

ORIGINAL RESEARCH REPORT

Group Influences on Children's Delay of Gratification: Testing the Roles of Culture and Personal Connections

Yuko Munakata*, Kaichi Yanaoka[†], Sabine Doebel[‡], Ryan M. Guild[§], Laura E. Michaelson^{||} and Satoru Saito[¶]

Delaying gratification can be difficult, especially for children. Social factors such as group norms influence whether children delay gratification and may shape their life trajectories. However, such influences have been tested experimentally only in American contexts and may not generalize, given differences among cultures in personal connections and group dynamics. We tested the influences of groups and personal connections on delaying gratification in 106 Japanese preschoolers. Extending previous findings with American preschoolers, Japanese children also delayed gratification and valued delaying gratification more if they believed that their group delayed gratification (and an outgroup did not) than if they believed that their group did not delay gratification (and an outgroup did). Group identity shifted toward the outgroup when Japanese children had a personal connection to the outgroup, but they nonetheless followed the behavior of their ingroup in delaying gratification. These findings highlight similarities and potential differences in social influences across cultures, and underscore the importance of cross-cultural work for theories of development.

Keywords: self-control; executive function; social influences; cognitive development; open data; open materials; preregistered; culture; group identity

Children often go for immediate rewards. When given the choice of one sweet now or two sweets later, many children will say that they prefer two sweets later but end up eating the one sweet available now (Mischel, Ebbesen, & Zeiss, 1972; Mischel, Shoda, & Rodriguez, 1989; Mischel & Ayduk, 2004; Mitsutomi, 1988). Preschoolers' delaying of gratification, waiting for larger rewards later over smaller rewards now, predicts important life outcomes years and decades later (Ayduk, Mendoza-Denton, Mischel, Downey, Peake et al., 2000; Ayduk, Zayas, Downey, Cole, Shoda et al., 2008; Casey, Somerville, Gotlib, Ayduk, Franklin et al., 2011; Duckworth, Tsukayama, & Kirby, 2013; Michaelson & Munakata, in press; Mischel, Shoda, & Peake, 1988; Rodriguez, Mischel, & Shoda, 1989; Seeyave, Coleman, Appugliese, Corwyn, Bradley et al., 2009; Shoda, Mischel, & Peake, 1990; cf. Watts, Duncan, & Quan, 2018).

Many theories of delaying gratification and its predictive validity have focused on the role of executive functions, which support the ability to override impulsive actions in the service of goal-relevant behavior (Casey et al., 2011; Duckworth et al., 2013; Eigsti, Zayas, Mischel, Shoda, Ayduk et al., 2006; Mischel & Ayduk, 2004). For example, the ability to maintain goals in working memory could support the delaying of gratification, by allowing individuals to actively hold in mind the goal of waiting for two sweets and to use that goal to guide their behavior in the face of a tempting treat. Prefrontal cortical regions that support executive functions are activated when individuals make decisions to delay gratification (Figner, Knoch, Johnson, Krosch, Lisanby et al., 2010; McClure, Laibson, Loewenstein, & Cohen, 2004). In addition, individual differences in executive functions correlate with individual differences in delaying gratification (Duckworth & Kern, 2011). Individual differences in executive functions also show stability across development (Friedman, Miyake, Robinson, & Hewitt, 2011; Moffitt et al., 2011), such that preschoolers who engage executive functions to wait for two sweets may go on to become adults who can engage executive functions to succeed in life.

Social processes may also be a powerful influence on delaying gratification and associated life trajectories. Delaying gratification only makes sense if the person promising the reward is trustworthy, and children and adults are more

* Department of Psychology and Center for Mind and Brain, University of California Davis, Davis, CA, US

[†] Graduate School of Education, The University of Tokyo, Tokyo, JP

[‡] Department of Psychology, George Mason University, VA, US

[§] Department of Psychology and Neuroscience, University of Colorado Boulder, Boulder, CO, US

^{||} American Institutes for Research, Washington, DC, US

[¶] Graduate School of Education, Kyoto University, Kyoto, JP

Corresponding author: Yuko Munakata (ymunakata@ucdavis.edu)

likely to delay gratification under such conditions, whether they arise naturalistically or are created experimentally (Kidd, Palmeri, & Aslin, 2013; Mahrer, 1956; Michaelson, de la Vega, Chatham, & Munakata, 2013; Michaelson & Munakata, 2016; Mischel, 1961; Mischel et al., 1972; Mischel & Ayduk, 2004). In addition, delaying gratification may be influenced by the social norms of other individuals, in their attitudes, judgments, and behaviors. Children's delaying of gratification varies naturalistically across families and across cultures in ways that are consistent with such social shaping (Bernier, Carlson, & Whipple, 2010; Houck & Lecuyer-Maus, 2004; Lamm, Keller, Teiser, Gudi, Yovsi, et al., 2017; Mauro & Harris, 2000). In experimental studies testing the causal role of social norms, children are more likely to delay gratification when they believe that other members of their group delayed gratification and members of an outgroup did not, compared to children who believe that other members of their group did not delay gratification and members of an outgroup did (Doebel & Munakata, 2018). Thus, preschoolers who have social support for delaying gratification may go on to become adults who have social support and associated gains across development to succeed in life.

