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Authors

Ghai, Jasleen
Fozi, Cameron
Ma, Hannah

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Children's Use of Gender as a Social Cue: A Replication Study

Cameron Fozi
Hannah Ma
Mentor: Jasleen Ghai

Abstract

It has been well researched that social hierarchies can determine the developmental outcomes of young children, but little has been studied about the timing of when children develop an understanding of social hierarchies in their respective communities. It was hypothesized that children believe social status co-varies with gender and is unaffected by in-group bias, and that these beliefs are modulated by the child's own identity. Using multiple tasks that will be discussed in the methods, the hypotheses were tested on children ages 3.5-6.9 years. Results suggest that children use gender as a social cue for status, and boys show in-group bias whereas girls do not. In today's social climate, it is important to understand children's development of beliefs in the context of social hierarchies, such as gender, in order to understand the impact of these concepts on self-image, success, and equity.

Introduction

Effect of gendered information on children's development of gender stereotypes

To have a comprehensive understanding of how gender bias is related to the primary study, Mandalaywala (2020), it is important to see how it comes into play in children's decisions. It has been well observed that gender is a strong indicator of decision-making and bias in young children. Maximilian Seitz and their colleagues (2020) examined whether children learn new gender stereotypes from stories when unknown words are presented with a gendered protagonist or gendered context. Gender and racial bias in society are hypothesized to begin at a young age (Seitz et al., 2020). Thus, much research has been done on how children use racial and gender cues to determine status and roles in society. Children are influenced by environmental stimuli, such as family and media (Seitz et al., 2020). The study concluded that children preferred to conduct the unknown pseudoword activity when the gender of the protagonist matched their own sex, providing evidence of gender as a strong indicator of decision making and bias (Seitz et al., 2020). In relation to the primary paper, Mandalaywala (2020), this study delves into possible origins of gender bias in children that leads to later societal bias of status as the children age.

Importance of gender rather than race in development of children's identities

While the primary paper by Mandalaywala et al. studies how children evaluate others' social status, it does not investigate the raw notions that children have about race and gender. It

has been found that gender plays a larger role than race in establishing the identity of children at an early age. Gender is determined to be a more powerful identity than race in informing how children view their own identities. While children saw genders as different, distinct groups, another study found race to be more of a difference in physical appearance rather than the group difference they noted between genders (Rogers et al., 2017). This was done by staging semi-structured interviews with 222 Black, white, and mixed-race children (average age = 9.96) from three racially-diverse public schools in a largely low-income, urban community in the northwestern United States. However, the study did have limitations, such as the majority white demographic of children interviewed in the study, the order of presentation when interviewing the children, and the lack of independent categorization of mixed-race identities. In contrast, Mandalaywala (2020) broadens the demographic of participants to include a more diverse sample of children and utilizes more effective methods of categorization by race in the analysis.

Influence of gender and age on children's decision making

While our replication of the primary paper, Mandalaywala (2020), aims to show how children may perceive others based on race and gender, it does not study the effect of these demographics on how they make decisions for themselves based on endorsements from their peers. Similarly, studies have shown that young children use gender and age of the people who endorse certain products to decide whether or not they would use them. Specifically, Shutts and colleagues (2010) sought to show how gender, race, or age affects whether young children choose an activity. In Experiment 1, 32 three-year-old, white children were recommended imaginary toys, activities, and clothing by children of different races and genders. It was shown that children had a preference for consumer products that were recommended by members of their own gender (Shutts et al., 2010). The data shows that race was not as influential of a factor as gender in children's choices (Shutts et al., 2010). Experiment 2 was carried out with the same methods as Experiment 1, but with adults recommending various products as well. The researchers concluded that children responded better to recommendations given by those of their own gender and age (Shutts et al., 2010). However, it is worth noting that all the children interviewed were white and from a predominantly white area in Boston. This made for a very narrow demographic of children tested. Although this study provides a useful analysis of how young children subconsciously use gender and age, and to a limited extent, race, as cues for the choice of products and activities, its limitations call for further research on this topic. The primary study, Mandalaywala (2020), expands on previous research by including representative participants of different races in order to accurately determine how children utilize racial and gender cues in their conception of wealth and status.

