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# Harsh but Expedient: Dominant Leaders Increase Group Cooperation via Threat of Punishment

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## Abstract

Dominant leadership is, surprisingly, on the rise globally. Previous studies have found that intergroup conflict increases followers' support for dominant leaders, but identifying the potential benefits that such leaders can supply is crucial to explaining their rise. We took a behavioral-economics approach in Study 1 ($N = 288$ adults), finding that cooperation among followers increases under leaders with a dominant reputation. This pattern held regardless of whether dominant leaders were assigned to groups, elected through a bidding process, or leading under intergroup competition. Moreover, Studies 2a to 2e ($N = 1{,}022$ adults) show that impressions of leader dominance evoked by personality profiles, authoritarian attitudes, or physical formidability similarly increase follower cooperation. We found a weaker but nonsignificant trend when dominance was cued by facial masculinity and no evidence when dominance was cued by aggressive disposition in a decision game. These findings highlight the unexpected benefits that dominant leaders can bestow on group cooperation through threat of punishment.

## Keywords

dominance, prestige, leadership, cooperation, punishment, follower psychology, open data, open materials, preregistered

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Many regions around the world, from the East to the West, are currently being swept by the rise of tough, threatening, and authoritarian leaders, so much so that many commentators describe current world political affairs as the dawn of a "strongmen era" (Bremmer, 2018). This surge of dominant leaders poses an important puzzle to social scientists. One rather obvious explanation for the preponderance of dominant leaders is their use of coercive means to gain power and authority (Henrich & Gil-White, 2001), whereby dominant individuals extract compliance by leveraging force, threats, and their general ability and willingness to inflict costs on others. Research across a range of social groups has revealed, for example, that individuals who are feared are accorded differential influence and leadership within groups—despite lacking greater respect or prestige (Cheng et al., 2013; Garfield & Hagen, 2020)—and are generally disliked by followers (Laustsen & Petersen, 2020a).

Although coercive compliance may be one contributing mechanism, it appears unable to fully explain why dominantly inclined individuals can effectively acquire leadership positions. General observation and evidence indicate that some dominant leaders are elected democratically and receive widespread follower support (Kakkar & Sivanathan, 2017; Laustsen & Petersen, 2020a, 2020b). This suggests that they may rise, in part, via prestige and freely conferred deference rather than strictly on the basis of coercive compliance, adding to the puzzle of how dominants rise to power. The current

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research explored the unexpected benefits that dominant leaders can sometimes generate for groups when leaders have the power to punish.

Why would followers tolerate dominant leaders, especially given their tendency to exploit followers and abuse power in pursuit of narrow self-interest (Maner & Mead, 2010)? Explanations that have been put forth refer to how dominant, assertive leaders assuage followers' concerns with uncertainty (Kakkar & Sivanathan, 2017), self-similarity with the leader (Mutz, 2018), and the leader's ability to successfully navigate conflicts with out-groups (de Waal-Andrews & van Vugt, 2020; Laustsen & Petersen, 2017, 2020a). Yet another common proposal is that dominant leaders can better resolve collective-action problems, including enforcing norms and deterring free riders who undercontribute to the public good (Bøggild & Laustsen, 2016; Lukaszewski et al., 2016). This notion, however, has not been directly tested; the only indirect support for this notion comes from vignette-based studies showing that people perceive dominant individuals as more capable of punishing norm violators and maintaining order (Lukaszewski et al., 2016). Whether such beliefs translate into dominant individuals actually being able to promote collective action, however, remains unclear.

Here, we filled this gap by testing whether dominant individuals can indeed more effectively increase group cooperation by deterring free riders. Much work has established that groups with a designated single punisher (e.g., leader; Fehr & Gächter, 2000; O'Gorman et al., 2009), decentralized peers (Balliet & Van Lange, 2013; Fehr & Gächter, 2002), or strong, more punitive institutions (Muthukrishna et al., 2017) can all achieve more efficient coordination in collective action, compared with groups without these punishment mechanisms. Our contention, however, is that not all leaders are equally effective at promoting group cooperation even when they have the same punishment power: Dominant leaders with a known history of willingness to inflict harsh punishment will have greater efficacy at promoting cooperation. Similarly, leaders who appear more dominant as a result of their personality dispositions, social and political attitudes, or physical attributes will also more effectively promote cooperation through anticipated punishment. When the threat of free-rider punishment looms large, followers are less likely to defect and more likely to cooperate under a dominant leader in charge of maintaining group order (Fehr & Gächter, 2000).

## Present Research

Our main research question focused on how dominant leaders shape group cooperation. In Study 1, we operationalized dominance using the degree of sanctioning threat that dominant leaders pose to group members, which was assessed using an endogenous measure of willingness to punish norm violators. Studies 2a through 2e extended Study 1 by diversifying the operationalization of leader dominance. In all studies, we tested the prediction that dominant leaders more effectively increase cooperative behavior among followers, compared with less dominant leaders. Beyond this primary prediction, we also examined several additional questions related to the foregoing theory, including how intergroup conflicts influence group cooperation, preference for dominant leaders, and their effects on cooperation.

### Statement of Relevance

Many regions around the world, from the East to the West, are currently being swept by the rise of tough, threatening, and authoritarian leaders. In this research, we examined why the popularity of strong leaders seems to be rising. One rather obvious mechanism for the preponderance of dominant leaders is their willingness to use coercive means and harsh sanctions to increase follower cooperation. Consistent with this suggestion, our results showed that leaders with a dominant reputation succeeded in increasing cooperation among followers. The finding was observed when leader-dominance impressions were evoked by punitive tendencies, personality profiles, authoritarian attitudes, or physical formidability. These findings highlight the unexpected benefits that dominant leaders can bestow on group cooperation through threat of punishment. This helps to explain why dominant leaders may at times gain support not in spite of, but precisely because of, their toughness.

## Study 1

To test our research question in Study 1, we used a behavioral-economics approach that measured real, naturalistic group-based decisions. Our predictions, research design, and analysis plan were preregistered (copies can be accessed at https://osf.io/s94ge/). Our OSF project also includes all deidentified data, analysis scripts, and descriptions of additional demographic and personality measures not examined in the present article.

### *Method*

***Participants.*** A total of 288 participants (168 women; age: $M$ = 20.81 years, $SD$ = 3.28) completed the study

across nine experimental sessions ($n$ per session = 32). Given the group-based nature of our study design, we recruited a convenience sample of individuals from a paid subject pool open to students and employees of the university. The total sample size was determined a priori to achieve a desired power of .80 for an effect size ($d$) of 0.78 (the meta-analytic effect size of costly punishment on cooperation; Balliet et al., 2011). Participants received a show-up fee of $7 plus an additional bonus payment earned in the form of points (converted to U.S. dollars at a rate of 100 points = $0.50). The average combined earnings were $16.76 ($SD$ = 2.79). Sessions were conducted between January and April 2019 and lasted 2 hr on average. All study procedures were approved by the University of Illinois at Urbana-Champaign Institutional Research Board.

***Procedures.*** The study was conducted one experimental session at a time. In each session, 32 participants were seated at 32 individual computer stations in a large computer laboratory. After providing informed consent, they played variations of the public-goods game (PGG)—a widely used measure of prosociality (Camerer & Fehr, 2002)—in real time and anonymously with each other via a web interface programmed in *oTree* (Version 2.5.5; Chen et al., 2016).[1]

*Experimental-design overview.* The study design had five within-subjects treatments: (a) standard PGG, (b) PGG with randomly designated leader, (c) PGG with either dominant leader or nondominant leader, (d) PGG with follower-chosen leader, and (e) PGG with intergroup competition (for a schematic overview of the experiment, see Fig. 1). Treatments appeared in this fixed order for all participants, who proceeded through the study synchronously in real time.

Each treatment consisted of eight rounds, except the standard PGG (Treatment 1), which had six rounds. In each round, players decided how much they wished to contribute to the public good. At the end of each round, only after having indicated their decision, they learned other players' contributions and the resulting payoff for each player. Groups were reshuffled after every round to avoid any reputational effects. We not explicitly inform players of the precise number of rounds to minimize endgame effects. All PGG contribution decisions were incentive compatible; participants were paid for their decisions on 17 rounds chosen randomly at the end of the experiment, and all points earned during the game were converted to U.S. dollars. Moreover, immediately before the PGG with randomly designated leader (Treatment 2), all participants individually completed a measure of their punitive tendency, which additionally provided a mechanism for allocating participants to dominant- or nondominant-leader roles in Treatment 3 (see below).

