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Three- and 5-year-old children's understanding of how to dissolve a joint commitment

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ABSTRACT

When young children form a joint commitment with a partner, they understand that this agreement generates obligations. In this study, we investigated whether young children understand that joint commitments, and their associated obligations, may likewise be dissolved by agreement. The participants (3- and 5-year-olds; $N = 144$) formed a joint commitment with a puppet to play a collaborative game. In one condition, the puppet asked permission to break off and the children agreed; in a second condition, the puppet notified the children of his or her leaving; and in a third condition, the puppet just left abruptly. Children at both ages protested more and waited longer for the puppet's return (and said that the puppet deserved scolding and no prize at the end) when the puppet left abruptly than in the other two conditions (with "asking permission" leading to the least protest of all). Overall, 3-year-olds protested more, and waited longer for the partner's return, than 5-year-olds. Preschool children understand that the obligations of a joint commitment may be dissolved by agreement or, to a lesser degree, by notification.

Introduction

Joint commitments have been called the "social atoms" of distinctively human social interaction (Gilbert, 2003). They are social atoms because they are the simplest form of normative connection

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between human individuals in which they come to owe something to one another. Whereas social norms are the collective expectations of the social group for individual behavior, joint commitments are made directly between individuals. Whereas social norms exist before individuals are even born, joint commitments are normally created voluntarily (Gilbert, 1990; but see also Michael, Sebanz, & Knoblich, 2016a, 2016b). And whereas individuals have virtually no possibility of dissolving or altering societal-level norms, they can dissolve or alter joint commitments at will—that is, if (and only if) their partner agrees. That is because the bidirectional normative obligations created by a joint commitment cannot (without consequence) be canceled unilaterally; each partner is obligated to follow through on the joint commitment unless and until the partners agree to do otherwise (Gilbert, 1990).

Children display some understanding of joint commitments from around 3 years of age. Prior to this age, children collaborate with both adults and peers (Brownell & Carriger, 1990; Warneken & Tomasello, 2007; Warneken, Chen, & Tomasello, 2006), but there are no reliable signs that they are normatively committed to the collaboration. By 3 years of age there are several types of evidence that collaboration generates a different kind of relationship between children and their collaborative partner. Thus, 3-year-olds, but not 2-year-olds, help their partner get rewards more often if they are collaborating than if they are not (Hamann, Warneken, & Tomasello, 2012). Similarly, 3-year-olds, but not 2-year-olds, tend to divide the spoils of a collaborative activity "fairly" more often if they are collaborating than if they are merely acting in parallel (Hamann, Warneken, Greenberg, & Tomasello, 2011). The conclusion is that collaboration by itself tends to create a sense that "we" are doing this together and so we should treat each other with special respect.

But in addition, at 3 years of age, children also show signs that they feel the special normative force of explicitly made joint commitments. Gräfenhain, Behne, Carpenter, and Tomasello (2009, Study 1) had an adult orchestrate a joint commitment with a child (adult: "Let's play X"; child: "Okay"). In contrast to a situation in which the adult simply joined children in their play unbidden, if they made a joint commitment, 3-year-olds, but not 2-year-olds, waited longer for their partner and tried more persistently to reengage the partner when the partner broke off. Similarly, Gräfenhain, Carpenter, and Tomasello (2013) found that when 3-year-olds made a joint commitment to collaborate with a (puppet) partner, as opposed to merely playing beside the partner, they more often did such things as wait for their partner when the partner was delayed, repair damage done by their partner, refrain from tattling on their partner, and perform their partner's role when the partner was unable to do so. Finally, 3- and 5-year-olds persisted longer at a boring cleaning task if they had agreed with an adult ("promised") to do so than if they had made no such explicit agreement (Kanngiesser, Köymen, & Tomasello, 2017, Study 2). Overall, children display in their behavior in various ways the effects of having made a joint commitment to a partner.

Another line of evidence suggesting that 3-year-old children understand the normative force of a joint commitment is their behavior when their partner reneges in some way; they know not only that they owe something to their partner but also that their partner owes something to them. Kachel, Svetlova, and Tomasello (2018) presented pairs of 3-year-olds with a collaborative task involving a joint commitment (an adult got them to agree with each other that they would work together). In one condition, one of them seemed to intentionally not play her or his role in the mutually known way (this deviant behavior was experimentally induced). In response, the partner very often protested, sometimes vigorously and often using normative language (e.g., "No, you can't do it like that!"). Children did not protest if the partner was seemingly ignorant of how the apparatus worked (in which case they often taught the partner) or if the apparatus accidentally broke. Similarly, Kanngiesser et al. (2017, Study 1) found that 3- and 5-year-old children responded to a collaborative partner's breaking of a promise with normative protest (which they did not do if no promise was given). Thus, 3-year-olds both feel a normative obligation to live up to their commitments and expect their collaborative partner to do so as well.

As noted above, an inviolable feature of joint commitments is that neither party to the agreement can dissolve it unilaterally; relatedly, if one does break the commitment, one owes the partner some kind of explanation, excuse, or apology. Once again, children begin to display an understanding of this constraint at around 3 years of age. For example, Gräfenhain et al. (2009, Study 2) had a child and an adult make a joint commitment to play a game together. Then another adult enticed the child away to a new, more attractive game. In response, 2-year-olds simply dropped everything and took off for the

new game. But 3-year-olds understood their joint commitment; before taking off (if they did), they hesitated and looked to the adult and often did something overt to "take leave," for example, handing over the tool used in the game or even verbally apologizing (much more than in the exact same situation with no prior joint commitment). It is not clear in that study whether children ever asked permission explicitly to break their joint commitment. But in this direction, Banerjee, Bennett, and Luke (2010) reported that 4- to 9-year-old children thought that a transgressor deserved more punishment when he gave "no account" than when he gave either an excuse or an apology. However, in that study, there was no condition in which the transgressor asked permission before acting.

