Preferring the Mighty to the Meek: Toddlers Prefer Novel Dominant Agents.

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Abstract

Every human society includes social hierarchies—relationships between individuals and groups of unequal rank or status. Recent research has shown that even preverbal infants represent hierarchical relationships, expecting larger agents and agents from larger groups to win dominance contests. However, to successfully navigate social hierarchies, infants must also integrate information about social rank into their own behavior, such as when deciding which individuals to approach and which to avoid. Here we demonstrate that two-year-old children (ages 21-31 months) preferred novel dominant agents to subordinates. That is, by the age of 21 months, toddlers not only use phylogenetically stable cues to predict the winner of dominance contests, they also like the dominant agents better. This finding suggests that young children use their ability to infer relative rank to selectively approach dominant individuals.

Keywords: social hierarchy, naïve sociology, infant cognition, social cognition

Introduction

Humans are ultra-social species. A person's ability to interpret, create, and maintain social relationships is key to his or her physical and mental well-being (Silk, 2007). One very common type of social relationship occurs between individuals who are ranked along some linear dimension such as age, military rank, physical size, etc. (Fiske & Schubert, 2012; Fiske, 1992; Kaufmann & Clément, 2014; Sapolsky, 2004). Such hierarchical relationships are found across species (Sapolsky, 2004), across human societies (Boehm, 1999; Fiske, 1992), and across human social settings (e.g., academic, domestic, recreational, professional) (Magee & Galinsky, 2008).

The ubiquity of social hierarchies means that it is important that individuals can recognize relative social rank. Indeed, natural selection has conferred this ability on many species, including fish, birds, chimps, wolves, and humans (Bond, Wei, & Kamil, 2010; Grosenick, Clement, & Fernald, 2007; Sapolsky, 2004).

In humans, the ability is present very early on: preverbal infants expect larger agents and agents with more allies to win right-of-way dominance contests (Thomsen, Frankenhuis, Ingold-Smith, & Carey, 2011; Pun, Birch, & Baron, 2016). They also expect rank to be transitive (i.e., they expect that if A outranks B, and B outranks C, then A will outrank C) (Gazes, Hampton, & Lourenco, 2015, see also Mascaro, Csibra, 2014) and expect that those who have won dominance contests in the past (e.g. over resources) will win new dominance contests (e.g. over territory) (Mascaro & Csibra, 2012.)

Such studies demonstrate that infants use dominance cues found across phylogenesis to *detect* hierarchical relationships. But to survive and thrive in human society, detection of rank is not enough; individuals must also use this information to motivate their own behavior toward others. For example, they must evaluate social situations to decide which individuals to approach and which to avoid, and which to form relationships with.

One reason to expect that children might behave differently toward high- vs. low-ranked individuals comes from observations in daycare centers (Sluckin & Smith, 1977). Toddlers are deferent to peers that outrank them, and assertive towards those they outrank. Furthermore, toddlers who take contested toys or thwart other children tend to be preferred playmates and are more likely to influence and be imitated by other children, and rank between two children often remains stable across time (see Hawley, 2015 for review; Sluckin & Smith, 1977).

While this indicates that children do integrate rank into their behavior, it could simply reflect a history of interactions between individual children (e.g. a child might think, "I fought with this kid yesterday over a toy and lost; I don't want to go through that again, so now I will just give him the toy.") This leaves open the question of whether children possess a 'default' core motivational system that specifies how to relate to novel individuals depending on their social rank.

For example, it has been argued that detecting social rank is adaptive because it allows infants (and animals) to 'size up the competition' and avoid dangerous conflicts they are unlikely to win (e.g. Pun et al., 2016). And in fact, the ability to avoid dominant individuals is associated with lower stress levels in other species (Sapolsky, 2005). For example, subordinate wolves in captivity, who cannot easily avoid dominant wolves, have elevated stress hormones compared to subordinate wolves in the wild. If avoiding dominant individuals is the main benefit of detecting rank, then we might expect children in the present study to avoid the novel high-ranking individual.

However, insofar as dominance rank reflects success in one's ecological context, affiliating with high-ranking individuals might bring benefits in the form of access to important know-how, (Chudek, Heller, Birch, & Henrich, 2012; Henrich & Gil-White, 2001), material resources, and control (Thomsen & Carey, 2013). Consistent with this proposal, macaques use rank to decide whom to align with when facing opponents, and they consistently choose allies who outrank themselves and their opponents (Silk, 1999).

