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Selfish or servant leadership? Evolutionary predictions on leadership personalities in coordination games

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ABSTRACT

We study the personalities of emergent leaders in two coordination games in groups of four players each with monetary incentives. Our results support the evolutionary hypothesis that leadership is a social good for the group: leadership benefits followers but is potentially costly for the individual taking on the leader role. Across the two economic games leaders do less well – earn less money – on average than followers. Furthermore, social participants choose to lead more often than selfish participants and there is no relationship between leadership behavior and personal dominance. Our results support the idea that leadership can be servant rather than selfish and we note the implications of this finding.

1. Introduction

The collapse of the banks, the invasion in Iraq and the election of Barack Obama, the first Black president in US-history, all invariably point to the importance of leadership. Leadership is arguably one of the main themes in current social affairs and is one of the most widely studied subjects in the social sciences. Yet the question "Who leads" has not been fully addressed. For instance, it remains to be seen whether leaders are primarily concerned with serving their own selfish interests or the interest of their followers. Personality research on leadership has found a stable set of traits cross-culturally associated with good leadership such as intelligence, generosity, vision and competence (Den Hartog, House, Hanges, Ruiz-Quintanilla, & Dorfman, 1999). Yet, it is also clear that there are many dominant, authoritarian, and despotic leaders out there who try to exploit group resources to benefit themselves and their close allies.

An evolutionary approach suggests that there are two contrasting theoretical positions on the origins of leadership in humans with implications for the types of personalities that are attracted to leadership positions (Van Vugt, 2006; Van Vugt, Johnson, Kaiser, & O'Gorman, 2008). The first is a by-product theory which views leadership as the outcome of dominance battles between (mostly male) group members. The argument is that evolution has equipped individuals with the psychological tendencies to compete over status and dominance because someone's position in the hierarchy of the group determines their access to reproductively relevant resources. Leadership is thus the product of status competitions whereby leaders occupy the top positions in the hierarchy and by virtue of their position can exercise power over lower-ranked individuals. This is how most evolutionary biologists and psychologists write about leadership (Wilson, 1975).

The alternative perspective is that leadership is a group-level adaptation that enables individuals to function better in groups (Wilson, Van Vugt, & O'Gorman, 2008). Leadership is a coordination device that helps groups to solve problems with regard to the planning and execution of group tasks such as collective movement, resource sharing and group decision-making. Having someone as leader serves the interests of followers because they can reap the benefits of being in a highly coordinated and cohesive group. This is essentially the concept of servant leadership as coined by Greenleaf (2002) to depict a style of leadership in which the primary service is to the followers (Liden, Wayne, Zhao, & Henderson, 2008).

The dominance versus coordination perspective thus make different predictions about the personalities of individuals emerg-

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ing as leaders in formerly leaderless groups. According to the leadership-as-dominance view leadership emergence is expected to correlate with essentially selfish and egotistic traits whereas the leadership-as-coordination perspective hypothesizes an association between leadership and pro-social personality traits – we can refer to these in terms of the selfish leadership versus servant leadership hypothesis.

In order to test these competing predictions we examine the emergence of leadership in leaderless four-player groups in two social decision-making experiments whereby we examine the behaviors of individuals in four-player coordination games in which they can decide to go first (leader) or wait (follower) and their decisions are associated with certain monetary pay-offs. We can then link their decisions to data from personality questionnaires and their earnings in the game.

We define leadership behaviorally in terms of the individual who coordinates group activities by making the first move in a coordination game (of course first movers only emerge as leaders if their moves are being followed by the rest). This is essentially leadership-by-example – one individual acting publicly before the rest and thereby influencing others into taking a particular course of action (Yukl, 1989). Leading-by-example is a prominent form of leadership among both humans and nonhumans (for a recent review see King, Johnson, & Van Vugt, 2009) but it has not yet been sufficiently studied in humans. Examining this kind of leadership in economic games enables us to investigate if there are stable personality differences in the propensity to take the lead in situations in which the (monetary) pay-offs for leadership varies (Cartwright, Gillet, & Van Vugt, 2009; Gillet, Cartwright, & Van Vugt, 2009). So, the core question in these games is who leads and how do they fare compared to followers in terms of their earnings in the game?