Participants always played in groups of four players. In all treatments except the standard PGG, one player was selected as a leader who is designated with the power to punish other people using taxes that are mandatorily extracted from everyone in the group (including the group leader). The allocation of the leader role varied between treatments. In the PGG with randomly designated leader (Treatment 2), the leader role was randomly allocated to one player. By contrast, in all subsequent treatments, the leader role was nonrandomly allocated; only the most highly dominant players or least dominant players within the session were allocated as leaders using the punitive-tendency measures as a proxy for dominance. This served as our manipulation of dominant and nondominant leaders. At the beginning of each treatment, instructions for the period were presented to participants with a video recording followed by a short quiz to verify comprehension of the rules of that treatment. All players were anonymous, identified only by player ID (i.e., Group Leader, Group Member 1, Group Member 2, Group Member 3).

*Variations of PGG treatments.* The experiment began with a standard PGG treatment (Treatment 1), administered to both measure participants' baseline level of cooperation (i.e., their willingness to contribute in the absence of any threat of punishment) and facilitate familiarization with the basic setup. In each round, participants received an endowment of 100 points and had to decide how many of these points to contribute to a group project and how many to keep to themselves. All contributions were multiplied by a factor of 1.6 and then distributed equally among all group members. This game captured the tension between individual and group interests; contributing benefited the group collectively but was individually costly, thus creating incentives to be a free rider by limiting one's contribution (Fehr & Fischbacher, 2004; Fehr & Gächter, 2000).

*PGG with randomly designated leader (Treatment 2).* To introduce leadership (and the treatment of punishment), we next presented participants with a PGG with a randomly selected leader. One player was randomly selected as the group leader who could mete out punishment (i.e., remove points) using fixed taxes extracted from the group (10 points were taxed from each player's initial endowment; Muthukrishna et al., 2017). This method of "pool punishment" captures the real-life practice of outsourcing punishment to a central authority—such as a paid third party or organization (e.g., a police force)—through public investment. Past work has revealed that people generally prefer this institutional arrangement over

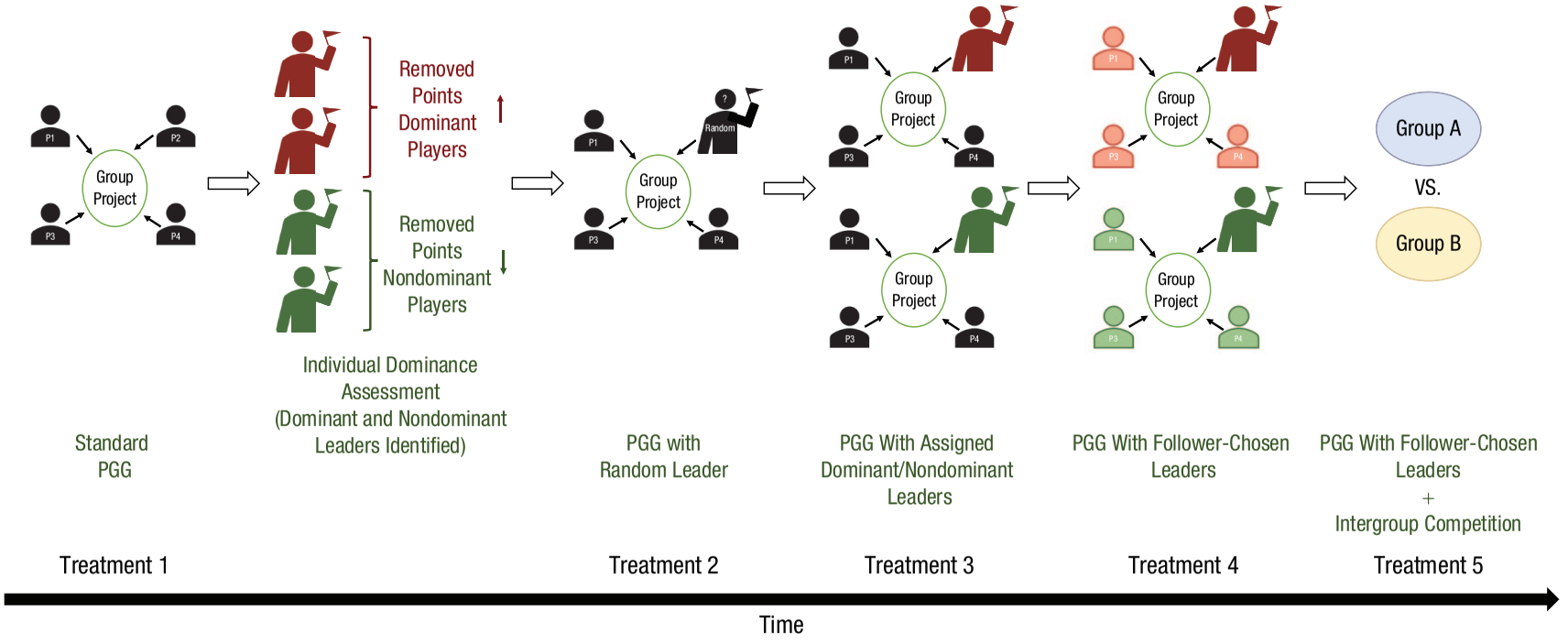


**Fig. 1.** Design of Study 1. In Treatment 1, participants were placed in groups of four and completed six rounds of the standard public-goods game (PGG). Each participant was given 100 points and had to decide how much to contribute to the group project (i.e., the public good) and how much to keep for themselves. We then assessed each participant's dispositional dominance, operationalized as their willingness to punish others, and classified them into one of three categories (i.e., dominant vs. nondominant vs. moderate players). In this assessment, we asked each participant to play the role of a leader in three hypothetical rounds of the PGG with leader punishment, in which they decided how many points to remove from designated free riders; dominant players (depicted in red) were the top 12.5% of participants who removed the most points, nondominant players (depicted in green) were the bottom 12.5% of participants who removed the fewest points, and moderate players were the 75% of participants who fell between these two. Next, in Treatment 2, participants completed another eight rounds of the PGG with leader punishment, in which the leader was permitted to punish other players by removing points. "Group Leader" was randomly assigned from among one of the participants in that group. In Treatment 3, across a total of eight rounds, each group was assigned either a dominant leader (red) or a nondominant leader (green) on the basis of the dominance classifications in Treatment 1. Treatment 4 extended Treatment 3 but allowed group members to select their own leader. Participants who spent more points bidding for a dominant leader (depicted in light red) were subsequently more likely to be paired with a dominant leader, whereas those who spent very few points bidding for a dominant leader (depicted in light green) were subsequently more likely to be paired with a nondominant leader. Treatment 5 extended Treatment 4 by introducing intergroup competition. For full details, see the Procedures section in Study 1. P = player.

an alternate system in which punishment acts are carried out by peers (Traulsen et al., 2012). In this treatment, every player had an equal chance of being selected as the group leader.

At the start of each round, all players were informed of their role (leader or nonleader), and then they privately indicated the amount they wished to contribute (their PGG decision). Importantly, in this treatment, players did not receive any additional information about their leaders (who obtained their role through random allocation) before making contribution decisions. After all decisions were recorded, the designated leader received information on the players' contributions and exercised their monitoring power by deciding how many points they wanted to "remove" from each player using the collective tax fund (which contained a total of 40 points). Any unspent tax points were forfeited; they could neither be returned to the taxpayers nor be pocketed by the leader, and hence leaders did not stand to gain personally by withholding punishment (by contrast, leaders benefited by increasing the size of the public good through punishing and constraining free riding). For every punishment point that a leader spent, the punished follower lost 3 points (i.e., a punishment multiplier of 3). At the end of each round, all players learned their individual payoff and that of other followers from the PGG, including all other followers' contributions to the shared project and the number of points they lost (if any) owing to the leader's punishment decision.

*Punitiveness assessment and dominance classification.* To capture individual differences in willingness to punish (a proxy for dominance, or the capacity to enforce coercive compliance through fear), just before Treatment 2 (above) was completed, we presented all participants with three rounds of the PGG with randomly designated leader, in which they always played the leader role. All participants, designated as leader, were shown the same hypothetical player contributions in each round and indicated how many points (0–60) they wished to remove from the single player who contributed the least to the group project (i.e., who is most likely to be considered the free rider in the group). To survey punitive sentiment toward free-riding behavior across a range of situations, we designed each round to depict different player contribution amounts. Participants were informed that their punishment decisions would not affect their payoff but may influence their experience in the remaining parts of the experiment. For each participant, we averaged punishment decisions across the three rounds to create an overall, continuous measure of punitiveness ($\alpha = .93$, $M = 13.55$, $SD = 14.46$).