While social influences can thus be powerful in the moment and in explaining life outcomes, they have been tested in experimental studies of delay of gratification only in American children. Individuals from different cultures show both similarities and differences in how they respond to social influences (Markus & Connor, 2013; Markus & Kitayama, 1991; Senzaki et al., 2018; Triandis, 1994), such that findings and theories about the causal role of social factors in delaying gratification and life outcomes may not generalize outside of the limited contexts where they have been tested. Individuals across cultures can show in-group/out-group dynamics, preferring members of their own group to members of a different group, but the basis for these dynamics differs between cultures. Some Western cultures may emphasize categorical distinctions between social groups, defining groups and their role within the group in terms of features shared among prototypical group members, while some Eastern cultures may focus more on relationships among individuals, defining groups and their role within the group in terms of interpersonal networks among group members (Abrams, Ando, & Hinkle, 1998; Brewer & Gardner, 1996; Watkins, Adair, Akande, Gerong, McInerney, Sunar, et al., 1998; Yuki & Takemura, 2014). For example, both American and Japanese adults trust members of their group more than members of a different group; however, Japanese adults care more about personal connections with these group members than do Americans (Yuki & Takemura, 2014). Specifically, when an individual is a member of an out-group but has a potential personal connection to subjects, Japanese subjects treat that individual like an in-group member whereas American subjects treat that individual like an out-group member, as evidenced in both their trust (Yuki et al., 2005) and their memory of the individual (Takemura et al., 2010).

Given the power of social influences and potential cultural differences in how social factors shape fundamental aspects of behavior, the current preregistered study extended prior work with American children to

test the influence of groups and personal connections on delaying gratification in Japanese children. We experimentally manipulated group behavior and personal connections in order to test their causal roles. As in prior work with American children (Doebel & Munakata, 2018), children were assigned to be a member of a group, and they learned that either: a) their group delayed gratification while a different group (i.e., outgroup) did not, or b) their group did not delay gratification while a different group did. Children also formed either: a) a personal connection to an individual in the outgroup, or b) no personal connection to an individual in the outgroup, building on prior work with Japanese and American adults (Yuki & Takemura, 2014). This connection was manipulated by asking children to first complete a computerized cooperative task, which included a photo of a child that the participant was ostensibly completing the task with. In the condition with the personal connection, this photo was later included and pointed out in the picture of the outgroup. Children's delaying of gratification was then measured on the same delay-choice task that they had just learned about the other children completing.

We predicted an interaction between group behavior and personal connection. When children have no personal connection to the out-group, they should delay gratification more when their group delays and the out-group does not, compared to when their group does not delay and their out-group does. This finding would replicate and extend prior work tested only in American children to a Japanese context. When children have a personal connection to the out-group, this difference between conditions should be reduced. That is, children with a personal connection to the out-group should delay relatively less when their group delays and the out-group does not, and relatively more when their group does not delay and the out-group does. The difference in delaying between these conditions should thus be reduced. This finding would demonstrate the importance of a personal connection in group influence, and the role that such connections play early in development, laying the foundation for future cross-cultural studies.

In addition, the mechanisms of action of social influences on delaying gratification are relatively unexplored. Such social factors may seem separate from cognitive processes like executive functions that have been linked to delaying gratification. Alternatively, social factors could potentially be understood in terms of their influence on cognitive processes. For example, information about other people can serve as a context that enhances working memory performance (Ishiguro & Saito, 2018), and the ability to maintain goal-relevant information in working memory may support a wide variety of executive functions and behaviors (Miller & Cohen, 2001; Miyake & Friedman, 2012; Miyake et al. 2000; Munakata et al., 2011), such that social information may influence delaying gratification via working memory. We tested the effectiveness of our manipulations and possible mechanisms of action by measuring children's: 1) memory for information in our manipulations, 2) identification with members of the groups, 3) trust of members of the groups (building on Yuki et al., 2005), 4) working memory in the context of

members of the groups (building on Ishiguro & Saito, 2018), and 5) valuing of delay of gratification (1, 2, and 5 are all as in Doebel & Munakata, 2018).

Method

Participants

The target sample was all kindergartners at one school (5 classrooms) of approximately 140 children. We chose this sample based on available resources. All parents of these children were approached regarding the possibility of having their children participate in the study. A few parents declined, and the remaining children who did not participate either chose not to or were not approached by the experimenter. No children for whom data were collected were excluded from the study, consistent with our preregistration. Our final sample was 106 participants ($M = 4.90$ years, $SD = 0.80$, females = 57). These participants were randomly assigned to one of four conditions: 26 in the ingroup-didn't-wait/no-personal-connection condition ($M = 4.86$ years, $SD = 0.76$, females = 14), 27 in the ingroup-didn't-wait/personal-connection condition ($M = 4.87$ years, $SD = 0.83$, females = 13), 27 in the ingroup-waited/no-personal-connection condition ($M = 4.92$ years, $SD = 0.86$, females = 15), and 26 in the ingroup-waited/personal-connection condition ($M = 4.95$ years, $SD = 0.84$, females = 14). The racial makeup of the sample was 100 % Japanese and their socioeconomic background was predominantly middle class. For all participants, we obtained their assent and informed consent was obtained from their parents prior to their participation. This study was approved by the institutional ethics committee for experimental psychology at Graduate School of Education, Kyoto University (approval number: CPE-183; title: Cognitive and Social Factors in Children's Self-Control).

Procedure

Overview

Children were brought into a room individually and seated at a table. The experiment began with the cooperative task, followed by the in-group induction phase, an introduction phase to the delay of gratification test, the experimental manipulation phase, the delay of gratification test, and then working memory task. These tasks, phases, and test were conducted in the fixed order as above described. Children were also asked questions at different points in the procedure that served as manipulation checks and tests of potential mechanisms. A video camera was set up on a tripod to record the session.

The face stimuli for the group members, the partner in the cooperative task, and children in the follow-up questions came from several sources: the Child Affective Facial Expression (CAFE) stimuli set hosted on Databrary (LoBue, 2014; LoBue & Thrasher, 2015), photos provided by Viola Cassia and Kang Lee from prior research studies (personal communication), Wikimedia Commons, FaceTracer (Computer Vision Laboratory, Columbia University; Kumar, Belhumeur, & Nayar, 2008), and colleagues and family members (personal communication); all photos were of children of Japanese origin or of Asian children who we believed could pass for Japanese. The format

and gender makeup was identical across the in- and out-groups. Faces were counterbalanced across the ingroup, outgroup, and partner roles to ensure that any effects were not driven by biases toward particular children.