This core leadership question has not been addressed in the economic and psychological literatures although there is an increasing interest in studying leadership in coordination games and social dilemmas (Brandts & Cooper, 2006; Coats, Gronberg, & Grosskopf, 2009; Coats & Neilson, 2005; Cooper, 2006; Gächter, Nosenzo, Renner, & Sefton, 2009; Güth, Levati, Sutter, & Van Der Heijden, 2007; Weber, Camerer, & Knez, 2004). So far the economic literature has primarily focused on the benefits of leadership in terms of helping players coordinate while neglecting questions about the potential costs for the individuals moving first. O'Gorman, Henrich, and Van Vugt (2009) found some evidence for altruistic or "servant" leadership in a public good game where leaders were given the opportunity to punish freeriders. Servant leadership increased cooperation within the group but at a significant cost to the leaders. In addition, the literature has been relatively ignorant about the personalities of individuals who take on leadership roles in these games (these roles are usually determined by the experimenter; O'Gorman et al. (2009)).

What we typically observe, however, in these games is that leaders receive lower pay-offs than followers. Two distinct reasons for this are noted. First, leaders may try to signal something to followers but followers miss the meaning of or ignore the signal. Second, followers can punish a leader who appears to exploit any strategic advantage from leadership. All of this supports the social coordination or servant leadership hypothesis that pro-social people are more likely to want to lead (and are more likely to be successful leaders).

At the same time there is also some evidence for the dominance or selfish leadership hypothesis. This comes mainly from historical records of leadership such as the writings on kings, emperors, and tyrants who often use their leadership positions to enrich themselves and their relatives (Betzig, 1993) and from experimental social psychological research on social dilemmas. For instance, when people are assigned to leadership positions – even if they are randomly allocated – they tend to harvest more points from a common resource pool than ordinary group members. The amount they took was also predicted by their personality: Individuals with pro-social personalities took less than individuals with proself personalities (De Cremer & Van Dijk, 2005). In addition, leadership emergence in unstructured laboratory groups is associated with personality traits such as Machiavellianism and Narcissism (that together with Psychopathy form the so-called Dark Triad) which produce manipulative and self-centered leaders (Van Vugt, 2006). Thus, these findings support the idea that selfish people are more likely to want to lead.

To test the selfish versus servant leadership hypothesis we examined decision-making in two coordination games, a standard weak-link game (Van Huyck, Battalio, & Beil, 1990) and a coordination game that we designed ourselves (which included some conflict of interest between players). In each of the experiments we used four-player groups and per game trial each group member received a pay-off matrix and could then make a decision whether to move as first player or as a follower. Their pay-offs per trial were a function of their personal decisions in combination with the decisions of the other game players. In this experimental context we tested the selfish versus servant leadership hypothesis. The selfish hypothesis predicts that leaders do better (earn more) than followers in the game and that they score highly on personality traits associated with dominance and selfishness. The alternative servant leadership hypothesis predicts that overall leaders do worse (earn less) in the game than followers, and that they score low on dominance and selfishness traits. In order to measure personality we asked participants to complete the dominance scale (Heckert et al., 1999), the social value orientation measure (Kuhlman & Marshello, 1975; Van Lange & Kuhlman, 1994), and for exploratory purposes the NEO-FFI (aka the Big Five) scale (Costa & McCrae, 1992).

2. Experiment 1: weak-link coordination game

2.1. Methods

2.1.1. Participants and design

Eighty students participated (34 male, 46 female, average age 21.44). Participants were recruited via the university-wide research participation scheme of the (Psychology department of the) University of Kent. The experiment was programmed and conducted with the software Z-tree (Fischbacher, 2007) and for the questionnaires we used the online questionnaire system from the University of Kent. The experiment was run at the University of Kent at Canterbury in March 2008. Participants earned on average £8.82. The experiment took about 45 min.

2.1.2. The weak-link game

Participants played a so-called weak-link game (Van Huyck et al., 1990) in groups of four. In the game the players had to choose a number between 1 and 7. Their earnings depended on the number they picked and the lowest number picked in the group according to the following formula:

$$0.60 + 0.10\,[\text{minimum choice}] - 0.10\,[\text{own choice} - \text{minimum choice}]$$

The earnings for every combination of number and lowest choice in the group were also presented in the instructions, and on their screen during the game, as in Fig. 1.