Using this punitiveness measure, we classified each participant as one of three types of individual: *dominant* (top four most punitive participants out of the 32 participants in the current session, or top 12.5%), *nondominant* (the four least punitive participants in the session, or bottom 12.5%), or *moderate* (the intermediary 24 participants who fell between these two extreme ends, or middle 75%). In our subsequent treatments (described below), players saw the category to which their leader belonged. This provided players with information on their current leader's dominance reputation (before indicating their contribution), thus allowing us to examine how a leader's perceived dominance—shaped directly by the history of their punishment acts—influences follower cooperation. This approach of operationalizing leader dominance through threat-based reputation informed by actual punitive behavior more closely resembles how followers come to formulate impressions of their leader (i.e., on the basis of known history of behavior).

*PGG with dominant versus nondominant leader (Treatment 3).* To establish the effect of dominant leadership—the central focus of the current study—we modified the previous treatment by allocating the leader role only to participants who were previously classified as either dominant or nondominant. Thus, leadership allocation was nonrandom in this treatment, in contrast to the PGG with randomly designated leader. Participants classified as moderate players always played the follower role.

Crucial to this design was that before participants made contribution decisions, we manipulated the leader's perceived dominance by explicitly revealing to followers the punitiveness category to which their leader belonged. Specifically, when paired with a dominant leader, followers were informed, "Your Group Leader is from Category A (participants who removed the most points)," and when paired with a nondominant leader, followers were informed, "Your Group Leader is from Category C (participants who removed the fewest points)." This revealed to followers their leader's history of dominance (while protecting anonymity). All followers played four rounds with a dominant leader and another four rounds with a nondominant leader, in a random order. Importantly, this setup resulted in four PGG transfer decisions (per player) that captured their response to dominant leaders and four separate transfer decisions that captured their response to nondominant leaders. New leaders—from the pool of individuals classified as dominant and nondominant—were selected in each round with replacement. Overall, this treatment allowed us to examine how followers' cooperative

behavior responded to leadership under more or less dominant leaders who varied in their history of in-game punitive behavior and reputation.

*PGG with follower-chosen leader (Treatment 4).* In the next treatment, we allowed followers to participate in the selection of their monitoring authority for two reasons. First and foremost, we aimed to explore whether the effect of dominant leadership may be augmented when leaders have greater legitimacy, such as when selected via election in contrast with a random selection process. Existing work raises the possibility that followers may be more responsive to the authority of an elected official with greater perceived legitimacy (Baldassarri & Grossman, 2011). Our secondary goal was to examine whether people exhibit a general preference for dominant leaders when facing collective-action problems. Players may, for example, intuit that a tough, punitive leader can help sustain cooperation by constraining in-group free riding.

With these two goals in mind, here we assessed preference among followers for a dominant leader and the effect of these "chosen leaders" on PGG transfer. In this treatment, we modified the game by offering players the choice to bid for a particular category of leader (dominant or nondominant). At the start of each round, followers were given 100 bid-fund points that they could spend. Higher bids increased the likelihood of receiving a leader in the dominant category. After the bidding process terminated at the end of each round, we paired the top 12 bidders (of the 24 follower players) with the four dominant leaders (forming four groups of four) and the bottom 12 bidders with the four nondominant leaders (forming another four groups of four). Any unspent bid-fund points were directed into a player's personal fund as the take-home payment; hence, bidding for a dominant leader is very costly. Immediately following this bidding procedure, followers were explicitly informed of the punitiveness category of their leader (i.e, whether they had previously removed the most or the fewest points). All players then proceeded to play the same game as in the PGG with dominant versus nondominant leader. Hence, some groups (and their players) received dominant leaders, whereas other groups (and their players) received nondominant leaders. When a round concluded, a new round began again with the bidding procedure, for a total of eight rounds.

*PGG with intergroup competition (Treatment 5).* Finally, to explore intergroup psychology, we modified the PGG with follower-chosen leader to include an intergroup-competition element. Players were informed that two groups would be randomly matched against each other in each round and that the group with the larger group project would win. The individual payoff for all players in the winning group was increased by 20%, whereas the payoff for the losing group was decreased by 20%. Apart from this intergroup-competition modification, other aspects across the eight rounds of this treatment were otherwise identical to the PGG with follower-chosen leader. Our goal here was to examine how preferences for dominant leaders and cooperation may respond to intergroup competition.

After completing these five treatments, participants filled out an exit survey containing demographic and personality inventories. They then viewed a summary page detailing their final take-home earnings and were paid and dismissed.

## Results

To analyze these data, we modeled PGG contributions by accounting for the clustering using random effects for multiple contribution decisions within the same participant. Note that this procedure partially diverged from our preregistered plan, in which we initially proposed the inclusion of random effects for participants within groups on the basis of our experimental design. After data collection, however, we observed that there was, empirically, little clustering of the PGG data points by group (i.e., groups did not differ in their mean levels of contribution). Results showed that the group-to-group variance in mean group-level contribution was sometimes empirically indistinguishable from zero. Given this feature of the data, we used a two-level (PGG transfer nested within individual) mixed model implemented in the *nlme* package (Version 3.1-117; Pinheiro, 2014) in the R programming environment.

***Main analyses: Do dominant leaders promote cooperation among followers?*** Because we used a within-subjects design in which participants completed all experimental treatments in a fixed order, we were able to compare cooperation levels of the same players both within and across treatments. We focused only on cooperation among followers and excluded leader contributions.[2] We began by verifying our dominance classification. As expected, individuals who we classified as—and who played the role of—dominant (who were most punitive in the hypothetical PGG rounds) indeed subsequently allocated more punishment when they were given punitive authority in the leader role ($M = 19.93$, $SD = 22.64$), compared with those classified as nondominant leaders (who were least punitive in hypothetical PGG rounds; $M = 12.98$, $SD = 19.45$), $\gamma = 6.95$, $SE = 0.73$, 95% confidence interval (CI) = [5.52, 8.38], $t(1510.26) = 9.47$, $p < .001$.

The key prediction of interest here was whether follower cooperation would increase when followers are

**Table 1.** Model Results for the Effect of Leader Dominance on Follower Contributions in Study 1

| Fixed-effects predictor | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| | Treatment 3 | Treatment 4 | Treatment 5 | Treatment 3 | Treatment 4 | Treatment 5 |
| Leader (1 = dominant, 0 = nondominant) | 16.76*** [14.96, 18.55] | 19.32*** [17.02, 21.61] | 6.72*** [2.93, 10.51] | 18.24*** [15.14, 30.02] | 18.58*** [14.52, 22.64] | 9.58** [2.95, 16.21] |
| Female | | | | 5.59 [–0.54, 11.71] | 5.09 [–1.12, 11.29] | 5.06 [–4.61, 14.73] |
| Female × Leader | | | | –1.90 [–5.78, 1.98] | 1.56 [–3.43, 6.55] | –3.41 [–11.53, 4.71] |
| Intercept | 28.65*** [25.82, 31.48] | 23.66*** [20.76, 26.57] | 60.47*** [55.88, 65.05] | 25.14*** [20.25, 30.02] | 20.67*** [15.75, 25.59] | 57.61*** [49.57, 65.35] |
| $\tau_0^2$ | 360.8 | 352.4 | 715.8 | 366.8 | 354.8 | 692.7 |
| $\sigma^2$ | 361.9 | 224.3 | 370.1 | 368.7 | 224.5 | 357.5 |
| Observations | 1,728 | 1,440 | 1,344 | 1,624 | 1,351 | 1,264 |
| Group variable (participants) | 216 | 216 | 168 | 203 | 203 | 158 |

Note: Unstandardized mixed model parameter estimates and 95% confidence intervals are shown for each fixed-effects predictor. The dependent variable was follower contributions, expressed as a percentage of the initial endowment, modeled across each type of treatment (Treatment 3 = dominant leaders are assigned, Treatment 4 = dominant leaders are chosen by followers, Treatment 5 = intergroup competition is present). In all models, we accounted for the clustering created by the experimental design by including random intercepts for multiple public-goods-game decisions within players.
**$p < .001$. ***$p < .0001$.

led by a dominant leader, as stated in the preregistration. To test this, we regressed follower contribution on leader dominance (classified using the measure of punitiveness; 1 = dominant leader, 0 = nondominant leader), separately for each of the three treatments with designated dominant and nondominant leaders.[3] Results for all models in Study 1 are shown in Table 1, but only results from Model 1 are discussed here in the Results section. In all three PGG treatments, followers cooperated more with dominant than with nondominant leaders. We found that mean contributions increased by 16.7% when a leader with a dominant reputation was established as a central authority, and even more by 19.3% when their authority had been certified by followers' choices. Perhaps more impressively, even in the context of intergroup competition—under which cooperation levels tripled, as is shown in other work (Tan & Bolle, 2007) and predicted in our preregistration—the same positive effect of dominant leadership was observed, although the increase was substantially smaller in magnitude at 6.7% (but nevertheless significantly different from zero). The effects were robust when we controlled for main and interaction effects of follower gender, neither of which reached significance in the models examined.