In the current study, therefore, we were interested specifically in 3- and 5-year-old children's understanding of the importance of seeking permission to dissolve a joint commitment. An experimenter orchestrated a joint commitment between a child and a puppet partner in one of three between-participants conditions. In one condition, the puppet partner gave a brief and neutral reason for breaking off (the puppet had forgotten something) and then asked for the child's okay to leave. In a second condition, the puppet notified the child by stating the same brief reason and then left. In a third (baseline) condition, the puppet broke off the joint commitment abruptly by leaving without any communication whatsoever. In the puppet's absence, in all three conditions, children continued to work alone and then reaped the rewards of the activity by themselves. We measured in each of these conditions how much children protested as the puppet was leaving, how long children waited for the puppet's return, and how much children wanted to share the rewards with the puppet at the end (and also their answers to several other questions about the puppet and her or his behavior). What did they know about, and feel about, the partner's commitment to them?

Method

Participants

Participants were 144 children of heterogeneous socioeconomic backgrounds (predominantly Caucasian) attending preschool in a medium-sized German city. There were 72 3.5-year-olds (M = 41.7 months, SD = 1.2; 36 boys) and 72 5.5-year-olds (M = 65.6 months, SD = 1.4; 36 boys). Children were randomly assigned to three experimental conditions such that in each age group there were 24 children participating in each condition. Prior to the study, parents had given informed consent for their children's participation. An additional 37 dyads were excluded from all analyses due to errors in the procedure or child uncooperativeness: experimenter error (n = 8; 6 5-year-olds and 2 3-year-olds), camera malfunction (n = 4; 2 5-year-olds and 2 3-year-olds), inattentiveness or disinclination of the child participant (n = 7; all 3-year-olds), fear of the puppet (n = 2; 1 5-year-old and 1 3-year-old), fear of being alone in the test room (n = 10; 1 5-year-old and 9 3-year-olds), and lack of agreement to the puppet's asking permission to leave in the Dissolved condition (n = 6; 4 5-year-olds and 2 3-year-olds). An additional 28 children (4 5-year-olds and 24 3-year-olds) needed to be excluded, but only after the first and main dependent measure—protest against the puppet's leaving—was taken (because they waited for the puppet's return and never started collecting beads on their own). The main analyses were done without them, but we also report their data on the first measure (in a footnote and in the Appendix).

Materials and design

Children were randomly assigned to one of three between-participants conditions: Just Leave condition, Notify condition, or Dissolved condition. Children in all conditions played together with two same-sex, human-like puppet partners (animated by Experimenter 2 [E2], who never gave instructions and only talked on behalf of the puppets): "Max" and "Paul" for boys and "Maxi" and "Paula" for girls. One puppet served as a main play partner, and the other was presented as a potential future partner; which puppet played which role was counterbalanced across children.

In all three conditions, children and their puppet partners were trained to obtain wooden beads (in order to make a bracelet later) from an apparatus. The apparatus was a modified version of the

Elevator task apparatus used by Warneken et al. (2006). As in the original apparatus, the goal of this task was to retrieve an object from the inside of a vertically movable cylinder. For one player to successfully retrieve the object through an opening in the cylinder from one side of the apparatus (Role A), a second player needs to push up the cylinder from the other side of the apparatus (Role B). It is impossible for one person to retrieve the object from the cylinder individually because transparent Plexiglass screens prevent reaching to the opening while pushing up the cylinder. In our version of the apparatus (Fig. 1), there were 3 collaborative cylinders containing 10 beads each (solvable only with a partner) and 10 individually accessible cylinders containing 1 bead each (solvable individually without a partner because the openings were not covered by the Plexiglass screens).

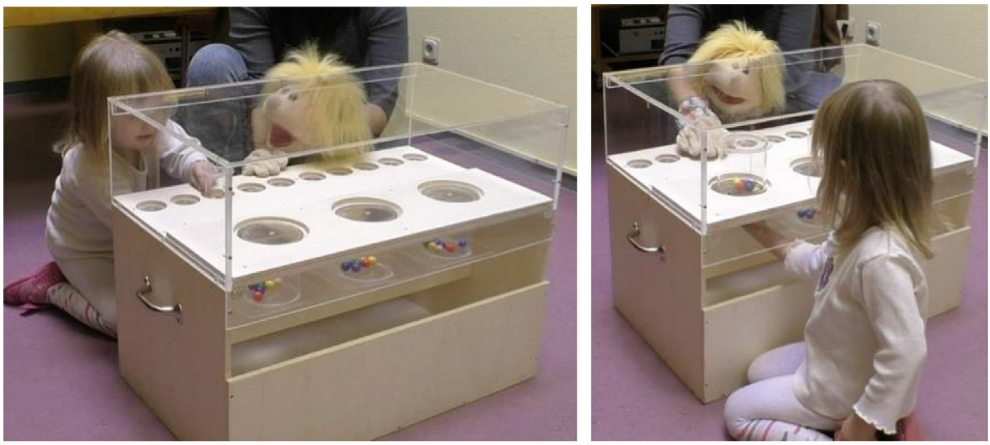
During a short warm-up phase, Experimenter 1 (E1) introduced the child and the main puppet partner to each other and asked them a series of questions that established similarities between them (the child and the puppet were the same age, lived in the same city, and liked to play in school). Then E1 asked them to jointly work on coloring a picture. To familiarize the child with the fact that the puppet could make mistakes, and to make the child comfortable to protest when that happened, the puppet attempted to draw with the wrong end of the pencil. If the child did not intervene spontaneously, E1 prompted the child to correct the puppet.

Procedure

Children were trained and tested in a quiet room in their preschool in a session lasting approximately 60 min. To begin, children were summoned from their classroom and brought to the test room by the lead experimenter. After the warm-up phase with the main puppet, a second puppet (also played by E2) was introduced briefly. E1 pointed out that this puppet had played the game before, and because only two players could play the game, the second puppet would sit and watch in the back. The second puppet served only as a potential future play partner.

Training trial

E1 explained the elevator apparatus, starting with the individually solvable cylinders. The puppet and the child collected two beads each from the small individually solvable cylinders into a common



A **B**

Fig. 1. Apparatus adapted from the Elevator task (Warneken et al., 2006). The goal of this task is to retrieve colorful beads from the inside of vertically movable cylinders. Transparent Plexiglass screens prevent reaching into the opening while pushing up the cylinders. There are 10 individually accessible cylinders containing 1 bead each (solvable without a partner) (A) and 3 collaborative cylinders containing 10 beads each (solvable only with a partner) (B).

collector. Then E1 pointed out that there were many more beads in one of the big collaborative cylinders but that one could not get them out alone. E1 asked the child to try to push up the cylinder and grab some beads from the opening. After the child experienced that obtaining beads from the big collaborative cylinders alone was impossible, E1 explained how the child and the puppet could retrieve beads together and induced them to form a joint commitment (both needed to agree to play together with a verbal "Okay" and a high-five hand gesture). The child then pushed up the big collaborative cylinder, and the puppet collected the beads into the bead collector. To rebait the apparatus, E1 then asked them to wait outside and color their picture some more.

