Cross-Cultural Comparison of Peer Influence on Discovery Rate during Play

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Abstract

Previous literature has explored how factors such as maturation, attachment style, and security influence children's free-play behavior. The present study investigates a previously unexplored factor: peer presence. This is an important consideration because much of children's play and early learning occurs in a social context with siblings and friends. We tested children (ages 2 to 11) from two different cultural environments: the lowlands of Bolivia, the home of a group of Amazonian farmer-foragers called the Tsimane' (Experiment 1), and the United States (Experiment 2). We presented groups of children from both cultures with a set of toys hidden in envelopes to explore and discover either *with* a familiar peer or *without*. Tsimane' children discovered significantly more objects in the presence of a peer, over and above the effect that would be expected from simply having two children search the toys independently in parallel. Additionally, Tsimane' children discovered more objects as a function of age. The United States children did not exhibit the same pattern of behavior. Peer presence facilitated exploration in younger children but *inhibited* exploration in older children, relative to exploration rate without the peer. Taken together, peer presence facilitates exploration among young children across both cultures. However, among older U.S. children, peer presence inhibited exploration. We propose that the positive effect of peer presence on discovery rate may be driven by an increase in competition for resource control. The differences among older children across cultures may be an artifact due to experience with formal schooling.

Keywords: Developmental psychology; developmental experimentation; cross-cultural analysis; exploration; discovery; learning; play; social development.

Play in a Social Context

Play and exploration are important for social development and learning in humans and mammals alike (Weisler & McCall, 1976). While there is a relatively large literature on how maternal presence and attachment style affect play behavior, relatively little research investigates the role of peer presence on play and exploration throughout childhood. The social framework in which play spontaneously occurs is important for scientific consideration because the majority of children interact with other children on a daily basis, in either their homes (e.g., siblings) or communities (e.g., nearby children, classmates). Furthermore, the majority of play occurs in a social context involving siblings, peers, or caretakers. This context is believed to be critical for the development of social learning (e.g., Youniss, 1982; Sutton-Smith & Rosenberg, 1970).

Research about the effect of maternal presence on play behavior overwhelmingly demonstrates that social contexts do alter both the quality and quantity of play (e.g., Passman, 1977; Adams & Passman, 1979). Two- to 4-year-old children with visual or auditory access to their mothers increase exploratory play and duration of play relative to children who are provided with comparable access to an unfamiliar woman (e.g., Passman & Erck, 1978; Adams & Passman, 1979; Passman & Longeway, 1982). Although ignored by the literature as an influence on play behavior, siblings offer a unique source of social learning—older siblings enhance younger siblings' theory of mind (e.g., Perner, Ruffman, Leekam, 1994; Jenkins & Astington, 1996) and empathy (e.g., Tucker, Updegraff, McHale, & Crouter, 1999). It is less certain how the presence of siblings or familiar peers influences curiosity, exploration, and learning during play.

Peer Influence Shifts during Development

How does the presence of a peer influence children's exploration and learning during play? Some evidence suggests that children younger than 2 years of age inhibit their play behavior in the presence of peers (e.g., Turkheimer, Bakeman, & Adamson, 1989). In a study that assessed play behavior in 1-year-old infants across three different social contexts, infants were *most unengaged* with their toys in the presence of a familiar peer (57% of the time), in comparison to with their mothers (30%) or alone (45%) (Turkheimer et al., 1989). Turkheimer et al. (1989) also found that children engage in less complex play with peers than with mothers. They also engaged in less functional object play with a peer than alone. Similarly, Gunnar, Senior, and Hartup (1984) reported that 1.5-year-olds play less and get bored faster in the presence of a peer.

Between 2 and 3 years, children appear to exhibit a shift in their response to peer presence. At 2.5 years, infants engaged in more social play with an unfamiliar peer, as compared to their behavior a year earlier (Gunnar et al., 1984).[1] In sum, the effect of peers on play interaction seems to shift from *inhibitory* to *facilitative* as children age.

