Title

Group Influences on Engaging Self-Control: Children Delay Gratification and Value It More When Their In-Group Delays and Their Out-Group Doesn’t

Journal
Psychological Science, 29(5)

ISSN
0956-7976

Authors
Doebel, Sabine
Munakata, Yuko

Publication Date
2018-05-01

DOI
10.1177/0956797617747367

Peer reviewed

Research Article

Psychological Science
2018, Vol. 29(5) 738–748

Reprints and permissions:
sagepub.com/journalsPermissions.nav
DOI: 10.1177/0956797617747367
www.psychologicalscience.org/PS

Group Influences on Engaging Self-Control: Children Delay Gratification and Value It More When Their In-Group Delays and Their Out-Group Doesn't

TC

Sabine Doebel and Yuko Munakata
Department of Psychology and Neuroscience, University of Colorado Boulder

Abstract
Self-control emerges in a rich sociocultural context. Do group norms around self-control influence the degree to which children use it? We tested this possibility by assigning 3- to 5-year-old children to a group and manipulating their beliefs about in-group and out-group behavior on the classic marshmallow task. Across two experiments, children waited longer for two marshmallows when they believed that their in-group waited and their out-group did not, compared with children who believed that their in-group did not wait and their out-group did. Group behavior influenced children to wait more, not less, as indicated by comparisons with children in a control condition who were assigned to a group but received no information about either groups' delay behavior (Experiment 1). Children also subsequently valued delaying gratification more if their in-group waited and their out-group did not (Experiment 2). Childhood self-control behavior and related developmental outcomes may be shaped by group norms around self-control, which may be an optimal target for interventions.

Keywords
self-control, executive function, social influences, cognitive development, open data, open materials, preregistered

Received 5/3/17; Revision accepted 10/30/17

What shapes our ability to exercise self-control—to inhibit the urge to order chocolate cake when on a diet or to save money now for a bigger payoff later? People vary in how successful they are at engaging self-control. Children are notorious for struggling with it. Childhood self-control predicts important life outcomes (e.g., employment, academic success, health, wealth, criminality; Mischel, Shoda, & Rodriguez, 1989; Moffitt et al., 2011), suggesting it is an early-emerging and stable individual difference that supports adaptive behavior throughout life. Identifying factors that predict self-control in childhood and beyond is thus of considerable interest.

Self-control is often explained in terms of early-developing cognitive skills, such as executive functions (e.g., goal maintenance, working memory, and inhibition), prefrontal circuitry associated with executive functions (Bunge & Zelazo, 2006; Casey et al., 2011), and psychological traits (e.g., Duckworth, Tsukayama, & Kirby, 2013; Moffitt et al., 2011). However, self-control emerges not in isolation but in a rich sociocultural context that may influence how it is exercised and develops. Self-control is linked to parenting (e.g., Bernier, Carlson, & Whipple, 2010; Lamm et al., 2017) and socioeconomic status (SES; e.g., Hackman, Gallop, Evans, & Farah, 2015) and may be moderated by beliefs about the reliability of the environment and social trust. Children and adults wait less for rewards when the person providing the reward is unreliable (e.g., Kidd, Palmeri, & Aslin, 2013) or untrustworthy (Michaelson, de la Vega, Chatham, & Munakata, 2013; Michaelson & Munakata, 2016). Children also adjust whether they exercise self-control in response to an adult model's

Corresponding Author:
Sabine Doebel, Department of Psychology and Neuroscience, University of Colorado Boulder, 1805 Colorado Ave., Muenzinger 345 UCB, Boulder, CO 80309
E-mail: sabine.doebel@colorado.edu

delay behavior (Bandura & Mischel, 1965) or undesirable outcomes (Lee & Carlson, 2015).

We propose and test another possibility—that self-control is influenced by group membership and norms. Adults and children can be strongly influenced by the behavior and norms of others in their attitudes, judgments, and behaviors (Kim, Chen, Smetana, & Greenberger, 2016; Myers & Lamm, 1976). While self-control might seem like a universally valued behavior, the importance placed on self-control in modern society is relatively new (Pinker, 2011). And while self-control is prominent in both popular press coverage and scientific journal articles today, cultures, communities, peer groups, and family members may vary in how much they emphasize self-control and the importance of using it to achieve goals (Carlson & Zelazo, 2011; Lamm et al., 2017). Thus, variations in group behavior and norms around self-control might influence whether self-control is used and how it develops. Cultures differ in delaying gratification (e.g., Lamm et al., 2017); however, such patterns could be due to either cultural norms around self-control or other differences between cultures.

One way to assess influences of group norms is by manipulating children's identification with a group who shows or does not show self-control. Group behavior motivates children from infancy (e.g., Xiao et al., 2017). Preschoolers show in-group biases based on factors such as eye color and accent (Bigler, Jones, & Lobliner, 1997; Kinzler, Corriveau, & Harris, 2011) even when there is no substantive basis for group membership (Dunham, Baron, & Carey, 2011), and such biases influence their actions (Jordan, McAuliffe, & Warneken, 2014). Thus, if group norms play a role in self-control, then learning that one's in-group engages in self-control (and one's out-group does not) should influence children to increase their self-control behavior.

Gaining insight into the influence of group behavior on self-control is timely given interest in interventions to support the development of self-control and the mixed findings thus far (Diamond & Lee, 2011). Common issues are the absence of long-term effects and limited improvements that are generally confined to tasks similar to those used to train control (so-called *narrow transfer*). If group behavior influences children's tendency to use self-control, then interventions that capitalize on this (e.g., by working to influence norms and values) may achieve broader transfer and longer lasting gains.

