

SUPPLEMENTAL MATERIALS FOR
**‘HARSH BUT EXPEDIENT: DOMINANT
LEADERS INCREASE GROUP
COOPERATION’**

TABLE OF CONTENTS

STUDY 1: Supplemental models for Hypothesis 1	3
STUDY 1: Relational between leader punitiveness and perceived dominance/prestige	4
STUDY 1: Are dominant leaders too harsh?	5
STUDY 1: Distinguishing between antisocial and prosocial punishment.....	6
STUDY 1: Descriptive statistics for all measured variables	10
STUDY 1: Leader contributions to public goods	11
STUDY 1: Preference for dominant leaders (additional analyses).....	12
STUDY 2: Descriptions of measures.....	13
STUDY 2: Stimuli for leader dominance manipulation	14
STUDY 2: Results for manipulation check in Studies 2a – 2e.....	17
STUDY 2: Additional exploratory analyses in Studies 2a – 2e	19
STUDY 2: Additional References	23

Following our preregistered plans, below we examine the robustness of our results for Hypothesis 1 (dominant leaders increase follower cooperation) with controls for personality traits.

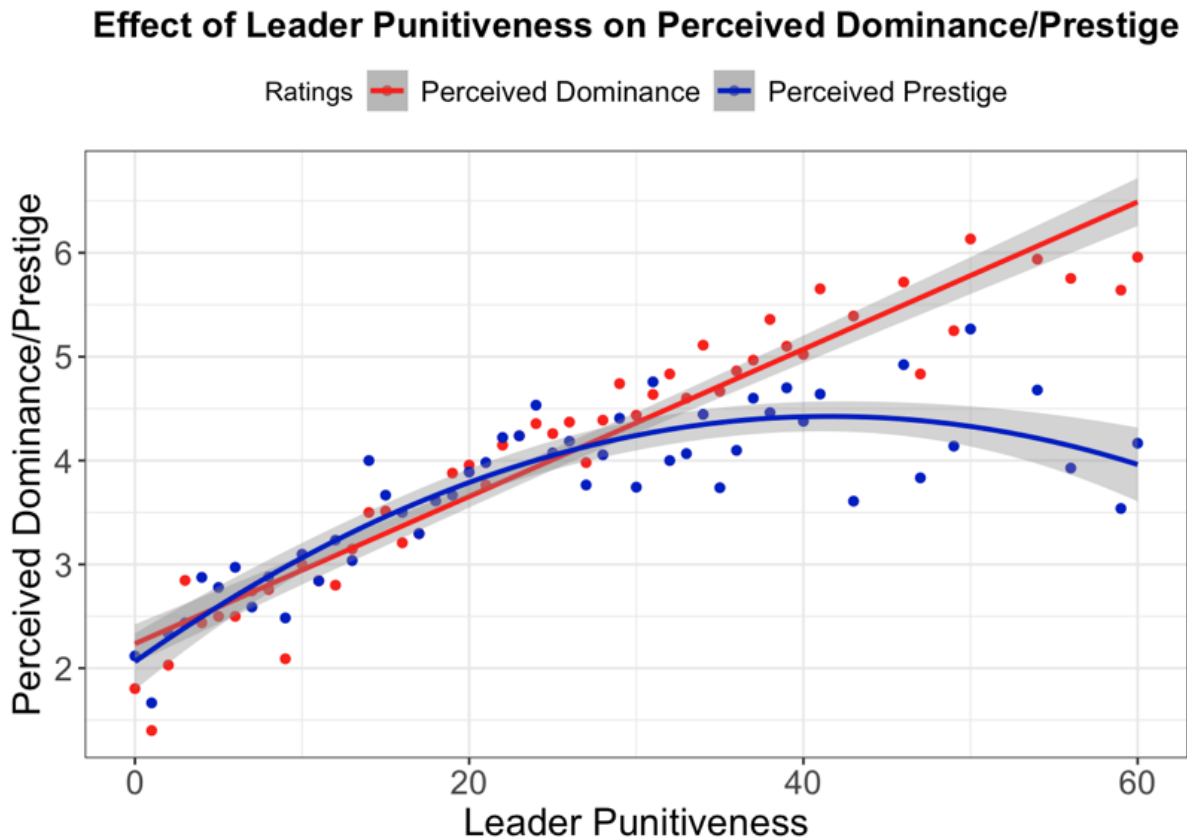
Table S1: Supplementary models for Hypothesis 1

Dependent variable: % of endowment contributed by follower		Model 1			Model 2		
		Treatment 3	Treatment 4	Treatment 5	Treatment 3	Treatment 4	Treatment 5
Leader (1 = dominant, 0 = nondominant)		18.24***	18.54***	9.19**	18.24***	18.68***	10.23**
		[15.14, 21.33]	[14.50, 22.59]	[3.13, 16.52]	[15.14, 21.33]	[14.61, 22.73]	[3.61, 16.85]
Female		7.385*	6.88*	8.18	7.56*	7.22*	8.84
		[1.32, 13.45]	[0.69, 13.07]	[-1.40, 17.77]	[1.47, 13.65]	[0.99, 13.44]	[-0.75, 18.43]
Female X leader		-1.82	1.37	-3.41	-1.82	1.27	-3.60
		[-5.71, 2.07]	[-3.62, 6.36]	[-11.49, 4.67]	[-5.71, 2.07]	[-3.72, 6.27]	[-11.68, 4.48]
Fixed effects	SDO	2.83	2.52	1.85	3.36*	2.61	1.86
		[-0.25, 5.91]	[-0.56, 5.60]	[-2.86, 6.57]	[0.08, 6.63]	[-0.66, 5.88]	[-3.06, 6.79]
	RWA	-6.12***	-5.37**	-8.83***	-6.27***	-5.55***	-9.10***
		[-9.33, -2.90]	[-8.56, -2.19]	[-13.63, -4.03]	[-9.51, -3.03]	[-8.75, -2.34]	[-13.89, -4.31]
	Self-rated dominance				-1.43	-0.66	-1.44
					[-4.51, 1.66]	[-3.71, 2.39]	[-6.05, 3.18]
	Self-rated prestige				0.53	-1.34	-2.87
					[-3.01, 4.07]	[-4.86, 2.18]	[-8.27, 2.54]
Intercept		35.29***	29.41***	78.58***	37.03***	38.93***	99.20***
		[24.53, 46.03]	[18.67, 40.15]	[62.11, 95.05]	[14.29, 59.77]	[16.41, 61.44]	[64.93, 133.48]
Random effects	τ^2	341.6	334.3	634.0	340.0	332.9	626.4
	σ^2	369.3	224.6	358.9	369.3	224.6	358.9
Observations		1616	1343	1256	1616	1343	1256
Group variable (Subjects)		202	202	157	202	202	157