Effects of gender composition in a child's environment on cognitive development

The primary study focuses on children's responses to tasks that may shed light onto preconceived notions of race and gender, but does not study the gendered and racialized environment in which they grow up. Another study by Drange (2020) found that the gender

composition of childcare center staff is an indicator of the children's cognitive development. Drange and their colleagues (2020) explores the relationship between the staff's gender composition and positive child cognitive development. This study examined a data set containing individual records of all institutional child care use for children born between 2004 and 2007, as well as test scores from 1st to 3rd grade for the same cohorts. Information about the child care center staff's gender and immigrant background was also collected. The study concluded that the share of males on the staff predicts positive child cognitive development (Drange et al, 2020). The share of staff with immigrant backgrounds does not seem to cause variation in child outcomes (Drange et al, 2020). In relation to the primary study, Mandalaywala (2020), this study highlights how not only gender but also the composition of gender in an environment can affect a child's cognitive development. However, a limitation is that this study measures a child's cognitive development through their grades, while the primary paper would define cognitive development specifically as the use of race and gender as social cues.

Present Study

The primary study, Mandalaywala (2020), aims to build on previous research on children's use of gender and race by broadening the research topic to include social cues, specifically in relation to wealth and status. This study aims to better understand how children develop certain beliefs about social status in their communities at a young age.

Methods

Participants and Procedure:

For the primary study on gender, children ages 3.5-7 years were asked to participate at the Children's Museum of Manhattan in New York, New York. For this study, the racial makeup of participants was the following: White: 33.0%; Hispanic: 13.0%; Asian: 16.7%; Black or African-American: 10.7%; Multiracial: 14.9%; other: 1.9%; not provided: 9.8%. For our replication, only the primary study on gender was replicated and the race of participants was not considered in our replication analysis. Although the socio-economic status was not provided by all parents of the participants, the general status makeup in New York City is the following: Median household income is $60,752, and the percent of the population living below the poverty line is 18.9%. 48.8% of participants in the primary study were identified as female and 51.2% of participants were identified as male. In the primary study, all participants were identified as either male or female. Participants were asked to perform the *rope task* and the *wealth-matching task*.

Rope Task:

In the primary study's *rope task*, participants were presented with a board of six equidistant wooden pegs that travelled up the board vertically with a rope running through the pegs. Researchers assigned the altitude of the pegs to a specific social status. For the top peg, participants were told that "kids at the top of the rope have lots of toys and new clothes, and they always get to pick the games that everyone else plays at recess and the snacks that everyone else eats at snack time." For the top peg, participants were told that "kids at the bottom of the rope don't have any toys or new clothes, and they never get to pick the games that anyone plays at recess or the snacks that anyone eats at snack time." To explain the middle pegs, participants were told that "[kids] can go to any of these places in the middle too."

Before starting the task, researchers in the primary study tested the participants' comprehension of the board's representations of status. Researchers gave participants a picture of a non-gendered stick figure and asked, "this kid has lots of toys and lots of new clothes and always gets to pick the games and the snacks. Can you put this kid on the rope where they go?" If the participant correctly placed the photo on the top peg, researchers asked another comprehension question. If not, researchers explained to the child the correct answer and asked another comprehension question. In total, participants were given three comprehension questions that tested their knowledge of placements of children on the top and bottom peg and the middle pegs. For the question pertaining to the middle peg, as long as the participant places the photo on one of the four middle pegs, their answer was considered correct.

Once their comprehension was tested, children were asked to represent their own status by placing a non-gendered photo of a stick figure on the board.

Participants were then tasked to rank boys and girls on the rope. Participants could respond between 1 (lowest status) and 6 (highest status) for each target, one at a time. About half of the participants were asked to put the boy on the rope first, and the other half of the participants were asked to put the girl on the rope first. The first target was removed after the participant placed the figure on the board, so that the full rope was available to the participant for both targets, meaning that participants could choose to put targets on different pegs or on the same peg.