Having ascertained the effect of dominant leaders on contributions, we next sought to examine how followers allowed the reputation of their leaders to influence their willingness to invest in the public good. One possibility is that followers increased their contribution strictly in response to the knowledge that the current leader had been a harsh enforcing agent in the past (i.e., leader reputation) without needing to directly observe how punitive leaders influence other group members' actual cooperation outcomes. Or, alternatively, the above results could reflect a learning effect in which followers increased their contribution only after (but not before) directly witnessing how other followers reacted to dominant leaders. To assess whether leader reputation alone is sufficient to promote cooperation, we repeated our analysis above but restricted it to modeling follower contributions in the very first round of the PGG with dominant versus nondominant leader (Treatment 3), in which players were first introduced to the leader's reputation (i.e., leader classification based on being the most or least punitive in the hypothetical PGG rounds) but had yet to be shown how said leader affected the provision of public goods (i.e., how other followers responded to leaders who varied in dominance; $n = 108$ followers in each type of leader condition). Note, however, that this additional analysis was not stated in our preregistration. Consistent with our results above, findings of this analysis showed that under these conditions, followers increased their investment in the public good by 18.41% ($SE = 4.12$, 95% CI = [10.29, 26.53]) when their leader had a more dominant reputation, $t(214) = 4.47$, $p < .0001$. This indicates that followers increased their contributions strictly because they had knowledge of the sanctioning authority's history of punitiveness or,

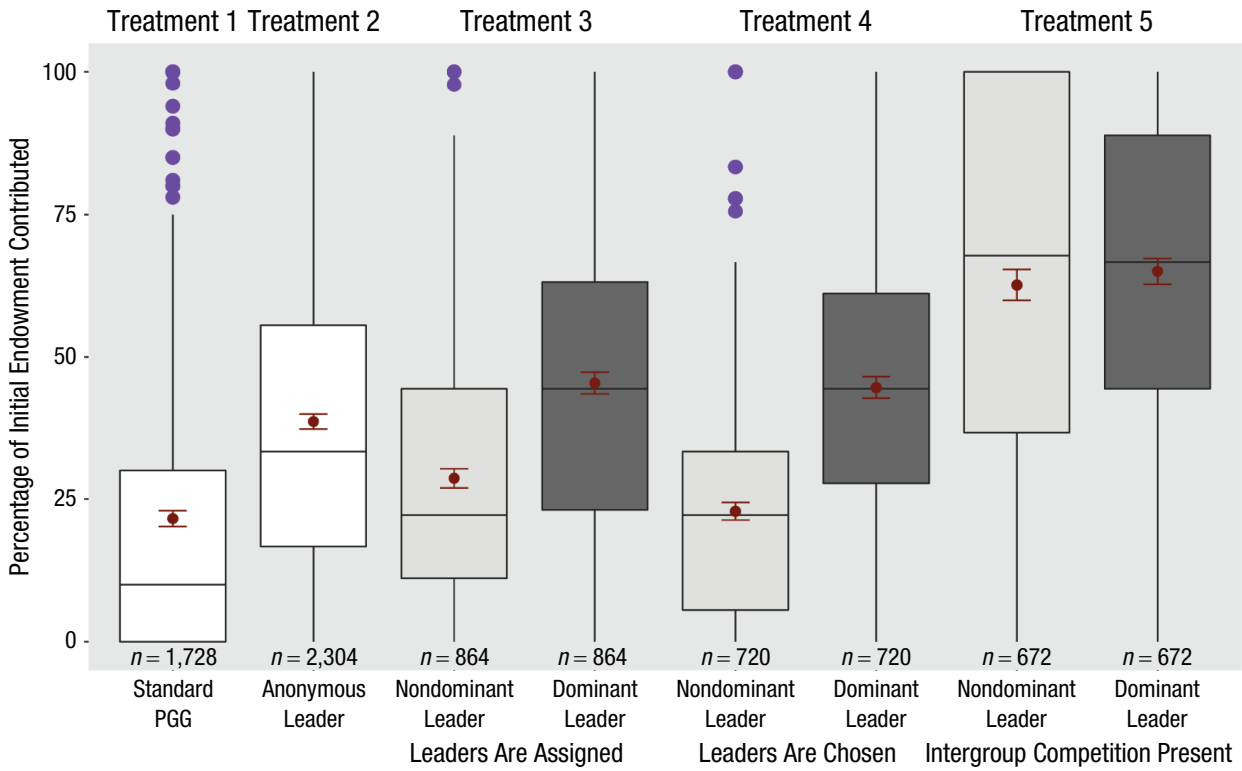


**Fig. 2.** Percentage of their initial endowments that followers contributed in different conditions of the public-goods game (PGG) in Study 1. In each box plot, the horizontal line represents the median, and the top and bottom hinges of the box indicate the first and third quartiles, respectively. Whiskers extend 1.5 times the interquartile range. Means are marked by red circles, and error bars represent 95% confidence intervals. Purple circles are outliers.

put differently, out of fear of a dominant leader's reputation, and they did not need to be exposed to a dominant leader's demonstrated effectiveness at increasing cooperation before raising their contribution.[4]

***Do weak leaders undermine cooperation?*** The results thus far highlight that under the same contextual conditions (i.e., within treatment), cooperation effectively increases under dominant leaders. An important question that we have yet to examine is whether cooperation can always be improved by revealing to followers the reputation of their leaders. It stands to reason that the answer is no. A weak leader who is unable or unwilling to enforce the rule of law may ultimately be less of a deterrent to free riding than a leader whose reputation is unknown or ambiguous. On the other hand, a leader with a fearsome reputation is likely to pose a greater threat of sanction to free riders, thus improving the public good relative to an unknown leader.

To examine these possibilities, we contrasted levels of cooperation (indexed by the percentage of their initial endowments followers contributed) across treatments. Figure 2 shows that, indeed, reputational information backfires on weaker leaders and helps only dominant leaders. Comparing treatments, we found that cooperation was the lowest (at 21.6%) in the standard PGG treatment, in the absence of any centralized sanctioning system (the baseline), but improved with the introduction of a single punishing monitor (as predicted in our preregistration), albeit to differing degrees across different types of leaders. That is, in the event of a randomly designated leader, when a leader can be anyone with a variable and unknown degree of dominance, cooperation improved to 38.6%, $\gamma = 17.15$, $SE = 0.72$, 95% CI = [15.73, 18.56], $t(3172.92) = 23.73$, $p < .001$. Importantly, however, cooperation declined to 28.7% when a leader's reputation was publicized but the leader was revealed to have punished weakly in the past (i.e., the leader was classified as nondominant), compared with a random leader with unknown dominance (38.6%), $\gamma = -10.06$, $SE = 0.78$, 95% CI = [−11.59, −8.53], $t(2356.58) = -12.84$, $p < .001$. In sharp contrast, cooperation increased to 45.4% when the leader's reputation was publicized and the leader was revealed to have punished harshly in the past—compared with a nondominant leader (28.7%), $\gamma = 16.76$, $SE = 0.92$, 95% CI = [14.96, 18.55], $t(1512.00) = 18.31$, $p < .001$, or compared with a random leader with unknown dominance (38.6%), $\gamma = 6.66$, $SE = 0.80$, 95% CI = [5.09, 8.23], $t(2355.08) = 8.30$, $p < .001$. The same patterns were

found when leaders were chosen via bids (Treatment 4) rather than allocated to groups.

These results demonstrate that not all leaders are equally effective at improving groupwide cooperation. Whereas cooperation increased under leaders with a known history of dominance to a significantly greater degree than under an anonymous leader with an unknown punishment history, nondominant leaders had the opposite effect: Cooperation significantly decreased for such leaders. Taken together, these analyses indicate that leader reputation is a double-edged sword that either improves or cripples cooperation depending on whether the leader has a reputation that connotes strength or weakness.

***Subsidiary analyses: Dominant leaders inspire both fear and respect.*** As we show above, strong, punitive leaders are able to elicit cooperation and deter free riding from subordinates who may fear the consequence of punishment. However, beyond controlling followers through fear and compliance, punitive leaders may also inspire respect and admiration by demonstrating a commitment to sanctioning violators and promoting collective action, thus gaining status based on both prestige and dominance (Cheng et al., 2013; Henrich & Gil-White, 2001). Although this question falls outside our primary research goal and was not included as part of our preregistration, it is nevertheless important to understand the relationship that punitive leaders establish with their followers and the basis of their influence, beyond confirming that dominant leaders, as conceptualized here, are indeed feared.