Relationships between leader punitiveness and perceived dominance/prestige

Among a separate group of participants who were not part of our main study ($N = xxx$), we observe a significant positive effect of leader punitiveness on these observers' ratings of the leader's perceived dominance, $\beta = .71$, $SE = 0.02$, 95% CI [0.66, 0.76], $t(48) = 30.92$, $p < .00001$, and a weak but significant quadratic term, $leader\ punitiveness^2$, $\beta = -0.14$, $SE = 0.02$, 95% CI [-0.18, -0.09], $t(48) = -6.01$, $p < .001$. In a separate model, we found a similar but weaker positive association with ratings of the leader's perceived prestige, $\beta = .42$, $SE = 0.03$, 95% CI [0.35, 0.49], $t(48) = 12.23$, $p < .00001$, and a significant quadratic term that is substantially larger in magnitude than in the dominance model, $\beta = -0.25$, $SE = 0.03$, 95% CI [-0.32, -0.19], $t(48) = -7.48$, $p < .001$. This latter finding suggests a concave pattern such that observers ascribe greater prestige as leader punitiveness increases, but the gain decreases and even becomes negative at extremely high levels of punishment.

Figure S1: Relationship between leader punitiveness and perceived dominance/prestige



Are dominant leaders too harsh?

Here, we explored whether dominant leaders may be too harsh, in the sense that while they increase the size of public goods (i.e., increase follower contribution), their high degree of punishment ultimately offset the profits that followers could gain from an expanded public goods. The means in the table below show that, while followers receive a larger group share when led by dominant leaders (due to increased in follower contribution), they also received harsher punishment when under dominant leaders than non-dominant leaders; Treatment 3: $\gamma = 6.03$, $SE = 0.98$, 95% CI [-4.10, 7.95], $t(1512.00) = 6.13$, $p < .001$; Treatment 4: $\gamma = 7.48$, $SE = 1.24$, 95% CI [5.05, 9.90], $t(1150.87) = 6.04$, $p < .001$; Treatment 5: $\gamma = 8.22$, $SE = 1.45$, 95% CI [5.38, 11.05], $t(825.94) = 5.68$, $p < .001$.

Table S2: Mean follower contribution, group share, points lost, and participant take-home earnings by leader dominance across treatments

		Mean follower contribution (raw contribution)	Mean follower share from public goods	Mean punishment imposed on a follower (points lost)	Mean follower points earned
Treatment 3	Dominant Leader	40.9 (25.6) [39.16, 42.58]	60.3 (21.3) [58.85, 61.69]	21.1 (23.1) [19.54, 22.62]	89.4 (24.0) [87.75, 90.97]
	Nondominant Leader	25.8 (22.7) [24.27, 27.30]	39.2 (20.1) [37.88, 40.57]	15.1 (20.2) [13.70, 16.40]	88.1 (20.4) [86.70, 89.43]
Treatment 4	Dominant Leader	40.2 (23.3) [38.47, 41.88]	60.4 (23.7) [58.65, 62.11]	19.7 (21.7) [18.13, 21.32]	90.0 (20.5) [88.51, 91.51]
	Nondominant Leader	20.7 (19.0) [19.28, 22.06]	34.7 (26.0) [32.77, 36.58]	14.2 (19.4) [12.73, 15.57]	87.9 (20.7) [86.33, 89.38]
Treatment 5	Dominant Leader	58.52 (26.79) [56.49, 60.55]	93.84 (27.88) [91.62, 95.84]	18.66 (22.89) [16.93, 20.39]	108.57 (37.13) [105.76, 111.38]
	Nondominant Leader	56.37 (32.19) [53.93, 58.80]	91.09 (30.25) [88.80, 93.38]	9.05 (17.83) [7.70, 10.40]	116.80 (39.50) [113.81, 119.79]

In addition, when we regressed players' earnings on leader dominance (1 = dominant leader), in both treatments we found no effect of leader dominance on individual earnings, indicating that dominant leaders, despite capable of increasing the size of public goods, did not increase follower's actual payoff. In fact, under intergroup competition (Treatment 5), participants actually earned *less* when led by dominant leaders, $\gamma = -7.33$, $SE = 2.61$, 95% CI [-12.44, -2.22], $t(531.93) = -2.82$, $p = .005$. These results may also speak to the low bidding rates in Treatments 4 and 5. Followers may have detected that dominant leaders neither decrease nor increase their take-home earnings. This observation, when combined with the costly nature of the bidding procedure (any bid point spent separately reduces their payoff), may work together to de-incentivize bidding for any leader at all.

How pervasive is antisocial punishment?

Below, we report the frequencies of antisocial and prosocial punishment observed in our study.

Table S3A: Frequencies (and percentages) of antisocial punishment (out of all leader punishment decisions) across treatments

		Approach 1	Approach 2	Approach 3	Approach 4
Cut-off rules		$C_{ij} \geq GC_j$ $Pun_{ij} > MPun_j$	$C_{ij} \geq GC_j$ $Pun_{ij} > 0$	$C_{ij} \geq LC_j$ $Pun_{ij} > 0$	$C_{ij} \geq LC_j$ $Pun_{ij} > MPun_j$
	Treatment 2	43 / 1728 (2.49%)	300 / 1728 (17.36 %)	518 / 1728 (29.98%)	280 / 1728 (16.20%)
Treatment 3	Nondominant	23 / 864 (2.66%)	140 / 864 (16.20%)	211 / 864 ^a (24.42%)	122 / 864 ^b (14.12%)
	Dominant	21 / 864 (2.43 %)	163 / 864 (18.87%)	253 / 864 ^a (29.28%)	156 / 864 ^b (18.06%)
Treatment 4	Nondominant	14 / 710 (1.97 %)	113 / 710 ^c (15.92%)	160 / 710 ^d (22.54%)	93 / 710 ^e (13.10%)
	Dominant	14 / 718 (1.95%)	152 / 718 ^c (21.17%)	212 / 718 ^d (29.53%)	140 / 718 ^e (19.50%)
Treatment 5	Nondominant	8 / 627 ^f (1.28%)	63 / 627 ^g (10.05%)	54 / 627 ^h (8.61%)	25 / 627 ⁱ (3.99%)
	Dominant leader	21 / 633 ^f (3.32 %)	119 / 633 ^g (18.80%)	91 / 633 ^h (14.38%)	47 / 633 ⁱ (7.42%)

Note. We define antisocial punishment based on four criteria adopted in previous research (e.g., Balafoutas et al., 2014; Pfattheicher et al., 2013; Pleasant & Barclay, 2018; Stavrova et al., 2013; Wu et al., 2009). C_{ij} = contribution of follower i in group j ; GC_j = mean contribution in group j ; Pun_{ij} = punishment (i.e., points removed by leader) received by follower i in group j ; $MPun_j$ = mean number of points (across all followers) removed by leader in group j ; LC_j = leader contribution in group j . Test of proportions compare the rates of antisocial punishment by dominant versus nondominant leaders. Proportions marked by the same superscript differ significantly from each other at $p < .05$.