Wealth-matching task:

In the primary study's *wealth matching task*, participants were presented with a laminated picture of two houses: one dilapidated and one well-maintained. The researchers then placed two pictures of children in between the houses. One was a boy and the other was a girl. The participants were asked to place the children into one of the houses. While children were allowed to assign both pictures of a boy and a girl to one house, all participants chose to assign one picture to each house. The researchers asked kids, "See this house? And see this house?" Then the researcher gestured to the two kids. "See this kid? And see this kid?" Once confirmed, the researcher asked the task question: "Can you put each kid in the house they live in?" If the participant did not choose a house, the researcher encouraged them by saying, "Can you put this kid in the house they live in?"

The stereotypical, expected response was putting the boy in the nicer house and the girl in the worse house. These responses were scored "1." Counterstereotypical responses were scored "0." No children placed both the boy and the girl in the same house. The participants did two trials of the *wealth matching task*, where the boy and the girl pictures were switched from the right and left of each other.

Social preferences; Preference for male or female targets

Lastly, participants were asked to complete a forced-choice social preference task. In this task, participants were presented with side-by-side pictures of a boy and a girl. Participants were told "Here are two kids, who do you want to invite to the movies with you?" The response where participants chose the boy (high-status) was given a score of "1" and the response where participants chose the girl (low-status) was given a score of "0". This task measured what gender participants prefer to associate themselves with. We expect participants to want to associate with people of their own gender due to the phenomena of in-group bias.

Analysis Plan:

For our replication study, we followed the same analysis plan done for Study 1 on gender in the primary paper. Using the lme4 package in R, we analyzed all data provided through an open-source platform that the researchers of the primary study had released. This was the exact data collected by the researchers of the primary study and was also used for the analysis in the primary paper. We accessed the data and analysis code from the primary study through Open Science Framework (https://osf.io/29vcu/). Using the provided data files and analysis code, we replicated the figures, and analysis for Study 1of the primary paper to find our own results.

For the *rope task*, we examined the effects of target gender (boy vs. girl), age (as a continuous, mean-centered variable), and participant gender (male participants vs. female participants) on placement on the rope. For the *wealth-matching task*, we examined whether the probability that participants responded in a stereotypical manner differed from random chance. In addition, we also examined the probability of responding in a stereotypical manner and if it varied across age or as a function of the participant gender. To compare results across the *rope tasks* and *wealth-matching task*, we categorize the responses in respective tasks as the following: *rope task* (stereotypical response, counter-stereotypical response, or equal response) and *wealth-matching task* (stereotypical response or counter-stereotypical response). However, for our analysis, if participants picked an equal responsibility for the *rope task*, meaning they put the boy and girl on the same level, the stereotypicality of their response on the *wealth-matching task* was substituted for their equal response on the *rope task*, since there were so few participants who had an equal response on the *rope task*. We included participant gender in our analysis and results since it may affect participant's rating of their own status.

Results

	Response type on Rope task		
	Equal	*Stereotypical*	*Counter-stereotypical*
Rope task	Boy and girl in same position	Boy in higher position than girl	Girl in higher position than boy
Female participants	*n* = 13	*n* = 48	*n* = 47
Male participants	*n* = 7	*n* = 57	*n* = 23
Weath-matching task	n/a	Boy in nicer house	Girl in nicer house
Female participants		*n* = 48	*n* = 66
Male participants		*n* = 51	*n* = 40

Fig. 1 Number of Study 1 participants who provided responses for the rope and wealth-matching tasks, separately for male and female participants. Table only includes participants whose parents reported their child's or children's gender (*n* = 195).

According to our primary model (participant gender x target gender x age), the main effect of target gender is represented by β = -1.42 SE = 0.31 t = -4.62 (95% CI: -2.02, -0.83), the main effect of participant gender is β = -0.72 SE = 0.29 t = -2.46 (95% CI: -1.29, -0.15), and the interaction of target gender by participant gender is β = 1.26 SE = 0.41 t= 3.05 (95% CI: 0.46, 2.07).