Test trial

Before the test trial began, E1 announced that she (and the second puppet who was watching the training trial) needed to meet with the head of the preschool to discuss something and, therefore, could not be present during this round of the game. She also reminded the child and the puppet partner that one could retrieve beads alone from the small individual cylinders but that they needed to work together in order to use the big collaborative cylinders. Then she asked the child and the puppet to confirm a joint commitment again (high five) and left. The puppet then suggested getting the beads from the big cylinders and that the child should push up the cylinders as in the training.

When the child pushed up one of the collaborative cylinders and waited for the puppet to collect the beads, the puppet quit playing the game and left by either (a) telling the child that she or he had forgotten something and needed to leave and asking whether it is okay (Dissolved condition; in this condition, the child needed to agree or the procedure was interrupted and E1 came back and proceeded to make bracelets for the puppet and the child, (b) telling the child that she or he had forgotten something and needed to leave (Notify condition), or (c) leaving the room without saying anything (Just Leave condition). In all three conditions, the puppet looked back to the child three times while walking out in order to give children a possibility to intervene. In the Dissolved condition, the puppet also repeated the child's approval of her leaving by saying "Okay," "All right then," and "Good, I'm going" when looking back to the child.

For the game to continue, the child then needed to switch to the individual cylinders and collect the 10 beads before E1 came back. If the child did not start using the individual cylinders alone, E1 gave three consecutive prompts every 20 s through a crack in the door (pretending not to know that the puppet had left) such as "Collect all the beads, time is almost up" and "I'm almost done, hurry to collect all the beads." If the child did not collect the beads from the small cylinders, E1 came back and proceeded to make bracelets. If the child collected the beads, E1 came back, quietly looked into the room to give the child a chance to tattle spontaneously, and then continued with a series of prompts, pretending that she did not know about the puppet's leaving, to elicit tattling: "Oh, so many beads were collected," "Oh, you two did such a good job," and "Great that you helped each other."

Then E1 asked the child about what happened and what the puppet had said while E1 was outside (e.g., "Did Max help collect the beads?", "Did he tell you that he had to go?" "Did he ask for your okay?") and finally summarized the situation. After that, E1 asked the child to decide whether she (E1) should scold the puppet for leaving and whether the puppet deserved to get a bracelet today. Then E1 put two cups, one for the child and one for the puppet, next to the bead collector and told the child that they could distribute the beads in any way they wished while she needed to leave the room again. When the child was done with the bead allocation, E1 came back and asked with whom the child would like to play the game next time: the puppet the child had just played with or the one who was watching during training. Then they made bracelets from the collected beads.

Coding and reliability

Our main measures of interest were children's reactions when the puppet quit the game and left the room. Children's language was transcribed and coded for protest utterances. Utterances were coded as protest if they indicated that children's intention was to let the puppet know that leaving the game was unsatisfactory (e.g., "No," "What are you doing?" "You have to push it up," "But I can't do it alone"). Because there were only two instances of protest that used normative language, we

cannot further distinguish protest utterances (e.g., normative vs. imperative protest). Then we measured (in seconds) how long it took children to start to collect the beads from the individual cylinders and how long they waited for their puppet partner to come back. Next we scored after how many prompts children tattled to E1 that the puppet had left the game (4 = spontaneous tattling, 3 = tattling after the first prompt from E1, 2 = tattling after the second prompt, 1 = tattling after the third prompt, 0 = no tattling). After that we coded children's decisions whether E1 should scold the puppet partner and whether the puppet deserved to get a bracelet. Furthermore, we counted how many of the 10 beads collected in the test trial children gave to the puppet. Lastly, we coded whether children preferred to play with the same puppet partner or the new puppet partner in the future.

All of the sessions were videotaped and coded by a primary coder. To establish reliability, a second coder who was blind to the conditions and hypotheses of the study coded a randomly selected sample of 20% of the data in each condition. The two coders were in very good to excellent agreement in the verbal and sharing measures (Cohen's κs = .87–1.00). For the duration measure, the correlation between coders was very high and significant (Spearman's rho = .997, $p < .001$).

Results

Protest

In the main analysis, we investigated whether children protested when the puppet quit the game and left the room. To model the impact of condition, age, gender, and the interaction of condition and age, we used a generalized linear model (GLM) with binomial error structure and logit link function (McCullagh & Nelder, 1989). To establish the significance of the effect of the test predictors as a whole, we ran a likelihood ratio test (Dobson & Barnett, 2008), comparing the full model with a null model (Forstmeier & Schielzeth, 2011). Overall, the full model provided a significantly better fit compared with the null model, $\chi^2(6) = 46.80$, $p < .001$. The interaction of condition and age was not significant, $\chi^2(2) = 2.49$, $p = .29$. Therefore, we dropped it from the analysis. The reduced model included condition, age, and gender and was significantly better at explaining the data than the null model, $\chi^2(4) = 44.30$, $p < .001$.

Of most importance, we found an effect of condition, $\chi^2(2) = 37.07$, $p < .001$, indicating that children protested more in the Just Leave condition (83.3% of 3-year-olds, 41.7% of 5-year-olds) than in both the Notify condition (37.5% of 3-year-olds, 16.6% of 5-year-olds, *estimate* ± *SE* = −1.65 ± 0.47, $z = -3.50$, $p < .001$) and the Dissolved condition (8.3% of both 3- and 5-year-olds, *estimate* ± *SE* = −3.13 ± 0.63, $z = -4.95$, $p < .001$) (see Fig. 2) and also protested more in the Notify condition than in the Dissolved condition (*estimate* = 1.48 ± 0.63, $z = 2.35$, $p < .05$). These results suggest that preschool children already appreciate that a joint commitment can be dissolved by agreement, in which case the partner's abandoning of the joint goal is excused. We also found an effect of age, $\chi^2(1) = 9.48$, $p < .01$, such that 3-year-olds protested more than 5-year-olds (*estimate* = −0.65 ± 0.22, $z = -2.95$, $p < .01$), possibly because 5-year-olds tended to assume that the puppet had a valid reason for leaving in all conditions (see Discussion).[1] There was no effect of gender, $\chi^2(1) = 0.04$, $p = .83$.