We examined the influence of group membership on self-control behavior by testing whether in-group identity influences children's tendency to delay gratification on the classic marshmallow task, in which children are given the option of having a small reward right away (one marshmallow) or waiting for a larger reward (two marshmallows; Mischel et al., 1989). In two experiments, we assigned children to an in-group using a *minimal-groups* induction procedure that creates in-group bias in young children (Dunham et al., 2011) and manipulated the degree to which self-control was presented as a group norm. Children were randomly assigned to conditions varying in what children were told about the behavior of their group and of another group on the marshmallow task. We predicted that children would delay gratification longer on the task when their group delayed while the other group did not, compared with children whose group did not delay gratification while the other group did.

Experiment 1

Method

Participants. A total of 98 children 3 to 4 years old (age: M = 4.22 years, SD = 0.33, range = 3.55–5.00; males = 46) were recruited from a database of families who had previously indicated interest in participating in child development research. Of these children, 8 were excluded because they became upset while waiting for two marshmallows (n = 1), required their parent to stay in the room throughout the procedure (n = 2), left the room (n = 2), or ate the marshmallow before being exposed to the manipulation (n = 1), or because of experimenter error that affected the manipulation (n = 1) or equipment failure that affected the manipulation (n = 1). We selected our sample size with a view to the feasibility of collecting the data within an academic semester and to roughly double that of previous studies (Kidd et al., 2013; Michaelson & Munakata, 2016). A power analysis informed by previous effect sizes was not possible because of a lack of precedent for this specific experimental manipulation in the literature. Data were collected between February and May 2016.

For 97% of our participants, at least one parent had a 4-year college degree or higher, 2% completed high school and some college, and 1% completed high school only. The racial makeup of the sample was 97% Caucasian, 1% African American, 1% Native Hawaiian, and 1% American Indian. Ninety-six percent of the sample was non-Hispanic/non-Latino.

Design. We employed a between-subjects experimental design, randomly assigning each child to one of three conditions in which (a) in-group members waited for a larger reward and out-group members did not (*group-waited condition*), (b) in-group members did not wait for a larger reward and out-group members did (*group-did-not-wait condition*), and (c) no information was provided about in-group or out-group members' delay behavior (*control condition*). All children then completed the marshmallow test (Mischel et al., 1989).

Procedure. Children were brought into a small room and seated at a white table. A video camera was set up on a tripod to record the session, along with a webcam, which fed into an adjacent room where the child's parent was observing. A lidded opaque rectangular container contained the plated marshmallow and green T-shirt. The room was otherwise empty and without decoration. The experiment began with the in-group induction, followed by an introduction to the marshmallow test, the experimental manipulation, and then the marshmallow test proper. Children were also asked questions at different points in the procedure, which served as manipulation checks.

Following Dunham et al. (2011), we assigned each child to a group and did not use any procedure to specifically encourage in-group affiliation. The experimenter knelt beside the seated child and said, "Guess what? You get to be in the green group today. Alright. Just like these kids here." The experimenter placed in front of the child a laminated 8- × 12-in. card depicting headshots of four children wearing green shirts presented in a 2 × 2 format with a boy on the left and a girl on the right in the top row and the reverse pattern on the bottom row. These pictures have been used and validated in previous research on young children's in-group preferences (Dunham et al., 2011). The children in the pictures appear to be 4 to 5 years of age. All of the children were Caucasian.

The experimenter continued, "The green group is great. Here's a special green shirt for you to wear because you're in the green group." The experimenter then helped the child put on the shirt. 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. This isn't your group; it's a different group." The format and gender makeup were identical across the in- and out-groups. The children also looked similar across the groups, but to ensure no biases toward particular children, we randomized across participants which group of children was shown with green shirts and presented as the in-group.

The experimenter then asked, "So which group are you in?" If the child hesitated, the experimenter repeated the question. Once the child responded, the experimenter said, "Yes, you're in the green group." If the child responded incorrectly, the experimenter said, "Actually, you're in the green group." Next, the experimenter presented children with an envelope, opened it, pulled out a small sticker, and said,

> So, I have this present, a sticker, that I want to give away. I will put it in this envelope and give it to the kids you tell me to give it to. Who should I give it to? Can you point or tell me?

The experimenter recorded children's responses and did not provide any feedback. The experimenter then began the marshmallow test (adapted from Kidd et al., 2013, and Michaelson & Munakata, 2016). The experimenter placed a single marshmallow on a black plate centered in front of the child, 4 in. from the edge of the table, and announced,

> Okay, it's snack time! You have a choice for your snack. You can eat this one marshmallow right now or—if you wait for me to go get more marshmallows from the other room—you can have two marshmallows to eat instead. How does that sound?

If the child declared that he or she just wanted one marshmallow, the experimenter simply repeated the choice, saying, "Okay, well, you can have this one marshmallow now or you can wait and get two later!" If the child attempted to grab the marshmallow, the experimenter said, "Oh, let me tell you something else first!"

The experimenter placed a laminated 8- × 12-in. picture depicting the in-group (in green shirts) and out-group (in orange shirts) on a small bookstand 4 in. behind the plated marshmallow. In the group-waited condition, the experimenter pointed to the images on the laminated sheet and said,

> Look! These kids are in the green group, too, just like you! And guess what? They waited until they could have two marshmallows. And these kids are in the orange group, and they didn't wait until they could have two marshmallows.

The left half of the laminated picture depicted a row of headshots of the four in-group members, below which were images of marshmallows: On the left was an image of one marshmallow (representing the immediate reward), and on the right was an image of two marshmallows (representing the delayed reward). Consistent with the in-group waiting for the larger reward, an arrow pointed from the in-group to the two marshmallows. The right half of the laminated picture depicted the four out-group members above the same marshmallow images but with an arrow pointing to the single marshmallow instead of the two marshmallows, consistent with the out-group not waiting for the larger reward.

In the group-did-not-wait condition, the laminated picture was identical except that the arrows pointing to the marshmallows 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, too, just like you! And guess what? They didn't wait until they could have two marshmallows. And these kids are in the orange group, and they waited until they could have two marshmallows.