Cooperative task

Children completed 2 simple puzzle tasks with a laptop computer (Surface pro 4; Microsoft). A photo of another child appeared on the screen with each puzzle. Children were told that the partner was Tomoya (or Nami), who was the same age and gender as them and usually went to the neighborhood kindergarten school, and that they would be working on the puzzles with that partner. The participant and the virtual child had three separate pieces of the puzzle, so that they had to work on the game together to complete it. Children took turns with the partner three times. Children pressed a puzzle piece on the screen to fill in that part of the puzzle. The experimenter then pressed the image of the child on the screen to indicate that it was the virtual child's turn, and one of the virtual child's pieces was added to the puzzle. This task was conducted for shaping personal relationships with the collaborator who appeared as a member of out-group in the ingroup-didn't-wait/personal-connection condition and the ingroup-waited/personal-connection condition.

In-Group induction phase

As in Doebel & Munakata (2018) and Billig & Tajfel (1973), we aimed to assign children to groups based on shared preferences. The experimenter said, "I'm going to show you some pictures of things and ask you about what you like! Look at these pets. Can you point to the one you like more?" The experimenter then asked three more questions like these about fruits, toys, and treats and recorded children's choices. If a child refused to make a choice for one of the questions the experimenter noted this and omitted it from the remainder of the procedure.

Next, the experimenter placed in front of the child a laminated card depicting headshots of four Asian children wearing green shirts¹ presented in a 2 × 2 format with a girl then boy on the top row, and girl then boy on the bottom row. The placement of the group members was fixed. The experimenter said, "Okay, now look! This is the green group! The green group likes the same things you like. They like ____, ____, ____, and ____."

Next, the experimenter placed on the table (to the right or left of the in-group, randomized between participants) a picture of the out-group and said, "Now look here, this is the orange group! The orange group likes different things than you like. They like ____, ____, ____, and ____." In the personal-connection condition, the child from the cooperative task appeared in the orange group. The experimenter pointed and said, "Here is your partner from the puzzle game. S/he is in the orange group." In the no-personal-connection condition, the child from the cooperative task did not appear in the orange group.

The experimenter then said, "So you are going to be in the green group! Here's a special green shirt for you to wear because you're in the green group!" The experimenter helped the child put on a green t-shirt.

Memory for group questions

The experimenter asked, "So which group is your group?" If children hesitated, the experimenter repeated the question. If children responded correctly, the experimenter said, "That's right, green is your group!" If children responded incorrectly, the experimenter said, "Actually, green is your group." The experimenter also asked "Which group is not your group?" Correct responses were affirmed and incorrect responses were corrected as with the first question.

Group identification questions

The experimenter asked children questions to assess in-group identity. Children were presented with the pictures of children from their in-group and the pictures of children from their out-group, with the side of each group alternating across trials. On each trial, the experimenter asked a question (see Appendix), such as "Who should I give a sticker to?", followed by "Can you point or tell me?" The experimenter recorded children's responses and did not provide any feedback. The score was measured as the proportion of selecting the pictures of children from their in-group across 4 questions.

Introduction phase to the delay of gratification test

We used a sticker real-choice measure of delaying gratification (as in Thompson, Barresi, and Moore, 1997, and similar to Moriguchi et al., 2018). This measure is brief and simple to administer, making it well-suited for use in an active setting such as a kindergarten, and this measure may be more natural than a sustained delay task for Japanese preschoolers, who are unaccustomed to receiving sweets for no reason and to sitting alone for an extended time period.

Children chose one set of stickers to use from a set of 6 and one colored sheet to put stickers on. The experimenter then introduced one envelope with a single circle on it to represent one sticker, and a second envelope with three circles on it to represent three stickers, and explained (pointing to the envelope with a single circle) there was one sticker in this envelope because only one circle was depicted; (pointing to the envelope with three circles) there were three stickers in this envelope because three circles were depicted. Children's understanding of the envelopes was checked by asking children which envelope included one sticker and which envelope included three stickers. Children received feedback on their answers, and almost all children answered the questions correctly. This procedure was adapted from Carlson, Davis, & Leach (2005), to convey the difference between the two options in terms of the number of stickers, while minimizing distraction from details of specific stickers. The experimenter placed one sticker in an envelope with a single sticker symbol on it, and placed three stickers in an envelope with three sticker symbols on it. The experimenter placed one envelope on one side of the child, and the other envelope on the other side of the child, and announced "You can have one sticker right now to put on this sticker sheet, or if you wait until we are all done with our games, then you can have three stickers to put on your sticker sheet instead. How does

that sound?" If the child attempted to indicate the choice, the experimenter said, "Oh, let me tell you something else first!"

Experimental manipulation phase of in-group and out-group behavior

The experimenter placed a picture depicting the in-group (in green shirts) and out-group (in orange shirts) behind the envelopes. In the case of the in-group-waited condition, the left half of the picture depicted a row of headshots of the four in-group members, below which was images of sticker symbols: on the left was an image of one sticker symbol (representing the immediate reward) and on the right was an image of three sticker symbols (representing the delayed reward). Consistent with the in-group waiting for the larger reward, an arrow pointed from the in-group to the three sticker symbols. The right half of the laminated picture depicted the four out-group members above the same sticker symbol images but with an arrow pointing to the single sticker symbol instead of the three sticker symbols, consistent with the out-group not waiting for the larger reward.

In the in-group-waited condition, the experimenter pointed to the images and said, "Look! These kids are in the green group, just like you! And guess what? They didn't take one sticker; they waited until they could have three stickers and finally played with them. And these kids are in the orange group, not your group! They took one sticker and played with it; they didn't wait until they could have three stickers."

