended purpose of the toy is to do something with the parts in a specific sequence, such as stacking ring or nesting block toys. For example, if there are four blocks or rings that are part of a toy, being able to refer to each block or ring in a clear manner will be helpful to both the parent and the child. Specificity may be achieved in different ways, such as by appealing to a distinctive, specific feature or attribute (e.g., colour) unique to each part or the use of a more idiosyncratic, agreed-upon name (e.g., the lid) via a "referential pact" (e.g., Brennan & Clark, 1996; Matthews, Lieven, & Tomasello, 2010). By whatever means, the key is that specificity is possible given the visual design features of the parts of the toy. If specificity is not possible, then one is left with only the choice to use a very general means to refer to a part such as the use of a demonstrative like *this one* or *that one*. The latter option is not only potentially ambiguous, but also in the context of early parent–child talk, reduces the opportunity for exposure to informative vocabulary that will be necessarily incorporated into more specific references (e.g., colour and size terms such as *the blue block* or *the biggest one*). Thus, the inability to achieve specificity in referencing can be viewed as another way in which a toy's design could negatively impact the quality of parent–child talk.

In our study, we examined a parent's references with respect to the parts of two toys: (a) the rings of a stacking ring toy and (b) the blocks of a nesting block toy. Our manipulation consisted of the creation of a simple visual design version of each of these toys by adapting the busy commercial version of each by, for example, covering up

the original detailed patterned sides of a toy's parts with material of a single colour. We believe this is the first study to examine the effect of the physical visual design of toys on the quality of an aspect of parent talk during toy play. Given that the features of the toys we manipulated in this study all pertained to aspects of the toy's visual appearance (i.e., not other physical properties such as the shape of the parts), we have referred to these features as the *visual design* of the toys.

Our goal to assess whether a toy's visual design affects the specificity of an adult's references to parts of the toy led us to address the following main hypothesis in this study: A greater proportion of a parent's references to the parts of a toy will be more specific (e.g., *the blue block*) when a toy's visual design is simple than when it is busy. That is, a toy's simpler visual design features may result in a greater number and proportion of informative (i.e., specific) references to its parts (e.g., *the green one*) because the smaller number of unique and easier-to-name features of the parts make it easier to describe the different parts in a clear and unambiguous manner. In contrast, similar to how the electronic affordances of toys have been shown to negatively influence parents' language during play with their child, a toy with busier visual design features may result in a greater number and proportion of references to its parts that are less specific and less informative (e.g., *that ring*) because of the preponderance of difficult-to-name features, or features that repeat across parts, that make it difficult to describe the parts in a clear and unambiguous manner. In addition, because we expected this effect of toy design to operate within-parent, toy design was manipulated within-parent. We compared the proportion of specific references for simple versus busy toys for a single group of parents who all played with both a simple and busy toy with their child.

Method

Participants

Twenty-four children (12 girls, 12 boys) ranging in age from 19.4–28.5 months (M = 23.5 months, SD = 66 days; M_{girls} = 23.1 months, SD = 79 days, age range: 19.4–28.5 months; M_{boys} = 23.8 months, SD = 54 days, age range: 21.5–27 months) participated in this study. All children were accompanied by their mother. Data from an additional six participants was excluded because English was not spoken during the session (n = 2), the child had a speech delay (n = 1), or the child was unwilling to play with the toy at all (n = 3). Participants were recruited via advertisements in local community centres and from the existing database at the UW Centre for Child Studies at the University of Waterloo. Participants were mostly of middle class, Western and Eastern European descent as is representative of the region. All children were exposed to no more than 20% of a second language at home, as recorded by parent report at the time of scheduling their visit to the lab. All participants received a certificate and a book as compensation for their participation in the study. All the procedures of this study received ethics clearance (Approval ORE#14874) from the Human Research Ethics Committee of the University of Waterloo's Office of Research Ethics.

Materials

The toys used in this study consisted of two versions, simple and busy, of both a stacking ring and nesting block toy (four toys altogether). As will be described further below, the busy version of each toy was largely the unadapted commercial version of the toy, whereas the simple version was created by modifying the commercial version to reduce its busy features. Pictures of these four toys are shown in figures 1a–1d. Both toys were indicated on their boxes to be appropriate for children aged 12 months and older. The manipulation of toy design was within-mother: each mother played with her child with one simple and one busy toy (i.e., the two toys played with were the simple stacking and busy nesting toys OR the simple nesting and busy stacking toys).

