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Citation: Todd, B., Barry, J.A. & Thommessen, S. (2017). Preferences for 'Gender-typed' Toys in Boys and Girls Aged 9 to 32 Months. Infant and Child Development, 26(3), e1986. doi: 10.1002/icd.1986

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Link to published version: https://doi.org/10.1002/icd.1986

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Preferences for 'gender-typed' toys in boys and girls aged nine to 32 months.

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Key words: sex differences; toy preference; play; infancy; gender differences

Acknowledgements: We would like to thank the children, parents and staff at the following nurseries: Green Gables Montessori School, Paradise Park Children's Centre, The Grove Nursery & Preschool and Robert Blair Children's Centre. We also thank the Experimental Psychology Society for funding this research.

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ABSTRACT

Many studies have found that a majority of boys and girls prefer to play with toys which are typed to their own gender, but there is still uncertainty about the age at which such sex differences first appear, and under what conditions. Applying a standardized research protocol and using a selection of gender-typed toys, we observed the toy preferences of boys and girls engaged in independent play in UK nurseries, without the presence of a parent. The 101 boys and girls fell into three age groups: nine months to 17 months, when infants can first demonstrate toy preferences in independent play (N = 40), 18 to 23 months, when critical advances in gender knowledge occur (N = 29) and 24 to 32 months, when knowledge becomes further established (N = 32). Stereotypical toy preferences were found for boys and girls in each of the age groups, demonstrating that sex differences in toy preference appear early in development . Both boys and girls showed a trend for an increasing preference with age for toys stereotyped for boys. Theoretical implications of the findings are discussed with regard to biological predispositions, cognitive development and environmental influences on toy preference.

INTRODUCTION

Sex differences in play and toy choice are of interest in relation to child care, educational practice and developmental theory and are reliably found across a variety of social contexts in typically developing young children aged over two years (Berenbaum & Hines, 1992; Fein, Johnson, Kosson, Stork, & Wasserman, 1975; Schau, Khan, Diepold & Cherry, 1980; Servin, Bohlin & Berlin, 1999; Wilansky-Trainor & Lobel, 2008; Zosuls et al., 2009). However, there is still uncertainty about the origins of boys' and girls' preferences for play with toys typed to their own sex and the developmental processes which underlie this behaviour. One approach to advancing our understanding is to determine when such preferences appear and whether they increase with age as knowledge of gender categories expands and a gendered identity is acquired in infancy (defined as the period between 0 – 24 months) and early childhood.

Sex differences in infants' preferences and abilities

There is evidence of early sex differences in infant's visual interest in toys, or 2D representations of toys; girls aged between 3-8 months showed more visual interest in a doll than a truck, whereas boys fixated more on the truck than girls did (Alexander, Wilcox, & Woods, 2009) and, at nine months of age, boys looked longer at photographs of own-gender-typed rather than other-gender-typed toys, though no equivalent effect was found for girls of that age (Campbell, Shirley, Heywood, & Crook, 2000).

Other studies using visual preference and habituation-dishabituation techniques found sex-differences in infant abilities which may pertain to play preference: boys show greater aptitude for mental rotation than girls at three to four months old (Quinn & Liben, 2008) and at five months old (Moore & Johnson, 2008). Later in their first year, boys are found to succeed at event mapping tasks earlier than girls (Schweinle & Wilcox, 2004; Wilcox, 2003; Wilcox, 2007). In contrast to these studies showing boys' greater interest or ability in spatial

processing, a meta-analysis revealed that infant girls had more ability or interest in the perception of facial expressions than infant boys (McClure, 2000).

Small sex differences in aptitude, which might also impact on play behaviour, have been observed in infancy. For example, infant girls showed advantage over infant boys in fine motor skills (Touwen, 1976), and a meta-analysis of 46 infancy studies, using a range of assessment procedures, showed higher levels of motor activity in males than in females (Campbell & Eaton, 1999). In addition, an experimental study found that, between the ages of 6 and 9 months, boys were more likely than girls to imitate propulsive movement (Benenson, Tennyson, & Wrangham, 2011).