In the in-group-didn't-wait condition, the laminated picture was identical except that the arrows pointing to the sticker symbols were consistent with the in-group not waiting for the larger reward and the out-group waiting for the larger reward. The experimenter said, "Look! These kids are in the green group, just like you! And guess what? They took one sticker and played with it; they didn't wait until they could have three stickers. And these kids are in the orange group, not your group! They didn't take one sticker; they waited until they could have three stickers and finally played with them."

Memory for group's behavior questions

Children were then asked to indicate what each group did. For example, "So what did the orange group do?" If the child said they do not know or provided an otherwise uninformative answer, the experimenter asked, "Did they wait or not wait?" Correct responses were affirmed and incorrect responses were corrected. For example, if the child responded correctly, the experimenter said, "Yes that's right they waited until they could have three stickers." If the child responded incorrectly the experimenter said, "Actually, they waited until they could have three stickers."

Delay of gratification test

Participants were asked across 6 trials whether they would prefer 1 sticker now or 3 stickers at the end of the session. On each trial, children chose one sheet of stickers from a set of 6, and then the experimenter placed one sticker in an envelope with a single sticker symbol it, and placed

three stickers in an envelope with three sticker symbols on it. The experimenter placed one envelope on one side of the child, and the other envelope on the other side of the child, and the colored sticker sheet in front of the child, and announced "You can have one sticker right now to put on this sticker sheet, or if you wait until we are all done with our games, then you can have three stickers to put on your colored sticker sheet instead." If children chose to put one sticker on the sheet right now, the experimenter took it out of the envelope and gave it to them. After they enjoyed putting it on the sheet, they went on to the next trial. If children chose to put three stickers on the sheet later, the experimenter told them the stickers would be given at the end of the testing and they went on to the next trial. This procedure was repeated six times. The score was measured as the proportion of trials out of 6 trials that the child chose to wait to receive three stickers.

Post-test questions

Children were then asked several of the same questions they were asked in the pre-sticker-test phase: memory for group, memory for group behavior, and group identity (see Appendix). The only difference was that no feedback was provided following children's responses to any of the questions.

Evaluation of delay choice questions

As in Doebel & Munakata (2018), this procedure tested the hypothesis that group behavior influenced children via a change to how they evaluated delaying gratification. Children completed two trials in which they were presented with scenarios involving a pair of children who differed in their delay behavior. Each trial involved different rewards (stickers or sweets). They were shown a page with small pictures of two children of the same gender, one on the right side of the page and one on the left. Each depicted child had small pictures of rewards directly beneath them. A trial was introduced by the experimenter saying, for example, "Genki and Taiki love sweets! Their mom said they could have one sweet right away, or, if they waited until she found more sweets they could have two instead. Genki ate one sweet right away. Taiki waited until he could have two sweets." The experimenter then asked questions aimed to tap children's implicit preference for one of the children. For example, children will be asked "Who do you like more?", "Who is nicer?", and "Who would you like to play with?" The score was measured as the proportion of trials out of 6 trials that the child preferred the character who waited to receive three rewards.

Trust of members of the groups questions

Children were shown pairs of pictures of that included 1 in-group member, 1 out-group member, or the partner from the cooperative task, and they were asked questions to assess their trust, such as "Who would you ask to hold onto your favorite toy for you?" Children were asked 6 questions in total, 2 about each possible pair (see Appendix). The score was measured as the probability that children would prefer the ingroup member/disprefer the outgroup member across 6 questions.

Working memory in the context of members of the groups

Children were asked to try to remember the items that different individuals like, in order. For example, "I'm going to tell you the colors that this boy from the green group likes, in order. Can you try to remember them in order, and then say them back to me?: blue, white, yellow, pink." Children were asked 4 types of questions, each about a different category of item (e.g., zoo animals, vegetables, and vehicles), for each of 3 individuals: 1 in-group member, 1 out-group member, and the partner from the cooperative task. This task was conducted with the laptop computer (Surface pro 4; Microsoft) and the sequences of names were auditorily presented. During the auditory presentation, four question marks that corresponded to each name were presented. Next, children were encouraged to respond verbally as auditory presented. To focus our measure on the working memory component of ordering the stimuli and minimize demand on long-term memory for the items, pictures of the options were visible on the computer screen when it was time for children to respond, and children completed practice trials with each of the 4 types of questions before being asked about the target individuals. The score was measured as the number of the items recalled in the correct serial position.

Results

The study design and analytic plan were preregistered on the Open Science Framework (osf.io/pxgdk). Here we describe our analytic approach, manipulation checks, and effects of our manipulations on group identity, delaying, evaluations of delaying, trust, and WM. Our preregistered plan was to use ordinary least squares regression to test our confirmatory hypothesis of an interaction between group behavior and personal connection, unless one or more assumptions of this test were violated. Because our key dependent measure (i.e., choosing to have one sticker now or wait to have three stickers later) was characterized by a binomial distribution, the assumption of normally distributed errors and of homogeneity of variance were violated. We thus used generalized linear mixed models (lme4 R package; Bates, Martin, Bolker, & Walker, 2015) with a logit link function to predict the proportion of sticker delaying choices from group behavior (e.g., ingroup waited and outgroup did not wait), personal connection to the outgroup, and their interaction. We also used generalized linear mixed models to conduct other analyses involving binomial dependent variables (ingroup identity, preference for the character who delayed, and preference for the ingroup member or dispreference for the outgroup member).

All children remembered which group they were in, both before and after the sticker test. Children remembered their group's delay behavior prior to the sticker test (99%, 104 of 105; one additional child did not answer the question), but were significantly less likely to remember afterwards (82%, 86 of 105), $\chi^2(1) = 6.79, p = 0.01$.