In a separate study (reported here only partially for brevity), a group of 98 raters, recruited from Amazon Mechanical Turk (MTurk), was randomly presented with a subset of six punishment responses elicited from participants in the current laboratory study (i.e., punitiveness profiles, indexed by the number of points that a participant removed from the norm violator). These raters indicated the perceived dominance and prestige of these six participants, who spanned a range in their punitiveness by removing anywhere from 0 to 60 points, using an abbreviated six-item Prestige and Dominance scale (from the study by Cheng et al., 2010). Confirming the effectiveness of our punitiveness measure in eliciting greater perceived dominance (and thus highlighting the validity of our experimental manipulation), results showed that regressing dominance (averaged across multiple raters) on participant punitiveness had a strong, linear, and positive effect, $b = 0.07$, $SE = 0.003$, 95% CI = [0.06, 0.08], $\beta = 0.70$, $SE = 0.03$, 95% CI = [0.64, 0.76], $t(49) = 23.34$, $p < .00001$. Moreover, regressing prestige (averaged across multiple raters) on participant punitiveness revealed a similar but weaker positive association, $b = 0.036$, $SE = 0.004$, 95% CI = [0.03, 0.05], $\beta = 0.40$, $SE = 0.05$, 95% CI = [0.30, 0.50], $t(49) = 8.08$, $p < .00001$. Note, however, that punitive leaders appear more dominant than they appear prestigious; the coefficient for prestige is half the size of that for dominance and is significantly larger in magnitude (dependent-sample coefficient test, $z = 4.33$, $p < .001$). Still, even evidently dominant behaviors such as punishing violators can earn prestige. This suggests that, despite wielding control over punishments, the dominant leaders in our study were unlike the less dominant leaders in their reputation; through their demonstrated greater readiness to sanction transgressors, they cultivated both fear (dominance-based status) and respect (prestige-based status). These findings are consistent with the notion that dominance-oriented leaders may be preferentially favored and gain support for their capacity to enforce norms and maintain the public good (Lukaszewski et al., 2016).[5]

***Additional analyses.***

*Preference for dominant leaders.* In light of existing evidence linking formidable traits to greater perceived capacity to both enforce group norms and resolve conflicts with out-groups (Lukaszewski et al., 2016), we predicted in our preregistration that followers would express greater preference for a dominant leader both when given a say over the leader-selection process (in the PGG with follower-chosen leader) and in the presence of intergroup competition (in the PGG with intergroup competition). However, the bidding procedure used to assess leader preference exhibited a floor effect ($M = 12.92$, $SD = 22.77$, minimum = 0, maximum = 100), with 0 bid points spent in the majority of bidding decisions (61%) and the higher end of 50 points and above spent only in 11.4% of bidding decisions. This limited variability in the leader-preference variable precluded the opportunity to model leader preferences. Unsurprisingly, contrary to our stated predictions, results showed that bid points spent toward acquiring a dominant leader were low when intergroup competition was absent ($M = 13.59$, $SD = 23.12$) or present ($M = 12.19$, $SD = 22.36$), and the difference across these treatment conditions did not reach statistical significance, $\gamma = -1.17$, $SE = 0.60$, 95% CI = [−2.35, 0.01], $t(2630.89) = -1.94$, $p = .052$. We return to the limitations of this bidding procedure in the General Discussion.[6]

*Effect of intergroup competition.* Beyond expecting intergroup competition to intensify a preference for dominant leaders, we also proposed in the preregistration the expectation for the threat of dominant leaders and intergroup conflicts to act synergistically in promoting cooperation (beyond their predicted and confirmed independent effects). We indeed found an interactive effect between leader dominance (1 = dominant) and intergroup competition (1 = present), $\gamma = -16.81$, $SE = 1.63$, 95% CI = [−19.99,

−13.62], $t(2629.53) = -10.33$, $p < .001$, but the result was in a different direction from that hypothesized. The effect of dominant leaders on follower cooperation, although significant in both cases, was weaker when intergroup competition was present, $\gamma = 6.72$, $SE = 1.93$, 95% CI = [2.93, 10.51], $t(1333.30) = 3.48$, $p < .001$, than when intergroup competition was absent, $\gamma = 19.31$, $SE = 1.17$, 95% CI = [17.02, 21.61], $t(1426.36) = 16.50$, $p < .001$. As stated in our preregistration, we also conducted additional analyses (including robustness checks) in which we progressively added personality covariates into our models (for full results, see Table S1 in the supplemental online material [SOM] available at https://osf.io/zdhkj/; for descriptive statistics of all variables measured, see Table S4 at https://osf.io/zdhkj/).

### *Discussion*

Together, the findings from Study 1 demonstrate that follower cooperation increased under dominant leaders across a range of situations, including when leaders were assigned, elected, or leading under intergroup competition.

## Studies 2a to 2e

To test whether the effect of dominant leaders generalizes when dominance is cued using other means, we conducted five additional studies that diversified the operationalization of dominance using facial masculinity (Study 2a), dominant personality descriptions (Study 2b), disposition toward aggressive behaviors (Study 2c), endorsement of authoritarian social and political policies (Study 2d), and physical formidability (Study 2e). All studies were preregistered (https://osf.io/s94ge/).

### *Method*

***Participants.*** We conducted a priori power analyses for all five studies by assuming an effect size ($r$) of .21 (the average effect size in social-psychological research; Richard et al., 2003). Participants in all studies were recruited from MTurk. There were 189 participants in Study 2a (75 women; age: $M = 37.77$ years, $SD = 11.10$), 283 in Study 2b (128 women; age: $M = 37.92$ years, $SD = 11.03$), 199 in Study 2c (77 women; age: $M = 38.01$ years, $SD = 10.06$), 202 in Study 2d (80 women; age: $M = 40.71$ years, $SD = 12.19$), and 247 in Study 2e (117 women; age: $M = 40.34$ years, $SD = 11.73$). As stated in our preregistration, we oversampled in all studies by an additional 30% to 40% of our targeted sample sizes to account for potential exclusions.[7] All study procedures were approved by the University of Illinois at Urbana-Champaign Institutional Research Board.

***Procedures.*** As in Study 1, all five studies were programmed on *oTree* (Version 2.5.5; Chen et al., 2016). In all five studies, participants first learned the rules and completed a standard PGG with no punishment (one practice trial plus three rounds; similar to Study 1). Then we introduced a between-subjects design with two levels: Participants played three rounds of a PGG with either a dominant leader or a nondominant leader who had punishing power (similar to Study 1, Treatment 3).[8] In all rounds, players were informed that they were playing with new group members in each round but that in the PGG-with-leader rounds, they had the same leader in all three rounds. Except for the practice trial, no feedback was provided regarding the other group members' contributions or the leader's punishment decision. Unlike in Study 1, participants were led to believe that they were playing synchronously in groups of four players, despite in actuality each completing the study alone without group members. In addition, all participants played only the follower role, and there were no real leader players beyond the fictitious information provided. We also increased the group-project multiplier from 1.6 (in Study 1) to 2. To reduce complexity, we simply described punishment as determined by the leader (who can remove up to 60 points from each group member) rather than funded by a punishment pool as in Study 1.

To manipulate leader dominance in the PGG-with-leader rounds, we provided participants with background information about their group leader before the start of the first round (for a summary, see Fig. 3). In Study 2a, participants were shown either a masculinized (dominant-leader treatment) or feminized (nondominant-leader treatment) version of the same face (their group leader). In Study 2b, participants read a description ostensibly written by their group leader (for a similar design, see Laustsen, 2017), in which the individual self-described as having a domineering personality (dominant-leader treatment) or nondomineering personality (nondominant-leader treatment). In Study 2c, participants learned that their group leader, who played the hawk-dove game (Maynard Smith & Parker, 1976), had ostensibly either displayed a motivation for dominance and aggression, by playing the hawkish strategy that involves claiming another player's money (dominant-leader treatment), or displayed a passive motivation, by playing the dovish strategy that involves not claiming another player's money (nondominant-leader treatment). In Study 2d, participants were led to believe that their group leader had either strongly endorsed authoritarian social or political policies (such as support for harsh punishment, gun ownership; dominant-leader treatment) or opposed these policies (nondominant-leader treatment). Finally, the group leader in Study 2e self-reported to have either formidable (dominant-leader treatment) or nonformidable (nondominant-leader treatment) physical characteristics, reflected in their ostensible self-reports (e.g., "I am physically