In the control condition, the laminated picture depicted the in-group and the out-group in the same manner, but did not depict the marshmallows and thus provided no information about the groups' delay behavior. The experimenter said, "Look! These kids are in the green group, too, just like you! And these kids are in the orange group." We opted not to include a statement about the in-group receiving a choice between waiting and having two marshmallows because we anticipated doing so could induce children to speculate about their group's behavior, potentially influencing children's wait times.

The experimenter then asked the child, "So what did the green group do?" If the child said he or she did not know or provided an otherwise uninformative answer, the experimenter asked, "Did they wait or not wait?" If the child responded correctly, the experimenter said, "Yes that's right they waited until they could have two marshmallows." If the child responded incorrectly, the experimenter said, "Actually, they waited until they could have two marshmallows." In the control condition, this question was omitted.

The experimenter then said, "Okay, I'm going to go get more marshmallows from the other room. I'll leave this marshmallow here for you to eat if you want to while I'm gone, and if you haven't eaten any of it when I come back, you can have two marshmallows instead." At this point, the experimenter left the room and went to the adjacent room to watch the child via webcam. The session was stopped after the child took a bite or lick of the marshmallow or waited the full 15 min. At this point, the experimenter returned to the room and said, "Okay, all done with snack time!" and gave children the second marshmallow if they waited the full 15 min. The experimenter then proceeded with the posttest questions. The session was discontinued if children became distressed or left the room.

After the test, the experimenter then asked each child which group he or she was in. This memory check was identical to the first, except that no feedback was provided. Finally, the experimenter laid out the pictures of the two groups and asked the child, "Which kids are nicer?" A verbal or point response was recorded.

A coder who was blind to the experimental condition and study hypotheses recorded when each child's first lick or bite of the marshmallow occurred (as in Kidd et al., 2013; Michaelson & Munakata, 2016). To ensure reliability, we checked the coding against that of a second naive coder, $r(86) = .98$, $p < .001$. Coders differed by less than 3 s on 94% of judgments. The five cases in which the coding discrepancy was larger than 3 s were discussed and resolved by the coders. A research assistant who was blind to the experimental condition and study hypotheses then transcribed all self-talk in the videos. A naive coder recorded whether children made any reference to the in- and out-groups (green and orange, respectively) while waiting. Coding was checked against that of a second naive coder, and there were no discrepancies.

Analytic approach. The study design and analytic plan were preregistered on the Open Science Framework (https://osf.io/wrqtu/). Our preregistered hypothesis was that children whose group waited for two marshmallows would wait longer for two marshmallows than children whose group did not wait. All analyses beyond the confirmatory test comparing the group-waited and group-did-not-wait conditions were exploratory. Our preregistered analytic plan was to conduct a confirmatory test of this hypothesis using linear regression; however, the dependent variable was heavily right-censored, rendering linear regression inappropriate as it would produce biased estimates and inflate the Type II error rate (Mills, 2011). Thus we abandoned the planned linear analysis in favor of the more appropriate survival analysis using Cox proportional hazards regression models, developed specifically to handle censored data (Cox, 1972). All analyses were conducted using the R statistical package (R Core Team, 2006) and the lme4 add-on package to implement mixed-effects models (Bates, Mächler, Bolker, & Walker, 2015). No data were excluded. One session was terminated early during the delay period (at 9 min 51 s) because of experimenter error (the experimenter mistakenly thought the child had tasted the marshmallow); however, because the data point was valid (i.e., the only difference from other censored data points is that censoring occurred earlier), it was retained, and the delay time was coded as censored. Because of an equipment malfunction, video recordings of sessions were not available for 2 participants in the control group. One of these participants unambiguously waited the entire 15-min period, and the other participant ate the marshmallow 15 s after the experimenter left the room, as coded by the experimenter using the webcam and a timer. Excluding these participants from the sample did not affect the results.

Results

All children remembered which group they were in, both before and after the marshmallow test. Children also identified with their group: 80% of children chose to give a sticker to their group instead of the out-group prior to learning anything about their group's behavior, and, after the marshmallow test, 81% indicated that their group was nicer. These rates were well above chance, *t*s > 7, *p*s < .001. Almost all children remembered, both prior to and following the marshmallow test, whether their group waited or did not wait—pretest: M = 94% (51 of 54; 6 children were not asked this question because of experimenter error), SD = 23%, $t(53) = 14.13$, $p < .001$; posttest: M = 90% (54 of 60), SD = 30%, $t(59) = 10.24$, $p < .001$.

The results of our confirmatory test were consistent with our preregistered hypothesis, although they did not meet the traditional .05 alpha threshold. Children whose group waited for two marshmallows had nearly twice the odds of resisting the marshmallow (wait time *Mdn* = 15.00 min) of children whose group did not wait (*Mdn* = 9.48 min), $\chi^2(1) = 3.39$, $p = .07$, hazard ratio = 1.95, 95% confidence interval (CI) = [0.94, 4.01].

We also conducted an exploratory analysis with age included as a covariate because age tends to correlate with self-control ability; in this model, the greater likelihood of resisting the marshmallow for children whose group waited was significant, $\chi^2(1) = 4.19$, $p = .041$, hazard ratio = 2.13, 95% CI = [1.02, 4.43]. The effect of age was not statistically significant ($p = .1277$).

Exploratory comparisons with the control condition suggested that group behavior influenced children to wait longer but did not influence children to wait less. Children whose in-group waited were over two times more likely to resist the marshmallow compared with children who did not receive any information about their group's delay behavior (wait time *Mdn* = 2.95 min), $\chi^2(1) = 4.57$, $p = .033$, hazard ratio = 2.18, 95% CI = [1.05, 4.50]. On the other hand, there was no significant difference in the wait times of children whose group members did not wait for two marshmallows and children who did not receive information about their group's delay behavior, $\chi^2(1) = 0.16$, $p > .250$, hazard ratio = 0.88, 95% CI = [0.46, 1.66]. An exploratory analysis in which age and gender were added to the model did not change these results, $\chi^2(1) = 0.16$, $p > .250$, hazard ratio = 0.87, 95% CI = [0.45, 1.7].