Ingroup identity, which was measured by the group identification questions, varied as a function of personal connection to the outgroup (**Figure 1**). Including in the model personal connection to the outgroup (yes or

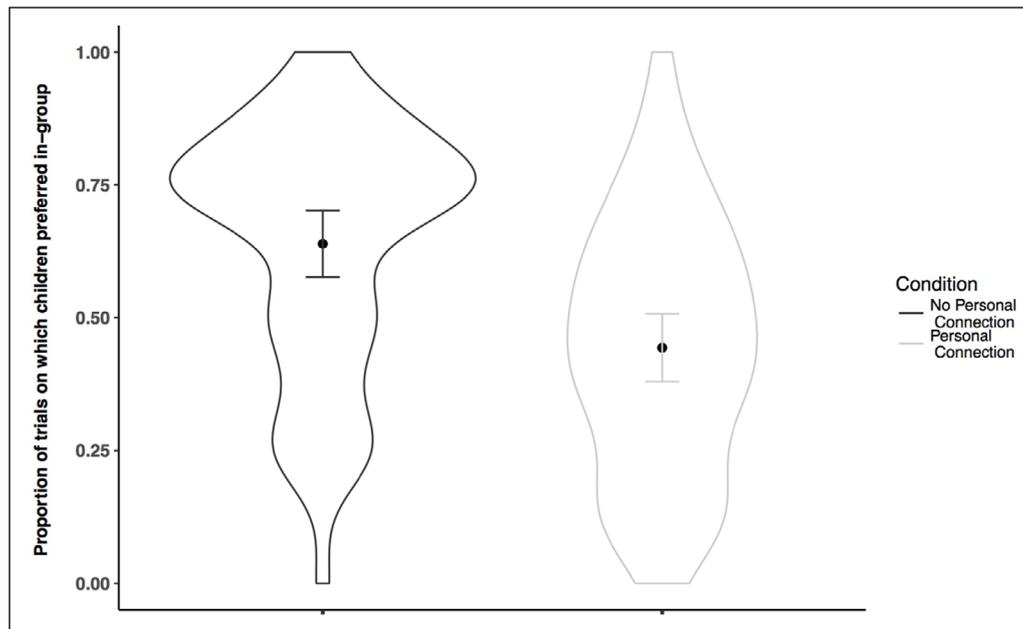


Figure 1: Children with a personal connection to the outgroup identified less with the ingroup than children with no personal connection. Dots represent the condition means and error bars represent the 95% confidence intervals. On each side of the black/gray lines represent the kernel probability density of the data at different proportions.

no) and time (before or after the sticker test) yielded a significant effect of personal connection to the outgroup on children's ingroup identity, with children with no personal connection to the outgroup showing a stronger ingroup preference ($M = 0.64$, $SD = 0.23$) than children with a personal connection ($M = 0.44$, $SD = 0.24$), $OR = 0.41$, $X^2(1) = 18.49$, $p < .001$. In addition, we tested whether the tendency of preference for the ingroup (the outgroup) over the outgroup (the ingroup) was significantly above chance level. Children without a personal connection to the outgroup were above chance in preferring the ingroup, $t = 4.34$, $p < .001$, whereas children with a personal connection to the outgroup showed a nonsignificant trend of dispreference for the ingroup, $t = -1.75$, $p = .087$.

This effect of personal connection to the outgroup did not lead to the expected downstream effects on children's choices and preferences related to delaying. Our preregistered hypothesis that the effect of group behavior on children's delay choice would vary depending on the presence of a connection to the outgroup was not supported, $OR = 0.97$, $X^2(1) = 0.00$, $p = .976$ (Waited, no personal connection: $M = .55$, $SD = .39$; Waited, personal connection: $M = .63$, $SD = .37$; Didn't wait, no personal connection: $M = .40$, $SD = .36$; Didn't wait, personal connection: $M = .47$, $SD = .35$).

In the same model, whether or not the ingroup waited was a significant predictor of children's delaying gratification in their sticker choices. The odds of children choosing to wait was over three times higher if their group waited ($M = 0.59$, $SD = 0.38$) than if their group did not ($M = 0.43$, $SD = 0.35$), $OR = 3.38$, $X^2(1) = 5.86$, $p = .015$ (Figure 2). This result conceptually replicated our findings with American children (Doebel & Munakata, 2018). Personal connection to the outgroup was not a significant predictor (personal connection: $M = 0.55$, $SD = 0.36$, no personal connection: $M = 0.47$, $SD = 0.38$), $X^2(1) = 1.64$, $p = .201$).

We found a similar pattern with respect to children's preferences for characters who delayed, which was measured by questions about evaluation of delay choices after the sticker test. The interaction term in the model testing the interaction between group wait behavior and personal connection to the outgroup in predicting preference for characters who delayed was not significant, $OR = 2.01$, $X^2(1) = 1.46$, $p = .227$; however, in the same model, group behavior was a significant predictor, $OR = 1.95$, $X^2(1) = 5.34$, $p = .021$, with children whose group members delayed preferring characters who delayed ($M = 0.63$, $SD = 0.29$) more than children whose group members did not delay ($M = 0.50$, $SD = 0.30$), $X^2(1) = 5.34$, $p = .021$, regardless of whether or not they had a personal connection to an outgroup member who did the opposite of their group (Figure 3). This result also replicated our findings with American children (Doebel & Munakata, 2018, Expt 2). Personal connection to the outgroup did not significantly predict preference for delayers (personal connection: $M = 0.57$, $SD = 0.29$, no personal connection: $M = 0.56$, $SD = 0.31$), $OR = 1.06$, $X^2(1) = 0.04$, $p = .850$.