Table S3B: Magnitude of antisocial punishment indexed by mean (and *SD*) across treatments

		Approach 1	Approach 2	Approach 3	Approach 4
Cut-off rules		$C_{ij} \geq GC_j$ $Pun_{ij} > MPun_j$	$C_{ij} \geq GC_j$ $Pun_{ij} > 0$	$C_{ij} \geq LC_j$ $Pun_{ij} > 0$	$C_{ij} \geq LC_j$ $Pun_{ij} > MPun_j$
	Stage 2	29.86 (15.25)	19.73 (12.75)	27.50 (17.24)	35.81 (17.09)
Treatment 3	Nondominant	40.83 (18.13)	23.04 (15.34)	27.43 ^a (18.13)	33.84 ^b (18.67)
	Dominant	44.43 (13.47)	22.23 (13.69)	33.55 ^a (19.20)	42.63 ^b (17.79)
Treatment 4	Nondominant	32.79 (19.06)	19.91 (13.82)	25.33 ^c (18.11)	31.19 ^d (19.25)
	Dominant	39.86 (15.67)	19.14 (12.83)	33.07 ^c (18.78)	40.91 ^d (16.97)
Treatment 5	Nondominant	25.50 ^e (13.22)	16.05 ^f (12.04)	21.00 ^g (18.24)	27.60 (21.28)
	Dominant leader	42.43 ^e (14.95)	21.88 ^f (14.48)	27.30 ^g (18.23)	31.91 (22.45)

Note. We define antisocial punishment based on four criteria adopted in previous research (e.g., Balafoutas et al., 2014; Pfattheicher et al., 2013; Pleasant & Barclay, 2018; Stavrova et al., 2013; Wu et al., 2009). C_{ij} = contribution of member i in group j ; GC_j = mean contribution in group j ; Pun_{ij} = punishment (i.e., points removed by leader) for member i in group j ; $MPun_j$ = mean number of points (across all followers) removed by leader in group j ; LC_j = leader contribution in group j . We also conducted independent t-tests between two leader types across treatments and approaches. Means marked by the same superscript differ significantly from each other at $p < .05$.

Here, we also present the frequencies and magnitude of altruistic (prosocial) punishment observed in current data.

Table S3C: Frequencies (and percentages) of altruistic (prosocial) punishment (out of all leader punishment decisions) across treatments

		Approach 1	Approach 3	Approach 3	Approach 4
Cut-off rules		$C_{ij} < GC_j$ $Pun_{ij} > 0$	$C_{ij} < LC_j$ $Pun_{ij} > 0$	$C_{ij} < GC_j$ $Pun_{ij} > MPun_j$	$C_{ij} < LC_j$ $Pun_{ij} > MPun_j$
	Stage 2	671/1728 (38.83%)	453 / 1728 (26.22%)	558 / 1728 (32.29%)	321 / 1728 (18.58%)
Treatment 3	Nondominant	286 / 864 ^a (33.10%)	215 / 864 ^b (24.88%)	255/ 864 ^c (29.51%)	156 / 864 (18.06%)
	Dominant	346 / 864 ^a (40.05%)	256 / 864 ^b (29.63%)	322 / 864 ^c (37.27%)	187 / 864 (21.64%)
Treatment 4	Nondominant	245 / 710 ^d (34.51%)	198 / 710 (27.89%)	217 / 710 ^e (30.56%)	138 / 710 (19.44%)
	Dominant	285 / 718 ^d (39.69%)	225 / 718 (31.34%)	265 / 718 ^e (36.91%)	139 / 718 (19.36%)
Treatment 5	Nondominant	124 / 627 ^f (13.78%)	133 / 627 ^g (21.21%)	115 / 627 ^h (18.34 %)	98 / 627 ⁱ (15.63%)
	Dominant leader	220 / 633 ^f (34.76%)	248 / 633 ^g (39.18%)	205 / 633 ^h (32.39%)	179 / 633 ⁱ (28.28%)

Note. We define altruistic (prosocial) punishment based on four criteria referenced in previous research (e.g., Egas & Riedl, 2008; Fehr & Gächter, 2002; Barclay, 2006; Nikiforakis & Normann, 2008). C_{ij} = contribution of member i in group j ; GC_j = mean contribution in group j ; Pun_{ij} = punishment (i.e., points removed by leader) for member i in group j ; $MPun_j$ = mean number of points (across all followers) removed by leader in group j ; LC_j = leader contribution in group j . We also conducted the proportion tests between two leader types across treatments and approaches. Proportions marked by the same superscript differ significantly from each other at $p < .05$.

Table S3D: Magnitude of altruistic (prosocial) punishment indexed by mean (and *SD*) across treatments

		Approach 1	Approach 3	Approach 3	Approach 4
Cut-off rules		$C_{ij} < GC_j$ $Pun_{ij} > 0$	$C_{ij} < LC_j$ $Pun_{ij} > 0$	$C_{ij} < GC_j$ $Pun_{ij} > MPun_j$	$C_{ij} < LC_j$ $Pun_{ij} > MPun_j$
	Stage 2	34.06 (18.42)	32.08 (18.79)	37.57 (17.64)	38.07 (17.96)
Treatment 3	Nondominant	34.20 ^a (19.36)	33.57 ^b (19.12)	36.04 ^c (19.06)	38.46 ^d (19.07)
	Dominant	42.16 ^a (18.62)	37.99 ^b (19.66)	44.11 ^c (17.63)	45.37 ^d (16.99)
Treatment 4	Nondominant	32.41 ^e (19.49)	31.00 (19.00)	34.82 ^f (19.09)	37.07 (18.62)
	Dominant	39.62 ^e (18.01)	31.96 (19.37)	41.17 ^f (17.46)	41.31 (17.79)
Treatment 5	Nondominant	36.90 ^g (20.71)	33.47 ^h (20.65)	38.32 ⁱ (20.52)	40.01 ^j (19.40)
	Dominant leader	42.12 ^g (19.73)	37.85 ^h (20.55)	43.29 ⁱ (19.78)	46.17 ^j (17.34)