This pattern was further confirmed by children's verbalized reasons for waiting. Among those in the group-waited condition, 24% of children (7 of 29; 1 additional child did not answer the question) cited the in- or out-group's behavior in their reason for waiting (e.g., "Because the green group waited," "Because I'm in the green group," "Orange didn't wait"). By contrast, 3% (1 of 29; 1 additional child did not answer the question) in the group-did-not-wait condition cited in- or out-group behavior in their reason for not waiting, $\chi^2(1) < 3.62$, $p = .057$. Similarly, among children who did not receive information about their group's behavior, 0% (0 of 29; 1 additional child was not asked the question because of experimenter error) cited the groups' behavior as their reason for waiting or not waiting, significantly less than in the group-waited condition, $\chi^2(1) = 5.84$, $p = .016$. The number of children who referred to the groups' behavior in the group-did-not-wait and control conditions did not differ, $\chi^2(1) < 1$, $p > .250$.

Children's self-talk during the delay period was also consistent with our primary findings. Seventy-three percent of children engaged in some form of self-talk during the delay period, and this did not vary by condition, $p > .250$. Children in all conditions talked about the green group (25%) and talked much less about the orange group (10%), $\chi^2(1) = 4.65$, $p = .031$, consistent with in-group identification. The number of children who talked about the green group in the group-waited condition (40%) was higher than in the group-did-not-wait condition (17%), $\chi^2(1) = 4.02$, $p = .045$, and marginally higher than in the control condition (18%), $\chi^2(1) = 3.43$, $p = .064$. There was no significant difference between the group-did-not-wait and control conditions, $p > .250$.

We also explored the possibility that children changed how they felt about their group after learning about their group's delay behavior, that is, that they were more biased in favor of their group after learning that their group did wait, and they were less biased in favor of their group after learning that their group did not wait. This would be consistent with children valuing waiting over not waiting at baseline. A mixed logistic regression (with random intercepts for participants to account for dependency among observations) indicated that the odds of children identifying with their group did not vary depending on whether they were asked before or after the marshmallow test, $p > .250$, whether they were in the group-waited or group-did-not-wait condition, $p = .105$, or the interaction of these factors, $p = .105$. Numerically, children in the group-waited condition showed more of an in-group bias after learning about their group's behavior (pretest: M = 73%, posttest: M = 90%), whereas children in the group-did-not-wait condition showed the opposite pattern (pretest: M = 73%, posttest: M = 67%).

Discussion

Experiment 1 provided the first evidence that group behavior influences self-control in children: Children tended to wait longer when their in-group delayed gratification and their out-group did not, compared with the reverse case. Group norms may have influenced children's engagement of self-control because they wanted to do what was normative in their group, avoid doing what was normative in the out-group, or both.

Alternatively, children may have been motivated to behave in accord with their group's behavior, without changing their thinking about whether or not delaying gratification is generally a good thing. In Experiment 2, we tested the possibility that group behavior influenced how children evaluate self-control.

While our group-waited manipulation induced children to wait longer, the group-did-not-wait condition did not have a comparable negative effect on wait times. In addition, although not statistically significant, children's identification with their group numerically increased after the marshmallow test in the group-waited condition, and numerically decreased in the group-did-not-wait condition. These patterns suggest that children may value delaying but cannot always act accordingly. Learning that the in-group delayed and the out-group did not may have supported delaying and increased in-group identification, whereas learning that the in-group did not delay and the out-group did may have led to dissonance between the valuing of delay behavior and in-group identity, resulting in a reduction in in-group preference and no reduction in delaying. In Experiment 2, we added more questions to better test whether children's identification with their group changed after learning about their group's delay behavior.

Finally, in Experiment 2, we used shared preference as a basis for children's group membership (as in Billig & Tajfel, 1973) and to increase group affiliation, which was expected to strengthen our manipulation by making children more likely to behave in accordance with their group.

Experiment 2

Experiment 2 tested three hypotheses. If group norms influence self-control, then children in the group-waited condition should (a) wait longer than children in the group-did-not-wait condition (replicating Experiment 1), (b) evaluate new individuals who delay gratification more positively than children in the group-did-not-wait condition, and (c) identify more with their group than children in the group-did-not-wait condition, if delaying gratification is a preexisting norm.

Method

Participants. A total of 100 children 3 to 5 years old (age: M = 4.39 years, SD = 0.33, range = 3.58–5.58, males = 40) were recruited to participate in this experiment, as specified in our preregistered plan, using the same method as in Experiment 1. Of these children, 13 were not included in the final sample because they refused to complete the tasks (n = 1), became upset while waiting for the two marshmallows (n = 4), left the room (n = 2), or ate the marshmallow before being exposed to the manipulation (n = 5), or because of experimenter error that affected the manipulation (n = 1), yielding a final sample of 87. Data were collected between July 2016 and April 2017. For 95% of our participants, at least one parent had a 4-year college degree or higher, 4% completed high school and some college, and 1% completed high school only. The racial makeup of the sample was 90% Caucasian and 10% mixed race. The ethnic makeup of the sample was primarily non-Hispanic/non-Latino (96%).

Design. This experiment had the same between-subjects design as Experiment 1, in which we manipulated in-group and out-group delay behavior. Each child was randomly assigned to either the group-waited condition or the group-did-not-wait condition. We did not run the control condition in this experiment, as it was not relevant to our hypotheses.[1]

Procedure. Experiment 2 followed the same general procedure as Experiment 1 but with some adjustments to increase power, control for potential confounds, and test new hypotheses. We highlight these changes below.