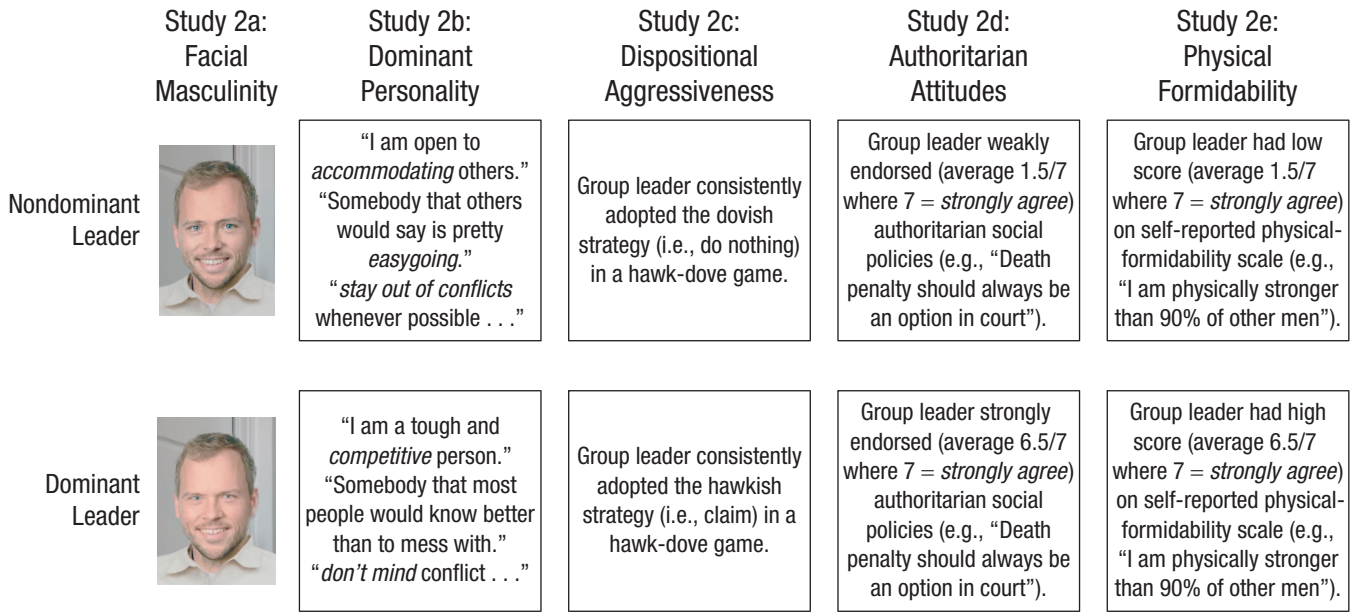


**Fig. 3.** Stimuli used to manipulate leader dominance in Studies 2a to 2e. In Study 2a, participants were shown a personal photo that the group leader had ostensibly uploaded. In Study 2b, they were presented with a self description that the group leader had ostensibly written. In Study 2c, participants viewed the group leader's ostensible decisions in several rounds of the hawk-dove game. Finally, participants viewed the group leader's ostensible responses on items pertaining to the endorsement of authoritarian social and political policies (Study 2d) or self-reported physical formidability (Study 2e).

stronger than 90% of other [men/women]"). As part of this experimental manipulation, participants learned that this information—in the form of the photograph, self-description, or responses on questionnaires—was previously provided by their group leader, who completed an additional or the same background survey prior to joining the game (for details, see https://osf.io/zdhkj/).

Finally, participants provided ratings of their group leader, including items used as manipulation checks for leader dominance and prestige, leader endorsement, and perceived leader harshness, and completed a demographic questionnaire (for full descriptions of these measures and manipulation check results, see https://osf.io/zdhkj/).

## Results

***Main analysis: Do dominant leaders promote cooperation among followers?*** To examine the effect of leader dominance on cooperation, in each study, we regressed follower contributions in the PGG-with-leader rounds on leader dominance (1 = dominant leader, 0 = nondominant leader), accounting for clustering using random effects for multiple contribution decisions within participants (see Table 2 and Fig. 4). Our interpretation of findings below refers to the results shown in Table 2 for Model 1. Overall, results supported our prediction. Specifically, we found that leaders with more domineering personalities (Study 2b), $\gamma = 12.26$, $SE = 4.57$, 95% CI = [3.30, 21.22], $t(185) = 2.68$, $p = .008$,[9] who more strongly endorsed authoritarian social and political policies (Study 2d), $\gamma = 11.06$, $SE = 4.69$, 95% CI = [1.87, 20.24], $t(200) = 2.36$, $p = .019$, or who had greater perceived physical formidability (Study 2e), $\gamma = 8.90$, $SE = 4.31$, 95% CI = [0.44, 17.35], $t(245) = 2.06$, $p = .040$, all elicited greater follower contributions, relative to nondominant leaders. Results from Study 2a (in which leader dominance was manipulated via facial masculinity), $\gamma = 8.47$, $SE = 4.78$, 95% CI = [–0.90, 17.83], $t(187) = 1.77$, $p = .078$, although nonsignificant, were nonetheless in the predicted direction. We did not observe any significant effect of leader dominance in Study 2c, in which leader dominance was operationalized as aggressive behaviors in an economic game, $\gamma = 4.57$, $SE = 4.09$, 95% CI = [–3.45, 12.59], $t(197) = 1.12$, $p = .265$. Additional robustness checks showed that these results held even after models controlled for follower-rated leader prestige, trustworthiness, and attractiveness, which also differed across leader conditions in some studies (see Table S7 at https://osf.io/zdhkj/). In another supplemental test, we also reran the same model by replacing the dummy for leader-dominance condition with perceived dominance of the leader and found that perceived dominance significantly predicted follower contribution even after models controlled for perceived prestige, attractiveness, and trustworthiness (see Tables S7 and S8 at https://osf.io/zdhkj/). Finally, as expected, participants did not vary across leader conditions in their baseline cooperation before observing their leader's information ($p$s = .20–.80).

**Table 2.** Model Results for the Effect of Leader Dominance on Follower Contributions in Studies 2a Through 2e

| Fixed-effects predictor | Study 2a: facial dominance | | Study 2b: dominant personality | | Study 2c: dispositional aggressiveness | | Study 2d: authoritarian attitudes | | Study 2e: physical formidability | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Model 1 | Model 2 | Model 1 | Model 2 | Model 1 | Model 2 | Model 1 | Model 2 | Model 1 | Model 2 |
| Leader (1 = dominant, 0 = nondominant) | 8.47 [–0.90, 17.83] | 4.59 [–7.59, 16.78] | 11.88** [2.94, 20.81] | 16.38** [4.25, 28.50] | 4.57 [–3.45, 12.59] | 3.65 [–6.74, 14.05] | 11.06* [1.87, 20.24] | 14.68* [2.62, 26.74] | 8.90* [0.44, 17.35] | 15.66** [3.94, 27.38] |
| Female | | –9.44 [–22.38, 3.49] | | 7.38 [5.37, 20.13] | | –1.73 [–13.54, 10.09] | | 2.99 [–10.75, 16.74] | | 13.95* [1.88, 26.09] |
| Female × Leader | | 9.98 [–9.20, 29.16] | | –11.06 [–29.06, 6.95] | | 1.75 [–14.87, 18.38] | | –9.09 [–28.06, 9.88] | | –13.89 [–30.85, 3.07] |
| Intercept | 61.22*** [54.94, 67.50] | 64.51*** [56.45, 72.57] | 59.45*** [53.11, 65.79] | 56.28*** [47.62, 64.94] | 59.35*** [53.69, 65.01] | 59.89*** [52.66, 67.11] | 56.97*** [50.31, 63.63] | 55.64*** [46.90, 64.38] | 64.75*** [58.71, 70.79] | 57.93*** [49.51, 66.35] |
| $\tau_0^2$ | 1,003.5 | 1,000.9 | 911.7 | 906.2 | 769.5 | 778.4 | 1,040.2 | 1,050.5 | 1,109.3 | 1,104.1 |
| $\sigma^2$ | 192.2 | 194.3 | 150.1 | 151.7 | 190.8 | 192.8 | 198.1 | 188.6 | 118.8 | 118.1 |
| Observations | 567 | 561 | 558 | 552 | 597 | 591 | 606 | 594 | 741 | 735 |
| Group variable (participants) | 189 | 187 | 185 | 183 | 199 | 197 | 202 | 198 | 247 | 245 |

Note: Unstandardized mixed model parameter estimates and 95% confidence intervals are shown for each fixed-effects predictor. The dependent variable was follower contributions, expressed as a percentage of the initial endowment. In all models, we accounted for the clustering created by the experimental design by including random intercepts for multiple public-goods-game decisions within players.

*$p < .05$. **$p < .01$. ***$p < .001$.