Note. We define altruistic (prosocial) punishment based on four criteria referenced in previous research (e.g., Egas & Riedl, 2008; Fehr & Gächter, 2002; Barclay, 2006; Nikiforakis & Normann, 2008). C_{ij} = contribution of member i in group j ; GC_j = mean contribution in group j ; Pun_{ij} = punishment (i.e., points removed by leader) for member i in group j ; $MPun_j$ = mean number of points (across all followers) removed by leader in group j ; LC_j = leader contribution in group j . We also conducted independent t-tests between two leader types across treatments and approaches. Means marked by the same superscript differ significantly from each other at $p < .05$.

Descriptive Statistics of all measured variables

Table S4: List of variables included in Study 1

Variable	Mean (SD)	Scale range [min, max]	# of Items	Cronbach's Alpha α
Extraversion ^a	3.05 (0.84)	[1, 5]	8	0.88
Agreeableness ^a	3.69 (0.64)	[1, 5]	9	0.79
Conscientiousness ^a	3.45 (0.66)	[1, 5]	9	0.81
Trait Competitiveness ^a	4.90 (1.37)	[1, 7]	5	0.88
Self-rated Prestige	5.09 (0.86)	[1, 7]	9	0.81
Self-rated Dominance	3.88 (0.96)	[1, 7]	8	0.77
General Prosociality	5.02 (0.91)	[1, 7]	4	0.69
Social Dominance Orientation	2.92 (1.05)	[1, 7]	8	0.79
Right-wing Authoritarianism	3.16 (1.02)	[1, 7]	14	0.84
Cooperative Value ^a	4.60 (1.05)	[1, 7]	4	0.58
Belief in a Just World ^a	3.38 (0.69)	[1, 7]	9	0.84
Religiosity ^a	2.97 (1.76)	[1, 7]	4	0.90

Note: Measures marked ^a were not examined or reported in any of our analyses.

Summary contributions from leaders

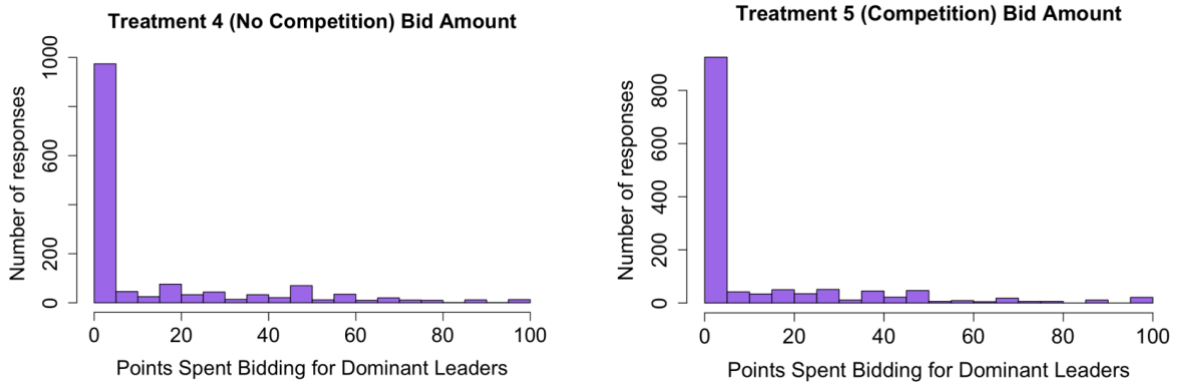
Here we report the descriptive statistics of dominant and nondominant players' public goods contributions across treatments.

Table S5: Contribution by leader players across treatments

		Contribution (% of endowment)	SE	95 % CI	
				Lower	Upper
Treatment 1	Nondominant leaders (216 Observations nested within $n = 36$)	15.8	3.20	9.55	22.1
	Dominant leaders (216 Observations nested within $n = 36$)	25.5	4.23	17.20	33.8
Treatment 2	Nondominant leaders (288 Observations nested within $n = 36$)	29.8	3.04	23.9	35.8
	Dominant leaders (288 Observations nested within $n = 36$)	40.7	3.48	33.8	47.5
Treatment 3	Nondominant leaders (288 Observations nested within $n = 36$)	21.2	3.36	14.7	27.8
	Dominant leaders (288 Observations nested within $n = 36$)	30.7	3.82	23.2	38.2
Treatment 4	Nondominant leaders (260 Observations nested within $n = 36$)	20.1	3.24	13.8	26.5
	Dominant leaders (260 Observations nested within $n = 36$)	33.1	4.08	25.1	41.1
Treatment 5	Nondominant leaders (256 Observations nested within $n = 36$)	63.5	4.37	54.9	72.0
	Dominant leaders (256 Observations nested within $n = 36$)	64.6	4.12	56.5	72.6

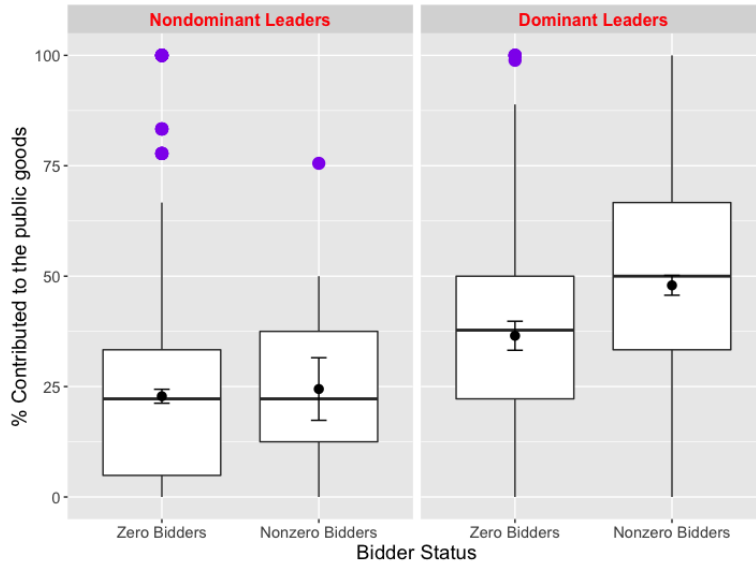
Preference for dominant leaders and dichotomizing bidder status

