DOI: 10.1111/cdev.13757

EMPIRICAL ARTICLE

CHILD DEVELOPMENT

How fairness and dominance guide young children's bargaining decisions

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Funding information
This research was funded by the Max Planck Society.

Abstract

Reaching agreements in conflicts is an important developmental challenge. Here, German 5-year-olds (N = 284, 49% female, mostly White, mixed socioeconomic backgrounds; data collection: June 2016–November 2017) faced repeated face-to-face bargaining problems in which they chose between fair and unfair reward divisions. Across three studies, children mostly settled on fair divisions. However, dominant children tended to benefit more from bargaining outcomes (in Study 1 and 2 but not Study 3) and children mostly failed to use leverage to enforce fairness. Communication analyses revealed that children giving orders to their partner had a bargaining advantage and that children provided and responded to fairness reasons. These findings indicate that fairness concerns and dominance are both key factors that shape young children's bargaining decisions.

Human everyday life is heavily structured by cooperation: we regularly join forces with others and thereby generate benefits that we could not generate alone (anything from carrying objects together to engaging in trade). At the same time, humans frequently face conflicts: we compete with others for resources, have opposing views on how cooperative activities should be performed (e.g., who carries the heavy part of the object, what conditions our contracts should have), or how goods should be divided. In many of these situations, each individual involved prefers to reach an agreement over not reaching an agreement, but each prefers an agreement that favors their interests. These are so-called bargaining problems (Nash, 1950). A central developmental challenge is for children to learn how to solve such bargaining problems by reaching agreements despite holding conflicting motives.

In many primate species, including humans, conflicts are sometimes resolved in accordance with individuals' position in status or dominance hierarchies (Anderson & Kilduff, 2009; Blue et al., 2016; de Kwaadsteniet & van Dijk, 2010; Muller & Mitani, 2005; Pusey et al., 1997; van Vugt et al., 2008). People thus possess tendencies (e.g., selfishness and a shared sense of social dominance) pushing them toward self-serving agreements and unequal resource divisions. On the other hand, humans are also equipped with social motivations that facilitate equal resource divisions (e.g., expectations for mutual advantage or a shared sense of fairness; Falk et al., 2008; Schelling, 1960; Sugden, 2003). Moreover, when people can abandon social partnerships in which they are treated unfairly in favor of alternative arrangements, sometimes called outside options, this can dramatically shift bargaining outcomes and support the emergence of fairness (Baumard et al., 2013; Binmore et al., 1989; Cooper et al., 1990; Debove, André, et al., 2015; Debove, Baumard, et al., 2015).

Sensitivities for both dominance and fairness develop early. Already in infancy, children track dominance relations among agents (Gazes et al., 2015; Mascaro & Csibra, 2012; Thomsen et al., 2011). Preschoolers are sensitive to a whole range of dominance cues and, for instance, view individuals who control resources and

Abbreviations: GLMM, Generalized Linear Mixed Model; OSF, Open Science Foundation.

deny permission to others as being "in charge" (Gülgöz & Gelman, 2017). Six- to 8-year-olds also make sophisticated predictions about who will prevail in conflicts by integrating multiple variables such as strength, size, or their alliances (Pietraszewski & Shaw, 2015). Social dominance—typically defined in terms of resource control and individuals' abilities to achieve their goals in conflict situations (Hawley, 1999, 2002)—has also been shown to affect children's own social decisions. Toddlers prefer individuals who prevail in conflict via means other than physical force (Thomas et al., 2018), preschoolers preferentially endorse testimony from socially dominant individuals (Bernard et al., 2016), and children aged 3 to 8 take recipients' relative dominance into account when allocating resources (Charafeddine et al., 2016).

Children are similarly attuned to fairness. In third-party contexts, even infants seem surprised when confronted with unequal resource divisions (Geraci & Surian, 2011; Schmidt & Sommerville, 2011) and when distributing resources, preschoolers not only prefer equality but even discard resources rather than create unfairness (Shaw & Olson, 2012). When dividing resources between themselves and others, children as young as three tend to share fairly if they produced the resource collaboratively (Hamann et al., 2011; Warneken et al., 2011), presumably because joint collaboration encourages them to see themselves and their partner as equally deserving (Engelmann & Tomasello, 2019). In non-collaborative settings, preschoolers are particularly attuned to being treated unfairly themselves and even forego resources in order not to get less than others (Blake et al., 2015). While these studies demonstrate that dominance and fairness are strong motivators for children from early on, less is known about how they might interact in shaping children's facility to reach agreements in bargaining situations.

Some first investigations have shown that around age five children first become able to resolve conflicts of interest in strategic interactions (Kagan & Madsen, 1971; Koomen & Herrmann, 2018; Sánchez-Amaro et al., 2017) and they sometimes do this in ways that result in fair outcomes. For example, in situations in which children have to work together but only one of them can benefit, 5-year-olds but not 3-year-olds have been shown to spontaneously develop turn-taking strategies such that they alternate who benefits over time (Grueneisen & Tomasello, 2017; Melis et al., 2016; Sánchez-Amaro et al., 2019).

However, unlike when they share the spoils of collaboration, evidence suggests that preschoolers do not yet enter bargaining situations jointly assuming solutions to be fair. In a recent study, pairs of 5- and 7-year-old children had to pick the same one of three reward divisions in order to benefit (Grueneisen & Tomasello, 2020). One division split the rewards equally, while the other divisions each favored one child, and children had to coordinate their choices without communicating or else got nothing. Seven-year-olds mostly succeeded by choosing the equal split suggesting that they expected—and expected each other to expect—benefits to be divided fairly among players (they mostly behaved selfishly when they could choose a division alone). Five-year-olds, by contrast, almost exclusively chose the division favorable to themselves, resulting in coordination failure. Perhaps, to arrive at fair bargaining agreements, younger children require explicit face-to-face negotiation or repeated interactions in which they are directly confronted with the conflict between their own and their partner's motives. To test whether young children gravitate toward fairness in a repeated face-to-face bargaining problem and by what processes children arrive at bargaining solutions was a first aim of the current study.

However, another possibility is that dominance is a more central factor than fairness in young children's conflict resolution. When deciding what game to play, who gets to do the more fun part of a joint activity, or who gets the larger of two rewards, socially dominant children may be able to assert their will. Indeed, preschoolers' cooperation sometimes results in strikingly unfair outcomes: when collaborating to obtain an equal or an unequal distribution of rewards, 3- and 5-year-old children often agree on unequal distributions (Melis et al., 2015). In peer groups, dominant children tend to control access to jointly produced resources (Charlesworth & LaFreniere, 1983; LaFreniere & Charlesworth, 1987) and in a repeated social dilemma, socially dominant children were able to accrue a significantly larger share of rewards than comparatively less dominant children (Grueneisen & Tomasello, 2017). It is not clear, however, if social dominance affects children's joint solutions to bargaining problems as well as their decisions over how to divide resources between themselves and a peer in face-to-face interactions (children's resource sharing in standardized games has almost exclusively been studied in anonymous situations with absent recipients, e.g., Benenson et al., 2007; Gummerum et al., 2010; Harbaugh & Krause, 2000; Malti et al., 2012). Addressing these issues was the second aim of the present study.

Finally, the leverage afforded by outside options is thought to be an important factor in adults' bargaining decisions and the emergence of fairness (Debove, André, et al., 2015). A third aim of the current study is to explore children's understanding of the strategic advantages afforded by possessing outside options in a conflict of interest and if they can use leverage to coerce (dominant) individuals to agree to fair resources divisions.