Latency before playing alone

In our second model, we analyzed how long children waited for the puppet partner to potentially come back and rejoin the game before they started to collect the beads from the individual cylinders. Prior to the analysis we log-transformed the latency measure (in seconds) to achieve an approximately symmetrical distribution. The GLM included condition, age, gender and the interaction of condition and age. Overall, the full model provided a significantly better fit compared with the null model, $\chi^2(6) = 58.18$, $p < .001$. The interaction of condition and age was not significant, $\chi^2(2) = 1.54$, $p = .46$.

[1] Adding in the additional 28 children who did not participate in all the measures following the protest measure provides very similar results: an effect of condition, $\chi^2(2) = 39.25$, $p < .001$, with similar differences between conditions and a similar effect of age, $\chi^2(1) = 6.40$, $p < .05$ (details in the Appendix).

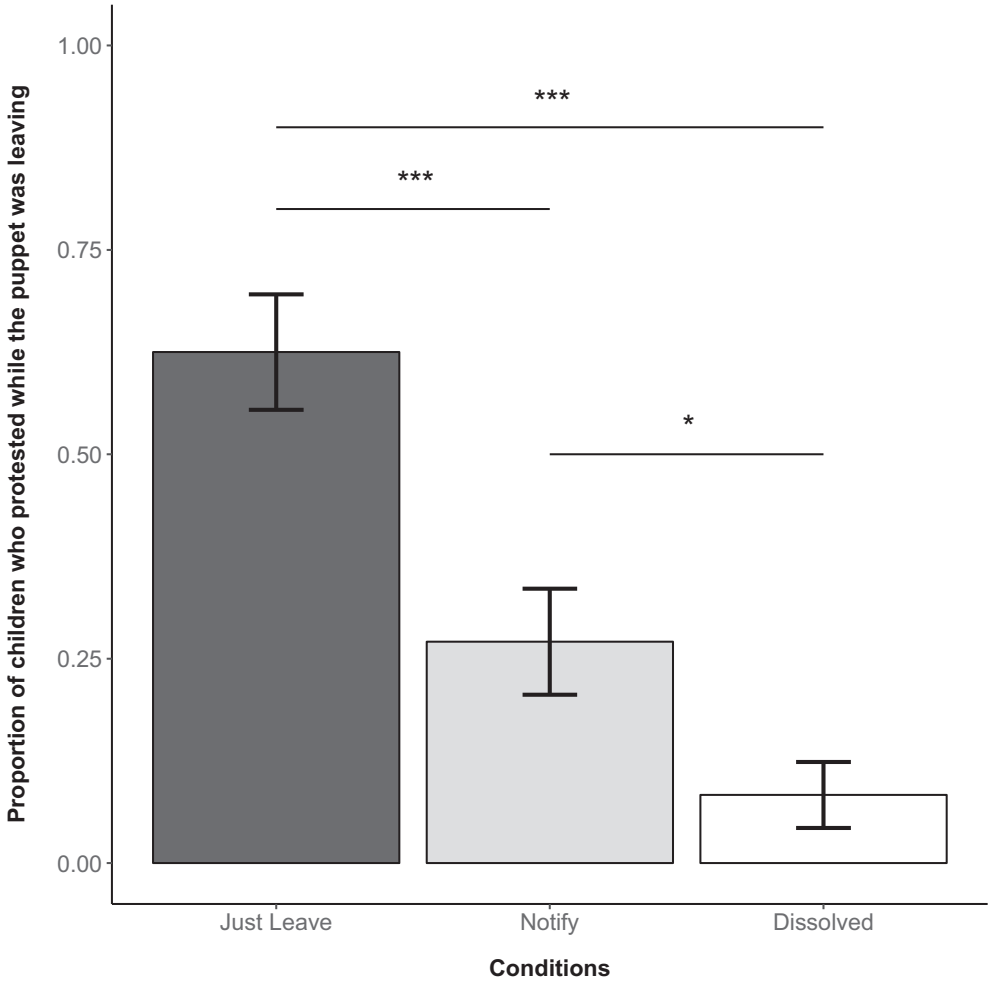


Fig. 2. Proportions of children who protested while the puppet was leaving. Error bars indicate standard errors of the mean. $^{*}p < .05$. $^{***}p < .001$.

Therefore, we dropped it from the analysis. The reduced model included condition, age, and gender. The reduced model was significantly better at explaining the data than the null model, $\chi^2(4) = 56.39$, $p < .001$.

Again, we found an effect of condition, $\chi^2(2) = 21.56$, $p < .001$, indicating that children waited longer for their puppet partner in both the Just Leave condition (*estimate* = 0.97 ± 0.22, $z = 4.35$, $p < .001$) and the Notify condition (*estimate* = 0.85 ± 0.22, $z = 3.79$, $p < .001$) than in the Dissolved condition (see Fig. 3). This also demonstrates that children stopped considering a joint commitment as binding only after a mutually acknowledged cancellation of the agreement in the Dissolved condition, whereas they seemed to expect their partner to rejoin in the other two conditions. Furthermore, we found an effect of age, $\chi^2(1) = 21.78$, $p = .001$, indicating that 3-year-olds waited longer for their partner than 5-year-olds (*estimate* = −0.44 ± 0.09, $z = -4.77$, $p < .001$). Again, 5-year-olds might just be quicker at assuming a valid reason for their partner's behavior. There was no effect of gender, $\chi^2(1) = 1.33$, $p = .25$.