Figure S2A: Distribution of bids across treatments



Given that followers’ bidding exhibits a floor effect, we created a new dummy variable, bidder status, that identifies followers who bid nothing compared to those who bid any amount above zero (0 = zero bidder; 1 = nonzero bidder), and explored its interaction with leader dominance in predicting follower contributions. Results indicate a significant interaction ($\gamma = 10.09$, $SE = 3.34$, 95% CI [3.55, 16.62], $t(1353.84) = 3.03$, $p = .003$), such that when players were led by nondominant leaders (whom they did not ‘pay for’ and did not desire), bidder status did not predict amount of contribution ($p = .46$). However, when followers were led by dominant leaders (whom they ‘paid for’ and desired), nonzero bidders contributed significantly more to the group than zero bidders, $\gamma = 5.10$, $SE = 2.47$, 95% CI [0.25, 9.95], $t(708.77) = 2.06$, $p = .039$.

Figure S2B: Bidder status \times leader dominance interaction in Treatment 4



Measures included in Studies 2a – 2e

Measures

Ratings of group leader (manipulation check; Studies 2a – 2e). In the end game survey, participants rated their Group Leader on 7 dimensions (i.e., attractive, feared, trustworthy, competent, aggressive, likeable, respected) on a 7-point Likert scale ($1 = \text{Not at all}$, $7 = \text{Extremely}$). The two items measuring perceived dominance (fear and aggressive) were strongly and positively correlated ($r = .72, .76, .65, .62$, and $.77$ for Studies 2a – 2e). Three items for perceived prestige (competent, likeable, and respected) were also internally consistent ($\alpha = .84, .80, .87, .92$, and $.82$ for Studies 2a – 2e respectively). As a result, two composite scores (i.e., perceived dominance and prestige) were created for each study.

Leadership preference (Studies 2a – 2e). We measured participants' support of their leader using 3 items (i.e., "I would like to have a group leader like this person in the future", "This person was an effective leader in the game", "This person should NOT be put in charge (reverse-coded)"). Cronbach's $\alpha = .46, .49, .73, .85$, and $.85$ for Studies 2a – 2e, respectively.¹ We tested the hypothesis concerning leadership preference using the composite of all 3 items.

Perceived leader punitiveness (Studies 2b – 2e). Participants were told to indicate how many points they *thought* their Group Leader would have removed from a free rider who contributed 0 points to the group project (if all other Group Members contributed 70 points). Participants provided a numerical value ranging from 0 to 60 points.

Perceived leader harshness (Studies 2b – 2e). In addition to perceived leader punitiveness specific to a PGG setting, we also measured participants' global perception of leader harshness using 3 items (e.g., "*This group leader would be a harsh punisher*", "*This group leader would definitely not let low-contributors go unpunished*", and "*This group leader would remove many points from group members who contributed very few points*"; each following a 7-point scale of $1 = \text{strongly disagree}$, $7 = \text{strongly agree}$). Cronbach's $\alpha = .80, .82, .79$, and $.84$ for studies 2b – 2e, respectively.

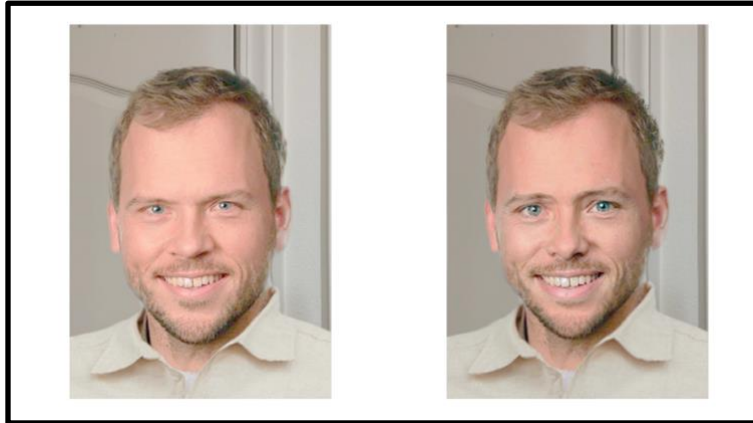
Trait punitiveness (Studies 2a – 2e). In a hypothetical scenario, participants were asked to imagine themselves as the Group Leader and indicate how many points (from 0 to 60) they would remove from a Group Member who contributed 0 points to the Group Project. This variable was not analyzed in the current study and will not be discussed further.

¹ Cronbach's α s for studies 2a and 2b are low, probably due to the poor performance of the third, reverse-coded item. We replaced the reverse-coded items in Studies 2d and 2e with "*This person should be put in charge*".

Leader Dominance Stimuli in Studies 2a – 2e

Below we described all stimuli used in Studies 2a – 2e for leader dominance manipulation.

Figure S3A: Leader facial dominance stimuli in Study 2a.



Note. Photo on the left represents the dominant-looking version and photo on the right shows the nondominant-looking version. These photos are adapted from Laustsen & Petersen (2017). This pair of images was selected based on results of a pilot test. We originally selected 10 pairs of photos (out of 20 available pairs, from Laustsen & Petersen (2017) by excluding those that appeared too old for a representative MTurker (e.g., appear much older than 45 years old). Each pair contained a masculinized and a feminized version of the same face. The first author replaced the professional attires found in these 10 pairs of photos with a more natural outfit (i.e., a casual beige collar shirt) and background while leaving the facial features and face-to-background ratio unaltered. We then randomly showed 10 photos (5 dominant version and 5 nondominant version) out of these 20 photos (i.e., 10 pairs) to a total of 140 undergraduate subjects recruited from a large Canadian University. These subjects rated each photo on 8 traits (attractive, feared, trustworthy, competent, aggressive, likeable, respected, looks like an average person you may see on the street) following a 7-point Likert scale (1 = Not at all, 7 = Extremely). We chose the current pair of photos as they exhibited the largest difference in fear ($p = .03$) and aggressiveness ratings ($p = .0006$) and non-significant differences in all other dimensions.

Figure S3B: Dominant personality descriptions stimuli in Study 2b.

This person will be your Group Leader.

The information below was submitted as part of this person's background survey.