To address these questions, we ran a series of studies investigating children's joint decision-making in repeated face-to-face bargaining situations. In Study 1, pairs of 5-year-olds were presented with a coordination game in which they had to jointly agree on one of two resource divisions, one fair and one unfair. In confirmatory analyses, we explored if children coordinated on fair rather

than unfair divisions and if dominant children have a bargaining advantage. In further exploratory analyses, we also examined the bargaining process leading up to children's joint decisions. Study 2 focused on children's decisions in mini-dictator games (in which a divider chooses between two predetermined ways of splitting up a resource between themselves and a recipient, Schulz et al., 2014) in a face-to-face context. As in Study 1, we investigated the role of fairness, dominance, and children's negotiations prior to their decisions. Study 3 aimed to replicate Study 1 and additionally explored whether children can enforce fair solutions if they have leverage via an outside option.

STUDY 1

Method

Participants

Fifty-two 5-year-old children (50% girls, M_{age} = 5 years; 6 months, range = 5 years; 3 months–5 years; 9 months), tested in same-gender dyads, were included in the study. 10 additional children (i.e., 5 dyads) were excluded because at least one child of the dyad failed to pass the training criteria (8) or because one child kept pressing buttons on their partner's side (2; see Procedure section for details). Children were recruited and tested at their daycare centers in Leipzig, a medium-sized German city. No socioeconomic status data were collected but the population from which the sample was drawn is approximately 91% native German, mostly White, and encompasses a wide range of socioeconomic backgrounds. The sample size was determined prior to data collection and was based on previous work on dominance and children's coordination strategies in conflict of interests (Grueneisen & Tomasello, 2017). The project entitled "cooperation and conflict" was approved by the internal ethics committee of the Max Planck Institute for Evolutionary Anthropology.

Procedure

Dominance test

In line with central theoretical accounts (Hawley, 1999), our dominance test conceptualized dominance in terms of the ability to control resources. Before children were introduced to the bargaining task, the experimenter placed a box containing a toy between children and left the room. The toy was a kaleidoscope that could only be used by one child at a time. The child who asserted themself by accessing the toy first was considered the dominant child of the dyad (a pilot suggested that first access was more clearly indicative of resource control abilities than, for instance, length of access since children would sometimes grab the toy but then quickly loose interest, thus letting their partner handle it longer in total).

In addition, in both Study 1 and Study 2, we asked kindergarten teachers to indicate which child of the dyad they thought was more dominant and by how much (a little more, more, much more). However, teachers often only knew one child of the dyad and no rating of the dyad's dominance relation could be obtained. We, therefore, used the outcome of the dominance test as our primary dominance measure in the main analyses. Yet, as a robustness tests of our hypotheses, we also report an analysis based on teacher ratings.

Overall, teacher ratings were weakly correlated with the dominance test, $r(63) = .23$, $p = .071$ (for Study 1 and Study 2 combined).

Coordination task

Apparatus familiarization. The apparatus was a Plexiglas box containing two horizontal platforms that were placed in between two players. Rewards—red marbles that children could make a bracelet out of—were placed on the platforms which players could access by collapsing the platforms. To do so, they had to press buttons that were attached on either side of each platform. If both players pressed buttons of the same platform, the platform collapsed and rewards fell into designated compartments from where players could retrieve them. If players pressed buttons of different platforms the platforms remained intact and no marbles became accessible. Players could reverse their decisions but only one button could be pressed at a time (if players pressed the second button, the first one sprang out again; this was done so that players could not "burn their bridges" by quickly pressing a button and thus practically force their partner to match their choice). Only one platform could be collapsed per trial.

Children (C) were introduced to the apparatus individually by an experimenter (E) while their partner waited outside the test room. E and C sat on opposite sides of the apparatus and each platform contained one marble for each player. E asked C to press one of the buttons and then E matched C's choice and showed how to retrieve the rewards. E removed the remaining marbles to highlight that only marbles from one platform could be retrieved per round. E then placed a barrier between C and the apparatus, re-baited the apparatus for a second round, and then removed the barrier (this was done in between all subsequent rounds). After C pressed a button, E first responded by choosing a different platform—allegedly by accident—so that the platforms remained intact and no rewards fell down. E then explained that decisions were reversible and pressed the button that corresponded to C's choice, causing that platform to collapse. In the third round, E again chose a different platform than C and asked C to reverse their decision (to illustrate to C that they

can change their decision too). In the last round, one platform contained two marbles for each player while the other platform only contained one, and E asked C to pick the platform with the largest number of rewards (to draw their attention to the number of rewards).

Individual criterion. C operated the apparatus alone by pressing buttons on both sides of the apparatus. Different payoffs were used in each round (Supporting Information S1) and C was instructed to get as many marbles as possible. Children who did so successfully proceeded to the next phase. If C made a mistake by failing to collect any or the highest number of marbles, they received two additional trials. If they made more than one mistake, they were excluded and not tested. This phase ensured apparatus understanding and that C paid attention to the number of rewards each platform. Once C1 completed this phase, C2 received the same training.

Joint criterion. One C was placed on either side of the apparatus and told that they would now play together (i.e., C1 pressed a button on one side and C2 on the other side). They could freely communicate and were instructed to collect as many marbles as possible.

The number of rewards varied between platforms but was identical for each player such that they never faced a conflict of interest (see Supporting Information S1). Once E removed the barriers to allow C to access the buttons E left the test room until C had successfully collapsed one of the platforms. If C successfully coordinated on the platform with the highest number of rewards on three successive trials, they proceeded to test phase. If they failed to do so they received two additional trials. If they made more than one mistake, the dyad was excluded and was not tested. This phase ensured that C paid attention to the rewards and was able to coordinate with their partner.

Test. The test phase was identical to the joint criterion phase except that new rewards (golden marbles) were used as an additional motivator and children now faced a conflict of interest (Figure 1): One payoff division was unfair and favored C1 (three marbles for C1 and one for C2) while the other was fair and divided the marbles equally (two marbles each). Before the first trial, E reminded C that they could only collect marbles from one platform and that they should try to win as many marbles as possible. Children then played eight rounds in which the unequal payoff division always benefitted C1. Which child of the dyad played the game as C1 was decided randomly before the experiment started. The position of the payoff divisions in the apparatus was counterbalanced across trials. E always left the test room after making the choices available to give children the sense that they could choose independently without an authority's supervision. If C complained to E about their partner or the game outcome E responded by saying "you sort it out amongst yourselves." If children failed to make a joint decision after 30 s, E opened the door and said"Go ahead, get your marbles." E then left the room again and re-entered every 15 s to give the same instructions until, after a maximum of 90, E would discard all marbles and repeat the trial (however, this never happened).

Coding and analysis

All sessions were recorded with a video camera. The dependent measure for all confirmatory analyses was whether or not children chose the fair reward division. On 3% of the trials, children coordinated on the unequal division but C1 shared one marble with C2 resulting in fairness. These trials were coded as if children had coordinated on the fair division (the results are virtually identical when these trials are excluded, see Supporting