In each round one of the players could act as a leader. By being the first to make a decision – picking a number and clicking *ok* – a player could make her/his decision publicly before the others. The remaining players learned the decision made by the leader and

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Choice:	1	2	3	4	5	6	7
min = 1	0,7	0,6	0,5	0,4	0,3	0,2	0,1
min = 2		0,8	0,7	0,6	0,5	0,4	0,3
min = 3			0,9	0,8	0,7	0,6	0,5
min = 4				1	0,9	0,8	0,7
min = 5					1,1	1	0,9
min = 6						1,2	1,1
min = 7							1,3

Fig. 1. Pay-off matrix for the weak-link game (Experiment 1).

then made their own decisions simultaneously with each other. If, within 3 min, none of the participants chose to go before the rest the game automatically changed into a game where all four players decided simultaneously (in the end this never happened; there was always someone who wanted to go first). After each round players learned only the lowest number picked in their group (they already knew, of course, the number chosen by the first-mover). The game lasted for ten rounds.

In a weak-link game participants prefer to pick the same number as everyone else in their group but they also prefer this number to be as high as possible. In game theoretic terms: every situation where every player picks the same number is a Nash equilibrium but these equilibria are Pareto ranked. The preferred outcome would be a situation where everybody picks 7. Picking 7 is, however, risky because a person picking 7 would get a relatively low pay-off if just one other person in the group picks a lower number. Specifically, anyone who picks 1 is guaranteed 0.7 while someone who picks 7 only gets 0.7 if all others in the group pick 4 or more.

The best a leader can do for the good of the group is to choose 7. This maximizes the chances of the group coordinating. We have seen, however, that choosing 7 is risky and potentially costly. A more selfish player may, therefore, want to wait and see what a leader does before picking.

We measure leadership by counting how many times a particular player chooses first. We measure leadership *quality* by measuring how high the numbers chosen as a leader were and the costs/benefits of leadership by points earned.

2.1.3. Personality measures

After the game (but before being told how much they had earned) participants filled out a number of psychological questionnaires:

First, we administered the standard NEO-FFI (Big5) personality questionnaire measuring extraversion, agreeableness, conscientiousness, neuroticism and openness via 44 items on five-point Likert scales (1 = completely agree to 5 = completely disagree).

Social Value Orientation was measured with nine items where the participants were asked to divide a (hypothetical) amount of money between themselves and a non-identified other. Each item had three options which can be classified as the pro-social, equally sharing option (e.g. 480 for me, 480 for the other), the competitive, difference maximizing option (480 for me, 80 for the other) and the individualistic, individually maximizing option (540 for me, 280 for the other). We scored participants who chose the pro-social distribution $\geqslant 6$ times as 'social' and those choosing the individualistic distribution $\geqslant 6$ time or the competitive distribution $\geqslant 6$ times as 'selfish'.

Dominance was measured with a 5-item questionnaire consisting of 5-option (1 = completely agree to 5 = completely disagree) Likert-scale questions such as 'I would enjoy being in charge of a project' and 'I strive to be 'in command' when I am working in a group'.

2.1.4. Procedure

Participants were randomly assigned to their groups (which were the same for the duration of the game). After a short general introduction participants were each placed behind a computer – with divisions to ensure privacy and anonymity – where they would stay the rest of the study. Participants played three games of which the weak-link game relevant here was one (the order in which these games were played was random and different in each session). When they were finished participants were paid their earnings of one randomly selected game, out of the three they played, where in the case of the weak-link game here the numbers in Fig. 1 referred to amounts in British pounds.

2.3. Results and summary

First, we find that per round Leaders earn significantly fewer points than Followers ($M_{\text{leader}} = 0.72$, SD = 0.29 vs. $M_{\text{follower}} = 0.78$, SD = 0,26; $t(798) = 2.334$; $p = .02$; Mann–Whitney's $U = 53779.5$, $p = .024$). We see therefore that leading in a weak-link game came at a cost to the individual at the benefit of the group as predicted by the servant leadership hypothesis.

Consistent with the servant leadership hypothesis we also find that participants who were classified as 'pro-social' chose to lead more often than participants classified as 'pro-self' ($M_{\text{pro-social}} = 2.94$, SD = 2.97 vs. $M_{\text{pro-self}} = 1.00$, SD = 1.35; $t(62) = 2.1936$; $p < .05$; Mann–Whitney's $U = 182.5$, $p = .023$). We find no significant correlation between how many times a participant acted as leader and their score on the dominance scale ($r = .213$, $p = .112$).