According to our analysis, males tended to place boys higher than girls in their response ($M_{boy\ target}$ target = 4.56 $SE_{boy\ target}$ = 0.20 $M_{girl\ target}$ target = 3.13, $SE_{girl\ target}$ = 0.20, β = -1.42 SE = 0.29 t = -4.86 (95% CI: -1.99, -0.85)). However, girl participants did not show this tendency for in-group bias and did not tend to put girls higher on the ladder than boys ($M_{boy\ target}$ = 3.84, SE = 0.20, $M_{girl\ target}$ = 3.67, $SE_{girl\ target}$ = 0.20).
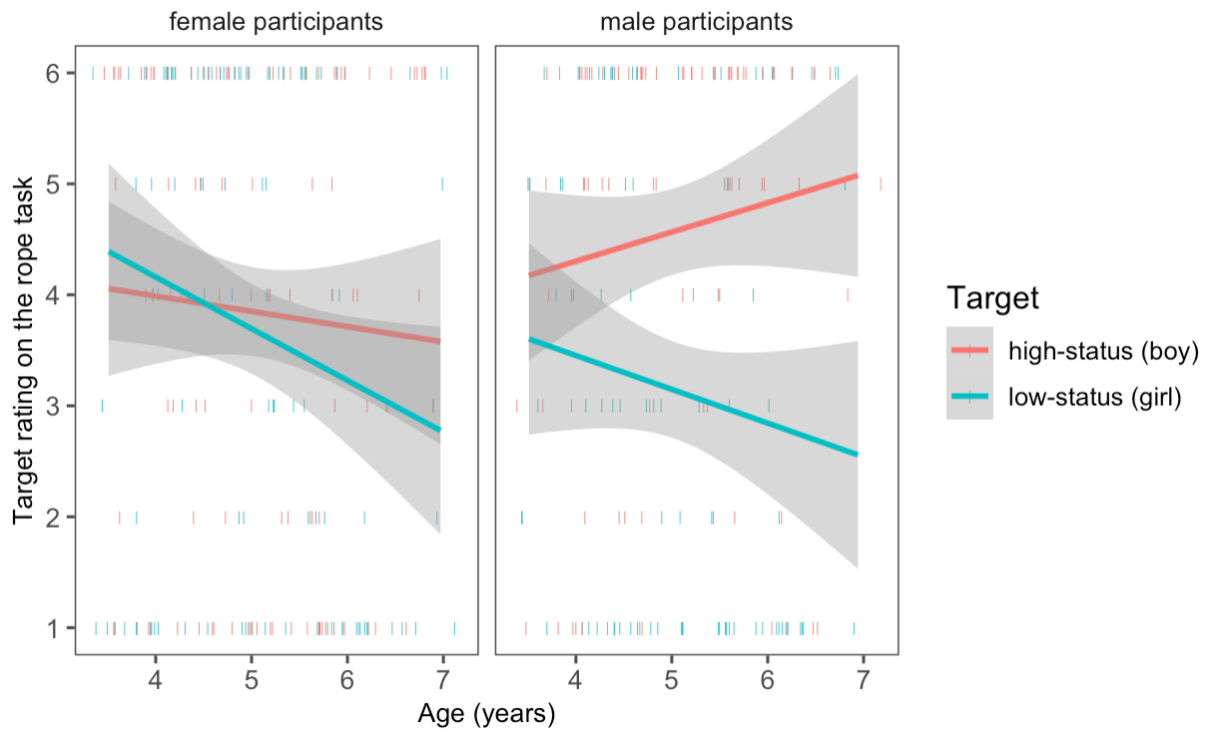
Fig 2. Rope task responses vs age and gender of participants. Shaded areas represent a 95% confidence interval around the regression lines. The small dashes represent participants.