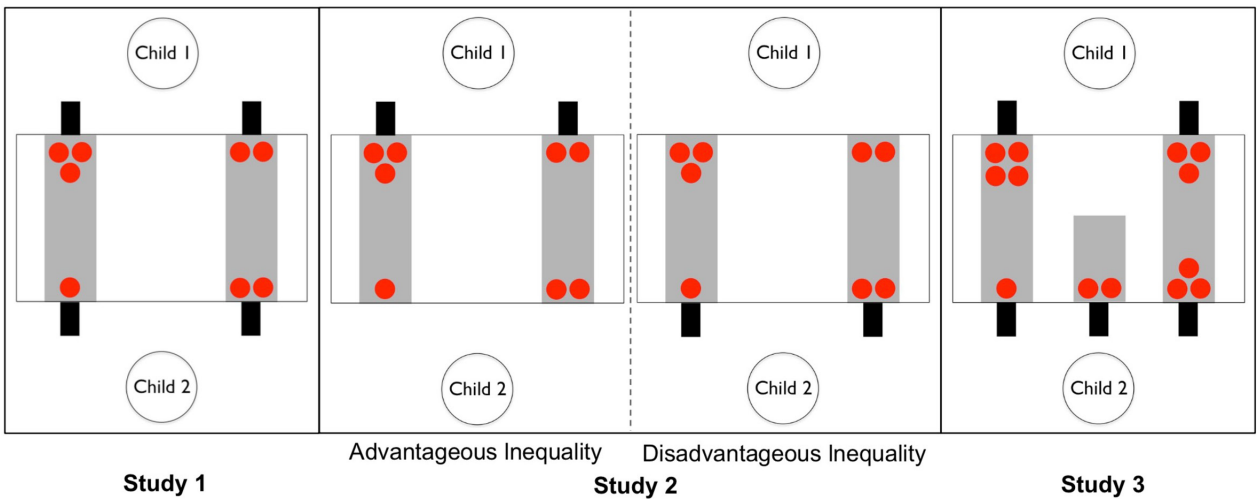

FIGURE 1 Experimental setup of the three studies

Information S6). We first compared the mean number of trials (of 8) on which dyads chose the equal reward division with the expected chance value of 4 (i.e., 50%) using a one-sample *t*-test. To examine potential dominance effects, we ran a Generalized Linear Mixed Model (GLMM; Baayen, 2008) with a binomial error structure. The test predictor was dominance (i.e., whether C1 or C2 was classified as more dominant) and its interaction with a trial number (to assess whether dominance effects changed over the session). We included the main effects of trial number and gender as fixed effect control predictors. We also included the random effect of dyad to account for the fact that dyads contributed multiple data points and the random slopes components of trial number nested within dyad ID to keep Type I error rates at the nominal level of 0.05 (Schielzeth & Forstmeier, 2009). In 10 dyads C1 was dominant in 15 dyads C2. One dyad was excluded from the dominance analysis as neither child picked up the toy during the dominance test.

In additional exploratory analyses, we examined how children reached agreements and whether children's dominance relation affected this process. For this purpose, we coded the bargaining process. For each trial, a coder who was blind to the study's predictions rated which child took command of the situation by first pressing a button or by first proposing which division to pick, how often children told their partner which division to pick, whether or not children had a verbal conflict by overtly expressing opposing preferences about which division to pick (Shantz, 1987), and if a child reversed their decision by first pressing one button but then switching to another. In addition, they coded if children gave a reason for why they should pick a division and if that reason alluded to fairness or equality (see Supporting Information S2 for detailed definitions and examples of coded categories). We predicted that dominant children would be more likely to take command, to give orders, to prevail in conflicts, and to be less likely to reverse their decision (each analyzed with a separate GLMM). We also conjectured that dyads would converge on divisions favorable to children taking command and giving orders and that reasons alluding to fairness would be predictive of dyads choosing the fair division (analyzed using a single GLMM with these variables as predictors of children's choices). To assess reliability, a second coder rated 25% of the dyads. For decisions, agreement between coders was very good (κ = .927), and for the bargaining variables good to very good (κ between 1 and .679, see Supporting Information S4 for details). Analyses were run based on the first coder's ratings.

Analyses were fitted in R (R Core Team, 2018) using the function "glmer" of the R-package lme4 (Bates et al., 2014). To test whether the test predictors combined had a significant effect, we always first compared a full model containing all predictors of interest with a null model not including these predictors but retaining all control predictors, random effects, and random slopes using a likelihood ratio test (this prevents multiple testing issues, Forstmeier & Schielzeth, 2011). We only considered the effects of individual predictors when this full null model comparison indicated a significant effect. We examined individual predictors by dropping them from the model one by one using the function "drop1." The data are accessible via Open Science Foundations (OSF; https://osf.io/4shn9/?view_only=f903abb4ea8d47baa2b6b786f0c33f6e).

Results

Children coordinated on the equal reward division more than would be expected by chance (64%; one samples *t* test, $t(25) = 2.19$, $p = .038$). In addition, dominance affected children's choices (full-null-model comparison: $\chi^2(2) = 6.82$, $p = .033$): Dyads were less likely to coordinate on the equal reward division when the child benefiting from the unequal division (i.e., C1) was dominant (46.25% compared to 76.67% when C2 was dominant), $\chi^2(1) = 5.54$, $p = .019$ (Figure 2).

The effect of dominance did not change significantly over trials (dominance-trial interaction: $\chi^2(1) = 1.28$, $p = .258$). However, children were generally more likely to coordinate on the equal division in later trials (main effect of trial number, $\chi^2(1) = 5.46$, $p = .019$). The results look similar when we use teacher ratings as our measure of dominance (full- null-model comparison: $\chi^2(2) = 7.10$, $p = .029$), except that the interaction between dominance and trial number was significant ($\chi^2(1) = 7.01$, $p = .008$): when C2—the child benefitting from fairness—was rated more dominant, fair choices increased over trials. Fair choices remained on a lower level when C1—the child benefitting from the unfair division—was rated more dominant.

The bargaining analysis revealed that dominant children were more likely to first pick or propose a division than less dominant children, $\chi^2(1) = 6.75$, $p = .009$. Dominant children were also more likely to tell their partner what division they should pick, $\chi^2(1) = 7.91$, $p = .005$. By contrast, dominance was not associated with how commonly children reversed their decision once they had already pressed a button, $\chi^2(1) = 0.01$, $p = .936$. Overall, children had an explicit verbal conflict about which division to pick in 36% of the trials and the probability of conflicts did not change across trials, $\chi^2(1) = 0.11$, $p = .739$, indicating a high motivation to win the rewards throughout the session. In trials with conflicts, dyads were significantly more likely to converge on the division favorable to the dominant child of the dyad, $\chi^2(1) = 5.83$, $p = .016$. A final analysis examined the effects of children's bargaining on children's choices. This revealed that orders by C1—the child benefiting from unfairness—about which division their partner should pick increased the probability of unfair outcomes, but only if C1 was the dominant child of the dyad (interaction between C1's

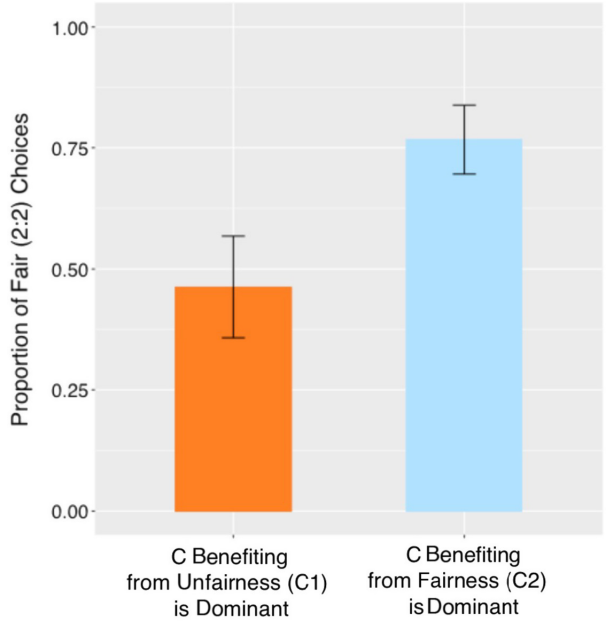

FIGURE 2 Results of Study 1: Mean proportion of trials on which dyads coordinated on the fair resource division, divided into dyads in which C1 (the child benefitting from the unfair division) or C2 (the child benefitting from the fair resource division) was dominant

orders and dominance: $\chi^2(1) = 8.94$, $p = .003$). C2's orders or which child picked or proposed a division first did not have an effect ($\chi^2(1) = 0.10$, $p = .751$, and $\chi^2(2) = 0.07$, $p = .965$, respectively). Reason-giving, however, did affect children's choices, $\chi^2(2) = 9.63$, $p = .008$: if, when giving a reason for why they should pick a division, a child alluded to fairness or equality, the dyad was more likely to converge on the fair division than when the reason did not mention fairness, $p = .022$, or when no reason was given, $p = .014$. For extended analysis descriptions and full model outputs, see Supporting Information S3–S6.