Children were assigned to the in-group in much the same way as in Experiment 1, but with two changes. First, we used shared preferences as a basis for children's group membership to increase group affiliation (Billig & Tajfel, 1973). Second, we made adjustments in wording to ensure that children did not perceive the experimenter as preferring one group over the other (avoiding the potential confound of children following their group because they wanted to please the experimenter).

The experimenter said, "I'm going to show you some pictures of things and ask you about what you like! Look at these animals. Can you point to the one you like more?" The experimenter asked three more questions such as these about foods, toys, and treats and recorded children's choices. Next, the experimenter said,

> Okay, now look! This is the green group! The green group likes the same things you like. They like ______, ______, ______, and ______. Now look here, this is the orange group! The orange group likes different things than you like. They like ______, ______, ______, and ______. 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!

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. As in Experiment 1, children were asked to indicate which group was their group. They were also asked to indicate which group was not their group. Correct responses were affirmed and incorrect responses were corrected. As in Experiment 1, children were also asked questions to assess in-group identity, but in the current experiment, four such questions were asked in each phase (i.e., pre–marshmallow-test and post–marshmallow-test) in an effort to reduce measurement error and increase power to detect effects involving this variable. Children were asked questions such as "Who should I give a sticker to?" and "Who helped their friend at school?"

The marshmallow test was introduced in the same way as in Experiment 1. The wording of the experimental manipulation was adjusted to equate for length in descriptions of each group's behavior. In the group-waited condition, the experimenter said,

> Look! These kids are in the green group, just like you! And guess what? They didn't have one marshmallow; they waited until they could have two marshmallows. And these kids are in the orange group, not your group! They had one marshmallow; they didn't wait until they could have two marshmallows.

In the group-did-not-wait condition, the experimenter said,

> Look! These kids are in the green group, just like you! And guess what? They had one marshmallow; they didn't wait until they could have two marshmallows. And these kids are in the orange group, not your group! They didn't have one marshmallow; they waited until they could have two marshmallows.

Children were then asked to indicate what each group did. If they failed to provide an informative response, the experimenter said, "Did they wait or not wait?" Correct responses were affirmed, and incorrect responses were corrected. The marshmallow test was then administered as in Experiment 1. Once the child waited the full 15 min or tasted the marshmallow, the experimenter returned to the room and said, "Snack time is over! I just have a few more questions for you." Children were then asked several of the same questions they were asked in the pre–marshmallow-test phase: memory for group, memory for group behavior, and group identity. The only difference was that no feedback was provided following children's responses to any of the questions.

An evaluation of delay choice (adapted from Shutts, Banaji, & Spelke, 2010) was added in Experiment 2 to test the hypothesis that group behavior influenced children via a change to how they evaluated delaying gratification. Children completed four trials in which they were presented with scenarios involving a pair of children who differed in their delay behavior. Each trial involved different rewards that were increasingly abstract from what they had experienced in the experiment (marshmallows, cookies, stickers, and money). 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. These images were from the Child Affective Facial Expression (CAFE) stimuli set hosted on Databrary (LoBue, 2014; LoBue & Thrasher, 2015). Each depicted child had small pictures of rewards directly beneath them. A trial was introduced by the experimenter saying, for example,

> Jenny and Kate love marshmallows! Their mom said they could have one marshmallow right away, or if they waited until she found more marshmallows, they could have two instead. Jenny ate one marshmallow right away. Kate waited until she could have two marshmallows.

The experimenter then asked three questions designed to tap children's implicit preference for one of the children. For example, children were asked "Who do you like more?" "Who is nicer?" and "Jenny loves playing Kazoop. It's her favorite game to play. Kate loves playing Babber. It's her favorite game to play. Now it's your turn. Would you rather play Kazoop like Jenny or Babber like Kate?" Novel words were used in the last question to ensure children were not influenced by their own preferences that were unrelated to the scenarios.

Coding was conducted in the same manner as in Experiment 1. Similar to Experiment 1, the two coders' ratings were highly correlated, $r(86) = .99$, $p < .001$. Coders differed by less than 3 s on 92% of judgments. The seven cases in which the coding discrepancy was larger than 3 s were discussed and resolved by the coders.

Analytic approach. As in Experiment 1, the study design and analytic plan were preregistered with the Open Science Framework (https://osf.io/7gszx). In our analytic plan, we specified that we would use Cox regression models, as in Experiment 1, and linear regression to test our preregistered hypotheses and that alternatives to regression would be used if any of the assumptions underlying the test were violated. Specifically, to test whether condition influenced children's wait times, we planned to use Cox regression to compare models with condition (group waited vs. group did not wait) as the only predictor and compare it with a model without any predictors. To test whether condition influenced children's evaluation of delaying gratification, we planned to use linear regression to compare a model with condition (group waited vs. group did not wait) as the only predictor to a model without any predictors. To test whether in-group bias varied depending on condition, we planned to use multiple linear regression to compare a model including condition (group waited vs. group did not wait), time (pre– vs. post–marshmallow test), and their interaction to a model excluding the interaction term, with the expectation that the model including the interaction term would be a better fit to the data.

Results

As in Experiment 1, all children remembered which group they were in with 100% accuracy. Children also identified with their group—pretest: M = 73%, SD = 22%, $t(86)$ = 9.6, $p < .001$; posttest: M = 66%, SD = 26%, $t(86)$ = 5.9, $p < .001$, and remembered both prior to and following the marshmallow task whether their group waited or did not wait—pretest: M = 92% (78 of 85; two children were not asked this question because of experimenter error), SD = 28%, $t(84)$ = 13.92, $p < .001$; posttest: M = 92% (79 of 86; one child was not asked this question because of experimenter error), SD = 28%, $t(85)$ = 14.11, $p < .001$.