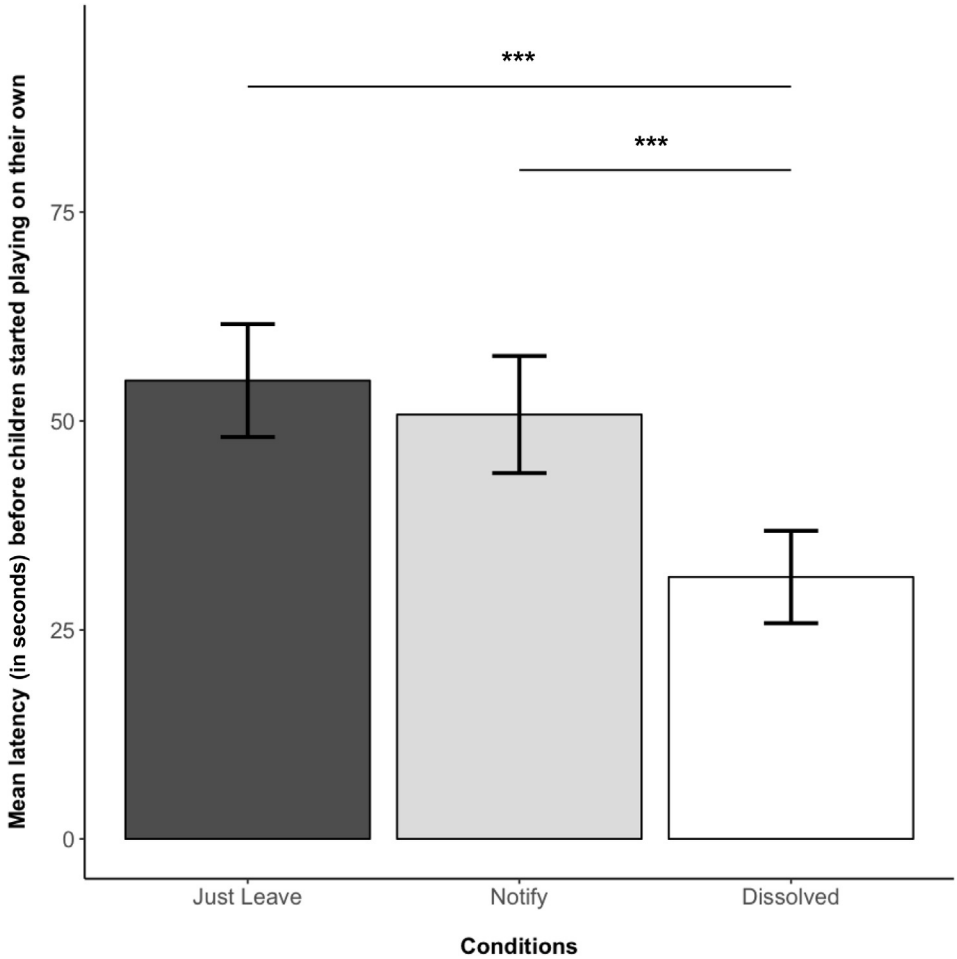


Fig. 3. Mean duration (in seconds) that children waited for their partner to potentially come back before they started to collect the beads from the individually solvable cylinders on their own. Error bars indicate standard errors of the mean. ***$p < .001$.

Scolding the puppet

We also analyzed whether children wanted E1 to scold the puppet partner for leaving the game. Again, we used a GLM with binomial error structure and logit link function including condition, age, the interaction of condition and age, and gender. Overall, the full model provided a significantly better fit compared with the null model, $\chi^2(6) = 27.62$, $p < .001$. The interaction of condition and age was not significant, $\chi^2(2) = 3.98$, $p = .14$, and was dropped from the analysis. The reduced model included condition, age, and gender. The reduced model was significantly better at explaining the data than the null model, $\chi^2(4) = 23.63$, $p < .001$. We found an effect of condition, $\chi^2(2) = 23.41$, $p < 0.001$, indicating that children wanted E1 to scold the puppet more in both the Just Leave condition (50% of 3-year-olds, 75% of 5-year-olds, *estimate* = 1.85 ± 0.46, $z = 3.98$, $p < .001$) and the Notify condition (66.7% of 3-year-olds, 58.3% of 5-year-olds, *estimate* = 1.85 ± 0.46, $z = 3.98$, $p < .001$) than in the Dissolved condition (25% of 3-year-olds, 16.7% of 5-year-olds) (see Fig. 4). Again, there was no effect of gender, $\chi^2(1) = 0.13$, $p = .72$.