Discussion

The findings indicate that, when faced with a repeated conflict of interest, pairs of 5-year-olds are more likely to coordinate on fair than on unfair outcomes. This contrasts with previous work using one-shot interactions without communication in which children mostly chose selfishly and thus failed to coordinate (Grueneisen & Tomasello, 2020). This suggests that, while 5-year-olds do not yet enter bargaining problems jointly expecting solutions to be fair, they can reach fair solutions over repeated interactions and via explicit negotiation.

Communication did indeed play a significant role in the current study: When children mentioned fairness when arguing that the dyad should pick a division, they were more likely to coordinate on the fair outcome than when no reason or a reason not alluding to fairness was given. Moreover, children's tendency to choose the equal division substantially increased over trials highlighting that young children might have to face conflicts repeatedly to reach fair agreements. Another feature of the current setup was that children were always aware of their partner's decisions. They thus received direct evidence of their partner's unwillingness to act in their own favor and this may have additionally highlighted the need to compromise.

In line with previous work (Charlesworth & LaFreniere, 1983; Grueneisen & Tomasello, 2017), the current findings also underline the role of dominance in children's conflict resolution. Two separate analyses using independent measures of dominance (the current dominance test and teacher ratings) revealed that the probability of children coordinating on the fair division was dependent on whether the child benefiting from that division was dominant compared to their partner. The bargaining analysis further revealed that dominant children were specifically more likely to prevail in trials in which the dyad had an explicit verbal conflict. Dominant children were also more likely to take command of the situation by first picking or proposing a division, to give orders to their partner about which division to pick, and orders by dominant children were more effective than those by less dominant children in swaying the dyad's decision toward unfairness. These data suggest that dominance effects can override fairness considerations in 5-year-old children.

STUDY 2

The current findings add to a growing literature showing that children perceive and adjust their own behavior in response to dominance asymmetries (Bernard et al., 2016; Charafeddine et al., 2016). Yet, it is less clear to what extent dominance relations affect children's cooperative decision-making more generally. For instance, does dominance influence children's resource divisions even when no coordination is necessary and they can choose, in principle, totally independently (i.e., when dividing resources between themselves and a partner)? To address this question, we ran a second study that was identical to Study 1 in terms of the overall setup, training procedure, and choice options but in which we removed children's interdependence at test such that one child could choose a division alone. We were interested in whether children's tendency to choose a fair resource division was affected by whether they were more or less dominant than their partner in situations in which they either benefited from or were disadvantaged by the unfair alternative.

Method

Participants

One hundred and four 5-year-olds (48% girls, M_{age} = 5 years; 6 months, range = 5 years; 3 months–5 years;

9 months) were included in the study (compared to Study 1, we doubled the sample since we had two experimental conditions). Two dyads were dropped from the analysis as neither child picked up the toy during the dominance test. Sixteen additional children (i.e., 8 dyads) were tested but no data were collected because at least one child of the dyad failed to pass the training criteria (14) or due to technical difficulties (2). Children were recruited from the same population as in Study 1. No child included in Study 2 participated in Study 1.

Procedure

The dominance test and the training procedure (Apparatus Familiarization, Individual Criterion, and Joint Criterion) were identical to Study 1. At test, however, one child of the dyad (the divider) could choose independently—as in a mini-dictator game (Schulz et al., 2014)—while the other child (the recipient) remained passive. For this purpose, the buttons on the recipient's side of the apparatus were removed and the mechanism was altered such that the divider could collapse one of the platforms by pressing the corresponding button. 50% of the dyads were randomly allocated to the *advantageous inequality condition* in which C1, the child benefitting from the unfair division, was the divider and choose between a 3:1 and a 2:2 division (see Figure 1). The other dyads were allocated to the *disadvantageous inequality condition*, in which C2, the child benefitting from the fair division, was the divider and choose between a 1:3 and a 2:2 division. The same child was the divider in all trials. Which child played the divider was determined randomly before the experiment. In all other respects, the test trials were identical to Study 1: children played eight rounds, they could freely communicate, and E always responded in a neutral manner to children's questions or complaints.

Coding and analysis

In all confirmatory analyses, the dependent measure was whether or not children chose the fair reward division. Trials on which children chose the unequal division but the advantaged child shared a marble with their partner (3.6% of all trials) were coded as fair choices (the results do not change meaningfully when these trials are excluded, see Supporting Information S6). In our main analysis, we ran a GLMM with binomial error structure and the test predictors condition, dominance, the three-way interaction between condition, dominance, and trial number as well as the two-way interactions between these predictors. Again, in the main analysis, the predictor dominance was based on the dominance test only since we did not have teacher ratings for all dyads. According to the test, in 24 dyads the divider was dominant and in 26 dyads the recipient. However, we also report a second analysis based on teacher ratings. We included trial number and gender as fixed effect control predictors as well as the random effect of the dyad and the random slopes components of trial number nested within dyad ID.

To analyze children's bargaining, a coder blind to the study's predictions rated (from videotape) for each trial whether the recipient ordered the divider which division to pick, whether the recipient protested against the divider's decision, and whether the recipient provided a reason for why the divider should pick a division and if that reason alluded to fairness or equality (see Supporting Information S2 for detailed descriptions and examples). In these exploratory analyses, we predicted that dominant children would be more likely to give orders and to protest, and that orders, protest, and reasons-giving would affect the dividers choices in the game. The general analytic approach was identical to the one in Study 1. A second coder rated 25% of the pairs. For children's game decisions, agreement between coders was perfect ($\kappa = 1$), and for the bargaining variables good to very good (κ from .685 to .876, see Supporting Information for details). All analyses were done based on the first coder's ratings. The data are accessible via OSF (https://osf.io/4shn9/?view_only=f903abb4ea8d47baa2b6b786f0c33f6e).

Results

The full-null model comparison indicated that the predictors condition, dominance, and their interaction combined had an effect on children's choices, $\chi^2(6) = 19.27$, $p = .004$. Further analyses revealed no significant three-way interaction between dominance, condition, and trial number ($\chi^2(1) = 0.45$, $p = .501$) or two-way interactions between condition and trial number ($\chi^2(1) = 2.41$, $p = .121$) or dominance and trial number ($\chi^2(1) = 1.06$, $p = .303$). However, we found a significant interaction between dominance and condition, $\chi^2(1) = 3.85$, $p = .050$. We then split the sample and looked at the effect of dominance in the two conditions separately. In the *advantageous inequality condition* in which when the divider benefited from the unfair division, children tended to choose the fair division—and thus against their personal interest—when the recipient was more dominant than them, $\chi^2(1) = 3.82$, $p = .051$. By contrast, dominance did not affect children's choices in the *disadvantageous inequality condition*: when choosing between a fair division and an unfair division that put themselves at a disadvantage, children tended to choose the fair division regardless of whether the recipient was more or less dominant than them, $\chi^2(1) = 0.65$, $p = .420$ (Figure 3).

Again, the results are very similar when we use teacher ratings as our measure of dominance (full-null model comparison, $\chi^2(6) = 21.39$, $p = .002$) with the interaction