The present study was a first step toward testing whether human children evaluate novel individuals according to their relative social ranks—motivating them to either approach or avoid them. Experiment 1 used a proven right-of-way paradigm (Thomsen et al., 2011, replicated in Pun et al, 2016) to establish that one individual in a dyad was ranked higher than the other. We then tested whether children ages 21-31 months prefer the dominant individual or the subordinate, using a well-established reaching paradigm (Hamlin, Wynn, & Bloom, 2007; Hamlin, Wynn, Bloom, & Mahajan, 2011). Experiment 2 followed up results from Experiment 1, showing children a scene that was similar but lacked any interaction between the characters. This ruled out a number of alternative explanations for the results of Experiment 1, including the explanation that toddlers may prefer the individual that reaches its goal, the individual that moves last or moves farthest, or the individual that stays upright throughout the scene.

Experiment 1

Methods

Participants

Participants were recruited at a children's museum. A total of 30 children participated in the experiment. Of these, 8 were excluded from the analysis for the following reasons: Refusing to choose a puppet (n=4); Choosing both puppets (n=2); Extreme fussiness (n=1); Distraction in the testing environment (a janitor entered the testing room and made loud noises, n=1). The remaining 22 children (9 girls, 13 boys) contributed data to the analysis. Their ages ranged from 21-31 months (M=24.95 months (SD=2.92 months). At the time of enrollment in the study, parents were asked to fill out a demographic questionnaire asking about the child's race and ethnicity, and their household income. Responses to the race/ethnicity questions included the following: White, Not Hispanic (n=11); Asian, Not Hispanic (n=6); Asian and White, Not Hispanic (n=2); White, Mexican-American (n=1) and Mexican-American, no race indicated (n=2).

We stopped at n=22 because we had a sufficiently strong Bayes Factor (see analysis below). Although frequentist statistical analyses do not allow for preferential stopping, Bayesian analyses do (Csibra et al., 2016; Dienes, 2011).

Materials & Procedure

The puppet stage used in all experiments was 75cm tall, 32.5cm deep, and 95cm long. It was placed on a folding table covered with black fabric. There were black curtains attached to the left and right side of the puppet stage, and a black curtain was used to cover the stage between scenes. Another black curtain behind the stage hid the experimenter who was manipulating the puppets. The puppets were 12.5cm tall and made of clay. They each had one plastic craft eye (with a fixed pupil so that the puppet always seemed to be looking straight ahead) and a black rectangle for a mouth. One puppet was a yellow oval and one was a red rectangle; the shapes were equal in diameter. The puppets were moved by means of black wooden dowels attached to their bases. The experimenter administering the puppet show wore black gloves and black clothing, and was hidden from the child's view. After the puppet show, two puppets identical to those used in the puppet show were presented to the child on a white foam board measuring 60 x 90cm. The puppets were placed on the board 75cm apart, and were attached to the board with magnets.

Participants were recruited from the floor of a children's museum during regular business hours. Parents

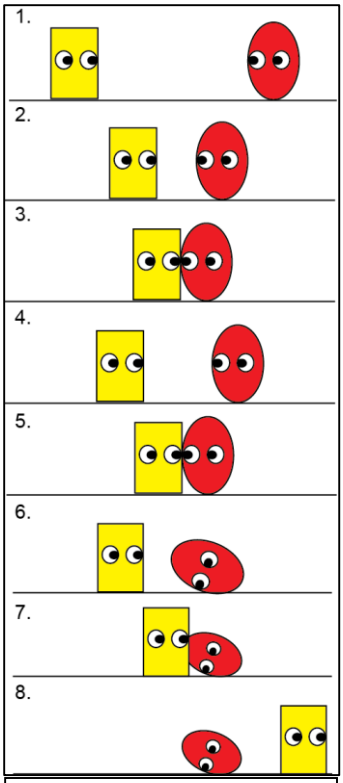

Figure 1: Puppet Show used in Experiment 1

were approached by an experimenter who greeted the parent and asked if they would like to hear more information about an experiment on children's understanding of social relationships. If the parent agreed, they were given the consent form and demographic questionnaire to fill out while the experimenter interacted with the child before leading the parent and child to a testing room. The testing room was a large room off the main floor of the museum. Before entering the testing room, parents were briefed about the procedure. They were asked to remain quiet during the puppet show and to close their eyes during the choice procedure. The participating child usually sat on the parent's lap. When this was not possible (e.g., because the parent was holding a younger sibling), the child sat in a chair next to their parent.