We expected that trust might be part of what leads children to follow their in-group behavior. Thus children should more often select their in-group member as someone they trust over an out-group member or previous collaborative partner, and they should less often select an out-group member as someone they trust over the collaborative partner, controlling for personal connection to the outgroup. To test this we used a mixed model predicting children's preference for the ingroup member or dispreference for the outgroup member, which was measured by questions about trust in members of the groups, and included personal connection to the outgroup as a predictor in the model, and random intercepts for subjects and question types. A score of "1" was given when the ingroup member was selected over an outgroup member or partner, and a score of "0" when an outgroup member

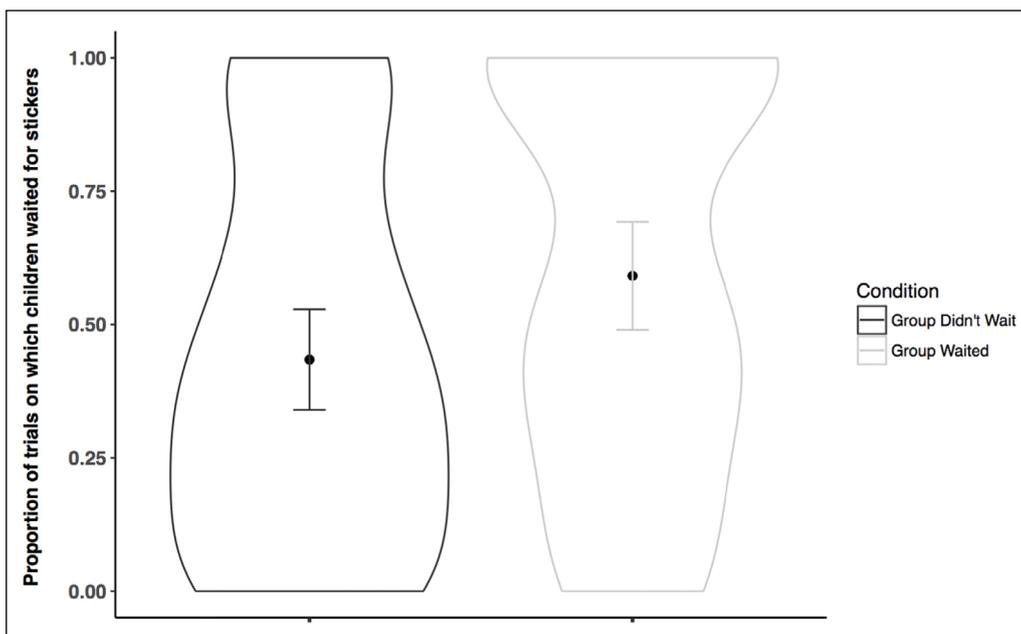


Figure 2: Children whose group waited chose to wait for more stickers than children whose group didn’t wait. Dots represent the condition means and error bars represent the 95% confidence intervals. On each side of the black/gray lines represent the kernel probability density of the data at different proportions.

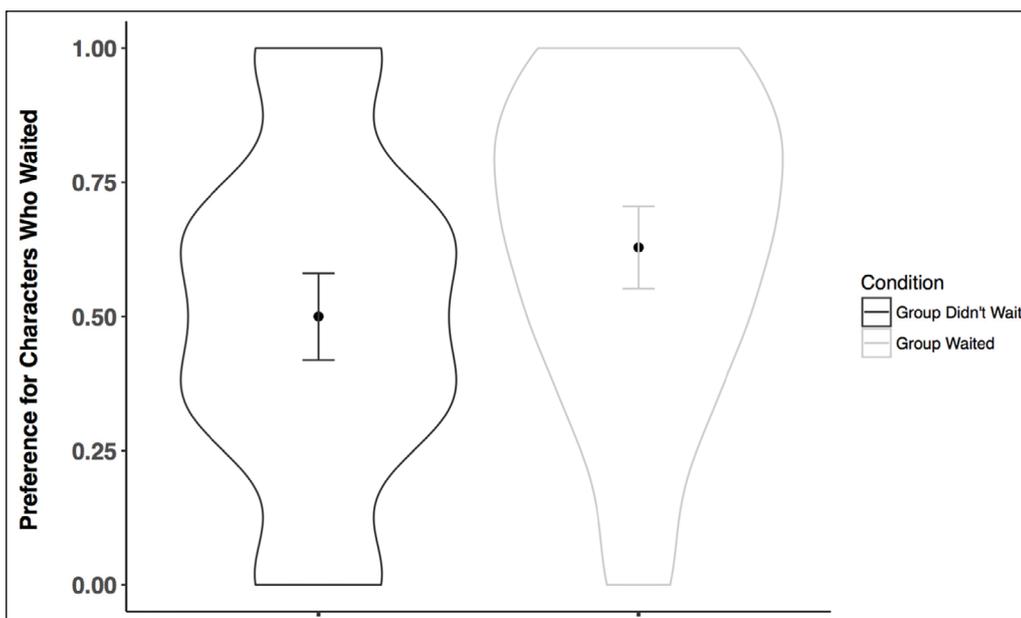


Figure 3: Children whose group waited preferred characters who waited over characters who did not wait. Dots represent the condition means and error bars represent the 95% confidence intervals. On each side of the black/gray lines represent the kernel probability density of the data at different proportions.

was selected over an ingroup member or a partner. Children as a whole were not above chance on this trust measure, $OR = 1.19, X^2(1) = 2.16, p = .142$ and personal connection did not significantly predict trust (personal connection $M = 0.50$, no personal connection $M = 0.58$), $OR = 0.73, X^2(1) = 2.42, p = .120$. We also looked at children’s trust preferences on each question separately (see **Table 1** for means). Personal connection predicted trust only when an ingroup member was contrasted with a partner, $OR = 0.44, X^2(1) = 4.51, p = .034$. Trust did not significantly predict children’s choice to wait for stickers, $X^2(1) = 1.81, p = .179$, or their preference for characters who delayed, $X^2(1) = 0.84, p = .360$.