Busy and simple stacking ring toys. The stacking ring toy was the *Nooboo Symphonic Stacker™* from Manhattan Toy and was 22 x 22 x 24 cm. Since it originally made a sound when a ring was placed on the post, the batteries were removed from this toy for the purpose of this study. The toy consisted of four flower-shaped, plush rings of increasing size, with the last ring being an enclosed topper piece. A solid colour of shiny, satin fabric lined the bottom side of each ring (i.e., yellow, green, orange, or pink) while the top of each ring was covered in several different fabrics of various colours (e.g., blue, purple, orange), patterns (e.g., polka dots, swirls, stripes), and textures (e.g., corduroy, satin, felt). Small ribbon tags of various colours were also attached around the side of each ring (see Figure 1a). This original commercial version of the toy was the busy version of the stacking ring toy. The simple version of this toy was created by covering the top (i.e., multi-coloured, textured, patterned) of each ring with felt of the corresponding solid colour of the bottom side of the ring (see Figure 1b).

Busy and simple nesting block toys. The nesting block toy was the *Whoozit® Tip Top Tower Block™* from Manhattan Toy and was 15 x 15 x 41 centimetres. The toy consisted of four soft, plush blocks of increasing size. Each

block could be inserted into each other or stacked on top of each other. The top, outside surface of each block was lined with different coloured checkerboard fabric. One outside panel of each of the four blocks had numbers and shapes/faces with different colours. A second outside panel had multi-coloured stars, while a third outside panel had a yellow pathway with stars that lined up to create a continuous pathway across the four blocks. A final outside panel of each block was covered with a multi-coloured, swirling pattern that resembled paint splotches on a canvas (see Figure 1c). The inside of each block, however, was a single colour. (Rattling rings were attached to each block and were removed for both busy and simple toy versions.) Thus, to create a simple version of this toy, all outside panels of each block were covered with a solid colour of felt matching the inside colour to produce one blue, yellow, green, and pink block. To retain some visual interest for children, the pathway of stars was replicated

Figure 1a

Photo supplied by authors.

Commercial version of the *Nooboo Symphonic Stacker*™ (Manhattan Toy) and its stacking rings used as the *busy* stacking toy in this study.

Figure 1b

Photo supplied by authors.

Modified *Nooboo Symphonic Stacker*™ (Manhattan Toy) used as the *simple* stacking toy in this study. The tops of its stacking rings were changed to a solid colour to match their original solid bottom colour.

Figure 1c

Photo supplied by authors.

Commercial version of the *Whoozit® Tip Top Tower Blocks*™ (Manhattan Toy) and its nesting blocks used as the *busy* nesting toy in this study.

Figure 1d

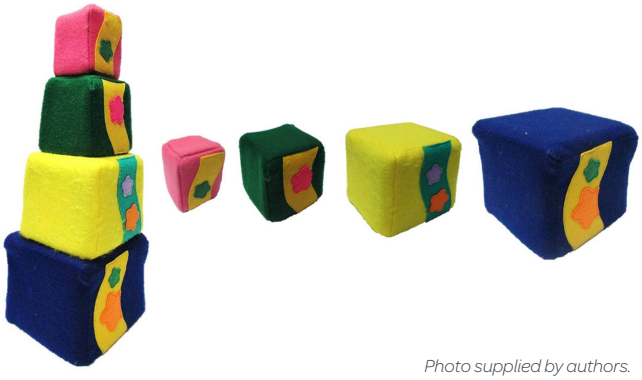

Photo supplied by authors.

Modified *Whoozit® Tip Top Tower Blocks*™ (Manhattan Toy) used as the *simple* nesting toy in this study. The outer sides of its blocks were changed to a solid colour to match their original solid inside colour.

from the original version (see Figure 1d).

Procedure

Parents and children were seated at a small table in the lab playroom. Parents were instructed that a small set of drawers labelled 1 and 2 contained the first and second toy to be played with. The drawer set kept the toys out of sight and reach of the child behind the parent. Ahead of time, one busy version of the nesting/stacking toy was placed into one drawer and one simple version of the other type of toy (stacking/nesting) in the other drawer according to fully counterbalanced orders within boys and girls.