Children Interact with Peers in Social and Education Contexts

Due to a small literature with a limited developmental focus, it is unclear how peer presence may affect play behavior and exploration in children older than 2 years of age. Exploration is an important yet understudied behavior that provides new information about objects or environments. Ascertaining the relationship between peer presence, learning, and exploration is critical because of how much learning occurs in a social context. By 3 or 4 years of age, learning with

[1] Gunnar et al. (1984) only included unfamiliar peers in the study. To our knowledge, no equivalent study was conducted with familiar peers or siblings. Therefore it is unknown whether the same shift in the effect of peer presence between 18 and 30 months would be observed for familiar peers or siblings.

other children—particularly unrelated peers—becomes an integral part of a child's daily life as children begin to attend daycare and preschool. Previous studies on speech content and pretend play dynamics for 4- and 5-year-olds suggest that play has benefits for literacy (e.g., Roskos & Christie, 2004), mathematic development (e.g., Seo & Ginsburg, 2004), social competence (e.g., Connolly & Doyle, 1984), and emotional self-regulation (e.g., Howes & Matheson, 1992)—effects that may be causally linked to the social interactions common in peer play among children. However, there has been no research on how peer presence shapes exploration behaviors in school-aged children. Furthermore, while children from Western societies begin to attend preschool or kindergarten, children in other societies may begin to learn important life skills (e.g., hunting, cooking) with their peer group in an indigenous community setting. Since the majority of the literature focuses on children from Western societies, it is uncertain whether the effects in the literature depend on particular cultural factors or if they extend more broadly across cultures.

Experiment 1 evaluates the role of peer presence on exploration in Tsimane' children between the ages of 2 and 11. The Tsimane' children come from a farming and foraging society, comprised of small villages in the lowlands of Bolivia. Experiment 2 uses a similar paradigm to investigate peer presence on exploration in U.S. children between the ages of 2 and 9. By examining the impact of social context on exploration behavior across cultures and development, the study will provide new insights on how the nature of the social context modifies play behavior. If peer presence facilitates exploration across development, we expect to find that exploratory behavior increases when children play with another peer relative to when they play alone. If exploration and discovery rate changes across development irrespective of peer presence, we expect that older children will discover more toys than younger ones across both play conditions.

Experiment 1

Methods

Participants Seventy-five Tsimane' children between the ages of 2 and 11 (*M*=5;10) were recruited from the villages of Cara Cara, Las Minas, Puerto Mayera, and Limoncito surrounding San Borja, Bolivia during the summer of 2014. Forty-eight children participated as pairs in the *dyad condition* (*M*=5;2, *range*=2-11) and 27 children participated in the *solo condition* (*M*=4;10, *range*=2-11). Three children were excluded from the study due to shyness (as determined by the criteria described in "Procedure" below).

Conditions Children participated in one of two conditions: dyad or solo. Children in the dyad condition participated with a sibling or unrelated friend. Due to little demographic documentation from the participants, it was not always clear whether dyads were siblings or unrelated, familiar peers. However, the Tsimane' social structure is community-oriented compared to the nuclear family structure common in the United States. In the solo condition, children participated in the task by themselves. In both conditions, an experimenter was also present during the task.

Procedure Participants in the villages of Cara Cara, Las Minas, and Limoncito were tested in schoolhouses. Prior to the study, the participants were encouraged to play in the space in which the experiment occurred. A large tent was used to isolate the participants from other children so that others would not be able to see the study. Participants were seated on the floor next to the experimenter. Eleven envelopes were placed in a pile in front of the child(ren). Each envelope contained one toy from a set of toys that were selected to appeal to children across a broad range of ages and cultural backgrounds (e.g., shakers, toy animals, wooden vehicles) in order to increase the likelihood that the toys would be of equivalent interest to both U.S. and Tsimane' children. The experimenter only spoke English, a language that the Tsimane' children did not understand, and thus refrained from speaking for the duration of the study after a translator introduced the child and the experimenter to each other. To begin, the experimenter held up one envelope, opened it to expose the toy inside, and offered the open envelope to the participant(s). The experimenter motioned at the participant(s) to take out the toy. Children who did not take the toy from the envelope offered by the experimenter were excluded from the experiment and the session was terminated. Participants were given two minutes to play with the toys, starting at the point they reached for their first closed envelope. If children hesitated, the free-play period started ten seconds before an envelope was moved towards the child by the experimenter. Discovery rate was operationally defined as the number of toys found within the two-minute period from within the ten unopened envelopes at the start of the experiment. At the end of the play period, the experimenter and child(ren) put the toys back in the envelopes.