After the parent and child were seated in the testing room, the child was shown the puppet show. One experimenter (occluded from the child's view) acted as the puppeteer. A second experimenter who was blind to the condition (i.e. could not see which puppet was the dominant puppet and which was the subordinate) stood beside the stage and moved the curtain up and down between segments, saying "down goes the curtain" when pulling the curtain down, and "up goes the curtain" when pulling the curtain up.

Following Thomsen, et al, (2011), during the familiarization sequence, one puppet, alone on stage, crossed the stage two times (both times in the same direction). Then the other puppet, also alone, crossed the stage two times in the opposite direction. The direction that the higher and lower-ranked puppet traveled was counterbalanced, along with which puppet crossed the stage first and which puppet was higher ranked (i.e. yellow oval or red square), In the hierarchy display sequence the two puppets appeared on opposite sides of the stage and started across at the same time, meeting in the middle. Upon meeting, both puppets backed up and tried again, only to meet again in the middle. After this meet-and-retreat sequence was repeated three times, the puppets approached one another, this time without touching (so it did not look like the lower-ranked puppet was being knocked over). Next, the lower-ranked puppet bowed down and moved aside, allowing the other puppet (the high-ranked puppet) to pass by. The entire hierarchy display sequence was repeated three times.

Following Hamlin et al, 2007, during the choice procedure, the second experimenter (who was blind to the condition) reminded the parent to close his or her eyes. The experimenter then retrieved the board with the puppets attached to it, and held it so that the child could see (but not reach) the puppets. The experimenter looked at the child and said, "Hi!" then said, "Look!" and looked down at the board, fixing her gaze directly in the center of the board, between the two puppets. Finally, the experimenter said, "Which one do you like?" and pushed the board toward the child so that the child could reach it. The experimenter mentally counted off 30 seconds. If the child had not made a choice after 30 seconds, the experimenter (keeping her gaze fixed on the center of the board) encouraged the child by saying, for example, "Its ok to choose one," or "You can grab one.") If the child still made no choice, the experimenter returned the board back to its starting position and repeated the choice process. If the choice procedure was done three times and the child still made no choice, then the trial was coded 'no response.'

After the puppet show, each child was given a prize (i.e. a rubber duck). Parents were invited to ask questions about the study and were given information about the lab to take home. Two research assistants who were blind to condition coded each video for choice. There were no disagreements between the two coders.

Results and Discussion

Of the 22 children who contributed data to the analysis, 18 chose the 'high-ranked' or 'dominant' puppet (as established by the hierarchy-display sequence of the puppet show). To compare the observed distribution (i.e. 18/22) to an expected distribution (i.e. assuming that children choose the high-ranked 50% of the time), we used 'binom.test' in the statistical program 'R' (p=.004344, estimated probability of success = .8182). We also used a Bayes Factor Binomial calculator (http://pcl.missouri.edu/bf-binomial) and found that the odds of the alternative model (i.e. the children were choosing the high-ranked either more or less than 50% of the time) over the null model (i.e. the children were choosing the high-ranked 50% of the time) to be 24.93, which is considered to be strong evidence (Kass & Raftery, 1995).

Experiment 2

Experiment 2 was conducted to rule out five alternative explanations as to why children might prefer the puppet who successfully crossed the stage: (1) Children might prefer the puppet that reached its goal (in this case, crossing the stage) over the one that failed to reach its goal; (2) Children might prefer the puppet that remained visible the whole time (in Exp. 1, the low-ranked puppet was occluded when the high-