The aptitudes apparent in typical boys may promote active play styles and be associated with their attraction to features of objects which afford movement in space, for example, balls and wheeled toys (Alexander & Hines, 2002). In contrast, girls may typically prefer toys with animate-like features such as faces (Alexander & Hines, 2002) or with features allowing fine manipulation of parts. If the early-appearing sex differences in aptitude persist through middle and late infancy and into early childhood, then we might expect to see consistent sex differences in toy preferences as soon as boys and girls can demonstrate them. Sex differences in interest in specific toys are indicated by the visual behaviour of infants aged under 12 months in a laboratory setting (Alexander et al., 2009; Campbell et al., 2001) but have less often been demonstratedwhen very young infants are engaged in independent free play. Detecting the object preferences of very young infants poses a challenge because of their physical and cognitive immaturity; whilst interest in specific object features can be inferred from visual behaviour, active play also involves exploration by touch and enactment of scripts (Zosuls et al., 2014).

Some studies that do find sex differences in the toy preference of young infants (e.g., Lamminmäki et al., 2012; Roopnarine, 1986; Servin, Bohlin, & Berlin, 1999; van de Beek,

van Goozen, Buitelaar, & Cohen-Kettenis, 2009) and older infants (e.g. Caldera, Huston, & O'Brien, 1989, Fein, et al.,1975; O'Brien & Huston, 1985; Zosuls et al., 2009) are undertaken wholly or partly in the context of proximity to, or interaction with, a parent. In such situations, boys' and girls' behaviour may reflect parent's differential reward of children's 'gender-typed' behaviours (e.g. Fagot, 1978; Langlois & Downs, 1980). Indeed, a meta-analysis of studies examining parents' differential socialization of boys and girls found evidence of parental encouragement of children's sex-typed activities (Lytton & Romney, 1991); however, the authors caution that such encouragement may be given in response to children's pre-existing preferences, a possibility which requires further exploration.

Sex-differences in toy preference have been found among 12 – 14 month old infants in 'play alone' conditions (Lamminmäki et al., 2012; Servin et al., 1999; van de Beek, 2009), yet parents were often present in the same room, sometimes sitting close by. Where 'play alone' and 'play with parent' conditions have been incorporated into the same study, results are not always consistent; Alexander and Saenz (2012) found stable sex differences across such conditions at 19 months, whereas Zosuls and colleagues (2009) found stereotyped preferences were generally weaker when infants aged 17 and 21 months played with their mother than when playing alone. Findings may vary by cultural context and sex of the play-partner (see Servin et al., 1999) and parental behaviour in the research context may not always represent their typical behaviour at home.

As testing infants alone is problematic, another option is to observe their behaviour in a nursery setting, amongst their familiar peers. Peer presence has been shown to affect the sex-typed play of older children; for example, three and four year old children played more with 'own-sex-typed' toys in the presence of a peer than alone (Serbin, Connor, Burchard & Citron, 1979). The proximity of adults other than the parents may also influence the play behaviour of pre-school children (Serbin, Connor & Citron, 1981) and older boys and girls

(Wilansky-Traynor & Lobel, 2008). Research into sex differences in the toy preference of younger infants is less often conducted in the presence of peers and this study therefore seeks to extend the range of contexts of such studies.

Explanations for the observed sex differences

Explanations of the observed sex differences in children's toy preference centre on biological, social and cognitive factors, each approach giving rise to particular expectations about the timing of their first appearance and changes in magnitude. Biological explanations are supported by evidence that children's preferences for 'gender-typed' toys vary with the degree of exposure to pre-natal and early post-natal androgens (Berenbaum & Hines, 1992; Berenbaum & Syder, 1995; Lamminmäki, et al., 2012; Nordenström, Servin, Bohlin, Larsson, & Wedell, 2002; Pasterski et al., 2005; Servin, et al., 2003). Findings of sex differences in the toy preference of other primates (Alexander & Hines, 2002; Hassett, Siebert & Wallen, 2008) indicate that they may occur relatively independently of social and cognitive means. If biological factors are influential, sex-differences in object preference should arise early in infancy because early androgen exposure gives rise to lasting changes in the brain (Alexander, 2014; Hines, 2010).