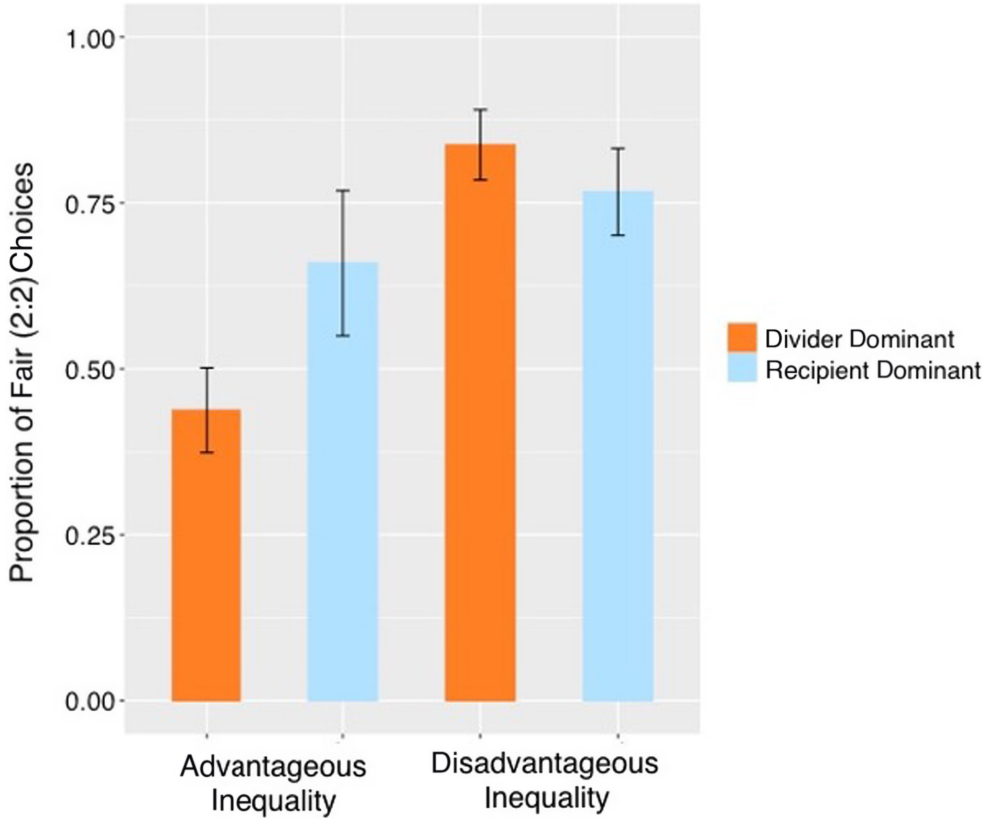

FIGURE 3 Results of Study 2: Mean proportion of trials on which children chose the fair resource division in the advantageous inequality condition (3:1 vs. 2:2) and the disadvantageous inequality condition (2:2 vs. 1:3), divided into dyads in which the divider was dominant and dyads in which the recipient was dominant

between condition and dominance, but no other interaction, approaching significance ($\chi^2(1) = 3.14$, $p = .076$). In the *advantageous inequality condition*, dividers were more likely to choose the fair division—and thus against their personal interest—when the recipient was more dominant than them ($\chi^2(1) = 5.67$, $p = .017$). Dominance had no significant effect in the *disadvantageous inequality condition* ($\chi^2(1) = 0.26$, $p = .608$).

As in Study 1, children were generally more likely to choose the fair division in later trials, $\chi^2(1) = 12.86$, $p < .001$. This effect was especially strong in the *disadvantageous inequality condition*, $\chi^2(1) = 10.86$, $p < .001$, but only marginally significant in the *advantageous inequality condition*, $\chi^2(1) = 3.19$, $p = .074$.

The bargaining analysis revealed that dominant recipients (according to the dominance test) were not more likely to give orders to the divider than non-dominant recipients, $\chi^2(1) = 0.37$, $p = .543$, and children's tendency to give orders did not differ in the two conditions, $\chi^2(1) = 0.50$, $p = .482$. Dominant recipients also did not protest more than non-dominant recipients, $\chi^2(1) = 1.749$, $p = .186$. However, recipients generally protested more in the advantageous inequality condition (when the divider had an incentive to choose the unfair division at a cost to the recipient) than in the disadvantageous inequality condition (when the divider had an incentive to choose the fair division at a cost to the recipient), $\chi^2(1) = 6.84$, $p = .009$.

Finally, we tested whether children's bargaining affected the divider's choices. This revealed that, in trials on which the recipient ordered the divider to pick a division, the divider was significantly more likely to choose fairly than when the recipient gave no order, $\chi^2(1) = 4.39$, $p = .036$. This effect did not differ between conditions (interaction between orders and condition: $\chi^2(1) = 0.95$, $p = .329$), and was equal for dominant and non-dominant recipients (interaction between orders and dominance: $\chi^2(1) = 0.72$, $p = .397$). Whether or not recipients had protested against the divider's decision did not affect the divider's decision on the subsequent trial, $\chi^2(1) = 0.34$, $p = .558$, and there was no interaction between protest and condition, $\chi^2(1) = 0.03$, $p = .864$, or protest and dominance, $\chi^2(1) = 0.02$, $p = .893$, on game outcomes. However, the divider's choice was affected by the reasons the recipient gave for why the divider should pick a division, $\chi^2(2) = 5.94$, $p = .051$ (note that this is only a non-significant trend): if the recipient alluded to fairness, the divider was more likely to choose the fair division than when the recipient provided a reason not mentioning fairness, $p = .034$. However, the divider's choices did not differ between trials on which fairness reasons were

given compared to trials on which no reasons were given, $p = .232$. See Supporting Information S3–S6 for full details on these analyses.

Discussion

Two analyses using independent measures of dominance (the current dominance test and teacher ratings) indicate that dominance asymmetries can impact 5-year-olds' decisions over resource divisions even when no coordination with their partner is necessary. However, dominance effects were dependent on children's choice options: When children chose between a selfish (3:1) and a fair division (2:2) they were less likely to pick selfishly if their partner was more dominant than them. By contrast, when children chose between a fair division (2:2) and an unequal division that put themselves at a disadvantage (1:3), they tended to choose the fair division regardless of who was more dominant. While dominant recipients could sway dividers to choose more fairly, dominance effects thus did not override children's well-documented aversion to disadvantageous inequality (Blake et al., 2015; McAuliffe et al., 2014). Indeed, irrespective of who was more dominant, recipients also protested substantially more against dividers incentivized to choose the unfair division than against dividers incentivized to choose fairly, even though the recipient benefited from the alternative division in both cases. This suggests that children recognized when they are justified in demanding different treatment.

Compared to previous dictator-game studies in which children shared with anonymous or fictional partners, children in the current study repeatedly faced real recipients with whom they could freely communicate—arguably a more naturalistic situation. The bargaining analysis suggests that communication did indeed have an impact: dividers were more likely to choose fairly when the recipient had told them which division to pick (regardless of condition and who was dominant) and when the recipient mentioned fairness as a reason for why the divider should pick a division. Somewhat surprisingly, the recipient's protest did not have an effect, perhaps because selfish dividers elicited more protest but also responded less to it. The face-to-face nature of the current setup might also explain why, as in Study 1, children were generally more likely to choose fairly in later trials.

STUDY 3

Given children's strong aversion to outcomes that put themselves at a disadvantage respective to their peers, they might be particularly attuned to strategic opportunities that allow them to enforce fair divisions when interacting with partners unwilling to compromise. Both theoretical models (Debove, Baumard, et al., 2015) as well as empirical work with adults (Debove, André, et al., 2015) indicate that the availability of outside options provides individuals with leverage they can use to assure they are treated fairly. Moreover, outside options might alleviate the advantages enjoyed by dominant individuals since they allow subordinate partners to abandon (or to threaten to abandon) exploitative arrangements. Whether young children are already capable of using outside options has sparsely been investigated. In Study 3, we thus used a similar overall design as in Study 1 except that, in one condition, individuals disadvantaged by the unfair division had access to an individual outside option. We also directly manipulated whether or not the child with access to the outside option was the dominant child of the dyad as indicated by the dominance test. We predicted that in the presence of an outside option dyads would be more likely to agree on the fair reward division and, in addition, dominance effects would decrease.

Method

Participants

One hundred and twenty-eight 5-year-old children (50% girls, M_{age} = 5 years;6 months, range = 5 years;0 months –5 years;12 months) were included in the study. Since we did not know what effect size to expect in our novel leverage manipulation, we increased the sample size slightly compared to Study 1 to reduce the probability of a Type 2 error. Ten additional dyads were excluded because at least one child failed to pass the training criteria (8) or due to technical difficulties (2). Children were recruited from the same population as in Study 1 and 2 no child included in Study 3 participated in Study 1 or 2.