Instructions: As Group Leader, please answer these questions to help your Group Members get to know you.

Q1: What is your name?
James Williams

Q2: Where are you from?
Naperville, a suburb just 30 minutes outside of Chicago

Q3: How would your coworkers and friends describe you as a person?
I think they'd say I'm a tough and competitive person. Somebody that most people would know better than to mess with. I like to lead and some people say I am quite pushy.

Q4: What tends to happen when you get into conflicts with coworkers or friends?
I don't mind conflict. Sometimes I even find that to be a good time to straight up tell people what I think and convince them that my way is the right way. I try to resolve conflict quickly to just get control of the situation.

Remember: As your Group Leader, he/she will be shown every Group Member's contribution decision. He/she will then decide to remove 0 to 60 points from each Group Member.

This person will be your Group Leader.

The information below was submitted as part of this person's background survey.

Instructions: As Group Leader, please answer these questions to help your Group Members get to know you.

Q1: What is your name?
James Williams

Q2: Where are you from?
Naperville, a suburb just 30 minutes outside of Chicago

Q3: How would your coworkers and friends describe you as a person?
I think they'd say I'm open to accommodating others. Somebody that others would say is pretty easygoing. I like to lead others and I'm not pushy.

Q4: What tends to happen when you get into conflicts with coworkers or friends?
I try to stay out of conflict whenever possible. But when there is conflict that can't be avoided, I avoid imposing my way on others and try to stop things from ever getting aggressive. I always try to resolve conflicts by finding ways to compromise different views, including compromising my own interests if necessary.

Remember: As your Group Leader, he/she will be shown every Group Member's contribution decision. He/she will then decide to remove 0 to 60 points from each Group Member.

Note. Descriptions on the left (right) represents the dominant (nondominant) personality version. In the control condition, participants were simply shown the first two sentences (name and origin).

Figure S3C: Aggressive disposition stimuli in Study 2c.

This person will be your Group Leader.

Your Group Leader played 2 rounds of the bargaining game, and below are his/her decisions:

Round 1 Decision: **CLAIM**

Round 2 Decision: **CLAIM**

Remember: As your Group Leader, he/she will be shown every Group Member's contribution decision. He/she will then decide to remove 0 to 60 points from each Group Member.

This person will be your Group Leader.

Your Group Leader played 2 rounds of the bargaining game, and below are his/her decisions:

Round 1 Decision: **DO NOTHING**

Round 2 Decision: **DO NOTHING**

Remember: As your Group Leader, he/she will be shown every Group Member's contribution decision. He/she will then decide to remove 0 to 60 points from each Group Member.

Note. Behavioral dispositions shown on the left (right) represents the dominant (nondominant) version, depicting their leader's behaviors in a Hawk-Dove game. In a Hawk-Dove game, Player A and Player B are both given the same amount of money, and their task is to privately decide between two options: whether to (1) *claim* some money from the other player or (2) *do nothing*. If both players decide to *do nothing* (the passive option), both get to keep their respective money. If one player chooses to claim (i.e., Hawkish strategy) while the other does nothing (i.e., Dovish strategy), the claimer/Hawk receives bonus money while the passive party/Dove loses some money. If both players choose to claim, *both* lose some money.

Figure S3D: Authoritarian social attitudes stimuli in Study 2d.

Instead of reducing prison time, we need stricter imprisonment laws to keep criminals behind bars	7 - Strongly agree	Instead of reducing prison time, we need stricter imprisonment laws to keep criminals behind bars	1 - Strongly disagree
All illegal immigrants living in the U.S. must be deported immediately and banned from re-entry	6 - Agree	All illegal immigrants living in the U.S. must be deported immediately and banned from re-entry	2 - Disagree
Rights to gun ownership should NOT be limited	6 - Agree	Rights to gun ownership should NOT be limited	2 - Disagree
Death penalty should always be an option to the court	7 - Strongly agree	Death penalty should always be an option to the court	1 - Strongly disagree
The best way to deter future crimes is to hand down harsher punishment against criminals	7 - Strongly agree	The best way to deter future crimes is to hand down harsher punishment against criminals	1 - Strongly disagree
Our country should prioritize military spending	6 - Agree	Our country should prioritize military spending	2 - Disagree

Note. Participants completed the same set of questions at the beginning of the study (before entering the public goods game). Then, in the PPG + Leader treatment, participants in the dominant (nondominant) leader condition were shown the responses on the left (right) ostensibly provided by their leader.

Figure S3E: Physical formidability stimuli in Study 2e.

I'm physically stronger than 90% of other men.	7 - Strongly agree	I'm physically stronger than 90% of other men.	2 - Disagree
If I got into a fistfight with an average 30-year old male, I would probably win.	6 - Agree	If I got into a fistfight with an average 30-year old male, I would probably win.	2 - Disagree
In the past, I have physically intimidated people who were asking for it.	5 - Slightly agree	In the past, I have physically intimidated people who were asking for it.	3 - Slightly disagree
When I have gotten into physical fights, I rarely regret it afterwards.	6 - Agree	When I have gotten into physical fights, I rarely regret it afterwards.	2 - Disagree
I have more muscle mass than most people my age.	7 - Strongly agree	I have more muscle mass than most people my age.	2 - Disagree
I spend a lot of my free time working out.	7 - Strongly agree	I spend a lot of my free time working out.	2 - Disagree

Note. Participants completed the same set of questions at the beginning of the study (before entering the public goods game). Then, in the PPG + Leader treatment, participants in the dominant (nondominant) leader condition were shown the responses on the left (right) ostensibly provided by their leader.

Manipulation check results for Studies 2a – 2e

We test the effectiveness of the leader dominance manipulation using simple linear regressions by regressing relevant perception ratings on leader dominance dummy (1 = dominant-looking leader, 0 = nondominant-looking leader).

Study 2a:

Supporting our manipulation, participants in the dominant-looking leader condition rated their Group Leader as significantly more dominant than participants in the nondominant-looking leader condition, $b = 0.59$, $SE = 0.26$, $t(187) = 2.28$, $p = .024$. Leader facial dominance had no effect on participants' ratings of leader perceived prestige, attractiveness, trustworthiness, and the degree to which they think the photo was realistic/unrealistic (ps in the range of .15 to .89).