Children's toy preferences are likely to be influenced by gender-specific socialisation and be augmented as knowledge of gender-typed behaviour, derived from observation of others, increases (Bussey & Bandura, 1999; Fagot & Hagan, 1991; Langlois & Downs, 1990). Adults may initiate and reward stereotypical play but the extent of their influence is difficult to determine. By the end of the infancy period, boys and girls were found to own more toys which complied with traditional stereotypes (Pomerleau, Bolduc, Malcuit & Cossette, 1990) but toy donors may take the child's own preferences as well as conventions into account. In a meta-analysis of studies where adults played with an unfamiliar infant arbitrarily labelled as

boy or girl, half of the examined studies found no effect of designated infant sex on adult toy selection, though in the remaining studies choice did accord with the stereotypes (Stern & Karraker, 1989). If socialization strongly influences children's toy preferences, then an increase in gender-typed preferences might be expected as social experience accumulates with age.

Furthermore, the acquisition of a gendered identity is likely to motivate boys' and girls' gender-typed play as they apply learned stereotypes to themselves and others. Developmental changes in multiple, relevant dimensions of cognitive ability are likely to be incremental (timeline in Martin, Ruble, & Szkrybalo, 2002). According to Kholberg (1966), infants can categorise the gender of others at around two years of age and have an appreciation of their own gender at around three years of age. Explicit labelling of others by gender has been demonstrated in infants aged between 18-24 months (for a review, see Martin & Ruble, 2010) but it is more challenging to establish the age at which infants can conceptualize their own gender. The sequence and timing of the capacity to categorise the gender of self and others is difficult to assess when measurement depends on the infant's language development and could be subject to sex differences (Stennes, Burch, Sen & Bauer, 2005). Evidence of a basic self-awareness is apparent between the middle and end of the second year (Bard, Todd, Bernier, Love, & Leavens, 2006; Rochat, 2003) and boys' and girls' productive vocabularies contained more own-gender-typed than other-gender-typed words at 24 months of age (Stennes, et al., 2005), with mother's reports show that 17% of 76 infants self-labelled by 21 months (Zosuls et al., 2009). These findings, taken together, indicate the latter part of the second year as a period of critical advances in gender knowledge and the start of the third year as the period when this knowledge becomes further established; we may therefore expect that infant toy preferences would be reflected increasingly strongly during these stages.

In the present study, we aimed to determine (i) whether sex differences in independent toy choice would be apparent among infants and pre-school children in a nursery setting with parents absent, and (ii) whether toy preferences would vary with age.

METHOD

Methodological considerations

For practical and ethical reasons, it is not advisable to record the behaviour of infants and preschool children remotely, without their immediate supervision by an adult. However, even in the case of very young children, the expression of sex-typed behaviour is likely to depend on the social setting in which it is produced. (Fabes,Martin & Hanish, 2003; Serbin, et al., 1979; Zosuls et al., 2009). This field of research can therefore benefit from the adoption of a variety of observational procedures and techniques across a range of social contexts.

We observed the behaviour of boys and girls in their familiar nursery school settings with parents absent. Children's toy choices were recorded by a researcher who sat adjacent to them, using a time sampling technique. This method was deemed less disruptive than isolating the infants and young children from their peers, yet the children were still tested individually, rather than in play with others. This procedure avoided the distraction of introducing cameras for filming the procedures.

Time-sampling methodologies have been used in previous research on children's toy preferences (e.g. Fein, et al., 1975; Jacklin, DiPietro & Maccoby, 1984, O'Brien & Huston, 1985; Snow, Jacklin & Maccoby, 1983). In the current study, an instantaneous time-sampling method, where a record of which toy was being touched at fixed time points (Martin & Bateson, 1993), was chosen as this allowed for relatively unobtrusive coding in current time.

We studied boys and girls aged from nine to 32 months in three age groups beginning from the period when they can move independently to select toys (nine months). The first age group (9-17 months) represents the period when the majority of infants do not demonstrate gendered self-awareness (Zosuls et al., 2009), the second age group (18-23 months), comprising the period when most infants develop the ability to label themselves and others by gender and use gender labels in speech (Campbell, Shirley & Caygill, 2002; Levy, 1999; Stennes et al. 2005) and encompasses the ages at which previous studies have typically first reported sex difference in independent play (e.g. Caldera, et al., 1989; Fein, et al., 1975; O'Brien & Huston, 1985) and the third age group (24-32 months) is the period when further substantial changes in gender category knowledge occur (Zosuls et al., 2014).

The boys and girls were observed in free play with sex-typed toys (provided by the researchers) in their familiar nurseries when parents were absent.