Ahead of time, parents were given the general instruction to "play with each toy with your child as you would at home for as long as your child remains interested." When their child was no longer interested in the first toy, they were also instructed to return it to its bin and select the next toy from the second bin. The study's session ended when the second toy was returned to its bin. Every session was audio and video recorded for later transcription and analysis.

Transcription

All sessions were transcribed according to the CHILDES transcription system (MacWhinney, 2000, 2016). All speech from both the parent and child was transcribed, although in this study only a mother's references to a single part of the toy were the focus of analysis (see details of the coding scheme below). All transcripts were initially transcribed by the third author and reviewed by the fifth author at which time any discrepancies were discussed and adjusted accordingly. The second author conducted a final third review at the time of coding at which time no further discrepancies were noted.

Coding of Mothers' References to the Toy Parts

Identification and total number. To begin, all possible types of references to a single part of the toy (i.e., one of the four rings or top piece in the stacking ring toy; one of the four blocks in the nesting block toy) were identified in the transcripts by the second author and reviewed together with the first author. Thus, not included were (a) plural referents (e.g., *they, those*) that referred to more than one part at a time, (b) the use of *one* to mean the number one, (c) an utterance containing only the sole use of a colour or adjective term (e.g., one-word utterances such as *blue* or *spotty*), and (d) the pronoun *it* as it presumes the establishment of a commonly understood referent in contrast to, for example, the use of *this* or *that*. Also excluded were a few references to a single part using a label that was uttered within the context of pretending the part was something else (e.g., *a hat*) and accompanied by pretend actions such as placing the ring on top of the head. The reader will note, however, that if such a label was used outside of a pretend context (e.g., calling the top piece *a hat*) then these references were included.

Reliability coding with respect to this initial identification of references to a part of either of the two toys was carried out with 30% of the participants' transcripts by a research assistant blind to the hypothesis of the study and was found to be 100%. Thus, we felt confident that all possible ways in which mothers had referred to a part of either toy (e.g., *this/that one, the hat, the blue one*) had been captured. The CLAN program (MacWhinney, 2016) for use with CHILDES transcripts was used to confirm the frequency counts of all references to toy parts identified at the first stage. Overall, 552 references to a single part of a toy (308 for the stacking ring toy and 244 for the nesting blocks toy) were identified and, in a second stage of coding, subsequently classified by level of specificity, as described next.

Level of specificity. Each reference was categorized into one of three levels of specificity. Although we had initially anticipated a dichotomous *non-specific* (e.g., *that/this one*) versus *specific* classification (e.g., *the biggest one*), a further in-between category of *under-specific* was added to capture references that contained more information than the non-specific, but remained only semi-specific given multiple possible referents among the stacking rings or nesting blocks (e.g., *the big one*). Thus, the three levels of specificity were defined as follows for coding:

(a) *Non-specific.* The part of the toy was referred to solely by the use of the demonstrative pronouns *that/this (one/block/ring/box)*, the pronoun *one*, the determiners *another* or *other coupled* with *one* (e.g., *another one, other one*); the question forms *which/what one*?; two instances of the use of a pronoun (he/she); *one* accompanied by an evaluative adjective (e.g., *nice one*); or the word *next*. In all these cases, the mothers' utterance contained no information that could be used by the child to identify the part intended from any other part (i.e., *that one* could potentially apply to any of the four boxes or rings). As a result, these references were considered non-specific. Note that instead of *ring*, at times mothers also referred generally to all the rings using terms such as *flower* (due to their wavy shape) or *bracelet*.

(b) *Under-specific.* The part of the toy was referred to by using *one* or *flower/block/ring/box* accompanied by another term (e.g., *little*) that provided some information that could be potentially used to distinguish it from another part, but that was not unique to this part and

could have referred to another part (or even other parts) as well. For example, the use of *big one* does not, in the context of all the rings or blocks, uniquely describe any of the three rings or blocks that are bigger than the one smallest ring/block. Similarly, the reference *a green one* does not uniquely establish this part as being the only green one (cf *the green one* classified as specific below). Thus, these references remain under-specific, but nevertheless provide some exposure to new information and vocabulary than the wholly non-specific references. Indeed, the syntax of generic versus non-generic utterances is considered to be a form of linguistic input to which toddler-age children are sensitive (e.g., Gelman & Raman, 2003) and that is demonstrated in parental speech to children around this age (e.g., Gelman, Chesnick, & Waxman, 2005; Nyhout & O'Neill, 2014). As a result, this category was retained for analysis.