Study 2b:

Participants in the dominant conditions rated their leader as more dominant than participants in the nondominant leader condition, $b = 2.08$, $SE = 0.23$, $t(183) = 9.14$, $p < .001$, and control condition, $b = 1.84$, $SE = 0.21$, $t(189) = 8.68$, $p < .001$. However, participants in the dominant condition also reported lower perceived prestige than nondominant leader condition, $b = -0.90$, $SE = 0.16$, $t(183) = -5.67$, $p < .001$, but not the control condition, $b = -0.30$, $p = .08$. Moreover, participants in the dominant leader condition also rated their leader as less trustworthy and attractive than nondominant leader condition (all $ps < .001$), but not the control condition. Finally, participants in all conditions did not differ in perceived realism (overall ANOVA-based $p = .78$).

Study 2c:

Participants in the dominant condition rated their Group Leader as significantly more dominant than participants in the nondominant leader condition, $b = 1.25$, $SE = 0.23$, $t(197) = 5.24$, $p < .001$. However, participants also rated the dominant leader as less prestigious, $b = -1.09$, $SE = 0.19$, $t(197) = -5.53$, $p < .001$, less trustworthy, $b = -1.61$, $p < .001$, less attractive, $b = -0.95$, $p < .001$, but similarly realistic ($p = .43$).

Study 2d:

Participants in the dominant condition rated their Group Leader as significantly more dominant than participants in the nondominant leader condition, $b = 1.68$, $SE = 0.18$, $t(200) = 8.48$, $p < .001$. However, participants also rated the dominant leader as less prestigious, $b = -0.68$, $SE = 0.21$, $t(200) = -3.23$, $p = .001$, less trustworthy, $b = -0.74$, $p < .001$, less attractive, $b = -0.71$, $p = .002$, but similarly realistic ($p = .10$).

Study 2e

Participants in the dominant condition rated their Group Leader as significantly more dominant than participants in the nondominant leader condition, $b = 2.76$, $SE = 0.16$, $t(245) = 17.62$, $p < .001$. However, participants also rated the dominant leader as less prestigious, $b = -0.68$, $SE = 0.14$, $t(245) = -5.04$, $p < .001$, less trustworthy, $b = -1.01$, $p < .001$, but not on attractiveness, $b = .02$, $p = .88$, and perceived realism ($p = .12$).

Although these findings showed that our manipulation of leader dominance was successful (in elevating perception of dominance), in some studies the nondominant leader was nonetheless perceived as more prestigious, trustworthy, and attractive. In light of these results, we also report subsidiary analyses (below) where we statistically control for the influence of these differing ratings across conditions.

Summary of Studies 2a – 2e

Below we summarized the key information pertaining to Studies 2a – 2e, including the effects of leader dominance condition on expected punishment and perception of harshness.

Table S6

Summary of Studies 2a – 2e.

	Study 2a	Study 2b	Study 2c	Study 2d	Study 2e
	Facial Masculinity	Dominant Personality	Disposition toward Aggressive Behaviors	Endorsement of Authoritative Social Policies	Physical Formidability
Total N	189	283	199	202	247
N Women	75	128	77	80	117
Mean Age (SD)	37.77 (11.10)	37.92 (11.03)	38.01 (10.06)	40.71 (12.19)	40.34 (11.73)
Manipulation of Leader Dominance	Group Leader with either a masculinized face (dominant condition) or a feminized face (non-dominant condition)	Group Leaders self-described as having a domineering (dominant condition) or non-domineering personality (non-dominant condition), or no description presented (control).	Group Leader either consistently adopted the Hawkish strategy (dominant condition) or Dovish strategy (non-dominant condition) in a Hawk-Dove game (Maynard Smith & Parker, 1976)	Group Leader either strongly (dominant condition) or weakly (non-dominant condition) endorsed authoritative social policies.	Group Leader self-reported as either having formidable (dominant condition) or non-formidable physical characteristics (non-dominant condition)
Effect size of Manipulation Check (Cohen's <i>d</i>)					
<i>Dominance</i>	0.33*	1.34***	0.74***	1.19***	2.24***
<i>Prestige</i>	0.02	0.84***	0.78***	0.46**	0.64***
<i>Trustworthiness</i>	0.13	0.80***	0.99***	0.47***	0.80***
<i>Attractiveness</i>	0.04	0.26	0.84***	0.45**	0.02
<i>Perceived Realism</i>	0.21	0.12	0.11	0.24	0.20
<i>Expected Punishment</i>	-	0.52**	0.49***	0.76***	0.57***
<i>Perceived Harshness</i>	-	1.03***	0.52***	0.93***	1.26***

Notes. For **bolded** Cohen's *d*, the mean score in dominant leader condition is higher than non-dominant leader condition. (*) indicates the statistical significance of the mean differences, where *** $p < .001$, ** $p < .01$, and * $p < .05$.

Additional Analyses (Studies 2b and 2c)

Robustness check 1

1. In Study 2b, we included a control condition to examine whether the observed effect of leader dominance is due to dominant leader elevating cooperation, nondominant leader decreasing cooperation, or both; we found no difference between nondominant and control condition ($p = .65$), suggesting that it is more likely that a dominant leader increases cooperation (than nondominant leader decreases cooperation).

2. Moreover, knowing that prestige and other perceptions also differ between dominant and nondominant leader condition, we reran the main model by controlling for prestige, trustworthiness, and attractiveness in the dominant vs. nondominant leader model. We present the results in Table S5.

3. As another robustness check, we ran another model where we replaced the leader dominance condition dummy with subject's perception of leader dominance. Results presented in Table S6.

Table S7*Summary Results Controlling for Additional Perceptions*

Dependent variable: % of points contributed		Study 2b		Study 2d		Study 2e	
		(Dominant Personality Description)		(Authoritarian Social Attitudes)		(Physical Formidability)	
		γ	<i>SE</i>	γ	<i>SE</i>	γ	<i>SE</i>
Fixed Effects	Dominant Leader	15.57**	4.99	13.29**	4.72	10.17*	4.67
	Perceived Prestige	2.43	3.44	-5.28	3.48	-0.57	2.99
	Perceived Trustworthiness	2.92	2.58	9.79**	3.02	1.65	2.52
	Perceived Attractiveness	-4.24	2.23	-2.14	2.54	-	-
	Intercept	49.28***	12.29	43.14***	8.62	59.42***	10.38
Random Effects	τ_0^2	898.6		991.9		1115.9	
	σ^2	131.5		198.1		118.8	
Observations		555		606		741	
Group variable (Subjects)		185		202		247	

Notes. In Study 2e, perceived attractiveness was not significantly different across groups ($p = .88$), and thus was not included in the model for robustness check.² We only reported robustness check for studies where the effect of leader dominance condition was significant.