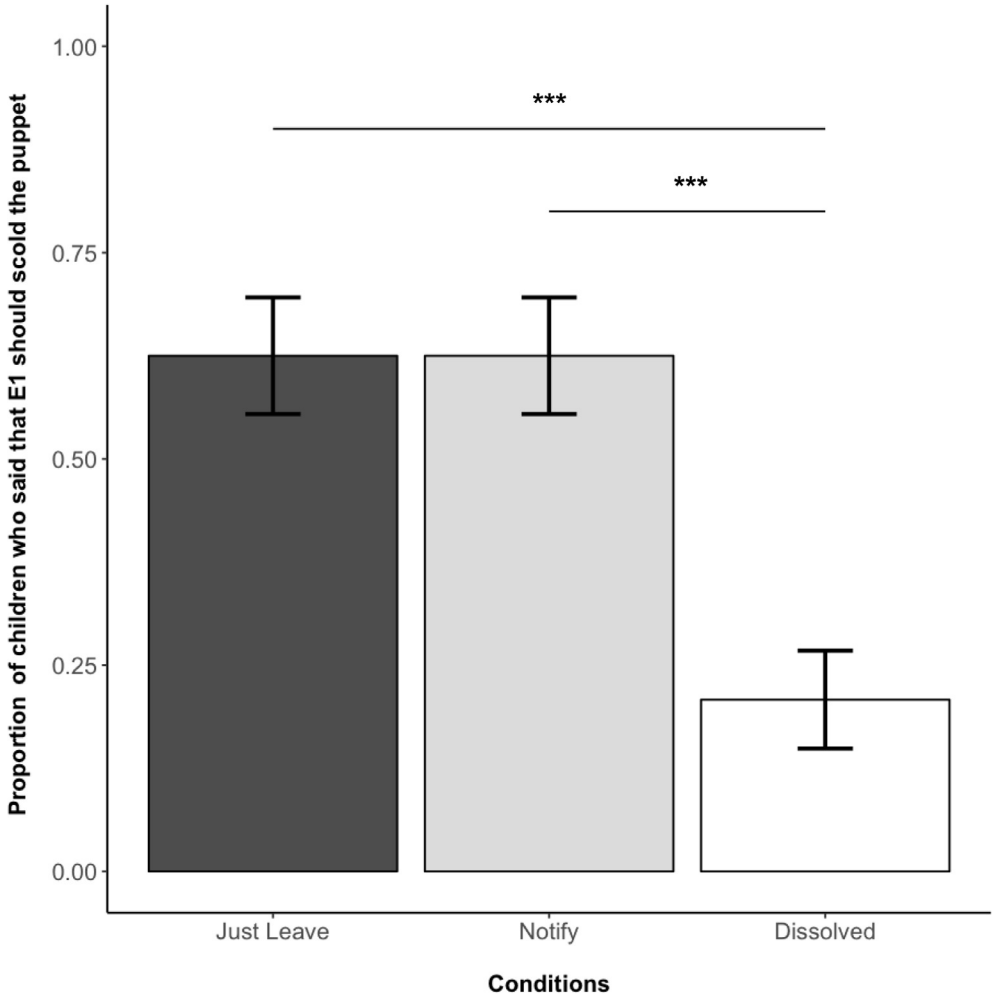


Fig. 4. Proportions of children who decided that E1 should scold the puppet for leaving the game. Error bars indicate standard errors of the mean. ***$p < .001$

Bracelet for the puppet

Similarly, we analyzed whether children said that the puppet partner deserved to get a bracelet. Again, the full model provided a significantly better fit compared with the null model, $\chi^2(6) = 18.17$, $p < .01$, but the interaction of condition and age was not significant, $\chi^2(2) = 0.08$, $p = .96$. The reduced model was significantly better at explaining the data than the null model, $\chi^2(4) = 18.08$, $p < .01$. The effect of condition, $\chi^2(2) = 11.75$, $p < .01$, indicated that children thought that the puppet deserved to get a bracelet more in the Dissolved condition (91.7% of 3-year-olds, 79.2% of 5-year-olds) than in both the Just Leave condition (66.7% of 3-year-olds, 45.8% of 5-year-olds, *estimate* = −1.59 ± 0.51, $z = -3.08$, $p < .01$) and the Notify condition (75% of 3-year-olds, 50% of 5-year-olds, *estimate* = −1.31 ± 0.52, $z = -2.54$, $p < .05$) (see Fig. 5). Furthermore, in this model, we found an effect of age, $\chi^2(1) = 6.84$, $p = .01$, indicating that 3-year-olds' decisions about giving a bracelet to the puppet partner were more generous than 5-year-olds' decisions about doing so (*estimate* = −4.96 ± 0.19, $z = -2.56$, $p < .05$). There was no effect of gender, $\chi^2(1) = 0.00$, $p = 1.00$.

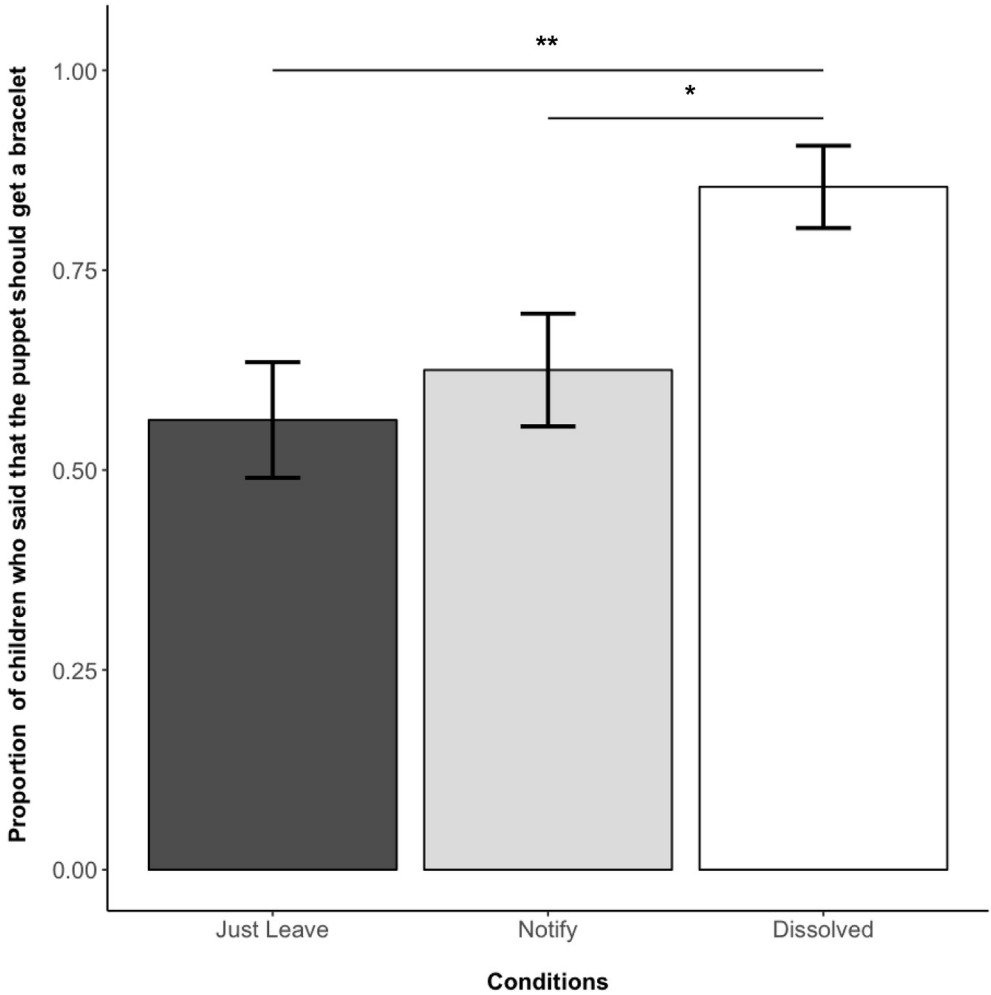


Fig. 5. Proportions of children who decided that their puppet partner deserved to get a bracelet at the end of the game. Error bars indicate standard errors of the mean. *p< .05. **p< .01.