Consistent with Experiment 2's first preregistered hypothesis and replicating the findings of Experiment 1, children whose group waited for two marshmallows had twice the odds of resisting the marshmallow (wait time Mdn = 14.95 min) compared with children whose group did not wait (Mdn = 5.77 min), $\chi^2(1)$ = 5.96, p = .015, hazard ratio = 2.05, 95% CI = [1.14, 3.70]. These results held when controlling for age, $\chi^2(1)$ = 5.16, p = .023, hazard ratio = 2.00, 95% CI = [1.1, 3.63].

To test whether the influence of group behavior varied depending on children's tendency to identify with their group, we conducted an exploratory test in which in-group identity, condition, and their interaction were included in the model. The interaction was significant, $\chi^2(1)$ = 4.61, $p < .03$, hazard ratio = 8.02, 95% CI = [1.2, 53.67]. Among children who tended to identify with their group (preferring the in-group on > 50% of the in-group-identity questions, n = 63), the effect of condition was significant (group-waited condition: Mdn = 15 min, group-did-not-wait condition: Mdn = 3.3 min), $\chi^2(1)$ = 11.8, $p <$ .001, hazard ratio = 3.28, 95% CI = [1.6, 6.7]. Among children who did not show evidence of identifying with their group (preferring the in-group on ≤ 50% of the in-group-identity questions, n = 24), the condition effect was not significant (group-waited condition: Mdn = 5.15 min, group-did-not-wait condition: Mdn = 15 min), $\chi^2(1)$ = 0.74, $p > .250$, hazard ratio = 0.60, 95% CI = [0.19, 1.91].

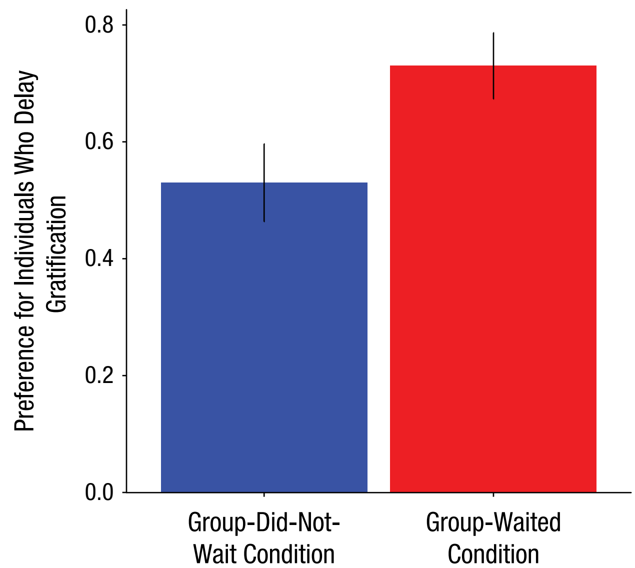

Fig. 1. Results from Experiment 2: children whose in-group waited and whose out-group did not were more likely to prefer individuals who delayed gratification. Error bars represent 95% confidence intervals.

Consistent with our second preregistered hypothesis, children in the group-waited condition were more likely to prefer new individuals who delayed gratification (M = 74%, SD = 19%), compared with children in the group-did-not-wait condition (M = 53%, SD = 22%), $t(85)$ = 4.66, $p < .001$ (Fig. 1). An exploratory analysis indicated that this effect held when controlling for children's delay performance, $t(84)$ = 4.13, $p < .001$. Children's delay performance also independently predicted their preference for new individuals who delayed gratification, $t(84)$ = 3.21, p = .002.

We did not find evidence supporting our third preregistered hypothesis. Children in both conditions tended to prefer their in-group—group-waited condition: M = 72%, SD = 26%, $t(87)$ = 7.78, $p < .001$; group-did-not-wait condition: M = 67%, SD = 22%, $t(85)$ = 7.4, $p < .001$. In-group bias did not significantly vary by condition, $t < 1$, $p > .250$, but it did vary by time, $\chi^2(1)$ = 3.98, p = .046, such that children preferred their group more at pretest (M = 73%, SD = 22%) than at posttest (M = 66%, SD = 26%). There was no interaction between condition and time, $\chi^2(1) > 1$, $p > .250$.

Discussion

Experiment 2 replicated and extended the key finding of Experiment 1 by showing that children who believed that their in-group delayed gratification and their out-group did not delay waited longer and subsequently preferred new individuals who delayed gratification, compared with children who believed that their in-group did not delay and their out-group did. Critically, the new individuals were not presented as group members, so if children were simply trying to behave in accord with their group's behavior, they would have had no reason to later prefer others who delayed gratification. Children led to believe that their group delayed gratification may think this is a group value and internalize this value.

Identification with the in-group was not affected by group behavior (i.e., whether or not the group delayed). Perhaps delaying gratification was not a preexisting norm, or it was but children's in-group identity was robust to negative information about their group. The latter possibility may be more likely, given that in neither condition did children prefer new individuals who did not delay over new individuals who did delay. Thus, children may have adjusted their valuation of delaying gratification on the basis of group behavior, but never to the point of preferring individuals who did not delay, given their preexisting norms.

General Discussion

We provide the first evidence that group membership and norms influence self-control behavior and evaluations in young children. Young children were more likely to delay gratification and value it when their group delayed and another group did not, compared with the reverse. These findings demonstrate an important way in which self-control behavior does not simply reflect self-control ability but is also influenced by social contextual factors (Gardner & Steinberg, 2005; Kidd et al., 2013; Lee & Carlson, 2015; Michaelson & Munakata, 2016; Pepper & Nettle, 2017). More broadly, these findings show that the influence of social groups on children extends beyond the realm of in-group biases, social expectations, and moral behavior (Jordan et al., 2014; Liberman, Woodward, & Kinzler, 2017) to the domain of self-control.