Results

Figure 1 plots the results for Tsimane' children. A linear regression with social condition (*dyad, solo*), age, and their interaction as predictors was used in order to evaluate the role of peer presence on Tsimane' children's exploration.

Tsimane' children discovered significantly more toys in the dyad condition (M=8.2±0.25) than in the solo condition (M=1.4±0.35)—$ß$=3.43, $t(68)$=15.88, $p<0.001$. This result supports the hypothesis that Tsimane' children explored more in the presence of a peer than alone. Older children discovered significantly more toys than younger children, as revealed by the main effect of age ($ß$=0.33, $t(68)$=3.45, $p<0.001$). The regression also yielded a significant interaction of age and condition ($ß$=0.22, $t(68)$=2.25, $p<0.03$), such that peer presence yielded an additional boost in discovery rate for older kids. Taken together, peer presence and age facilitate exploration and increase discovery rate.

Table 1: Regression coefficients for Tsimane' analysis

Term	Coef.	SE	*t*	*p*<
Intercept	3.05	0.55	5.52	0.001***
Age	0.33	0.10	3.45	0.001***
Condition	3.43	0.22	15.88	0.001***
Age*Cond	0.22	0.10	2.25	0.028*

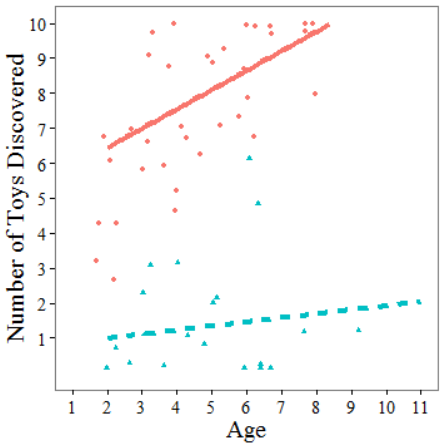

Figure 1: Discovery rate for Tsimane' children by age and condition. Linear regression lines plotted for *dyad* (red solid) and *solo* conditions (blue dashed).

Discussion

Across all ages, Tsimane' children playing with a peer consistently explored at a faster rate than children playing alone. These results indicate that peer presence facilitates exploration across development. One mechanism that may explain the relationship between peer presence and discovery rate is resource competition. Two children discovering toys from the same source may increase each child's awareness of the possibility that more interesting toys exist. This may lead to an increase in the discovery rate as each child searches for a more interesting toy.

In Experiment 2, we use the same paradigm as Experiment 1 to investigate the effect of peer presence on discovery rate in children from the United States.

Experiment 2

Methods

Participants Fifty-three U.S. children between the ages of 2 and 9 (*M*=4;7) recruited from the Rochester, NY area participated in the study. Thirty-two children participated in the dyad condition (*M*=4;10, *range*=2-8) and 17 children participated in the solo condition (*M*=4;5, *range*=2-9). Four additional children were excluded due to shyness (*n*=2), speaking the non-English language of the experimenter (*n*=1), and session interruption (*n*=1).

Conditions Similar to Experiment 1, children participated in the dyad condition or the solo condition. However, children in the dyad condition always participated with a sibling. In the solo condition, children participated in the task by themselves. Across all conditions, an experimenter was present during the task.

Procedure The procedure was identical to Experiment 1. However, because the children in Experiment 2 spoke English, children were told that the experimenter spoke a language other than English (that the child did not speak, according to parental report) in order to keep the procedure similar to that in Experiment 1. After the experiment, children were debriefed and told that the experimenter not only spoke a different language (either Spanish or German), but also spoke English.

Results

Figure 2 plots the discovery rate for U.S. children. Similar to Experiment 1, a linear regression predicting discovery rate was run with social condition (dyad, solo), age, and their interaction as predictors (Table 2). Among the U.S. children, age was not a significant predictor of discovery rate, but condition was marginally significant (*ß*=0.72, *t*(45)=1.88, *p*<0.07). U.S. children in the dyad condition had discovered more toys overall (*M*=3.91±0.45) as compared to children in the solo condition (M=2.46±0.62). There was also a significant interaction of age and condition (*ß*=-0.39, *t*(45)=-2.03, *p*= .048). Younger children in the dyad condition discovered more than younger children in the solo condition, while older children in the dyad condition discovered less than older children in the solo condition.