Bead sharing and tattling

We were also interested in how many beads children would give to the puppet and after how many prompts children tattled to E1 that the puppet had left the game. For both measures, we used a logistic generalized linear mixed model (GLMM; Baayen, 2008) with condition, age, the interaction of condition and age, and gender as fixed effects. The full model did not provide a significantly better fit compared with the null model in either the bead sharing model, $\chi^2(6) = 8.11$, $p = .23$, or the tattling score model, $\chi^2(6) = 5.67$, $p = .46$. Thus, none of the test predictors had an effect on either of these measures.

Preferred future play partner

Lastly, we analyzed whether children preferred to play with the same puppet partner or the new (but familiar) puppet partner in the future. Again, we used a GLM with binomial error structure and logit link function including condition, age, the interaction of condition and age, and gender. The full

model did not provide a better fit compared with the null model, $\chi^2(6) = 5.56$, $p = .47$; thus, none of the predictors had an effect on children's choice of puppet.

Discussion

If choosing to collaborate means forgoing other opportunities, then there is risk involved. To help mitigate the risk, partners make a joint commitment, attempting to assure one another of their trustworthiness. In essence, they explicitly put their reputations as cooperators on the line, declaring that if they were to behave noncooperatively, their partner could legitimately protest and they would accept it as warranted. Joint commitments, thus, create a simple and direct normative bond between individuals in a particular social-interactive context (Gilbert, 2003).

Previous research has shown that children as young as 3 years behave in special ways after they have formed a joint commitment with a partner. If the partner does not do her or his job as both children expect the partner to do (common ground expectations), children of this age will protest, assuming that the partner's misbehavior is not due to ignorance or to forces beyond her or his control (Kachel et al., 2018). If the partner does not share the spoils "fairly" at the end, again children of this age will protest (Warneken, Lohse, Melis, & Tomasello, 2011). In appreciating the legitimacy of the protest in such situations, children themselves tend to keep their joint commitments to play their role in collaboration and to share the spoils in accordance with common ground expectations (Hamann et al., 2011, 2012). They even "take leave" by verbally explaining the situation to their partner when they decide to do something else (Gräfenhain et al., 2009).

In the current study, we investigated children's understanding of the process by which one may cancel a joint commitment and its associated obligations altogether. When a puppet partner first made a joint commitment with children and then just abruptly up and left, children (a) protested more (albeit without normative language), (b) waited for the partner's return longer (as if they could not believe that the partner could just quit), and (c) judged that the puppet deserved censure (and no prize at the end) more than when the puppet asked permission to dissolve the commitment. The most straightforward interpretation of these results is that children of this age understand that just as a joint commitment is created by agreement, it may be dissolved by agreement—and not doing so speaks badly of the partner. Interestingly, nullifying a normative agreement is not possible with social norms—whose breaking children of this age also protest (Rakoczy, Warneken, & Tomasello, 2008)—because their status as societal-level agreements means that children do not, under normal circumstances, participate themselves in either creating or dissolving them.

Interestingly, the situation in which the puppet partner simply notified the child that the puppet was leaving—neither asking permission to leave nor just leaving abruptly—patterned differently for the different measures. As the puppet was leaving, children in the Notify condition protested an in-between amount—more than in the Just Leave condition and less than in the Dissolve condition. But then as time passed, children in the Notify condition began treating the puppet as if she or he had just left abruptly; that is, children waited for the puppet's return and thought that the puppet should be scolded (and be denied the bracelet) as much as if the puppet had just left abruptly. The obvious difference here is timing and/or context. That is, in some situations in everyday life, notification is sufficient for dissolving a joint commitment appropriately, specifically in situations where the permission of the partner may be taken for granted. Thus, in everyday interactions, adults break off from one another regularly by simply saying things like "Okay, see you later, I have to go pick up my child." They do indeed recognize that they need permission to break away (and in some situations they will ask for it), but when there is a conventionally recognized good excuse, simple notification suffices. In the Notify condition, then, when the puppet says that she or he forgot something, children presume that this is a conventionally legitimate excuse almost equivalent to asking permission. But with the passage of time—and for reasons we do not understand—the fact that the puppet did not ask permission to dissolve the commitment becomes more salient. Along with the reduction of the risk that a collaborative partner unexpectedly runs off from the joint action (Michael & Pacherie, 2015), the main point is that the underlying social dynamic in joint commitments is mutual respect among partners; normally, asking permission to break a commitment is maximally respectful, whereas notifying

can be a bit presumptuous (depending on the circumstances) and just leaving is typically disrespectful—and there are various considerations affecting judgments about whether appropriate respect is being shown.

Surprisingly, we found that overall the 3-year-old children protested more and waited longer for their partner than the 5-year-old children. We think it is unlikely, although of course possible, that 3-year-olds consider joint commitments as somehow more binding than 5-year-olds. More likely, as we speculated above, is the possibility that the 5-year-olds have learned that people do not very often simply up and leave after they have committed to something without some kind of good (even if unexpressed) reason. The 3-year-olds have not yet made this generous inference, at least not as strongly, and so are more upset about the leaving in all conditions.

A limitation of our study is that the joint commitment between the child and the puppet was not negotiated by just the two of them but rather was initiated by the adult experimenter (in a playful and suggestive manner). Thus, we cannot exclude that children were also motivated to some degree by the puppet ignoring an instruction that the adult gave. However, this effect should have been the same in all three conditions given that even when the puppet asked for the child's okay to leave that did not include the adult's permission to leave. Furthermore, in previous studies, 3-year-olds have shown commitment to peers with whom they were collaborating in the absence of any adult arrangements or even explicit commitments or promises (Hamann et al., 2011, 2012). Certainly, it could be an interesting topic for future research to investigate children's adherence to commitments in less adult-structured settings where children spontaneously form commitments or promises.

Another limitation—and potential line for further investigation—is that we chose to employ a neutral reason as the puppet's stated explanation for leaving in the Dissolve and Notify conditions. It is possible that other types of reasons would lead to different results. For example, it is likely that protest rates would decrease and differences between the Dissolve and Notify conditions would disappear if an urgent and morally prosocial reason were presented (e.g., "I have to leave to save my drowning puppy"). On the other hand, protest rates might go up if an irrelevant or even offensive reason were presented (e.g., "I just don't feel like doing it"). If such variations did have an effect, it would show even more clearly that children are assessing in a sensitive way the nature of their partner's commitment to the activity in the face of other more or less compelling motives.