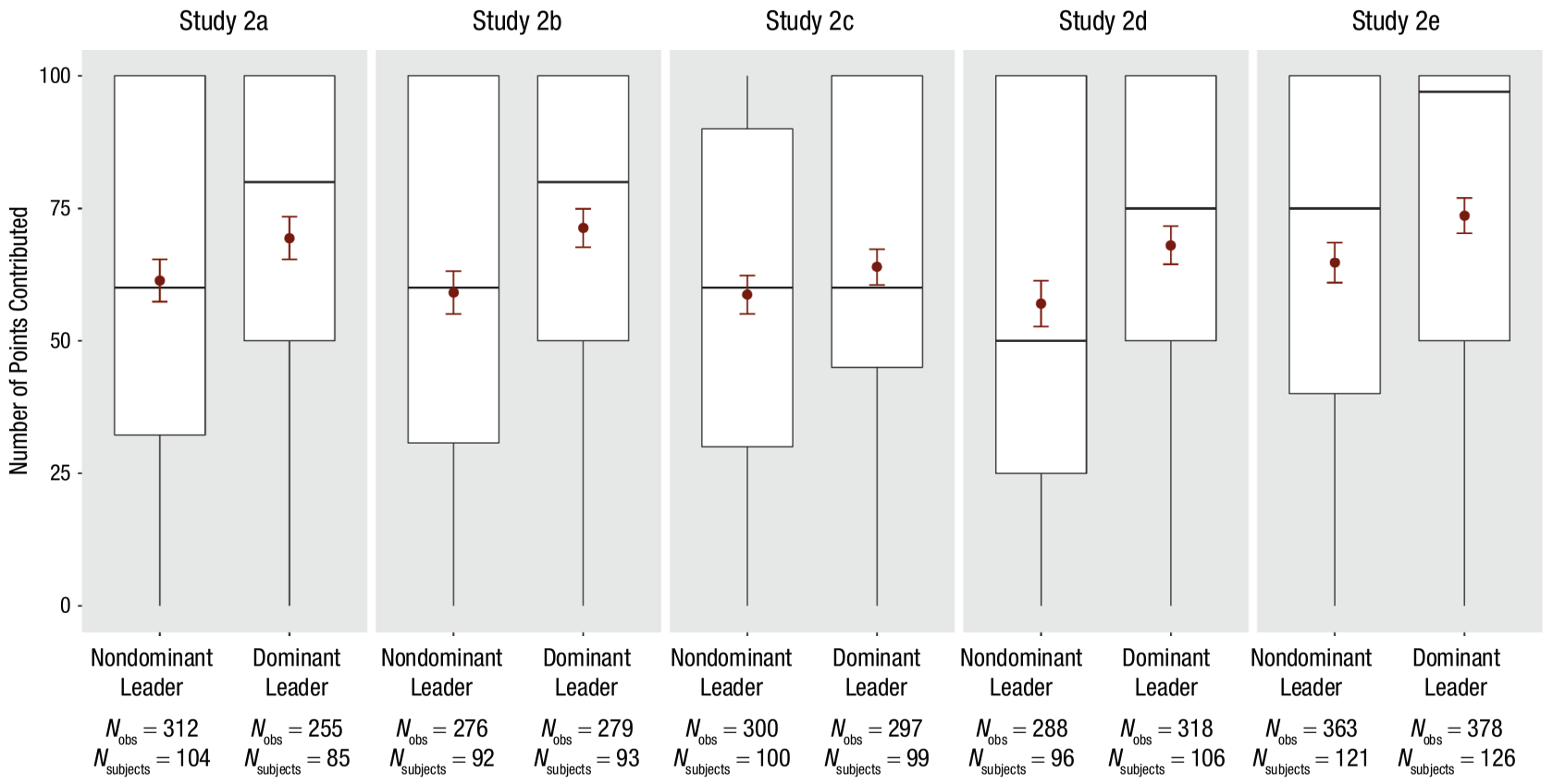


**Fig. 4.** Number of points contributed by participants in the dominant- and nondominant-leader condition in Studies 2a to 2e. In each box plot, the horizontal line represents the median, and the top and bottom hinges of the box indicate the first and third quartiles, respectively. Whiskers extend 1.5 times the interquartile range. Means are marked by red circles, and error bars represent 95% confidence intervals. Obs = observations.

**Table 3.** Exploratory Analyses: Indirect Effects of Leader Dominance on Follower Cooperation (Study 2)

| Study and mediator | *b* | Bias-corrected 95% CI |
|---|---|---|
| Study 2b | | |
| Anticipated punishment | 4.59 | [1.57, 9.45] |
| Perceived harshness | 5.08 | [0.19, 10.77] |
| Study 2c | | |
| Anticipated punishment | 3.35 | [0.91, 7.56] |
| Perceived harshness | 0.21 | [–1.72, 2.72] |
| Study 2d | | |
| Anticipated punishment | –1.83 | [–6.50, 1.77] |
| Perceived harshness | 5.91 | [1.84, 10.68] |
| Study 2e | | |
| Anticipated punishment | 4.51 | [1.89, 8.18] |
| Perceived harshness | 6.74 | [1.29, 12.35] |

Note: All indirect effects were estimated via bootstrapping (with 20,000 replications). We did not measure anticipated leader punishment and perceived harshness in Study 2a. In all models, the independent variable was leader-dominance condition (1 = dominant leader, 0 = nondominant leader), and the outcome variable was follower contribution (percentage of points contributed). CI = confidence interval.

***Exploratory analyses.***

*Mediation by anticipated punitiveness and perceived harshness.* Following our preregistration, we explored whether the effect of leader dominance on follower cooperation was mediated by perception of the leader's expected willingness to punish (i.e., number of points that one expected the leader to remove from a hypothetical free rider, from 0 to 60) and global perceptions of leader harshness (sample item: "This group leader would definitely not let low-contributors go unpunished"). This supplemental analysis addressed whether followers increased their cooperation in response to dominant leaders because of their greater perceived punitiveness. We found some support for this prediction (see Table 3). All 95% CIs of the (bias-corrected) indirect effects were estimated via bootstrapping (with 20,000 bootstrapped samples).

*Preference for dominant leaders.* We found no evidence that participants more strongly preferred dominant leaders than nondominant leaders across Studies 2a to 2e. In fact, the opposite was found in most studies: In Studies 2b to 2e, participants in the nondominant-leader condition reported greater support of their leader compared with those in the dominant-leader condition. No difference was found in Study 2a (see Table S9 at https://osf.io/zdhkj/).[10]

## *Discussion*

Studies 2a to 2e show that leader dominance expressed in the form of dominant personality, authoritarian attitudes, and self-reported physical formidability all significantly increased follower cooperation, whereas dominance cued by aggressive behavior in a decision game and facial masculinity did not. Supplemental analyses further revealed that this effect was indeed mediated by perceptions of leader punitiveness and harshness.

## General Discussion

Together, these findings advance the understanding of how dominant leaders promote cooperation when leaders have the capacity to punish followers. Consistent results across a range of leader-dominance manipulations reveal an unexpected benefit of dominant leaders: Follower cooperation increases under leaders with a more punitive reputation, dominant personality, authoritarian attitudes, or greater physical formidability. On the other hand, follower cooperation diminishes under less dominant leaders, as shown in Study 1. These findings are consistent with the notion that dominant leaders improve the provision of a public good via the fear of sanctions.

These findings provide the first empirical evidence that dominantly inclined leaders can improve cooperation relative to less dominant leaders via threat of punishment. Multiple lines of evidence from anthropology and psychology have revealed a link between dominance-related traits (e.g., physical size, strength, facial masculinity) and political influence (Laustsen & Petersen, 2015, 2017, 2020a; von Rueden et al., 2008), and a common explanation is that formidable individuals are perceived as more capable of resolving intragroup and intergroup disputes (de Waal-Andrews & van Vugt, 2020; Lukaszewski et al., 2016; von Rueden et al., 2014). Yet no work to our knowledge has previously tested the actual (rather than perceived) coordination ability of dominant leaders. Thus, these findings provide important first evidence for these hypotheses. Our exploratory mediation analyses in Studies 2b to 2e indeed show that dominant leaders' greater perceived harshness and willingness to punish explained why followers increased their contributions. However, we found no effect of dominant leadership on follower cooperation when it was cued by dispositional aggressiveness in the hawk-dove game or by facial masculinity.

## *Caveats, limitations, and future directions*

Across the present studies, we focused on situations in which leaders have the opportunity to sanction free riding through punishment and found that follower cooperation increased under leaders who evoked a dominant impression in the public-goods setting. However, it remains unclear how leader dominance might affect cooperation in situations that do not involve direct

punishment possibilities. Although dominant leaders may still find alternative ways to indirectly punish individuals and shape cooperation (e.g., use gossip to undermine certain free riders' reputations), it is also possible that in other contexts, the "commodity" that dominant leaders have to offer (i.e., their harsh sanctions) may no longer be needed or coveted. Future research is needed to uncover these further possibilities and test the scope of how dominant leadership shapes cooperation.