(c) *Specific.* The part of the toy was referred to via the use of a descriptor that could, with respect to that particular toy and part, uniquely and clearly distinguish it from all the other parts (e.g., *the yellow one*, with respect to a part in either one of the simple toys; *the biggest flower*, with respect to either the busy or simple stacking ring toy). Also included in this category were names given—albeit infrequently—to a part that was uniquely descriptive, such as a parent using *the lid* to describe the top-most part of the stacking rings.

In some instances, a single utterance referring to one part contained two levels of specificity, in which case we coded the utterance for the highest level (e.g., *that's the yellow one* was coded as specific rather than non-specific; *that's the big one* was coded as under-specific rather than non-specific). If an utterance contained a reference to two parts, each part received a code according to the descriptions above (e.g., *put the yellow one in the blue one* was coded as containing two specific references).

Reliability of this coding scheme was carried out in full for all 552 references by a Master's level student blind to the hypothesis of the study and was found to be excellent (99.3%, only three instances of a discrepancy).

Time played with toy. The length of the parent–child play session with each of the two toys was calculated. A play session was defined as beginning when the toy was first in joint view of the parent and child and ending when the parent returned the toy to its bin.

Results

Analysis of Time Played With Toys

Children and parents played with each toy for an average of 3 minutes and 59 seconds (*SD* = 2 minutes and 6 seconds). On average, the dyads played one minute longer with the simple version of the toys than the busy version of the toys. A paired samples *t* test, however, revealed that this difference in time played between the simple toys (*M* = 389.25 seconds, *SD* = 194.57 seconds) and the busy toys (*M* = 329.38 seconds, *SD* = 218.20 seconds) was not significant, $t(23) = 1.42$, $p = .168$.

Raw Frequency of Mothers' Production of the Three Reference Types for Each Toy Design

Table 1 displays the raw frequency of each type of reference per toy design over all 24 mothers. From **Table 1** it can be seen that, consistent with our main hypothesis, of all 148 specific references observed, 82.4% occurred during play with a simple toy as opposed to a busy toy (17.6%). It is also noteworthy that 62.5% of all 552 observed references to a toy's part (collapsed over specific, under-specific, and non-specific) were produced during play with the simple toy, as compared to only 37.5% with the busy toy. A paired samples *t* test confirmed that the difference in mean overall frequency of referencing between the simple and busy toy designs ($M_{Simple} = 14.38$, $SD = 7.25$ vs. $M_{Busy} = 8.63$, $SD = 8.65$)

Table 1

Total Number of Each of the Three Reference Types Produced Across all Mothers ($n = 24$) who Each Played With a Simple and a Busy Toy

	Toy Design		
Reference Type	Simple	Busy	Total
Specific	122	26	148
All non- & under-specific	223	181	404
Under-specific	76	66	142
Non-specific	147	115	262
Total	345	207	552

Proportion of Mothers' References of Each Reference Type for Each Toy Design

A proportion score for each of the three types of references was calculated for each mother separately

out of the total number of her references while playing with the simple toy, and also separately out of the total number of her references while playing with the busy toy. Mean proportion scores are shown in **Table 2**. No mother produced zero instances of referencing while playing with the simple toy. However, two mothers produced no references of any type when playing with the busy toy and were therefore excluded in our ANOVA analyses with proportion data as described below. Thus, the proportions

Table 2

Proportion of Mothers' References at Each Reference Level out of the Total (per Mother) per Toy Design Type

	Toy Design	
Reference Type	Simple *M (SD)*	Busy *M (SD)*
Specific	.360 (.277)	.076 (.129)
All non- & under-specific	.640 (.277)	.924 (.129)
Under-specific	.209 (.179)	.226 (.182)
Non-specific	.431 (.230)	.698 (.236)

Note. All these proportions are based on the final sample size of 22 used in our ANOVAs given that two mothers produced 0 references of any type with the busy toy.

Analyses of Proportions

We conducted three omnibus repeated-measures ANOVAs (n = 22) with proportion of specific, non-specific, or under-specific references as the dependent measure; Sex (boy or girl) and Toy Pair (e.g., whether a dyad received as a pair of toys the busy stacking rings and simple nesting blocks or the simple stacking rings and busy nesting blocks) as the between-subjects variables; and Toy Design (simple or busy) as a within-subject variable. A more conservative alpha value of α = .017 was adopted to take into account the three ANOVAs conducted (α = .05/3).