Participants

Participants were recruited from four multicultural nurseries in London, UK, and were mainly from middle socioeconomic status families. Ethical approval for the study was granted by City University London, and informed parental consent obtained. Forty-seven girls (*M* age 20.04, *SD* = 6.99 months old) and 54 boys (*M* age 20.44, *SD* = 6.63 months old) were divided into three groups: 9-17 months (20 boys, M age 13.40, *SD* = 1.97 months old; 20 girls, M age 13.20, *SD* = 2.73 months old), 18-23 months (18 boys, M age 20.83, *SD* = 1.76 months old; 11 girls, M age 21.09, *SD* = 2.17 months old), 24-32 months (16 boys, M age 28.81, *SD* = 2.46 months old; 16 girls, M age 27.88, *SD* = 2.92 months old). All participants were able to crawl or walk independently. All of the boys and girls attending at the nursery on testing days were invited to take part; three boys in the oldest age group and one girl and one boy in the middle age group were unwilling to participate and were not pressed to do so.

Materials

The selection of toys in the current study was based on a contemporary survey of the views of adults (92 male, 73 women, aged between 20 and 70 years) living locally to the participating nurseries in London, UK. Participants in the survey were asked which toy first came to mind when thinking about a young boy and a young girl and their answers were recorded on paper. The most common response for a boy was car, followed by truck and ball. The most common response for a girl was doll, followed by cooking equipment. Teddy bears were also identified as a favourite female-typed toy, yet it could be argued that baby boys as well as baby girls are typically given teddy bear toys. For this reason, a blue teddy, identical to the pink one except for colour, was also included in order to determine whether stereotypical colouring would render it more attractive to young boys (Alexander, 2003; Wong & Hines, 2015). The resulting stimuli comprised seven toys (female typed: a doll, a pink teddy bear, a cooking pot; male typed: a car, a blue teddy, a digger and a ball).

Procedure

Testing took place in a quiet corner of the nursery when all the boys and girls were engaged in free play, thus maximizing the naturalistic context of play. Nursery staff and other children were present in the same room in which the observation of individual participants took place, but they were not involved in testing and did not interact with the child being tested or handle the toys chosen for the study. Parents were not present. Individually, participants were seated at 1m from the toy stimuli so that they were more than an arm's length away and had to move towards a toy independently in order to touch it. Toys were arranged in randomized order in a semi-circle around the child. The experimenter was present throughout and encouraged participants to play with the toys by saying, "You can play with any of the toys that you want to". No further conversation was initiated by the experimenter.

Coding procedure

Using an instantaneous time sampling technique (Martin & Bateson, 1993), a record was made of which toy was being touched at each 5-s interval over a total of 3 min of observation (ranging from 0 - 36 intervals). Timing was denoted by a stopwatch facility on a mobile phone and recording began when the child's hand first touched a toy in a way that was defined as intentional contact, that is, holding, touching or moving the toy with hands or fingers, rather than accidental or inadvertent contact with hands or feet. After piloting the procedure, 5-s intervals were chosen as the most appropriate for capturing variations in toy choice over the 3-min duration and for maximising the accuracy of real-time recording. Participants were not restrained if they left the immediate testing area; coding was suspended if they ceased to play with the toys for brief periods and recommenced when they touched the next item. If more than one toy was being held, the first of the toys to have been touched was coded because the second toy was generally used in conjunction to or as an accessory to the first, for example, when the doll was placed on the car. A second researcher, sitting at a distance, coded approximately 20% of the observations. Coders were trained though supervised practice in the nursery setting.

The inter-rater reliability of the assessments of participants' play was tested using Cohen's kappa. A *k* value of 0.61 or more was taken to indicate substantial reliability. Twenty percent of the recordings of the children's toy choice behaviour were second-coded; comparison of the ratings made by the two observers showed substantial inter-rater reliability (k = .88).

Statistical Analysis

The dependent variable was the time a child spent in contact with the toy, measured at 5-s time intervals. The score obtained by this sampling method was the number of times the participant was in contact with each toy (ranging from 0-36). Seven boys (2 aged 9 – 17 months, 2 aged 18-23 months, 3 aged 24 -32 months) and four girls (1 aged 9 – 17 months, 1

aged 18-23 months, 2 aged 24 -32 months) were touching two toys at one or more time sample points. In these instances, for the reason stated in the Method section above, the first toy touched was used in the analysis.

Group differences and interactions between levels were assessed using analysis of variance. Statistical analyses were performed using SPSS Version 22 (IBM, Armonk, NY).