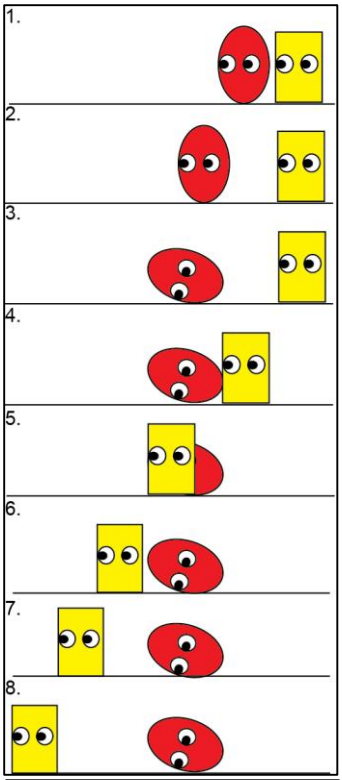

Figure 2: Puppet Show used in Experiment 2

ranked puppet passed in front of it); (3) Children might prefer the puppet that moved last; (4) Children might prefer the puppet that moved farther (i.e., traveled a longer distance); (5) Children might prefer the puppet that moved in the same way during the hierarchy-display sequence as it did during the familiarization sequence (crossing the stage instead of stopping in the middle). Experiment 2 replicated the features of Experiment 1, but without any social interaction (and therefore no show of relative social rank) between the puppets. The procedure was the same as Experiment 1 except for the following changes: During the familiarization sequence, the puppets again both crossed the stage twice, but this time they moved in the same direction. During the control-display sequence, the two puppets appeared on the same side of the stage. One puppet moved across the stage to the center, paused and bowed down (replicating the motion of the low-ranked puppet in Experiment 1). Then the other puppet crossed the stage, passing in front of the bowing puppet. The 'meet and retreat' sequence in Experiment 1 was taken out in Experiment 2. This sequence was repeated three times (See Figure 2).

Methods

Participants

Participants were recruited from the same children's museum using the same procedure as in Experiment 1. A total of 34 children participated in the experiment. Of these, 13 were excluded from the analysis for the following reasons: Choosing both puppets (n=7); Refusing to choose a puppet (n=3); Extreme fussiness (n=2); Experimenter error (the puppets were moved backward in the puppet show, n=1). The remaining 21 children (7 girls, 14 boys) contributed data to the analysis. Their age ranged from 21-31 months (M=26.24 months; SD=3.28 days). Parents were given the same demographic questionnaire as in Experiment 1. Responses to the race/ethnicity questions included the following: White, Not Hispanic (n=7); Asian, Not Hispanic (n=4); White, Mexican American (n=3); Asian and White, Not Hispanic (n=2); American Indian/ Alaska Native and Asian, Not Hispanic (n=1); Native Hawaiian/Other Pacific Islander, Not Hispanic (n=1); White, Hispanic (n=1). 2 participants declined to answer the race/ethnicity question.

Materials & Procedure: The puppets and stage were identical to those in Study 1. Procedures were the same as in Experiment 1 except for the following: During the familiarization sequence of the puppet show, both puppets moved across the stage in the same direction. During the Control-Display Sequence (analogous to the Hierarchy-Display Sequence in Experiment 1), the two puppets appeared on the same side of the stage. One puppet moved across the stage to the center, then bowed down and moved aside (replicating the motion of the low-ranked puppet in Experiment 1). Then the second puppet crossed the stage, passing in front of the bowing puppet. **(See Figure 2)**

Results and Discussion

Of the 21 children who contributed data to the analysis, 11 chose the puppet that completed its journey across the stage. To compare the observed distribution (i.e. 11/21) to an expected distribution (i.e. expected if the children chose the complete-crossing puppet 50% of the time), we utilized 'binom.test' in the statistical program 'R' (p=1, estimated probability of success = .524). We also used a Bayes Factor Binomial calculator (http://pcl.missouri.edu/bf-binomial) and found that odds of the null model (i.e. the odds that children were choosing the high-ranked 50% of the time) over the alternative model (that the children were choosing the high-ranked either more or less than 50% of the time) were 3.868, which is considered to be moderate evidence in favor of the null (Kass & Raftery, 1995).

General Discussion

Taken together, the results of these two experiments suggest that by 21 months, infants prefer novel high-ranking individuals. Results from Experiment 2 suggest that the children's choice of the dominant puppet in Experiment 1 could not be attributed to a preference for the puppet that accomplished its goal of crossing the stage, the puppet that remained visible throughout, the puppet that moved last or moved farther, or for the puppet that moved in the same way in the hierarchy-display sequence as it had during the familiarization sequence (i.e. remaining upright the whole time). When children saw a puppet show that maintained all of these features, but lacked the social interaction, which established the relative ranks of each puppet in Experiment 1, the preference for the puppet reaching its goal, disappeared. This suggests that the preference for the dominant puppet in Experiment 1 hinged on the fact that they directly interacted.