With respect to the NEO-FFI questionnaire we only find a (marginally) significant negative correlation between 'times going first' and openness to experience ($r = -.248$, $p = .063$). Thus, people who are more open to new experiences chose to lead less often, suggesting that leadership is more about pro-sociality than risktaking.

Finally, looking at the numbers they pick, men as leaders pick a significantly higher number than women leaders and are thus more effective ($M_{\text{male}} = 5.18$, SD = 2.158 vs $M_{\text{female}} = 3.73$., SD =

2.090; $t(57) = 2.5451$; $p < .05$; Mann–Whitney's $U = 256.5$, $p = .017$). There were no personality traits associated with effective leadership in this game. See Table 1 for an overview of the correlations between the various measures in the experiment.

3. Experiment 2. Coordination game (with conflict of interest)

3.1. Method

3.1.1. Participants and design

One hundred students participated (46 male, 54 female, average age 21.61). Software used and participants recruitment method were the same as in Experiment 1. The experiment was run at the Group Decision Making Lab of the University of Kent at Canterbury in May and June 2008. Participants earned on average £9.92. The experiment took about 1 h.

3.1.2. Coordination game

Participants played a four-player coordination game where each player had to choose between two options, x and y. Both options had an intrinsic value, X and Y respectively. Additionally there was a coordination value, C, which was awarded for every other player in the group that made the same decision. So, the pay-off to a particular player for choosing x was $X + n_x$, C and for choosing y it was $Y + n_y$, C, where n_x and n_y are the number of other players in the group choosing the same option. The intrinsic and the coordination values were randomly, and independently from each other and for each participant, drawn anew for each round from the set of whole numbers [1, 12]. The game lasted for 25 rounds (to avoid potential end game effects participants were told to expect 'somewhere between 20 and 30' rounds).

The sequence of events in each round was as follows. First, the participants learned the intrinsic and coordination values. Here there were three conditions. In the No Information condition players only learned their own values. In the Full Information condition all players learned, in addition to their own values, also the values for the other players. Finally there was the Half Information condition where two, randomly selected for each round, players learned the values of all players and the other two players learned only their own values. In all conditions the participants had to wait 15 s after learning the values before they could make their choice.

Players took their decisions sequentially and determined the order in which they did so endogenously. The leader is whoever chose first. The other players would observe the decision made by the first mover and could respond by deciding themselves or wait until others had made their decision as well. There was a maximum of 3 min for each round. When all four players had made their decision the total number of points for each player was calculated and a new round began.

Fig. 2 is an example of what a player would see (in the Full Information condition) at the beginning of a round. For this particular player choosing X earns 11 points, Y 4 points and for every player that makes the same decision this player receives 2 points.

In this game there is a potential conflict of interest within the group. Players do want to coordinate but some may prefer to coordinate on X and others on Y. This means that there are personal strategic incentives for leading or waiting that are determined by the randomly drawn intrinsic and coordination values (Cartwright et al., 2009). For example, someone indifferent between X and Y but with a high coordination value has a basic objective to coordinate with others, so, has an incentive to wait and see what others do. Someone with a high value for X but low value for Y has an incentive to lead, choose their preferred option of X and influence as many others as possible to do the same.

Of primary interest to us is how these seemingly selfish reasons to lead or wait interact with potential social reasons to lead or wait? The best a player can do for the group is to choose the option intrinsically preferred by most others. This leads to an important difference between the full, half and No Information conditions, motivating our interest in them. A person who knows others' pay-off values is able to knowingly choose an option good for the group. By contrast, a person who does not know others' pay-off values is constrained by their lack of information – they do not know what option is good for the group. Given this lack of information the best they can do for the group may be to wait and follow others. The servant leader hypothesis would imply, therefore, that we should see participants categorized as 'social' lead in the Full Information condition but not in the No Information condition. This provides a fairly specific test of the hypothesis.

We measure leadership by counting how often a particular player decides to choose first and the costs/benefits of leadership by looking at the points earned per round.

3.1.3. Personality measures

We administered the same personality questionnaire as in experiment 1 (NEO-FFI, Social Value Orientation and dominance).