Did mothers produce a significantly greater proportion of references classified as specific when playing with the simple toy compared to the busy toy? Supporting our hypothesis, there was a significant main effect of toy design, $F(1, 18) = 22.01$, $p < .001$, $\eta_p^2 = .550$. On average (see **Table 2**), the proportion of mothers' references to a toy's parts that were specific was significantly greater when playing with the simple toy (36%) than the busy toy (7.6%). No significant main effects of toy pair or sex, or any significant interactions, were revealed in either this analysis or the further two ANOVAs of under-specific and non-specific references (p-values = .117 to .985). As a result, our discussion will focus on the effect of toy design.

When the results were examined at the individual level, it was clear that this pattern held for the majority of mothers when they played with both toys with their child. Namely, 77% (n = 17) of the 22 mothers produced a greater proportion of specific references with the simple toy than with the busy toy, 18% (n = 4) produced no specific references for either the simple or busy toy, and only 5% (n = 1) produced a lower proportion of specific references with the simple toy than with the busy toy. If all 24 mothers are considered, these percentages are 79%, 17%, and 4%, respectively.

From the transcripts, with the goal of looking at the content of these specific references, it was found that with the simple toys, 77% (n = 94) of all of the mothers' 122 specific references relayed information about the colour of the part (e.g., *the blue flower*). Next, in order of frequency, mothers provided unique labels for the part (19%, n = 23; e.g., *the lid, the top*) and information about size (4%, n = 5; e.g., *the biggest one*).

In contrast, when playing with the busy toy, of the 26 specific references produced by only seven mothers overall, information was specified most often in the form of size (42%, n = 11) or via a unique label (35%, n = 9). Next most often, mothers specified colour (15%, n = 4) and pattern (8%, n = 2; e.g., *the one with polka dots*).

Proportion of non-specific references with simple versus busy toys. Our analysis revealed a significant difference between simple and busy toys for the proportion of non-specific references, $F(1, 18) = 20.01$, $p < .001$, $\eta_p^2 = .526$, but in the opposite direction to that of specific references. On average (see **Table 2**), the proportion of mothers' references to a toy's parts that were non-specific was greater when playing with the busy toy (69.8%) than the simple toy (43.1%). Mothers produced few to no specific references when playing with busy toys and thus non-specific references represented a much greater proportion of all references for busy toys.

Under-specific references to the toy parts. Under-specific references represented about one fifth of all references. On average, the proportion of mothers' references to a toy's parts that were under-specific did not

differ significantly for simple (20.9%) or busy (22.6%) toys, $F(1, 18) = .127$, $p = .726$, $\eta_p^2 = .007$.

Discussion

Our results demonstrate that a toy's visual design—simple or busy—affects the specificity, and thus the clarity, of mothers' references to the main parts (rings, blocks) of a stacking ring and nesting block toy they used when playing with their toddler. Consistent with our original hypotheses, when considering references at a at a non-specific, under-specific and specific level, a significantly greater number and proportion of mothers' references were specific (e.g., *the green ring; the biggest one*) when the dyad played with a toy with a modified simple visual design than when they played with a toy with the original (commercial) busy visual design (see toys in figures 1a-d). The difference in reference specificity observed between toy designs with respect to specific references was not subtle. The mean proportion of mothers' specific references dropped from a maximum of over one third (36%) when playing with the simple toy to only 7.6% when playing with the busy toy. Or stated conversely, the mean proportion of references produced with a simple toy that were specific was more than four times larger than the proportion produced by the same mothers playing with a busy toy.

Of the two remaining categories of references, non-specific references represented a significantly greater proportion of all references for busy toys (69.8%) than simple toys (43.1%). A middle category of under-specific references (e.g., *the big one; the next one*), representing about one fifth of total references, was not impacted by a toy's visual design. These results overall are not attributable to differences between mothers given the within-participant manipulation of toy design (simple vs. busy).

Looking at the raw data shown in **Table 1**, one can see that specific references represented at most about one third of all references (35%, 122/345) for the simple toy, but that this decreased to only one eighth of all references (12.5%, 26/207) for the busy toy. Another interesting finding from our study looking at the raw data is that of all 552 observed references, 62.5% were produced when playing with the simple toy. Thus, it appears that the busy version of the toys not only made it more difficult for mothers to produce clear (specific) references to the parts of these toys from the analyses above, but also significantly reduced mothers' overall propensity to reference the main parts of these toys.