Table 2: Regression coefficients for U.S. analysis

Term	Coef.	SE	t	*p*<
Intercept	4.20	0.98	4.29	0.001***
Age	-0.21	0.19	-1.10	0.277
Condition	0.72	0.38	1.88	0.066•
Age*Cond	-0.39	0.19	-2.03	0.048*

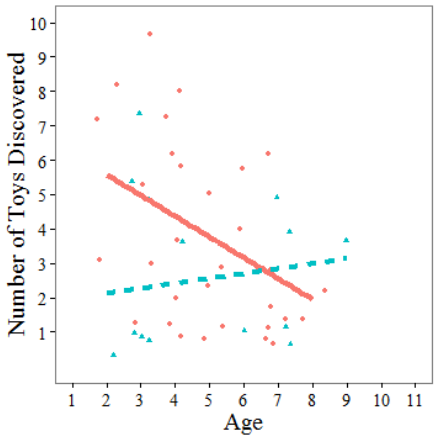

Figure 2: Discovery rate for U.S. children by age and condition. Linear regression lines plotted for dyad (red solid) and solo conditions (blue dashed).

Discussion

In Experiment 2, the effect of peer presence on discovery rate was moderated by age. In young U.S. children, peer presence facilitated exploration and increased the discovery rate of toys. However, in older children, peer presence inhibited discovery rate. One explanation for the change in the effect of peer presence on exploration behavior is that chil-

dren may engage in more social play as they get older. Siblings in the dyad condition may focus on playing with a small set of toys within the context of a play narrative. If greater social play in the dyad condition accounts for the decline in the discovery rate in older children, this would explain why children's play behavior in the solo condition was unaffected.

Alternately, children may engage with the toys together rather than explore independently. For instance, children may be discovering toys at a slower rate because they are demonstrating and sharing toys with each other. By focusing on a single toy together, it is possible that the children are exploring more properties of a single toy rather than discovering multiple toys. This form of exploratory behavior may emerge with age in the presence of a peer and explains our pattern of results. Since Experiment 2 did not investigate exploration of toy functions and properties, this is an important topic for future research.

A final possibility is that older children may have made inferences about the pedagogical context and nature of the task. Despite the fact that children were aware that the experimenter did not speak their language, the children may have made inferences about the task based on their experiences in pedagogical contexts. For instance, if older children had thought that the task involved following the directions of the experimenter, they may have inferred that they should only play with toys that the experimenter offered to them. Therefore, pedagogical inferences about the task may have inhibited older children from discovering more toys. However, it is unclear why older children in the dyad condition discovered less toys than children in the solo condition. One explanation is that the presence of another child in a relatively unfamiliar room more closely mimicked an educational setting. Since most children learn in classrooms with many other children, older children participating with a sibling may have made a stronger inference that the task was about following directions. These inferences would result in less self-directed play among older children in the dyad condition.

General Discussion

Experiments 1 and 2 examined the effects of age and peer presence on exploratory behavior among Tsimane' and U.S. children. Since the majority of the literature has focused on factors that affect play in the U.S. or Western societies, this is the first study to our knowledge that evaluates the influence of social context on play and discovery in children from a non-Western society. Across both cultures, peer presence facilitated exploration and discovery during play for younger children. Although older Tsimane' children had a higher discovery rate when accompanied by a peer, older U.S. children explored less when in the presence of a peer.

One possibility is that play dynamics differ when children played with a sibling relative to when they played with a familiar peer (e.g., Brody, Stoneman, & MacKinnon, 1982).This may influence children's degree of sharing or competition (e.g., sibling rivalry), which may in turn influence how children explore an environment. However, siblings and peers in the Tsimane' villages are raised in close proximity with unrelated children such that their relationships with familiar peers may be more similar to U.S. children's relationships with their siblings.

A more likely explanation for the differences in observed behavior across older children in Experiments 1 and 2 is the difference in levels of formal education across groups. Children who have more experience in a formal educational setting may have strong perceptions about how they should behave in the presence of a peer and an unfamiliar adult in the context of the study.