Table 1: Children’s Trust By Question Type and Personal Connection to the Outgroup.

Personal Connection	Ingroup Over Outgroup	Ingroup Over Partner	Partner Over Outgroup
no	0.60	0.57	0.56
yes	0.51	0.41	0.59

We did not find evidence that children followed their group’s behavior because they were better at maintaining representations of their group members versus members

Table 2: Children's Working Memory Performance by Trial Type and Personal Connection to the Outgroup.

Trial Type	Personal Connection	Mean	SD
partner	no	2.00	1.41
partner	yes	1.90	1.49
ingroup member	no	1.97	1.47
ingroup member	yes	2.15	1.33
outgroup member	no	1.79	1.40
outgroup member	yes	2.17	1.48

of the outgroup or partner in the cooperative game. We tested this via an omnibus test predicting the number of items recalled in the correct order from the trial type (ingroup, outgroup, partner). The omnibus test was carried out by comparing two linear mixed models: one that included trial type (ingroup, outgroup, partner), personal connection (yes or no), and random intercepts for subjects (to account for repeated measurement) and one that excluded trial type, the variable of interest. We found no significant difference between these models, or, in other words, no significant differences in children's ordered recall involving in-group members, out-group members, or partners, $X^2(1) = 1.82, p = 0.40$.

Children who had a personal connection to the outgroup showed more variability in working memory across trial types than children who did not have a personal connection to the outgroup. We tested this by comparing two models: one that included trial type, personal connection, and their interaction, and second model that did not include the interaction term. The model comparison was significant, indicating that including the interaction term significantly increased model fit, $X^2(1) = 9.06, p = 0.03$. Post hoc analyses were carried out for each level of the personal connection condition separately, finding a significant difference among trial types in the personal connection condition only, $X^2 = 6.45, p = 0.04$. Further post hoc tests revealed that children in the personal connection condition showed worse working memory on the (four) trials involving the partner than on trials involving the ingroup member ($X^2 = 4.38, p = 0.04$) or the outgroup member ($X^2 = 5.24, p = 0.02$) (see **Table 2** for means).

Discussion

Children responded to group influence and to personal connections in ways that highlight both cultural similarities and potential differences across Japanese and American contexts. First, the similarities: Consistent with previous findings with American children (Doebel & Munakata, 2018), Japanese preschoolers delayed gratification and valued delaying gratification more if they believed that other members of their group delayed gratification (and members of an outgroup did not) than if they believed that other members of their group did not delay gratification (and members of an outgroup did). This finding demonstrates the power of group influences early in development in a Japanese context.

This finding also extends the earlier findings with a sustained delay task (the classic marshmallow task) to a delay choice measure of delaying gratification, where children could choose the option of a larger reward later over a smaller immediate reward and then the delay was implemented for them. While various types of delay tasks may tap distinct processes to some degree (e.g., deciding to delay vs. actually sustaining a choice to delay), different delay measures also show considerable similarities (Duckworth & Kern, 2011). Our study demonstrates that behavior on sustained delay and delay choice task variants can be similarly influenced by the behavior of ingroups and outgroups. These findings provide experimental evidence consistent with theories about the social shaping of naturalistic variations in delay of gratification observed across families and across cultures (Bernier, Carlson, & Whipple, 2010; Houck & Lecuyer-Maus, 2004; Lamm et al., 2017; Mauro & Harris, 2000; Pepper & Nettle, 2017). However, these findings also highlight the likely role of additional factors in delaying gratification, given that group behavior influenced delaying but did not sway children completely. Factors such as individual differences in executive functions and prior experiences may contribute to the variations in delaying gratification observed across children within the same condition.

Consistent with prior findings with Eastern adults but in contrast with findings with Western adults (Abrams, Ando, & Hinkle, 1998; Brewer & Gardner, 1996; Watkins, Adair, Akande, Gerong, McInerney, Sunar, et al., 1998; Yuki & Takemura, 2014), Japanese preschoolers were influenced by a personal connection with a member of the outgroup. They identified more with their ingroup than with an outgroup in the absence of a personal connection to the outgroup, but they shifted toward identifying more with the outgroup than the ingroup in the presence of a personal connection to the outgroup. This finding demonstrates the power of personal connections early in development. It also highlights the power of a personal connection to an out-group member in changing the perception of *the group*, whereas prior work demonstrated the power of a personal connection to an out-group member in changing the perception of *that individual* (Yuki & Takemura, 2014). Thus, consistent with theorizing and evidence regarding an Eastern cultural emphasis on interdependence and relationships, Japanese children were attuned to individual relationships in their processing of group information. This finding should encourage future studies that test for contrasts across cultures and how they emerge across development. For example, personal connections with an out-group member may influence perceptions and actions to a lesser degree in American children, given that Western cultures have been argued to place a greater emphasis on categorical distinctions among groups. Moreover, arbitrary groups that are formed based on category preferences may have greater influence in some Western contexts than in some Eastern contexts (e.g., Wetherell, 1982), whereas groups based on personal connections with interdependence among members may have greater influence in some Eastern contexts than in some Western contexts. These distinctions may not map cleanly onto an East-West dichotomy, given variations

observed across Eastern cultures and across Western cultures in interdependence (Vignoles et al., 2016). Exploring such potential differences and their emergence should yield insights into fundamental aspects of social processing and the role of cultural influences.