3.2. Procedure

Participants were randomly assigned to one of the three experimental conditions and to their groups (which were the same for the duration of the experiment). Participants played only one version of the game. We ran nine groups with Full Information and eight groups each in the Half Information and No Information conditions. After a short general introduction participants were directed to their own private lab rooms – with computers – where the rest of the study took place. Participants played the game first and then, before hearing how much they had earned, filled out the personality questionnaires. When they were finished participants

Table 1
Pearson correlations between measures in the weak-link game.

	Choiclead	Extrav	Agree	Consc	Neuro	Open	Domin	Alpha
Timeslead	−.073	.019	−.030	−.055	−.114	−.248^{+}	.213	na
Choicelead	1	−.034	−.182	−.146	−.080	.190	.195	na
Extrav		1	.331**	.163	−.273**	.255*	.418**	.877
Agree			1	.381**	−.336**	.250*	−.015	.899
Consc				1	−.231*	.147	.316**	.852
Neuro					1	−.241	−.128	.834
Open						1	−.013	.807
Dominance							1	.839

Notes: Timeslead, how many times a participant acted as a leader; Choicelead, average choice made as a leader; Extrav, NEO-FFI, extraversion; Agree, NEO-FFI, agreeableness; Consc, NEO-FFI, conscientiousness; Neuro, NEO-FFI, neuroticism; Open, NEO-FFI, openness to new experience; Alpha, Cronbach's alpha. $N = 80$.

$^{+}$ $p < .10$.
* $p < .05$.
** $p < .01$.

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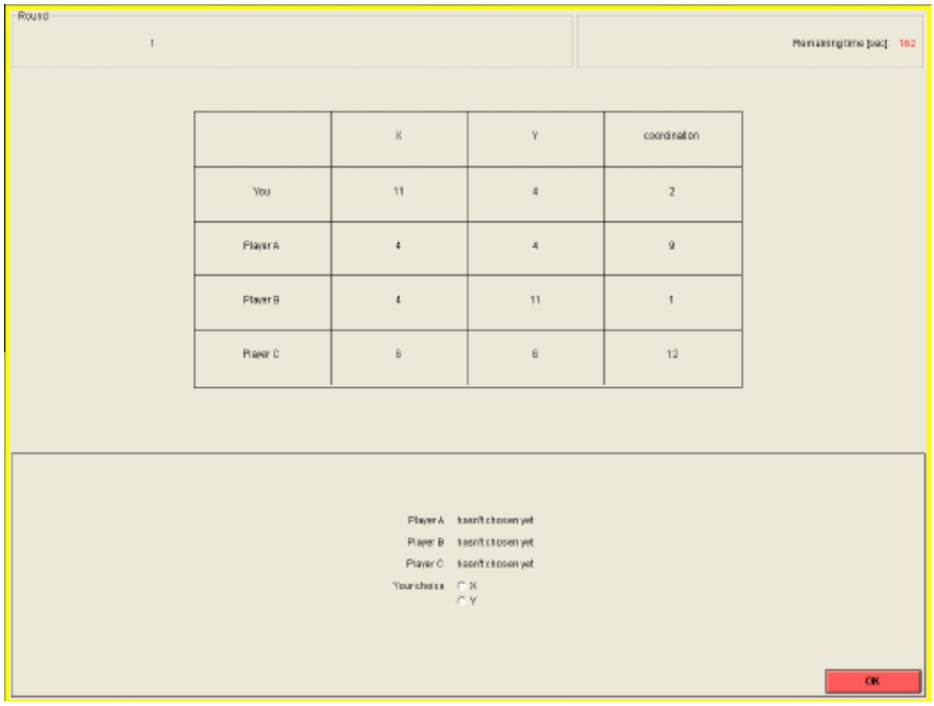

Fig. 2. The coordination game with conflict of interest (Experiment 2).

were paid the earnings of three randomly selected rounds, where each point was worth 10p.

3.3. Results and summary

In support of our main hypothesis, with regards to earnings we find that in the No Information condition Leaders earn significantly less than Followers (M_{leader} = 19.36, SD = 10.81 vs. $M_{follower}$ = 21.92, SD = 10.28; $t(798) = 3.0150$; $p < .01$; Mann–Whitney's $U = 50944.5$, $p = .001$). In neither the Full Information (M_{leader} = 23.72, SD = 10.67 vs. $M_{follower}$ = 22.77, SD = 10.67, $t(898) = 1.1582$, $p = .2471$; Mann–Whitney's $U = 72312$, $p = .283$) nor the Half Information condition (M_{leader} = 20.94, SD = 10.16 vs. $M_{follower}$ = 21.91, SD = 10.16, $t(798) = 1.1170$, $p = .2643$; Mann–Whitney's $U = 56747.5$, $p = .25$) is there a statistically significant difference in earnings.