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

² When it is included in the model, the effect of leader dominance became marginally significant, $p = .08$.

Table S8

Summary Results Controlling for Additional Perceptions and Replacing Dominant Leader Condition with Perceived Dominance

Dependent variable: % of points contributed		Study 2b		Study 2d		Study 2e	
		(Dominant Personality Description)		(Authoritarian Social Attitudes)		(Physical Formidability)	
		γ	<i>SE</i>	γ	<i>SE</i>	γ	<i>SE</i>
Fixed Effects	Perceived Dominance	2.74*	1.38	5.01***	1.44	3.53**	1.28
	Perceived Prestige	1.30	3.46	-3.72	3.48	-2.19	3.32
	Perceived Attractiveness	-4.45	2.33	-3.33	2.53	2.06	2.24
	Perceived Trustworthiness	2.98	2.66	9.46**	2.98	1.98	2.47
	Intercept	52.47***	13.75	29.9***	10.35	49.31***	11.07
Random Effects	τ_0^2	927.3		970.4		1090.0	
	σ^2	131.5		198.1		118.8	
Observations		555		606		741	
Group variable (Subjects)		185		202		247	

Notes. We only reported robustness check for studies where the effect of leader dominance condition was significant.

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

Leader Dominance and Follower Preferences (Study 2)

Here, we report the main findings concerning the main effect of leader dominance condition on follower leadership preference. As stated in the main manuscript, in Studies 2a and 2b we hypothesize that participants would prefer dominant leader (vs. nondominant), whereas in Studies 2c – 2e, we expected participants to prefer nondominant leaders (vs. nondominant), as inspired by findings in Studies 2b. Below we report the full results across Studies 2a – 2e.

Table S9

Main Effects of Leader Dominance Condition on Follower Leadership Preference

Study	Condition (Leader Dominance)	Mean	SD	<i>b</i>	<i>SE(b)</i>	<i>t</i>	<i>df</i>	<i>p</i>
2a	Dominant	4.86	1.11	0.01	0.16	0.00	187	.997
	Non-dominant	4.85	1.12					
2b	Dominant	4.33	1.20	-0.70	0.16	-4.45	183	<.001
	Non-dominant	5.03	0.92					
2c	Dominant	3.94	1.34	-1.08	0.18	-5.93	197	<.001
	Non-dominant	5.01	1.22					
2d	Dominant	4.12	1.55	-0.60	0.20	-3.03	200	.003
	Non-dominant	4.73	1.24					
2e	Dominant	3.95	1.37	-0.36	0.15	-2.36	245	.019
	Non-dominant	4.31	1.01					

Conservatives showed stronger preferences for dominant leaders

Although not preregistered, we explored whether political conservatism would interact with leader dominance in affecting follower preference. We observed significant interaction between leader dominance condition and subject political orientation in all studies except for Study 2a. Table S8 showed the full simple effects and simple slopes.

Table S10
Simple Slopes for Conservatism at Each Level of Leader Dominance Across Studies

Study	Condition	Ideology		<i>b</i>	<i>SE(b)</i>	<i>t</i>	<i>p</i>
		Liberal	Conservative				
2a	Dominant	4.95	4.77	-0.003	0.004	-0.77	.444
	Non-dominant	5.10	4.63	-0.007	0.004	-2.03	.043
2b	Dominant	4.04	4.59	0.009	0.004	2.33	.022
	Non-dominant	5.13	4.92	-0.003	0.003	-1.09	.281
2c	Dominant	3.40	4.39	0.015	0.004	3.73	<.001
	Non-dominant	5.03	5.00	-0.005	0.004	-0.14	.887
2d	Dominant	3.82	4.43	0.009	0.003	3.61	<.001
	Non-dominant	4.97	4.37	-0.010	0.004	-2.54	.013
2e	Dominant	3.39	4.51	0.018	0.004	4.88	<.001
	Non-dominant	4.40	4.22	-0.003	0.003	-1.06	.292

Notes: Subject's conservatism was measured using a single-item measure (1 = *very liberal*, 100 = *very conservative*). Shaded cells show the estimated means for Liberal (-1SD) and Conservative subjects (+1SD), respectively. Coefficient *b* represents the simple slopes of conservatism. All interaction effects between leader dominance condition and conservatism were significant except for Study 2a.

References

- Balafoutas, L., Nikiforakis, N., & Rockenbach, B. (2014). Direct and indirect punishment among strangers in the field. *Proceedings of the National Academy of Sciences*, *111*(45), 15924-15927. doi:10.1073/pnas.1413170111
- Barclay, P. (2006). Reputational benefits for altruistic punishment. *Evolution and Human Behavior*, *27*(5), 325-344. doi:10.1016/j.evolhumbehav.2006.01.003
- Egas, M., & Riedl, A. (2008). The economics of altruistic punishment and the maintenance of cooperation. *Proceedings of the Royal Society B: Biological Sciences*, *275*(1637), 871-878. doi:10.1098/rspb.2007.1558
- Fehr, E., & Gächter, S. (2002). Altruistic punishment in humans. *Nature*, *415*(6868), 137-140. doi:10.1038/415137a
- Nikiforakis, N., & Normann, H. (2008). A comparative statics analysis of punishment in public-good experiments. *SSRN Electronic Journal*. doi:10.2139/ssrn.747144
- Pfattheicher, S., Landhäußer, A., & Keller, J. (2013). Individual differences in antisocial punishment in public goods situations: The interplay of cortisol with testosterone and dominance. *Journal of Behavioral Decision Making*, n/a-n/a. doi:10.1002/bdm.1811
- Pleasant, A., & Barclay, P. (2018). Why hate the good guy? Antisocial punishment of high cooperators is greater when people compete to be chosen. *Psychological Science*, *29*(6), 868-876. doi:10.1177/0956797617752642
- Stavrova, O., Schlösser, T., & Fetchenhauer, D. (2013). Are virtuous people happy all around the world? Civic virtue, antisocial punishment, and subjective well-being across cultures. *Personality and Social Psychology Bulletin*, *39*(7), 927-942. doi:10.1177/0146167213485902

Wu, J., Zhang, B., Zhou, Z., He, Q., Zheng, X., Cressman, R., & Tao, Y. (2009). Costly punishment does not always increase cooperation. *Proceedings of the National Academy of Sciences*, *106*(41), 17448-17451. doi:10.1073/pnas.0905918106