Further, our results suggest that a toy's visual design also impacted the vocabulary children were exposed to via mothers' referencing. That is, when playing with their mother with a simple visual design toy they were exposed much more frequently to vocabulary about the features that could distinguish the parts of the toy. In the case of the simple toys, this overwhelmingly took the form of colour terms (e.g., *the blue block, the orange one, the green ring*). Indeed as described previously, within the category of specific references for simple toys, there were 94 instances of the use of colour terms. For busy toys, however, specific references were infrequent and there were only four instances of the use of a colour term among them as references generally took the form *this/that one*. Given that the age of the children in this study (i.e., 23 months) places them firmly within the stage of language acquisition where vocabulary is growing rapidly, this negative impact of a toy's busy visual design on children's exposure to more informative vocabulary, such as colour terms, should be noted.

Children's word learning was not explored in this study, but it is uncontroversial to state that to learn new vocabulary and make distinctions among similar terms, such as colour or size terms, it is advantageous if children can encounter these terms more frequently in different settings. In this study, the busy visual design of two toys significantly reduced the amount of information mothers' provided when referencing these toys' parts compared to modified, simpler visual design versions of the same two toys. Empirical studies have clearly shown that the diversity of vocabulary input to children (of the same age as children in this study) is positively correlated with children's later vocabulary diversity, even with quantity controlled (e.g., Hart & Risley, 1995; Rowe, 2012). Thus, how easily a toy's visual design affords opportunities for parents to use diverse and informative vocabulary would appear to be a feature of a toy for parents, educators, and early intervention and speech-language professionals to consider.

There are indeed many toys in the marketplace beyond the two used in this study where such a consideration is relevant. For example, Fisher-Price has introduced a new version of their *Brilliant Basics Rock-A-Stack™, the Rock-A-Stack Pink Stacking Rings™*. Instead of the original classic blue, green, yellow, orange, and red stacking rings, the pink version features one blue base ring topped by four rings in successively lighter shades of pink (see **Figure 2**). For any adult, the pink version is likely to pose a greater challenge with respect to finding a way to refer clearly to one of the four different-shades-of-pink rings, especially using language that would be age-appropriate and easily understood by a toddler.

Figure 2

Photo supplied by authors.

Brilliant Basics Rock-A-Stack™ and *Rock-A-Stack Pink Stacking Rings™* by Fisher-Price.

It is most likely clear to readers from **Figures 1b** and 1d how easy it was for a parent to refer to each part of the simple toys clearly by, for example, using colour terms. What may be less obvious to glean from **Figures 1a** and **1c** is exactly how difficult it was for parents to find a way to refer to parts of the busy toys and the lengths parents went to in order to try to attain a greater level of specificity. For example, for the four busy stacking rings, a blue colour is shared by all rings, two depict stripes, one depicts spirals (not a frequent toddler-age vocabulary term), and one depicts something almost like polka dots but the dots are egg-shaped. For the four busy nesting blocks, similar colours are found on all blocks as well as difficult-to-name patterns (e.g., checkerboard). Other panels have difficult-to-name features such as one panel that depicts the numbers 1–4 but the corresponding pictures include items not easy to name including the *Whoozit*® face used on other toys in the line. As a result, we observed some mothers even try to introduce completely different dimensions by which to try to distinguish one part clearly (e.g., *the daddy*). With the busy nesting blocks, we also observed mothers talk about features on the panels of the toy and struggle to name them (e.g., *funny guy, smiley face, fireworks*).

Interestingly, we think, the effects of the toys' differing visual design in this study appeared to produce effects on the quality of mothers' references in terms of their level of specificity in a similar manner to how electronic features of toys have been shown to reduce parents' language related to the function of the toy (e.g., to highlight spatial language with a shape sorter; Zosh et al., 2015). Although in the literature on electronic toys some have argued their features result in parent disengagement (i.e., the child plays largely alone), we did not observe a similar disengagement with busy toys in our study. Rather, we would argue that the busy toy led the same mother who used specific references to toy parts when playing with the simple toy to be much less effective at doing so with the busy toy. As a result, the child playing with the busy toy with his or her mother was exposed, proportionally, to much more talk that simply referenced the parts of the toy as *this one* or *that one* and very little to no opportunity to hear more specific references used that made identification of the intended part much clearer (e.g., *the orange flower*).