Procedure

Children first completed the same dominance test as in Study 1 (given our difficulty with obtaining teacher ratings in Studies 1 and 2, this measure was dropped). The apparatus familiarization phase was identical to Study 1, except that the apparatus contained an additional platform which could be accessed by and delivered rewards only to Player 2 (Figure 1). That is, if Player 2 pressed the button of this new platform, the platform collapsed, the trial ended, and Player 2 could retrieve the marbles without any action being required by Player 1. This platform served as the leverage option in the test phase. Moreover, before C made a choice in the last familiarization trial, E asked them to state the number of rewards on each side of each platform (including the new additional platform). This was done to draw children's attention to the number of rewards and encouraged them to consider all platforms.

Individual criterion

C played two rounds in which they operated the apparatus alone by pressing buttons on both sides. On one trial, the highest number of rewards was placed on the new platform which would later be the leverage option. This was done to familiarize children with this option and to show them that this option could be accessed from Player 2's side without requiring any action by Player 1 (see Supporting Information S1 for all payoff configurations). If children made a mistake, they received two more trials. If they made more than one mistake they were excluded from the study.

Joint criterion

One C was placed on either side of the apparatus and was instructed to collect as many marbles as possible. C did not face a conflict of interest in the sense that they were incentivized to pick different platforms. On one trial, however, only the outside option was baited with a single reward while the other platforms were empty. C2 thus had to act alone to extract a reward for themself. This trial was included to draw both children's attention to the additional platform and to highlight that C2 could end the trial and receive rewards without C1's contribution. In another trial, C1 received one reward more than C2 so that children always entered the test phase with the same number of rewards. If children retrieved the highest number of rewards on three of four trials they proceeded to the test phase. If they made more than one mistake, the dyad was excluded and was not tested.

Test

The test phase was identical to the joint criterion phase except that new rewards (golden marbles) were used and C now faced a conflict of interest (Figure 1): One payoff division favored C1 (four marbles for C1 and one for C2) while the other rewarded both C equally (three marbles each). The contents of the third platform, from now on referred to as the leverage option, varied by condition.

In a 2 × 2 (leverage × dominance) between-subjects design, children were randomly assigned to the *leverage* or the *no leverage condition* (50% each). In the *leverage condition*, the leverage option contained 2 marbles for C2 (and nothing for C1). Hence, C2 could pick (or threaten to pick) the leverage option and get a higher reward than by agreeing to the unfair division, which might convince C1 to agree to the fair division. In the *no leverage condition*, the leverage option was empty and thus could not be used by C2 to encourage a fair distribution of resources. In half of the dyads, the more dominant child (as determined by the dominance test) was assigned to the role of C2 and thus had access to the leverage option. Before the first trial, E reminded C that they could only collect the marbles from one platform and that they should try to win as many marbles as possible. Children then played eight rounds in which they could freely communicate. The position of the payoff divisions that required children to coordinate was counterbalanced (the leverage option was always in the middle). E always left the test room after making the choices available, used the same prompts as in Study 1 if children took time come to a decision, and always responded neutrally to children's questions or complaints.

Coding and analysis

The overall statistical approach was identical to Studies 1 and 2. Our confirmatory analyses addressed three main questions: (1) whether children in the *leverage condition* were more likely to coordinate on the fair division than children in the *no leverage condition* and whether this was affected by children's dominance relation, (2) whether children in the *leverage condition* achieved more equal resource divisions overall than children in the *no leverage condition*, and (3) whether dyads in the *leverage condition* were more likely to coordinate on the fair division if C2 had chosen the leverage option on the previous trial compared to when C2 had not chosen the leverage option.

To address question 1, we ran a GLMM with a binomial error structure. The dependent variable was whether or not children coordinated on the equal reward division (we did not include trials in which C2 chose the leverage option). The test predictors were condition (leverage vs. no leverage), dominance (i.e., whether or not C2 was dominant), the three-way interaction between leverage condition, dominance, and trial number as well as the two-way interactions between these predictors. We included trial number and gender as control predictors, dyad ID as a random effect, and the random slopes of trial number nested within dyad ID. To address question 2, we ran a linear model (using the R function "lm"). We computed an inequality score for each dyad by dividing the difference between children's payoffs by the overall dyad payoff. This score was log-transformed to ensure normality of residuals and served as the dependent variable. The predictors were condition, dominance, and their interaction and we included gender as a control predictor. To address question 3, we ran a GLMM on children's choices in trials 2–8 in the *leverage condition*. The only predictor was whether or not C2 had used the leverage option on the previous trial. The control predictors, random effects, and random slopes were identical to the model used to address question 1. For the exploratory analyses, the bargaining process was coded from videotape in the same way as in Study 1 except that for each trial the coder also rated whether or not C2 mentioned the leverage option before a choice was made (see Supporting Information S2). However, since children only explicitly referred to the leverage option on 10 trials, we did not include this variable in any analyses. A second coder rated 25% of the pairs. For game decisions, the agreement between coders was very good

(κ = .899), and for the bargaining variables good to very good (κ from .734 to .867, see Supporting Information for details). All analyses were done based on the first coder's ratings. The data are accessible via OSF (https://osf.io/4shn9/?view_only=f903abb4ea8d47baa2b6b786f0c33f6e).

Results

As in Study 1, children were significantly more likely to coordinate on the fair division than on the unfair division and this was the case in both conditions (*leverage condition*: $t(31) = 5.44$, $p < .001$; *no leverage condition*: $t(31) = 3.23$, $p = .003$; overall 69%; Figure 4). In the *leverage condition*, children chose the leverage option on 16% of all trials, thus ending the trial and providing two marbles to C2 and nothing to C1 (they never used the leverage option in the no leverage condition). However, the full-null model comparison indicated that the combined effect of the test predictors (leverage, dominance, their interaction as well as their interactions with trial number) on children's tendency to coordinate on the fair division was not significant, $\chi^2(6) = 2.79$, $p = .835$ (question 1). The leverage condition, dominance, or their interaction also did not affect how evenly payoffs were divided between children, overall, $F(59, 3) = 1.93$, $p = .135$ (full-null model comparison, question 2). However, children in the leverage condition were significantly more likely to coordinate on the fair division following trials on which C2 had used the leverage option on the previous trial compared to when C2 had not used it, $\chi^2(1) = 4.09$, $p = .043$ (question 3). As in Studies 1 and 2, children were more likely to coordinate on the fair division in later trials, $\chi^2(1) = 13.57$, $p < .001$ (Figure 5).

The bargaining analysis showed that dominance did not affect which child of the dyad took command, $\chi^2(1) = 0.13$, $p = .717$, or reversed their decision, $\chi^2(1) = 0.13$, $p = 717$, and in trials in which children had an explicit verbal conflict (22%), dyads were not more likely to pick the division favorable to the dominant child, $\chi^2(1) = 0.03$, $p = .866$. The probability of conflicts did not change significantly across trials, $\chi^2(1) = 2.83$, $p = .093$. Surprisingly, dominant children were less likely to give orders to their partner, $\chi^2(1) = 4.854$, $p = .028$.