RESULTS

Data distributions (time spent playing with toys) were positively skewed because, although most participants played with specific toys for short periods of time, a minority played with specific toys for a longer time. Table 1 shows the median and range times, and the results of non-parametric tests (Mann-Whitney) that were applied to compare boys' and girls' time playing with each toy. Prior to further statistical analysis, a log10 transformation was applied to the data to normalize the distributions to approximate a Gaussian curve (Kirk, 1968) so that the composite variables (times playing with male-typed and female-typed toys) could be analysed using analysis of variance.

Preliminary assessment of the toys

Table 1 shows the results of the preliminary analysis. Because there was no significant sex difference in play with the blue teddy, and the teddies did not attract much play from children in the two older age groups, both teddies were omitted from further statistical analysis. To balance the number of toys in each group, the male-typed toy that showed the smallest sex difference (the ball) was also omitted from further statistical analysis. Two composite dependent variables were, therefore, devised, comprising the mean time spent in play with the car and digger (male-typed toys) and the mean time played with the doll and cooking pot (female-typed toys). These composite dependent variables have the advantages of (i) including only toys which showed a statistically significant gender difference and (ii) having the number of toys balanced in each variable (i.e. two toys in each variable).

Group comparisons

Table 2 shows the mean and standard deviation (SD) time intervals for the two composite variables (male-typed toys and female-typed toys) for each of the three age groups. Table 2 shows that, in general, the boys played with male-typed toys for longer than with female-typed toys, and conversely the girls played with female-typed toys for longer than with male-typed toys.

Table 3 shows that there was there was no main effect of Sex ($p < .95$) or Toy Type ($p < .91$), on time played with toys; neither boys nor girls played more with toys in general and, when play for boys and girls was combined, male-typed toys were not played with more than female-typed toys. There was also a significant main effect of Age ($p < .05$). There was a highly significant interaction between the type of toy and the sex of the child ($p < .000001$). Regarding age, Hochberg's GT2 post-hoc tests (for unequal sample sizes) showed that the oldest group played with toys for nonsignificantly longer than the youngest group ($p < .053$) and significantly longer than the middle group ($p < .026$). There was no significant difference in the time of play in the middle group compared to youngest group ($p < .950$).

Planned comparisons between boys and girls of all age groups combined found significantly more play with male-typed toys by boys ($p < .00000000003$) and significantly more play with female-typed toys by girls ($p < .00002$). Planned comparisons between boys and girls in each age group found significantly more play with male-typed toys than female-typed toys by boys (for 9-17 months, $p < .0002$; for 18-23 months, $p < .002$; for 24-32 months $p < .00000004$) and significantly more play with female-typed toys than male-typed toys by girls (for 9-17 months , $p < .00002$; for 18-23 months, $p < .005$; for 24-32 months $p < .00000005$).

Six boys and eight girls in the youngest age group were aged between nine -12 months. All of these boys played with the ball, and play with the ball accounted for 53.2% of their time playing with the toys. Overall, the girls aged 12 months or less chose the cooking pot most

frequently: seven of these eight girls played with the cooking pot and their play with this toy accounted for 49.8% of the time playing with the toys.

DISCUSSION

When studied in a familiar nursery setting with parents absent, boys played with male-typed toys more than female-typed toys and girls played with female-typed toys more than male-typed toys. Significant sex differences were found across all three age groups. Finding sex-difference in the youngest group (aged 9-17 months), when infants are able to crawl or walk and therefore make independent selections from a range of toys made available to them, is of particular interest; although sex differences in object preference have been found in visual preference studies with young infant participants (Alexander et al., 2009; Campbell et al., 2000), observational studies have not typically reported sex differences in toy preferences before 18 months of age when parents are not present.

The effect of age on boys and girls toy preferences

In the present study, sex differences in toy preference are demonstrated among infants and young children aged between 9 and 32 months. Our findings of sex differences in toy choice in the 9 to 17 months age group adds some weight to the suggestion that such preferences appear prior to extensive socialization and do not depend on gender category knowledge but are reflections of our biological heritage (Alexander & Hines, 2002: Hassett et al., 2008).