According to Figure 2, boys placed boys higher and concurrently, girls lower, on the rope task as their age increased. Girls did not show in-group bias because as age increased, girls tended to place girls lower. Female participants actually showed a decline in rating girls as higher as age increased (β = -0.46 SE = 0.22 t = -2.08 (95% CI: -0.90, -0.03). There seemed to be no significant change in female target's tendency to rate boys higher as participant age increases, as evident by the fact that the CI as seen in Figure 2 includes 0. Although this analysis suggests that girls did not show in-group bias as age increased, responses could be potentially caused by stereotypical responses. However, stereotypical response rate was not analyzed as a part of this particular analysis, thus there cannot be a definitive conclusion made based on stereotype.

On the wealth-matching task, children were not more likely to place a boy in a nicer house than to place a girl in a nicer house, which would have been an expected societal stereotypical response ($M_{\text{boy in nicer house}}$ = 0.49, 95% CI: 0.42, 0.55) compared to the general probability of putting a male in a nicer house (t=-0.42, df=203, p= .675, 95% CI: 0.42, 0.55). There was a discrepancy between the p-value of chance responding we found (p = .675) and the one found in the original analysis of the primary paper (p = .068), however, both p values offer the conclusion that this value was not significant. In the primary model of participant gender x age, the main effect of participant gender was seen (B = -0.59, SE = 0.29, z = -1.99, p= 0.05). Additionally, male participants were more likely to put a boy in a nicer house ($M_{\text{boy in nicer house}}$ =

0.58, SE= 0.08, 95% CI: 0.41, 0.74), following stereotypical responses, than a female participant was ($M_{\text{boy in nicer house}}$ = 0.44, SE = 0.08, 95% CI: 0.28, 0.60). However, the overlap between the CI of placing boys in a nicer house by chance (95% CI: 0.42, 0.55) overlaps with the CI of male participants putting boys in a nicer house (95% CI: 0.41, 0.74) and of female participant putting boys in a nicer house (95% CI: 0.28, 0.60). This suggests that the placement of boy and girl targets was consistent with that of chance.

When finding a relation between responses on the rope task and the wealth task, we found that children who had a stereotypical response on the rope task also tended to follow a stereotypical response on the wealth matching task (β = 0.75, SE = 0.33, z = 2.27, p = 0.02). However, based on Figure 3 and the analysis previously discussed, we can see that the tendency of children to place boys in nicer houses is consistent with that of chance.

Status belief as measured by the rope task: The target gender that participants wanted to affiliate with, or had a social preference for, was unrelated to their rope task. In our primary model (response on rope task x participant gender x age), we only found a significant main effect of participant gender (β = -3.89, SE = 0.63, z = 16.14, p < 0.01). Male participants preferred to be affiliated with boys and female participants preferred to be affiliated with girls, regardless of age and response on rope task. This can be fully explained by in-group bias.

Status beliefs as measured by the wealth matching task: Participants preferred the same gender social partners regardless of their response on the wealth matching task. In our primary model (response on wealth matching task x participant gender x age), we only found a significant main effect of participant gender (β = -3.72, SE = 0.51, z = -7.31, p < 0.01).

Participants in our study tended to rate their status highly. A primary model that included participant gender and age showed that rating one's own status did not vary by participant gender (M_{male} = 5.5, SE = 0.12, M_{female} = 5.3, SE = 0.1) . In addition, the subjective status rankings of participants were unaffected by the participant's beliefs regarding gender and status. In a primary model that included all the above variables and response type on the rope task, we found no main effect or interactive effects between the variables.

Discussion

Our replication results corroborated the conclusions stated in the primary paper, which analyzed whether children use gender cues to determine social status and wealth, as well as its implications on gender preference and subjective status. The first test, the rope task, involved both social power and wealth considerations. Our data shows the participants did rank status based on gender. In the rope task, male participants significantly rated boys higher on the rope. Girls chose the stereotypical response of a high-status boy, contrary to what in-group bias would predict. In fact, while younger girls were more likely to rank boys and girls equally on the rope

task, older girls increasingly chose the stereotypical response as age increased. This trend seems to indicate that girls are already struggling at a young age to maintain in-group bias when societal stereotypes tell them otherwise: that boys dominate in terms of power and wealth. This discrepancy between in-group bias versus societal notions of power has the potential to interfere with young girls' developing sense of identity.