Taken together, the current study contributes to the growing body of research, suggesting that for the first time at around 3 years of age children appreciate the normative force of joint commitments (see Tomasello, 2018, for a review). Because young children are forming joint commitments not only with adults but also with peers and puppets, it is unlikely that they believe the force is coming from some authority vested in their partner. Rather, they understand that it is coming from the agreement they have made with their partner. The current results bolster this interpretation by showing that just as joint commitments are made by agreement, they may be dissolved by agreement—or some other respectful act such as notification—between those same parties as well.

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Appendix A. Children's protest toward the leaving puppet (including the dropped participants; N= 172)

An additional 28 children (4 5-year-olds and 24 3-year-olds) needed to be excluded after the first and main dependent measure (children's protest when the puppet quit the game and left the room) because they waited for the puppet's return and never started collecting beads on their own. Including these children in the main analysis provides very similar results to the analysis without these children (see Table A1 for an overview of the numbers of participants in the main sample and the sample including the children who participated only in the protest measure). Overall, the full model provided

a significantly better fit compared with the null model, $\chi^2(6) = 46.50$, $p < .001$. The interaction of condition and age was not significant, $\chi^2(2) = 2.51$, $p = .28$. Therefore, we dropped it from the analysis. The reduced model included condition, age, and gender and was significantly better at explaining the data than the null model, $\chi^2(4) = 43.98$, $p < .001$.

We found an effect of condition, $\chi^2(2) = 39.25$, $p < .001$, indicating that children protested more in the Just Leave condition (74.2% of 3-year-olds, 38.5% of 5-year-olds) than in both the Notify condition

Table A1
Overview of the number of participants in the main sample and the sample including the children who participated only in the protest measure.

Age group	3 years			5 years		
Condition	Just Leave	Notify	Dissolved	Just Leave	Notify	Dissolved
Main sample (N = 144)	24	24	24	24	24	24
Sample including dropped participants (N = 172)	31	33	32	26	25	25

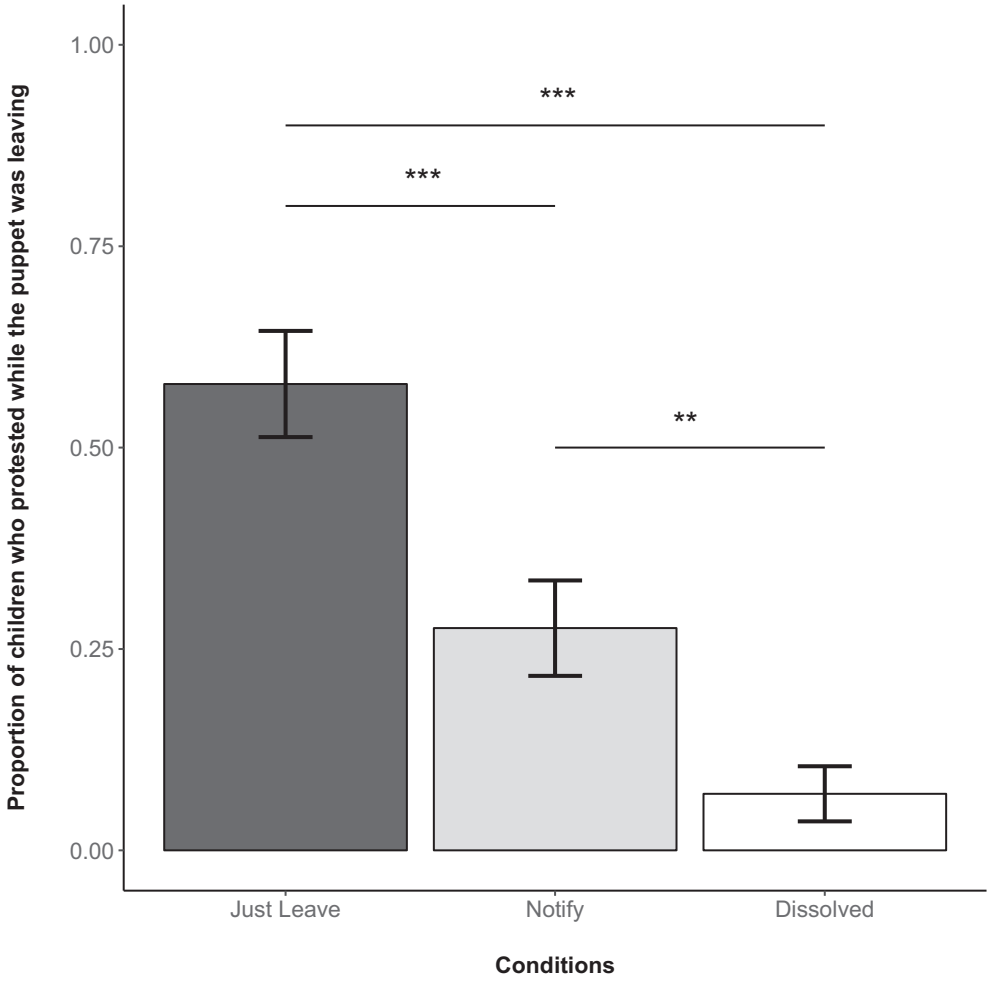

Fig. A1. Proportions of children who protested while the puppet was leaving. Error bars indicate standard errors of the mean. $^{**}p < .01$. $^{***}p < .001$.

(33.3% of 3-year-olds, 20% of 5-year-olds, *estimate* ± *SE* = −1.38 ± 0.41, $z = -3.33$, $p < .001$) and the Dissolved condition (6.3% of 3-year-olds, 8% of 5-year-olds, *estimate* = −3.03 ± 0.60, $z = -5.07$, $p < .001$) (see Fig. A1). In addition, children protested more in the Notify condition than in the Dissolved condition (*estimate* = 1.66 ± 0.60, $z = 2.75$, $p < .01$). We also found an effect of age, $\chi^2(1) = 6.40$, $p < .05$, such that 3-year-olds protested more than 5-year-olds (*estimate* = −0.65 ± 0.22, $z = -2.95$, $p < .01$). There was no effect of gender, $\chi^2(1) = 0.02$, $p = .89$.

Appendix B. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jecp.2019.03.008.

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