A personal connection to the outgroup reduced children's identification with their ingroup over an outgroup, but children's delaying of gratification followed that of their ingroup rather than their outgroup regardless of whether they had a personal connection to the outgroup. Further work is needed to explore this unexpected pattern, but one potential explanation is that children may be inclined to behave as their ingroup does regardless of personal connections or how much they actually identify with their group (e.g., Harris, 1998). A similar dissociation has been observed in children's information-seeking: The presence of an antisocial individual in the in-group reduces children's in-group preferences, but children nonetheless prefer to learn from members of their in-group over members of an outgroup regardless (Hetherington, Hendrickson, & Koenig, 2014). Group membership can thus be powerful in guiding children's decisions even in the absence of a preference for one's group.

Children's trust and working memory for their partner, ingroup member, and outgroup member did not yield clear evidence regarding potential mechanisms of social influence. It is possible that these newly-developed measures were not sufficiently sensitive for this age group and that better measures would show significant effects, given that many of the findings went in the expected direction (e.g., numerically, children showed greater trust and working memory for an ingroup member than an outgroup member in the absence of a personal connection, and these differences were smaller with a personal connection to the outgroup). The measures of trust and working memory were nonetheless sensitive enough to yield some significant findings, which suggest that in the final tasks of the session, children remembered at some level whether or not the puzzle partner was a member of the outgroup. First, children showed more of a trust preference for an ingroup member over their puzzle partner when the partner was not a member of the outgroup than when the partner was a member of the outgroup. Second, children showed worse working memory on trials involving their puzzle partner relative to an ingroup or outgroup member when the partner was a member of the outgroup compared to when the partner was not a member of the outgroup. This unexpected finding could reflect retrieval-induced forgetting in the condition where the partner was a member of the outgroup, with children retrieving information about both the partner and the outgroup member when presented with the outgroup member, leading to inhibition of the partner information such that it became less effective as a context to support working memory performance. These findings suggest that children's responsiveness to group influence but not to personal connection in their delay of gratification is likely meaningful, rather than reflecting a decrease across the session in children's sensitivity to whether or not the puzzle partner was a member of the outgroup.

This work adds to a growing literature on cross-cultural similarities and differences in the development of executive functions and goal-directed behaviors (Lamm et al., 2017; Lan et al., 2011; Moriguchi et al., 2012; Oh & Lewis, 2008; Sabbagh et al., 2006). Such studies highlight the importance and challenge of cross-cultural work for theories of development (e.g., Cole, 1998; Cooper & Denner, 1998). Our deliberate use of a delay-choice measure makes it difficult to compare overall levels of delaying gratification in this sample and in the prior sample of American children tested with the classic marshmallow task (Doebel & Munakata, 2018). However, cross-cultural comparisons can be difficult even when using the same task. For example, Cameroon and German children performed quite differently on the marshmallow task (70% of Cameroonian Nso children waited the full delay period, compared to only 28% of German middle-class children; Lamm et al., 2017), but this difference is considerably smaller after removing the children who may have behaved in culturally-specific ways that altered their experience of the session: 10% of the Nso children fell asleep during the delay (vs. 0 German children), and 22% of the German children left the room during the delay (vs. only 1 Nso child). If we had used a sustained delay task in our sample, performance might have largely reflected how unnatural the unearned sweets and solitary wait seem for Japanese preschoolers.

Despite the challenges, this work revealed similarities in group influences on Japanese children and American children that are consistent with theories about social factors that shape delay of gratification and life trajectories across families and cultures. Japanese children's sensitivity to personal connections also highlights potential points of cultural contrast in how social factors influence children in the moment and in the longer term. The influence of personal connections on group identity but not on delay of gratification raises questions about dissociations between what individuals feel about their group and whether they follow it. Future exploration of such issues will shed light on delaying gratification, the life trajectories that it predicts, and the personal, social, and cultural forces that shape children's development.

Appendix

Group identity questions-pre tests

1. Who should I give a nice origami to?
2. Who helped their friend at school?
3. Who broke their friend's toy on purpose?
4. Who got to play soccer on a beautiful, sunny day?

Group identity questions-post tests

1. Who helped their parents clean the house?
2. Who happened to find a delicious apple hanging from a tree?
3. Who took some money without asking?
4. Who bought their friend some juice?

Trust of the member of the group questions

1. Each of these kids is playing with toy you want to play with. They say: "I am playing with toy now. I will give it to you later." Who will give it to you later?

2. Each of these kids is playing with sandbox-scoop you want to play with. They say: "I am playing with sandbox-scoop now. I will give it to you later." Who will give it to you later?
3. Each of these kids is using colored pencils you want to use. They say: "I am using colored pencils now. I will give it to you later." Who will give it to you later?
4. At recess, each of these kids finds an attractive origami flower. They say they will bring it to the teacher. Who will bring it to the teacher?
5. At recess, each of these kids finds an attractive origami ship. They say they will bring it to the teacher. Who will bring it to the teacher?
6. At recess, each of these kids finds an attractive origami animal. They say they will bring it to the teacher. Who will bring it to the teacher?

Data Accessibility Statement

The stimuli used in the study are restricted use; thus, we are not able to share them on the OSF page. The CAFE dataset is available by permission through the Databrary website (<https://nyu.databrary.org/>). The analytic plan for this study was preregistered at the Open Science Framework (<https://osf.io/awghb/registrations>). Participant data and analysis scripts have been made available via the Open Science Framework (<https://osf.io/awghb/>).

Note

- ¹ In-group/out-group colors were counterbalanced, and children were randomly assigned either to the green group with the outgroup being orange, or to the orange group with the outgroup being green. We describe only the first condition for simplicity.

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Competing Interests

The authors have no competing interests to declare.

Author Contributions

- Contributed to conception and design: YM, SS, KY, RG
- Contributed to acquisition of data: KY
- Analysis of data: SD
- Interpretation of data: SD, YM, KY, SS, LM, RG

- Drafted and/or revised the article: YM, SD, RG, SS, KY
- Approved the submitted version for publication: YM, KY, SD, RG, LM, SS

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