Taken together, this suggests that detecting relative rank does not only allow children to 'size up the competition' and avoid conflicts with dominant individuals. If this were the case, we would expect children to either avoid the high-ranking puppet, or to show no preference (if the children did not expect to have a conflict with the puppets).

There are at least two possible explanations for this preference. The first is that children may seek to affiliate with individuals who have more power and access to resources. In other words, humans may share the tendency previously shown in macaques (Silk, 1999) to seek alliances with higher-ranked individuals.

Another possible explanation for the preference, is that children may expect high-ranking individuals to act as leaders in what anthropologist Alan Fiske has called Authority Ranking relationships (Fiske & Haslam, 2005; Fiske & Rai, 2014; Fiske, 1992). Leaders in these types of relationships are motivated to guide and protect subordinates; who in turn are motivated to defer to leaders (and to punish other low-ranking individuals who don't defer). According to Fiske, subordinates *expect* leaders to provide this protection and guidance. Support for this view comes from a large body of ethnographic research that suggests human social hierarchy is often expressed through these mutually beneficial relationships between high- and low-ranked individuals.

When considering these results, a few points should be kept in mind. First, the puppets in the current experiment were much smaller than the children reaching for them. It is possible that children might avoid a dominant puppet if the puppets were as big as the children themselves, and further studies will investigate this possibility.

It is also worth noting that the children who participated in this study have likely had many positive experiences with high-ranking individuals such as parents, older siblings and other caregivers. Generalizing from these experiences, children may view higher-ranked individuals in a positive light, expecting them to provide protection and guidance. Further research could also explore whether children who have experienced abuse or neglect show the same preference, although such research presents many practical challenges. It is also worth noting that younger infants might not share this preference who have had less experience with high-ranking individuals. It could be that the 'default' preference is to avoid high-ranking individuals, but that through experience children form positive associations with them. Future studies will explore this possibility.

Finally, children (like adults) are complicated creatures, who can be fascinated by things that also scare them a little. Further studies are needed to establish whether children's preference for the 'dominant' puppet in the present study reflects unambiguously positive feelings (e.g., the expectation of guidance and protection), or some mixture of positive and negative (e.g., curiosity and fear).

In any case, it is interesting to compare the preference for high-ranking puppets shown in the present study to the established finding that infants prefer helpers over hinderers (Hamlin et al., 2007, 2011). In our study, one puppet bowed and moved aside which, while not actively helping, at least *allowed* the other puppet to reach its goal. (And by the same token, the non-bowing puppet could be seen as preventing or hindering the other from reaching its goal.) The findings by Hamlin et al. would seem to suggest that if children had looked at the scene primarily in terms of helping and hindering, they should have preferred the puppet who bowed (i.e. the helper). The fact that children actually showed a strong preference for the puppet who did not bow suggests that children did not view this social interaction primarily as a helping/hindering event. This may be because children view active helping (i.e., pushing another puppet up a hill, or opening a box for him) differently from passive helping (i.e., moving out of the way). Or it may be that social rank takes precedence over prosocial behavior. That is, children at this age may care more about affiliating with high-ranking individuals than with helpful ones.

The null result we found in Experiment 2 provides another point of contact with the broader literature. At least one study has shown that toddlers prefer competent individuals over non-competent individuals (Jara-Ettinger, Tenenbaum, & Schulz, 2015; see also Pasquini, Corriveau, Koenig, & Harris, 2007). This raises the question of why children did only preferred the puppet that crossed the stage in Experiment 1. One possibility is that in Experiment 2, where there was no meet-and-retreat sequence, and one puppet stopped halfway across the stage, children thought the puppet stopped of its own volition. Another possibility is that the two studies operationalized 'competence' differently enough to affect children's preferences. In the study by Jara-Ettinger et al., the puppets' goal was to play music. Children may have cared more about this goal than about seeing a puppet cross a stage in the present experiment. (That is, toddlers may only pay attention to competencies they care about, or may only prefer those individuals who are competent at doing something the toddler wants done.) In contrast, our experiment used the sparse goal of simply crossing the stage, which children presumably have no experience with. This makes it all the more striking that they preferred the high-ranking puppet in Experiment 1, since the puppets goal was both novel and irrelevant.

Future studies will investigate the effects that social rank, competence and prosocial behavior have on children's evaluations of individuals. For now, the present study demonstrates that very young children are not only sensitive to the relative social status of novel agents; but that they also prefer dominant ones.

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