However, while children relied on gender cues to rank boys and girls on the rope task, this was not the case for the wealth matching task. Our statistical tests showed that children were not more likely to place a boy in a nicer house than a girl. Even though boys did place boys in the nicer house, this can be attributed to chance. Children did not use gender cues to predict status when only wealth was a factor. As the original researchers pointed out, most of the participants lived in heterosexual, two-parent households, where wealth and income were indistinguishable by gender. Therefore, gender-based wealth is not as ingrained in children's subconscious the same way social power is. This difference is partly explained by the level of exposure to these dynamics that influence children's status beliefs. One note is that since the rope task included both wealth and social power considerations, more research is needed to conclude whether children's status beliefs are due to social power only, or whether wealth does indeed have an effect.

Notably, stereotypical responses in the rope task had no bearing on children's gender preference for social partners. Boys significantly chose to affiliate with boys and girls with girls. Both male and female participants displayed strong in-group bias in this test. This result allows some interesting insight into societal status versus preference. Even though males are designated as higher social status, it does not mean girls will always prefer to affiliate with boys. Status beliefs and notions of gender bias are present in some aspects of society and absent in others. The last test of subjective status revealed children ranked their own subjective status particularly high, regardless of whether they chose the stereotypical or counter stereotypical responses on previous tests. Young children have yet to establish their own identity, and for now, are buffered from their subconscious belief of gendered status. This study analyzed the way children utilize gender cues to predict social status. The results raise questions about how these developing biases are carried with them throughout their lives, affecting their identity and sense of self-worth.
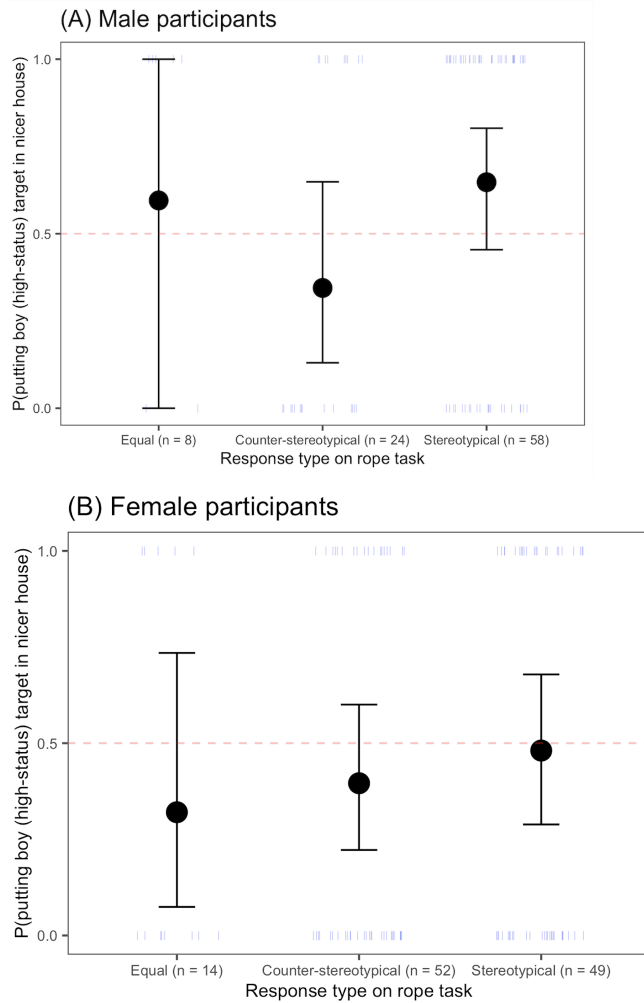
Fig 3. Probability of stereotypical responses, a boy in a nicer house (high-status), against rope task responses for (A) male participants and (B) female participants. The red dotting line represents chance responses. The circles represent the mean and the error bars represent a 95% confidence interval. The small dashes represent individual participants.
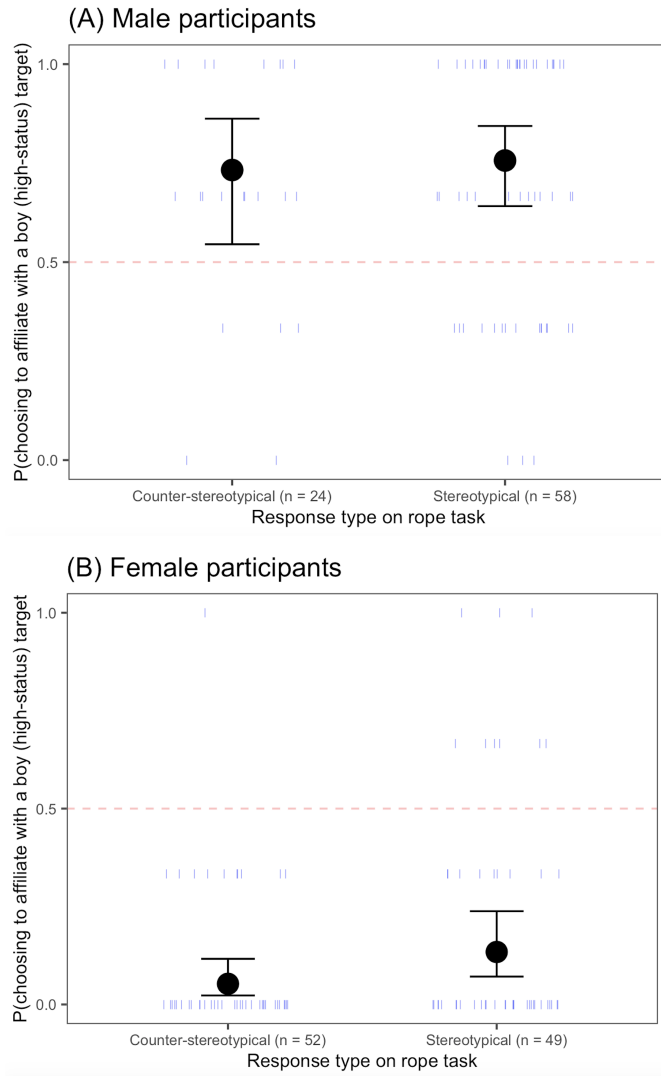
Fig 4. Probability of affiliating with a boy (high-status) target as a function of the responses on the rope task and participant gender (A) male and (B) female. Circles represent the mean and error bars represent 95% confidence interval. The small dashed lines represent individual participants.