It is likely, however, that a developmental system comprising biologically-based preferences for specific features of stimuli and social influences undergoes reorganization with the acquisition of gendered self-labelling (Hines, 2010; Zosuls et al., 2009) and as knowledge of the two gender categories, male and female, is demonstrated (Zosuls et al., 2014). Individual variation in the age at which the awareness of the gender of the self and others is achieved may have ranged more widely than the age groups specified in this study; Zosuls et al. (2009) found that the percentage of infants using gender labels for others increased from 25% at age

17 months to 68% at 21 months, which suggests considerable variability. Another possibility is that gendered self-awareness may be available implicitly before infants can demonstrate it explicitly. Future research assessing boys and girls over longer time periods than previously studied may help to reveal developmental trajectories of interest.

Table 2 shows that the sex difference in gender-typical preference for toys was large across all three age groups. For boys, the difference increased with age, from 0.75 in the youngest group, to 1.84 in the middle group and to 3.83 in the oldest group, but for girls, the preference levelled off after an initially very large preference, showing a slightly U-shaped trend from -2.45, to -1.06, to -1.88. These large *d* values show that gender-typical preferences were present for boys and girls of all ages represented here. The trends suggest that as boys grow older, they increasingly prefer male-typed toys, and although girls initially much prefer female-typed toys, this preference settles to a merely strong preference. Thus, it is interesting that not only are there sex differences in preference but also sex difference in the development of preference over time.

Although girls' interest in female-typed toys remained higher than that of boys across all age groups, the time spent with male-typed toys increased with age for both girls and boys. This result is consistent with findings of a decrease in pre-school-aged girls' and boys' interest in female-typed toys with age in a Swedish study (Servin et al., 1999) and in US kindergarten children's toy requests (Etaugh & Liss, 1992). It is possible that, rather than demonstrating increased socialization with age, such findings reflect a weaker compliance with stereotyped roles in the older girls than the older boys, or simply that the age changes pertain to the specific stimuli presented. The sample size in the groups was small, and so the lack of increase in girls' interest in female-typed toys may have been due to low power. However, this is unlikely because, as Table 2 shows, there was no real increase in the mean time played with female-typed toys by girls over time. Our results contrast with those of two earlier

studies of US children aged between 14 and 35 months, which report an increase in girls' preference for "female-typed" toys with age (Blakemore, LaRue, & Olejnik, 1979; O'Brien & Huston, 1985). The disparity between the reported relationships between girls' age and their toy preferences may reflect differences in the presented stimuli, the relative attractiveness of different stimulus toys for children of different ages, or variation in the socialization of girls at different time periods or geographical locations. The choice of stimuli for the present study was based on a contemporary local survey of adults, and, therefore, should be considered to be reasonably consistent with contemporary local stereotypes.

Stimulus choice

A strength of this study is that the same stimuli were used to assess play behaviour across a relatively wide age range, thus enabling comparisons across pertinent age groups. However, the breadth of the age range posed challenges in the selection of stimuli which would appeal equally to infants and pre-school children. Toy preference is likely to vary across a range of age-related variables, for example, the development of motor abilities and interests, thereby creating confounds with the development of a gendered self-concept and gender-knowledge. An effect of including the same stimuli for all age groups may be to limit choice for some age groups more than others, if boys and girls show little interest in toys deemed age-inappropriate. Partly for this reason, toys which have shown appeal across a wide age range in previous studies (vehicles, dolls, cooking pot) were subject to further analysis in the present study. One potentially distinguishing characteristic between the present study and the majority of other studies in this area was that all the stimuli toys were classified as male-typed or female-typed and no gender-neutral-typed toys were included. This was done in order to avoid the dilution of dichotomous sex differences in toy choice by introducing a third option.

Limitations

In the present study, participants were observed in individual play in proximity to an unfamiliar female researcher and in the same room as familiar nursery staff and peers. Peer presence may have decreased the likelihood of play with other-gender-typed toys, as demonstrated in 3- and 4- year old children tested in the U.S. (Serbin et al., 1979). Untangling the various potential effects of observers is challenging; the effect of parent, other adult or peer presence is likely to vary by age and sex of the participant, by sex and role of observer and by wider cultural context. In future studies the relationship between young infants' preferences and the beliefs and behaviour of their parents could be explored.

The findings of this study pertain to the specific toys selected as stimuli; these were based on local stereotypes, and further research is required to determine which types of toy elicit sex-differences in each age group and whether this varies by region and culture.