An alternative possibility is that the effect of peer presence on exploration could differ as a function of the age difference between peers. For example, the presence of an older peer may facilitate exploration more than a younger or same-aged peer. In our dyad sample, there is not enough variance in age to address this question. However, future studies should consider the contribution of a peer's age on the influence of peer presence on exploration.

Underlying Mechanisms Explaining the Role of Peer Presence on Rate of Discovery

One mechanism that may explain the effect of peer presence on discovery rate is competition for resource control. The struggle between social and agentic resources has been largely discussed in the framework of game theory (e.g., von Neumann & Morgenstern, 1944). More recently, this conflict-in-needs has been used to analyze social aggressive behavior in children and adolescents (e.g., Vaughn & Santos, 2007), as well as bistrategic resource control and peer-regard in preschoolers (Roseth et al., 2011). In the framework of our free-play task, children in the solo condition had complete control over the set of toys in the task. In the dyad condition, two children played with toys belonging to the same set. The presence of another child may have heightened each child's drive to discover toys in an effort to assert temporary control or dominance over a larger subset of toys from the available pool.

If resource control is the underlying mechanism driving a high discovery rate in the presence of peers, it would seem that the drive for resource control increases with age for Tsimane' children, but decreases with age for U.S. children.

Influence of Learning Context

A final consideration that may contribute to the results of Experiments 1 and 2 is the amount of experience children had in an educational context. While U.S. children begin formal schooling as early as 5 years of age, Tsimane' children begin at highly variable, generally older ages because the educational system is largely optional and unstandardized. Thus, children of the same age possess varying degrees of education. Furthermore, the educational context and curriculum is considerably different across societies. This difference could have contributed to the different patterns of results across the Tsimane' and U.S. children if children made different inferences about the intentions of the experimenter and the nature of the task. There is evidence that

children are able to use people's knowledge states and pedagogical intentions to make inferences about what actions to imitate (e.g., Buchsbaum, Gopnik, Griffiths, & Shafto, 2011; Butler & Markman, 2010; 2012; Schulz, 2012). At as young as 3 years of age, children can make inductive inferences based on the perceived intentionality of an action by the experimenter (Butler & Markman, 2012). At 4 years old, U.S. children are sensitive to not only the intentionality of an action, but also whether the action was performed pedagogically for the child's benefit. Children make weaker inferences about the generalizability of the property when it was demonstrated intentionally compared to when it was demonstrated pedagogically. These studies reveal how older U.S. children may have different expectations about actions and learning environments, which may have affected their performance on our task.

School-aged U.S. children in our study could be more sensitive to the perceived intentions of the experimenter and the overall context in which the experiment occurred relative to the Tsimane' children. In the study, the experimenter showed participants an open envelope containing a toy which was offered to the participants. Participants could have made an inference that the experimenter was leading the interaction as an instructor. Because the experimenter did not open up any other envelopes, children may have inferred that they should only play with the toys offered to them. This may have resulted in older children solely playing with the toys that the experimenter offered. Other envelopes that were not touched by the experimenter may have been considered "out of bounds." Therefore, greater experience with pedagogical contexts may have contributed to the low discovery rate in U.S. children. It is unclear why the discovery rate in older children was lower in the dyad condition than the solo condition, but one possibility is that the presence of another child in the context of an unfamiliar room and adult may have heightened the similarity of the study to a school context.

Conclusion

Learning does not primarily occur in a "social vacuum" (Hay, 1981): Children play and learn in the context of social partners, such as parents, siblings, and peers. Therefore, it is important to understand the development of play and exploration in a social context. The present study provides evidence that peer presence facilitates discovery of new toys in young children across two cultures. In contrast, peer presence facilitated discovery in older Tsimane' children but inhibited discovery in U.S. children. We propose that the effect of peer presence on discovery rate may be driven by an underlying drive for resource control. Furthermore, different social dynamics and relationships between peers and siblings may explain the different pattern of results in Experiments 1 and 2. A further investigation of the difference in play dynamics among siblings and peers is warranted to fully understand how peer presence influences exploratory play. Finally, additional research should explore how experience with formal education modifies play behavior and discovery rate.

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