Finally, we examined if children's bargaining affected their choices. This revealed that dyads were more likely to converge on the fair division when C2—the child benefitting from that division—took command of the situation by first pressing a button or by verbally proposing which division they should pick, $\chi^2(2) = 14.14$, $p = <.001$. Dyads were also more likely to choose the fair division when

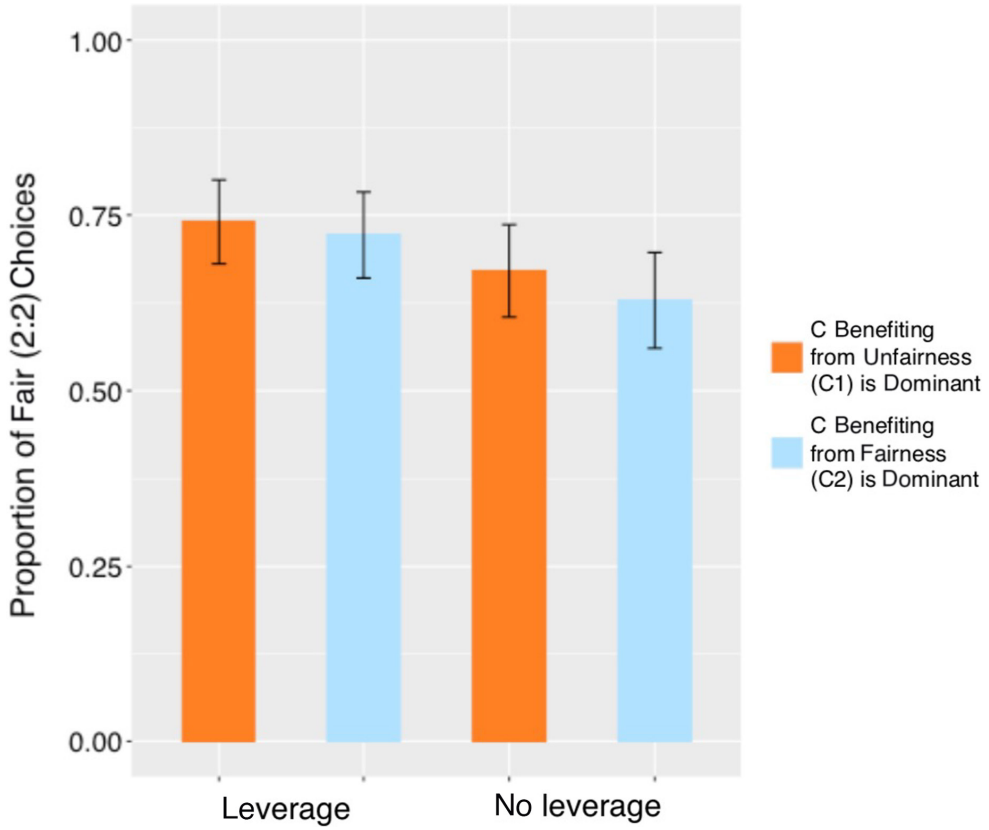

FIGURE 4 Results of Study 3: Mean proportion of trials on which dyads coordinated on the fair resource division in the leverage and the no leverage condition, divided into dyads in which C1 (the child benefitting from the unfair division) or C2 (the child benefitting from the fair resource division) was dominant

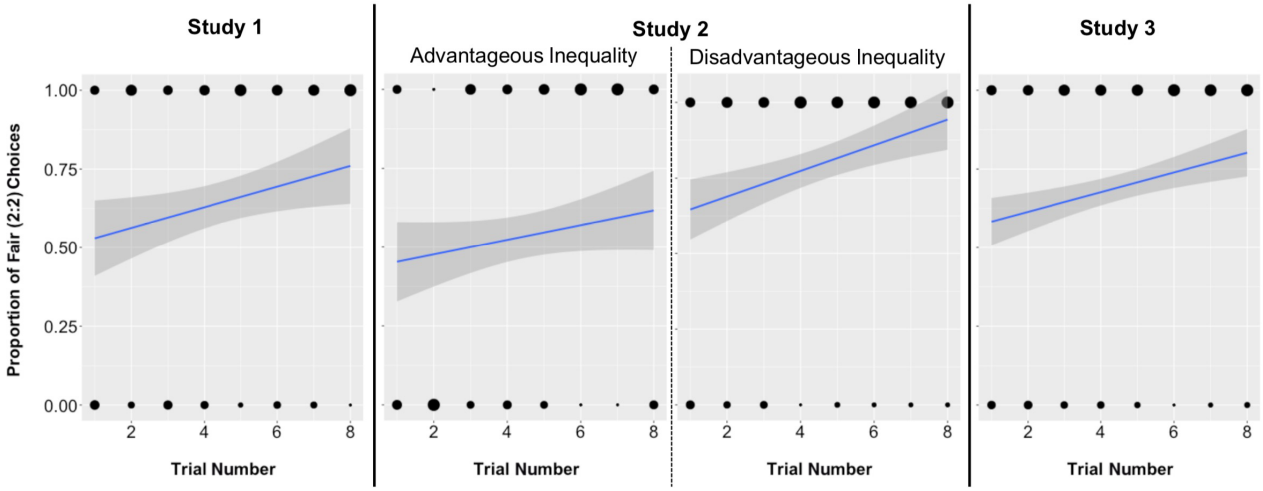

FIGURE 5 Effects of trial number on children's choices in Studies 1–3

C2 gave orders to their partner about which division they should pick, $\chi^2(1) = 4.05$, $p = .044$. In contrast, C1's orders did not have a significant effect, $\chi^2(1) = 1.88$, $p = .171$. Finally, as in Study 1 and 2, reason-giving affected children's choices, $\chi^2(2) = 7.30$, $p = .026$. Specifically, dyads were more likely to pick the fair division in response to reasons alluding to fairness or equality compared to other reasons, $p = .032$. For details on these analyses, see Supporting Information S3 and S5.

Discussion

The findings suggest that 5-year-old's comprehension of leverage is limited. Children did not strategically use leverage to persuade their partners to agree to fair resource divisions: while dyads agreed on the fair division somewhat more often in the *leverage* than in the *no leverage condition* (74% vs. 65%, respectively), this difference was not statistically significant. Dyads in the *leverage condition* also did not achieve fairer outcomes overall than dyads in the *no leverage condition* although children in the leverage condition did briefly choose more fairly on trials after the leverage option was used. These results indicate that 5-year-old children do not fully grasp the strategic advantages afforded by outside options, yet they seem to show the first responsiveness to leverage when it is being used (but note that these effects were short-lived).

Unexpectedly, and in contrast to Studies 1 and 2, children's tendency to coordinate on the equal reward division was not significantly affected by their dominance relation (this is also reflected in the analysis on children's bargaining where dominant children were not more likely to take command or to give orders). One difference between the studies that might account for this finding was that a new payoff configuration was introduced in Study 3. Perhaps the starker inequality of the unfair option in Study 2 and the greater net benefit of the fair option may have encouraged less dominant children to assert their will and made it harder for dominant individuals to justify why they should be advantaged. However, the bargaining analysis gives an indication of how children reached solutions more generally: children who took command of the situation by picking or proposing a solution first and who gave orders to their partner had a bargaining advantage, and as in Studies 1 and 2, fairness reasons promoted fair reward divisions.

GENERAL DISCUSSION

Together, the current experiments indicate that 5-year-old children already show a tendency to autonomously resolve conflicts in a fair way. In Studies 1 and 3, children faced a repeated bargaining problem in which they had to coordinate their decisions to be rewarded. In both studies, children were more likely to agree on fair than unfair solutions. These findings add to a growing literature suggesting that children's abilities to independently solve conflicts of interests markedly improve over the late preschool years (Grueneisen & Tomasello, 2017; Kagan & Madsen, 1971; Koomen & Herrmann, 2018; Melis et al., 2016; Sánchez-Amaro et al., 2017, 2019). By contrast, when dividing resources between themselves and a partner in anonymous dictator game contexts, 5-year-olds often act selfishly (Benenson et al., 2007; Fehr et al., 2008). Yet, they tend to proclaim that one ought to share equally (Smith et al., 2013) and hold egalitarian preferences when allocating resources among third parties (Shaw & Olson, 2012). In the current study, this normative understanding of fairness as well as a lack of legitimate reasons for why they should get more than their partner may have encouraged children advantaged by the unequal division to relent to their partner's demands for fair bargaining solutions.