This work also supports a new perspective on individual differences in self-control behavior in childhood, which predict concurrent and later life outcomes. In addition to variation in relevant cognitive and neural systems, variation in how much self-control is emphasized—in the family, community, or peer group—may influence how much individuals use self-control both in childhood and later in life (see also Lamm et al., 2017). Norms could influence children to work harder to exert control, could support their self-control by allowing them to imagine themselves or their group using self-control, or could lead them to utilize the self-control they have. Moreover, opportunities to practice self-control early in life may shape the neural substrates that support it (Diamond & Lee, 2011; Doebel, Michaelson, & Munakata, 2017; Zelazo, 2015), resulting in reciprocal, cascading effects (Karmiloff-Smith, 1998; Smith & Thelen, 2003) that make it easier for children to exercise self-control and to improve across the life span.

Our findings have implications for interventions to improve self-control in those who struggle with it. Supporting values and norms around self-control may be a fruitful approach to improving self-control in individuals for whom self-control is not a salient or well-established norm or value. For example, interventions to improve self-control could be conducted in a group format, and self-control could be promoted as a group value.

Future research can examine such possibilities, in addition to further investigating the ways in which group behavior and norms influence self-control. For example, are children driven to engage in self-control by the actions of their in-group, those of the out-group, or both (given that in-group bias and out-group prejudice are distinct phenomena; Aboud, 2003)? Do such influences of group norms vary by age (given that in-group bias may increase with age; Yee & Brown, 1992) or by culture (given that cultures vary in how relevant others are to self-construal; e.g., Markus & Kitayama, 1991)? Does group behavior exert its influence via cognitive mechanisms posited to support self-control, for example by strengthening relevant goal representations (Munakata, Snyder, & Chatham, 2012)? Addressing such questions will advance our understanding of how self-control develops and is shaped by sociocultural factors to support adaptive behavior across the life span and will inspire new approaches to improving it.

Action Editor

Charles Hulme served as action editor for this article.

Author Contributions

S. Doebel conducted all analyses and drafted the manuscript. S. Doebel and Y. Munakata developed the study concept and design, provided critical revisions, and approved the final manuscript for submission.

Acknowledgments

The authors thank Hannah Wickenheiser, Hailey Buckingham, Samantha Stone, Cleo Andersen-Green, Margaret McCandless, Marina Blum, and Taylor Kotary for assistance with data collection, and members of the Cognitive Development Center for helpful discussion.

Declaration of Conflicting Interests

The author(s) declared that there were no conflicts of interest with respect to the authorship or the publication of this article.

Funding

This research was supported by the Eunice Kennedy Shriver National Institute of Child Health & Human Development of the National Institutes of Health under Award Numbers F32HD079191 and R01 HD078532.

Open Practices

TC

All data and materials have been made publicly available via the Open Science Framework (Experiment 1: https://osf.io/fwt65/; Experiment 2: https://osf.io/da56v/). The design and analysis plans for the experiments were preregistered at the Open Science Framework (Experiment 1: https://osf.io/wrqtu/; Experiment 2: https://osf.io/7gszx/). The complete Open Practices Disclosure for this article can be found at http://journals.sagepub.com/doi/suppl/10.1177/0956797617747367. This article has received badges for Open Data, Open Materials, and Preregistration. More information about the Open Practices badges can be found at http://www.psychologicalscience.org/publications/badges.

Note

1. It is possible that our between-subjects design was not sensitive enough to detect differences between the control and group-did-not-wait conditions. A pre-post design in which baseline delay is compared with posttest delay might be more sensitive and could be explored in future research, but researchers would need to address the challenges inherent in having children complete the marshmallow test or a similar paradigm twice.

References

Aboud, F. E. (2003). The formation of in-group favoritism and out-group prejudice in young children: Are they distinct attitudes? *Developmental Psychology*, *39*, 48–60. doi:10.1037/0012-1649.39.1.48

Bandura, A., & Mischel, W. (1965). Modifications of self-imposed delay of reward through exposure to live and symbolic models. *Journal of Personality and Social Psychology*, *2*, 698–705. doi:10.1037/h0022655

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, *67*(1). doi:10.18637/jss.v067.i01

Bernier, A., Carlson, S. M., & Whipple, N. (2010). From external regulation to self-regulation: Early parenting precursors of young children's executive functioning. *Child Development*, *81*, 326–339. doi:10.1111/j.1467-8624.2009.01397.x

Bigler, R. S., Jones, L. C., & Lobliner, D. B. (1997). Social categorization and the formation of intergroup attitudes in children. *Child Development*, *68*, 530–543.

Billig, M., & Tajfel, H. (1973). Social categorization and similarity in intergroup behaviour. *European Journal of Social Psychology*, *3*, 27–52.

Bunge, S. A., & Zelazo, P. D. (2006). A brain-based account of the development of rule use in childhood. *Current Directions in Psychological Science*, *15*, 118–121.

Carlson, S. M., & Zelazo, P. D. (2011). The value of control and the influence of values. *Proceedings of the National Academy of Sciences, USA*, *108*, 16861–16862. doi:10.1073/pnas.1113235108

Casey, B. J., Somerville, L. H., Gotlib, I. H., Ayduk, O., Franklin, N. T., Askren, M. K., . . . Glover, G. (2011). Behavioral and neural correlates of delay of gratification 40 years later. *Proceedings of the National Academy of Sciences, USA*, *108*, 14998–15003. doi:10.1073/pnas.1108561108

Cox, D. R. (1972). Regression models and life-tables. *Journal of the Royal Statistical Society B: Statistical Methodology*, *34*, 187–220.

Diamond, A., & Lee, K. (2011). Interventions shown to aid executive function development in children 4 to 12 years old. *Science*, *333*, 959–964.