There was considerable variability amongst boys and girls as well as between sexes in the number of time intervals of play with specific toys; some children played with a greater number of toys and others focused on just one or two toys. The ecological validity of the study was good, since it was conducted in the boys' and girls' familiar daycare setting. On the other hand, the findings may be context specific and may not generalise to play behaviour in the home or laboratory. Although it would be informative to study infants engaged in solitary play, this was deemed inappropriate for younger infants because of ethical and potential safety issues.

Conclusion

This study adds to evidence from many previous studies of sex differences in children's toy preferences. We found evidence of strongly gender-stereotyped free preferences for objects, in both boys and girls aged between 9and 32 months, when observed in independent play in a

familiar play setting amongst familiar and unfamiliar adults and peers but in the absence of a parent. Therefore, the study adds to the literature in that the toy preference of younger infants was tested independently of parents and in the presence of, but not interaction with, peers. The finding of sex differences in toy choice prior to the age at which a gendered identity is usually demonstrated, is consistent with biological explanations of toy preference and with many results of highly controlled visual preference and habituation experiments. However, it is possible that preferences relate to previous positive experiences of play with similar gender-typed toys selected by caregivers (Alexander et al., 2009). The possibility that boys and girls follow different developmental trajectories with respect to selection of gender-typed toys is indicated. Thus, the results suggest both a biological and a developmental-environmental component to sex differences in object preferences.

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Table 1. Median and range sex difference in time intervals spent in contact with each toy.

Toy	**Boys** (n=54) aged 9 to 32 months	**Girls** (n=47) aged 9 to 32 months	**Mann-Whitney *U***
Blue Teddy	0.0 (0-32)	1.0 (0-36)	1112
Pink Teddy	0.0 (0-13)	1.0 (0-36)	852***
Cooking pot	0.0 (0-27)	5.0 (0-36)	846**
Doll	0.0 (0-6)	6.0 (0-36)	533******
Car	12.5 (0-36)	0.0 (0-16)	539******
Digger	4.0 (0-31)	0.0 (0-16)	657*****
Ball	5.5 (0-36)	0.0 (0-24)	646*****

Note. * $p < .05$. ** $p < .01$. *** $p < .001$. **** $p < .0001$. ***** $p < .00001$. ****** $p <$ .000001. Significance values are 2-tailed.

Table 2. Untransformed mean and standard deviation (SD) time intervals of play with toys by boys and girls aged between nine months and 32 months old.

	Male-typed Toys		**Female-typed Toys**			
	Mean	SD	Mean	SD	*d*	Sample size
All Boys	49.60	33.75	9.50	14.10	1.68	54
All Girls	10.00	15.40	54.40	32.55	-1.85	47
Boys 9-17 months	31.65	29.15	14.00	17.65	0.75	20
Girls 9-17 months	5.75	11.55	58.90	31.85	-2.45	20
Boys 18-23 months	46.95	29.70	7.35	13.45	1.84	18
Girls 18-23 months	12.30	17.65	42.05	38.35	-1.06	11
Boys 24-32 months	75.00	28.60	6.10	7.40	3.83	16
Girls 24-32 months	13.60	17.60	57.35	28.95	-1.88	16

Note: *d* indicates Cohen's *d*, a measure of effect size. A Cohen's *d* of 0.2 is a small effect size; $d = 0.5$ is a medium effect size; $d = 0.8$ is a large effect size.

Table 3. A 2 (Sex) x 3 (Age Group) x 2 (Toy Type: male-typed vs. female-typed) mixed ANOVA assessing the time (log10 transformed) that boys and girls spent playing with male-typed or female-typed toys.

Source	***df***	***F***	***η***	***p***[§]
		Between subjects		
Sex (S)	1	0.00	.00	.95
Age (A)	2	4.30	.08	.02*
S x A	2	0.19	.00	.83
Ss within-group error	94	0.11		
		Within subjects		
Toy (T)	1	0.01	.00	.91
T x S	1	96.05	.51	.00******
T x A	1	5.55	.11	.01**
T x S x A	2	2.06	.04	.134
T x Ss within-group error	94	0.18		

*$p < .05$. ** $p < .01$. *** $p < .001$. **** $p < .0001$. ***** $p < .00001$. ****** $p < .000001$.

[§] The *P* value is based on the analysis of variance of the logarithm transformation

Note: Values enclosed in parentheses represent mean square errors. Ss = subjects