The recurring nature of the problem seems to have been critical: children showed an increasing tendency to pick the fair division over trials (only 50% and 53% of dyads chose fairly on trial 1 in Studies 1 and 3, respectively) and, in a similar bargaining problem in which children could not communicate and played only once, 5-year-olds typically chose selfishly and thus failed to coordinate (Grueneisen & Tomasello, 2020). One possibility is that, after having accumulated resources in the game, advantaged children may have valued additional rewards less and thus became more willing to relinquish them to their partner. What speaks against this interpretation, however, is that verbal conflicts in which children overtly expressed opposing preferences about which division they should pick were common among children and did not decrease over trials, suggesting that motivation to win marbles remained high throughout the session. Instead, choosing the unfair division may have become increasingly hard to defend for the child benefitting from the unfairness, especially in the current face-to-face context in which children were directly and consistently confronted with their partner's dissatisfaction about the outcome. (This might also explain why we also observed trial effects in Study 2 in which children could choose alone.) Hence, the current data show that although 5-year-olds do not yet seem to enter bargaining situations jointly assuming solutions to be fair, they are able to arrive at fair agreements over repeated interactions and via explicit negotiation.

The bargaining analyses provide more detailed insights into how explicit communication affected outcomes. In all three studies, children were more likely to pick the fair division after a child had uttered a reason that alluded to fairness or equality. This suggests that 5-year-olds are able to come up with and show susceptibility to fairness reasons when resolving conflicts of interest (it should be noted, however, that children gave reasons only rarely). The analysis further revealed that being assertive was beneficial: children who ordered their partner to pick a division had a bargaining advantage in all of the studies. In Study 3, dyads were also more likely to pick the option favorable to the child who proposed a division first.

The current study also informs research on children's developing abilities for mental coordination. Previous work has shown that already at age 5 children show first competencies at coordinating decisions even in one-shot interactions in which they cannot communicate. For example, they can coordinate on solutions they jointly perceive to stick out, either because the solution is perceptually salient (Grueneisen et al., 2015a), others have coordinated on the solution previously (Berger et al., 2021; Grueneisen et al., 2015b), or because the solution can be presumed to be known by members of their cultural community (Goldvicht-Bacon & Diesendruck, 2016). To achieve this, children often make fairly sophisticated inferences about their interaction partner's perceptual states or beliefs and align their own decisions accordingly (Grueneisen et al., 2015c; Siposova et al., 2018). What these studies have in common, however, is that children's interests were perfectly aligned. In bargaining games like the current one, 5-year-olds either fail to coordinate (Grueneisen & Tomasello, 2020) or require multiple trials and open communication (this current study), suggesting that coordinating conflicting preferences adds considerable complexity.

A second main finding was that, while children generally gravitated toward fairness, dominant children were able to shift the outcome in their favor. In Study 1, dyads were more likely to coordinate on unfair divisions when the child benefitting from the unfairness was dominant. Conversely, dyads were more likely to choose fairly when the dominant child benefitted from fairness. (Future studies could add a systematic comparison to dyads consisting of children equal in dominance to test whether dominance effects are equally strong in both directions.) The bargaining analysis suggests that children asserted their dominance by giving orders to their partner about which division to choose.

Study 2 showed that dominance even affected children's choices when they could pick a reward division alone. Interestingly, this was only the case when children chose between a fair and an unfair reward division that put themselves at an advantage, with dominant children being more likely to choose selfishly than less dominant children. By contrast, children could not be swayed to pick an unfair reward division that favored their partner—irrespective of whether or not their partner was more dominant than them—suggesting that the effects of dominance and fairness considerations interact in guiding children's cooperative decision-making.

These findings correspond to previous work showing that dominant children tend to control access to collaboratively produced resources (Charlesworth & LaFreniere, 1983) and are less likely to concede in conflicts of interest (Grueneisen & Tomasello, 2017). However, one concern about the current studies is that the dominance measure, while being consistent with theoretical accounts defining dominance in terms of resource control (Hawley, 1999), could have been influenced by other factors. For instance, irrespective of their dominance status, traits such as selfishness, openness to experiences, or neophilia may have affected which child controlled access to the toy but also how children behaved in the bargaining game. While this concern cannot be ruled out completely, the bargaining analysis revealed that, in Study 1, children classified as dominant were also more likely to give orders to their partner in the bargaining game and their orders were more likely to sway the result—a result we think is more consistent with dominance than selfishness or neophilia (but note that this association between dominance and the effectiveness of orders was not found in Study 3).

A related concern is that the dominance test tapped into differences in motivation to interact with resources and that these motivational differences, rather than differences in dominance, were also expressed in the bargaining task. Although we did not test for motivation directly, the fact that we observed recurrent conflicts by dyads about which division to choose and, in Study 2, the high level of verbal protest by recipients against selfish partners indicates that motivation to win marbles was generally high. Indeed, rates of protest did not differ between dominant and less dominant recipients which does not support the notion that the dominance test merely captured differences in motivation. Most importantly, a second analysis using teacher ratings as a measure of dominance rather than the dominance test revealed a very similar pattern of results for Study 1 and Study 2 (no teacher ratings were obtained in Study 3). These analyses thus provide additional and independent support for the hypothesis that dominance can be an important factor in children's bargaining outcomes.

It should be noted, however, that no dominance effect was found in Study 3. A noticeable difference between studies was that children in Study 3 engaged in fewer verbal conflicts than in Study 1 (22% vs. 36% of all trials, respectively) and dominance asymmetries might be especially relevant when resolving overt confrontations. An explanation for the reduction in conflicts and the discrepancy between Studies 1 and 3 might be that, since dominance effects appear to interact with fairness concerns, the unfairness resulting from the unequal option in Study 3 was too stark for dominance asymmetries to be influential. However, what complicates the picture is that children in Study 1 and 3 coordinated on the unequal outcome at comparable rates suggesting that they were not generally more averse to the unequal option in Study 3. These findings underscore the need for further inquiry into the conditions under which social dominance affects children's bargaining.

Future work on the role of dominance would benefit from using a combination of in-depth teacher or parent interviews and a refined version of the current dominance test using familiar and desirable toys that children are motivated to engage with for an extended period of time. This would allow for a continuous rather than a binary measure of dominance while retaining the advantage of being short, easy for children to understand, and simple to administer. Another possibility would be to use naturalistic observations of children's peer interactions in their everyday environment to obtain an assessment of their dominance hierarchies (Pellegrini et al., 2007). In a second step, dominance rank information could be used as a predictor in controlled experiments such as the current one.

Finally, children's use of the outside option in Study 3 resulted in temporary concessions from their partner suggesting that children do show first signs of responding to leverage when it is used. However, these effects were short-lived and did not lead to more fairness overall. Generally speaking, children thus do not yet seem to register that outside options provide them with bargaining power which they can use strategically to avoid being taken advantage of. It remains to be seen, however, whether children's limited abilities are restricted to the current paradigm or if they are able to use leverage of different kinds. For instance, leverage in real life often comes in the form of alternative partners such that, when individuals find themselves in exploitative arrangements, they can abandon unfair partners in favor of fair ones (Baumard et al., 2013; Debove, André, et al., 2015). The developmental trajectories of children's use of different kinds of leverage in bargaining situations thus remain an interesting topic for future research.

In conclusion, the current studies show that 5-year-old children tend to settle on fair solutions in conflicts of interests requiring coordinated decisions. In light of previous research and compared to older children, they seem to require repeated face-to-face negotiations to do this (strategic use of leverage does not seem critical at this age). Children's bargaining outcomes are also affected by their dominance relation with dominant children being more likely to assert themselves and these dominance effects even extend to situations in which children can divide resources alone. Together, these findings indicate that fairness concerns are already an important aspect of 5-year-olds' bargaining solutions. However, fairness at this age is still unstable and children often switch to dominance strategies instead.

ACKNOWLEDGMENTS

We thank Claudia Salomo, Paul Bulano, Benjamin Reimann, and Linda Kerbl for their help with recruiting, testing, and coding. We thank Jan Engelmann for helpful comments on an earlier version of the article. We thank all children, parents, and daycare centers for their friendly cooperation. Open Access funding enabled and organized by Projekt DEAL.

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How to cite this article: Grueneisen, S., & Tomasello, M. (2022). How fairness and dominance guide young children's bargaining decisions. *Child Development*, *93*, 1318–1333. https://doi.org/10.1111/cdev.13757