In effect, the referencing occurring with busy toys seemed counter-productive to some of the main play functions of the toys that children and parents might be

trying to engage in together such as identifying, one-by-one, the different parts of the toy in a particular order to reproduce the original stack of rings, create a tower of nested blocks, nest the blocks within each other, or line up the parts by size. Indeed, the fact that the toys with a busy visual design reduced specific references to the toy parts so significantly, we argue, could be viewed as limiting parents' ability to provide scaffolding support to their child while playing with the toy. As a result, the type of adult linguistic input and engagement viewed as essential to explaining how children are successfully exposed to enriching language experiences during play (Weisberg et al., 2013) was hindered by the busy visual design of toys. Moreover, responding contingently to a child's actions has been shown to be an important aspect of enriching, instructive play (Fisher, Hirsh-Pasek, Newcombe, & Golinkoff, 2013; Weisberg et al., 2013). Thus, the ability of parents to easily be able to talk about pieces of a toy while playing with their child—rather than searching for a description as the first author found herself doing in the introductory anecdote to this study—would serve to increase the possible opportunities for contingent responses.

Our results also underscore the importance of considering situational and contextual factors when examining parent–child talk. It would not be appropriate to conclude from our results that some mothers had more or less informative or specific styles of referencing overall, or that the results are due to the greater or lesser talkativeness of some mothers. Rather, a mother's referencing was impacted by the visual design of the toy (simple or busy) and changed depending on which toy she was playing with together with her child. The toy's design is impacting the ability of mothers to refer clearly, or not, to the toys' parts. In this sense, our results are similar to findings that the complexity of mothers' talk varies as a function of book genre (e.g., vocabulary flashcard type picture book versus a story picture book; Nyhout & O'Neill, 2013).

The current study employed only two toys and focused on the impact of visual design on the specificity of a parent's references to parts of the toy. Potentially valuable extensions of this research could include an examination of the impact of visual design on other aspects of parent–child talk. For example, perhaps there exist shape-sorters with overly busy visual designs, or shapes in non-traditional styles, that detract from spatial language used by a parent in the same way that electronic affordances have been found to misdirect a parent's focus (Zosh et al., 2015). It is even possible that some toys would impact parents' talk for both reasons: the set of stacking rings used in our study, for example, also had a sound feature that we turned off (i.e., a sound occurred when rings were stacked on the post). Another avenue for further exploration could be a consideration of visual design effects with respect to toys for older children where the impact on adult–child, child–adult, and peer-to-peer talk might be of interest.

Finally, we note that both of the commercial toys we used in this study are well-regarded toys. The *NooBoo Symphonic Stacker™* received the Oppenheim Toy Portfolio Platinum Award 2006, the National Parenting Publications Awards 2006 Gold Award Infant/Toddler, and was listed on the National Association for Gifted Children Holiday Educational Toy List 2006. Toys among the *Whoozit®* collection have also won awards, including the Oppenheim Toy Portfolio Gold Seal award (https://www.amazon.com/Whoozit-Tip-Top-Tower-Block/dp/B00157D4UA).

It is not clear whether evaluations of these toys pertain largely to contexts in which a child is playing alone with them or together with an adult. Our results do not (and cannot) speak to the value of these toys in a solitary play context. That would require a different study with different measures (e.g., children's sustained attention). What our results speak to is the potential impact of busy visual designs on one aspect of the quality of parents' talk—the specificity of their references to parts of the toy—when playing with the toy together with their child. Here our results are clear: busy visual designs reduced the frequency and proportion of mothers' informative references and led to a preponderance of non-specific references.

Conclusion

This is one of the first studies of the impact of the visual design of toys on the quality of parent talk. Our results would support a "less is more" approach. However, just as has happened with further research exploring the positive and negative aspects of electronic versus traditional picture books, the answer is unlikely to be so simple. Instead, for toys, just as for e-books, it may be a case of understanding and exploring at a more subtle and specific level how certain features impact different aspects of play and talk with the toy in a negative or positive way. We believe our study begins a discussion of the potential ways in which a toy's visual design can impact the quality of parent–child talk as they play with the toy together and highlights the importance of considering a toy's visual design especially in contexts where the goal may be to foster adult–child language and a child's exposure to more information-rich vocabulary terms during toy play with an adult.

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