Conclusion

This replication of Study 1 on gender of "Children's use of race and gender as cues to social status" by Tara M. Mandalaywala, Ph.D., Christine Tai, Ph.D., and Marjorie Rhodes, Ph.D., aims to expand upon preceding literature on children's inferences of social status through observation of gender and race, specifically in their assumptions of others' wealth and status. In particular, this replication attempts to shed light on how young children develop notions of social status by way of others' gender. In order to do this, this replication study focuses on Study 1's data on gender, collected by the rope task and the wealth-matching task. The replication supports the findings of the primary Study 1 of "Children's use of race and gender as cues to social status." While the children in the study relied on a figure's gender to place children on a social

hierarchy on the rope task, the results of the wealth matching task did not show a main effect of gender on the placement of a male or female figure in a nicer or worse house. However, the replication did come with significant limitations. For example, members of the group performing the replication were unable to share the code required for data analysis. Two out of three group members could not directly interact with the code; they watched the replication of the code through Zoom screen share. In addition , replicators could not replicate the procedure of the rope and wealth-matching tasks, whose participants were wholly recruited and tested within only one place, the Children's Museum of Manhattan in New York City. Thus, the replication and primary study may not have tested a representative portion of the United States population.

Though the primary study and replication corroborate with one another and were able to produce data on children's use of gender to inform a figure's perceived status, more research and replication is needed in this field to further understand and analyze children's perception of others' status by their observation of gender.

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