Despite the potential of dominant leaders to improve the public good through threat of punishment, there are drawbacks to dominant leadership. First, the very same qualities expressed by dominant leaders—aggressiveness, toughness, and authority—that likely correlate with their capacity to mediate in-group conflicts (through punishment) are often precisely the fomenters of a diverse class of behaviors that may lead to group demise. This includes, for example, unchecked risk taking, corruption and bribery, prioritizing the self over the collective good, and the tendency to escalate costly intergroup disputes (e.g., Maner & Mead, 2010). Thus, in the real world, where collective success is determined by a multitude of factors—beyond strictly the degree of follower investment in collective ventures, which is our focus here—dominant leaders, despite their ability to police public goods, may cripple groups in other ways. This may explain why in our Studies 2a to 2e, when potential within-group threats were not immediately observable (because no feedback was given), participants did not show a preference for the dominant leader and instead showed a stronger preference for the nondominant counterpart. This suggests that dominant leaders will be preferred not under all circumstances but only when their perceived value, such as the ability to increase group cooperation through punishment, is considered justifiably larger than the detrimental cost they may present (Bøggild & Laustsen, 2016). A key future direction, in particular, is to study how political leaders with a tough and dominant reputation affect the well-being of societies more generally—beyond the effects they may have on lowering the prevalence of free riding—in domains such as country-level economic success and the well-being of citizens.

Second, there are likely important limits to relying on punishment by centralized sanctioning authorities as a means to cooperation. Excessively harsh or misdirected, "antisocial" punishment—that is, the punishing of participants who contributed many points to the group—on the part of the monitoring authority is bound to limit the effectiveness of any punishment scheme (Baldassarri & Grossman, 2011; Herrmann et al., 2008). Any misuse of control can quickly erode the legitimacy and power of dominant leaders, evoking strong resentment and retaliatory sentiments among followers. This fragility of dominance-based leadership may explain why, as revealed by existing work, dominant individuals manage to amass influence during initial periods when groups first form but come to lose their power over time (Cheng, 2020; Redhead et al., 2019). Sole reliance on strong sanctioning (and coercive control in general), although potentially effective in the short run, may be untenable as a long-term solution. Optimal leadership requires striking a fine balance between displaying strength and judicious authority.

Another key limitation that should be addressed in future work is to design a strong measure of preference for dominant leaders in studies of leader dominance. As noted above, our ability to examine this here is limited by the floor effect obtained on the leader bidding procedure in Study 1 (see Table S2 and Fig. S2A at https://osf.io/zdhkj/) and the absence of information about how dominant leaders may have enhanced cooperation in Studies 2a to 2e. That is, followers observed only the costs that dominant leaders imposed (via punishment) but not their value. Thus, the perceived costs inflicted by dominant leaders (such as the greater risk of exploitation) may outweigh the benefits that they would appear to provide, driving out follower support (Bøggild & Laustsen, 2016). Finally, another key area for future research is exploring cross-cultural differences in responsivity to dominant leadership. Just as societies vary in the extent of willingness to punish (Henrich et al., 2006), populations also differ in how they anticipate or respond to punishment (Wu et al., 2009; Zhang et al., 2017), thus highlighting the importance of future investigations into the existence and pattern of cultural differences in follower psychology under dominance-based leadership and institutions, particularly in non-Western, educated, industrialized, rich, and democratic populations.

## *Conclusion*

In sum, we showed that dominant leaders can benefit groups by increasing follower cooperation when punishment is an option. Leaders with a more fearsome reputation—cultivated by a history of harsh sanctioning, domineering personality, authoritarian social and political attitudes, or physical formidability—are more efficient in improving the public good via punishment, compared with leaders with no publicly known dominant reputations or with less dominant leaders.

### Transparency

*Action Editor:* Steven W. Gangestad
*Editor:* Patricia J. Bauer
*Author Contributions*

J. T. Cheng and L. Laustsen conceived the study idea. All the authors contributed to the study design. X. Zhang and F. X. Chen programmed the study. F. X. Chen conducted

the analyses with advice from J. T. Cheng. J. T. Cheng and F. X. Chen wrote the manuscript with input from the coauthors. All the authors approved the final manuscript for submission.

*Declaration of Conflicting Interests*

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

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*Open Practices*

Deidentified data, analysis scripts, and materials for the six studies have been made publicly available via OSF and can be accessed at https://osf.io/s94ge/. Copies of the preregistered design and analysis plans for all the studies can be accessed at https://osf.io/s94ge/. There was one deviation from the Study 1 preregistration, which is discussed in the text (there were no deviations from the preregistrations in Studies 2a–2e). Data collection for the first session in Study 1 was completed before the preregistration was uploaded (because we had to determine the suitable amount of participant payment). We did not examine or analyze any of the data prior to uploading the Study 1 preregistration (the preregistrations for Studies 2a–2e were uploaded prior to any data collection). This article has received the badges for Open Data, Open Materials, and Preregistration. More information about the Open Practices badges can be found at http://www.psychologicalscience.org/publications/badges.


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## Notes

1. The PGG is a well-established paradigm for measuring cooperative behavior that is used extensively in experimental economics and other fields (including psychology). As evidence of its external validity, a number of studies have shown that the PGG transfers correlate with actual helping or cooperative behavior in the field (Fehr & Leibbrandt, 2011) and self-reported moral values (Peysakhovich et al., 2014).

2. This analytic decision was guided by the fact that, because they could not self-punish, leaders did not pose a clear credible punitive threat to themselves in the study (or in the real world). Thus, their contribution cannot be influenced by our key independent variable of leader reputation, making their PGG contribution difficult to interpret. The mean contribution of players in the leader role is reported in Table S5 at https://osf.io/zdhkj/.

3. Given that the amount of the initial endowment varied across different phases of the study, for comparability we report the percentage of the initial endowment that a player contributed to the public good when comparing contributions across treatments. We also report the same percentage within treatment for consistency.

4. In the current study, we observed some degree of "antisocial punishment," or the punishment of high cooperators (Herrmann et al., 2008; for antisocial punishment, see Tables S3A and S3B at https://osf.io/zdhkj/; for altruistic punishment, see Tables S3C and S3D).

5. This raises the possibility that the effect of strong leaders on cooperation may stem not only from their ability to induce compliance via sanctioning but also from the effect of prestige in fostering groupwide cooperation. Neither our main studies (i.e., Study 1 and Studies 2a to 2e) nor this supplemental study was designed to examine this alternative explanation. However, preliminary evidence from the status ratings in this follow-up study indicated that prestige likely played a modest role in this context. We found a weak quadratic trend on prestige; the most punitive participants (who removed 50–60 points) were perceived as slightly less prestigious than the most highly prestigious participants at the vertex (who removed around 40 points; see Fig. S1 at https://osf.io/zdhkj/). Note that leaders in the main studies, however punitive, could sanction harshly without incurring a large cost (and not more than other members) because of the pooled punishment-tax mechanism (of which their own contributed taxes made up a small portion of the total tax pool). The leader's punishment decision in the current study context did not involve personal costs. However, it may still be regarded (implicitly) as costly, selfless, and altruistic, given that our evolved psychology may represent punishment as costly, particularly when we consider the prevalence of repeated encounters and risks of retaliation. It is possible that if there were a significant explicit cost involved in sanctioning efforts, such as entirely self-funded sanctions, greater prestige may be conferred on punitive leaders who would, in this case, appear exceptionally altruistic (Fehr & Gächter, 2002).

6. In an exploratory analysis, we subsequently dichotomized our followers on the basis of their bids (1 = nonzero bidders, who expressed a preference for a dominant leader; 0 = zero bidders, who expressed little or no preference for a dominant leader). We then regressed follower contribution on this bidder status (1 = nonzero bidder), leader dominance (1 = dominant leader), and their interaction term. We observed a significant interaction between bidder status and leader dominance; followers who bid for a dominant leader contributed significantly more to the public goods when they were eventually led by a dominant leader whom they voted for. This is consistent with the notion that followers may perceive an authority whom they personally elected as more legitimate and in turn behave more cooperatively (Baldassarri & Grossman, 2011; for full results, see Fig. S2B at https://osf.io/zdhkj/).

7. We included several attention and comprehension checks in all studies. Although we allowed for multiple attempts on these attention and comprehension checks, we included only

participants who passed all these checks on their first attempt.
8. One exception was Study 2b, which had an additional third treatment (i.e., control condition, in which no leader-dominance-related information was presented; for results pertaining to this condition, see https://osf.io/zdhkj/).
9. In Study 2b, follower cooperation was also higher in the dominant-leader condition relative to the control condition (in which no leader information was presented; $\gamma = 9.75$, $p = .030$). No differences were observed between the nondominant-leader and control conditions ($\gamma = -2.51$, $p = .59$).
10. Interestingly, in an exploratory analysis, we found an interaction between the leader-dominance condition and participant with a conservative political orientation (see Table S10 at https://osf.io/zdhkj/).

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