Doebel, S., Michaelson, L. E., & Munakata, Y. (2017). Beyond personal control: The role of developing self-control abilities in the behavioral constellation of deprivation. *Behavioral and Brain Sciences*, *40*, Article e324. doi:10.1017/S0140525X17000942

Duckworth, A. L., Tsukayama, E., & Kirby, T. A. (2013). Is it really self-control? Examining the predictive power of the delay of gratification task. *Personality and Social Psychology Bulletin*, *39*, 843–855. doi:10.1177/0146167213482589

Dunham, Y., Baron, A. S., & Carey, S. (2011). Consequences of "minimal" group affiliations in children. *Child Development*, *82*, 793–811. doi:10.1111/j.1467-8624.2011.01577.x

Gardner, M., & Steinberg, L. (2005). Peer influence on risk taking, risk preference, and risky decision making in adolescence and adulthood: An experimental study. *Developmental Psychology*, *41*, 625–635.

Hackman, D. A., Gallop, R., Evans, G. W., & Farah, M. J. (2015). Socioeconomic status and executive function: Developmental trajectories and mediation. *Developmental Science*, *18*, 686–702. doi:10.1111/desc.12246

Jordan, J. J., McAuliffe, K., & Warneken, F. (2014). Development of in-group favoritism in children's third-party punishment of selfishness. *Proceedings of the National Academy of Sciences, USA*, *111*, 12710–12715.

Karmiloff-Smith, A. (1998). Development itself is the key to understanding developmental disorders. *Trends in Cognitive Sciences*, *2*, 389–398. doi:10.1016/S1364-6613(98)01230-3

Kidd, C., Palmeri, H., & Aslin, R. N. (2013). Rational snacking: Young children's decision-making on the marshmallow task is moderated by beliefs about environmental reliability. *Cognition*, *126*, 109–114. doi:10.1016/j.cognition.2012.08.004

Kim, E. B., Chen, C., Smetana, J. G., & Greenberger, E. (2016). Does children's moral compass waver under social pressure? Using the conformity paradigm to test preschoolers' moral and social-conventional judgments. *Journal of Experimental Child Psychology*, *150*, 241–251.

Kinzler, K. D., Corriveau, K. H., & Harris, P. L. (2011). Children's selective trust in native-accented speakers. *Developmental Science*, *14*, 106–111.

Lamm, B., Keller, H., Teiser, J., Gudi, H., Yovsi, R. D., Freitag, C., . . . Lohaus, A. (2017). Waiting for the second treat: Developing culture-specific modes of self-regulation. *Child Development*. Advance online publication. doi:10.1111/cdev.12847

Lee, W. S., & Carlson, S. M. (2015). Knowing when to be "rational": Flexible economic decision making and executive function in preschool children. *Child Development*, *86*, 1434–1448. doi:10.1111/cdev.12401

Liberman, Z., Woodward, A. L., & Kinzler, K. D. (2017). The origins of social categorization. *Trends in Cognitive Sciences*, *21*, 556–568.

LoBue, V. (2014). The Child Affective Facial Expression (CAFE) set. *Databrary*. doi:10.17910/B7301K

LoBue, V., & Thrasher, C. (2015). The Child Affective Facial Expression (CAFE) set: Validity and reliability from untrained adults. *Frontiers in Psychology*, *5*, Article 1532. doi:10.3389/fpsyg.2014.01532

Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review*, *98*, 224–253.

Michaelson, L. E., de la Vega, A., Chatham, C. H., & Munakata, Y. (2013). Delaying gratification depends on social trust. *Frontiers in Psychology*, *4*, Article 355. doi:10.3389/fpsyg.2013.00355

Michaelson, L. E., & Munakata, Y. (2016). Trust matters: Seeing how an adult treats another person influences preschoolers' willingness to delay gratification. *Developmental Science*, *19*, 1011–1019. doi:10.1111/desc.12388

Mills, M. (2011). *Introducing survival and event history analysis*. Thousand Oaks, CA: SAGE.

Mischel, W., Shoda, Y., & Rodriguez, M. I. (1989). Delay of gratification in children. *Science*, *244*, 933–938. doi:10.1126/science.2658056

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., . . . Sears, M. R. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences, USA*, *108*, 2693–2698. doi:10.1073/pnas.1010076108

Munakata, Y., Snyder, H. R., & Chatham, C. H. (2012). Developing cognitive control: Three key transitions. *Current Directions in Psychological Science*, *21*, 71–77. doi:10.1177/0963721412436807

Myers, D. G., & Lamm, H. (1976). The group polarization phenomenon. *Psychological Bulletin*, *83*, 602–627.

Pepper, G. V., & Nettle, D. (2017). The behavioural constellation of deprivation: Causes and consequences. *Behavioral and Brain Sciences*, *40*, Article e314. doi:10.1017/S0140525X1600234X

Pinker, S. (2011). *The better angels of our nature: Why violence has declined*. New York, NY: Viking.

R Core Team. (2008). *R: A language and environment for statistical computing*. Retrieved from http://www.R-project.org

Shutts, K., Banaji, M. R., & Spelke, E. S. (2010). Social categories guide young children's preferences for novel objects. *Developmental Science*, *13*, 599–610. doi:10.1111/j.1467-7687.2009.00913.x

Smith, L. B., & Thelen, E. (2003). Development as a dynamic system. *Trends in Cognitive Sciences*, *7*, 343–348. doi:10.1016/S1364-6613(03)00156-6

Xiao, N. G., Wu, R., Quinn, P. C., Liu, S., Tummeltshammer, K. S., Kirkham, N. Z., . . . Lee, K. (2017). Infants rely more on gaze cues from own-race than other-race adults for learning under uncertainty. *Child Development*. Advance online publication. doi:10.1111/cdev.12798

Yee, M. D., & Brown, R. (1992). Self-evaluations and intergroup attitudes in children aged three to nine. *Child Development*, *63*, 619–629. doi:10.1111/j.1467-8624.1992.tb01650.x

Zelazo, P. D. (2015). Executive function: Reflection, iterative reprocessing, complexity, and the developing brain. *Developmental Review*, *38*, 55–68. doi:10.1016/j.dr.2015.07.001