As predicted by the servant leadership hypothesis participants who score as 'social' on the SVO emerge as Leaders significantly more often than participants who were rated as 'selfish' in the full but not No Information condition (Full Information: M_{social} = 8.05, SD = 4.92 vs. $M_{selfish}$ = 2.25, SD = 2.60; $t(27) = 3.1423$, $p < .01$; Mann–Whitney's $U = 21.5$, $p = .002$, No Information: M_{social} = 6, SD = 3.89 vs. $M_{selfish}$ = 6.33, SD = 3.00; $t(27) = .2274$, $p = .8218$; Mann–Whitney's $U = 83$, $p = .764$). In the Half Information condition we find no effect (M_{social} = 5.57, SD = 3.20 vs. $M_{selfish}$ = 6.86, SD = 3.58; $t(28) = .9106$, $p = .3703$; Mann–Whitney's $U = 62.5$, $p = .375$).

We find no effects of the dominance scale measure on times moved first ($r = .00$, $p > .90$), suggesting no evidence for the selfish leadership hypothesis.

Finally, there is a significant positive correlation between the Big5 score for neuroticism and how many times someone acted as leader ($r = .572$, $p = .001$) in the Half Information condition only[1]. See Table 2 for an overview of the correlations between the various measures in the experiment.

[1] We are not sure what to make of this particular finding. May be the Half Information condition produced more anxiety than the others and as a result individuals were anxious to do something.

4. Discussion

Our results are consistent with the evolutionary hypothesis that leadership can be a social good for the group by being associated with self-sacrificial behavior; behavior that is good for the group but comes at a cost to the leader. This is to our knowledge the first experimental evidence for servant leadership. In two economic games we find various traces of evidence for servant leadership. Leaders, on average, earned less money than followers and dispositionally social participants (on the basis of their social value orientation) chose to lead more often than selfish participants. Additionally there is no relationship between leadership and the kind of personality traits that are usual1y associated with selfish leadership, most notably personal dominance.

The results of our first experiment, a standard weak-link game, are easiest to interpret. In this game leadership improves the group outcome – setting a good example can help coordinate on the group on a better, more profitable outcome (as shown in Gillet et al., 2009) – but acting as a leader involves potential costs (risk of not being followed). That leaders earn less than followers – but that, at the same time, followers do better than they would have done in a situation without leadership – supports the idea of the servant nature of leadership (Wilson, Van Vugt, & O'Gorman, 2008). The finding that leaders are more likely to have a pro-social personality corroborates this explanation.

The results of the second game – a coordination game with conflict of interest – are a little harder to interpret. As predicted by the servant leadership hypothesis, people with pro-social personalities emerge as leaders more often in the Full Information condition. It is puzzling that although leaders also earn less than followers in the No Information condition there is no evidence for pro-social leadership in this condition. The most plausible explanation is that leadership in the No Information condition is not associated with pro-sociality but with risktaking (for evidence see Van Vugt, 2006).

Our research paradigm may seem to favour the servant leadership hypothesis. The games we used were coordination games and invite leadership strategies that help the group by making coordination easier. Also, the fact that the experiments were run in a to-

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Table 2
Pearson correlations between measures in the coordination game (with conflict of interest).

	Extrav	Agree	Consc	Neuro	Open	Domin	Alpha
Timeslead*N* (*n* = 32)	.096	.118	.259	−.255	.192	−.114	na
Timeslead*F* (*n* = 36)	.249	.264	.115	−.120	.111	.004	na
Timeslead*H* (*n* = 32)	−.205	−.152	−.105	.572**	−.010	.180	na
Extrav	1	.229*	.129	−.315**	.207*	.337**	.872
Agree		1	.301**	−.492**	.151	−.054	.795
Consc			1	−.157	.101	.283**	.869
Neuro				1	−.019	−.071	.880
Open					1	.150	.738
Dominance						1	.834

Notes: Timeslead*N*, how many times a participant acted as a leader (No Information condition); Timeslead*F*, how many times a participant acted as a leader (Full Information condition); Timeslead*H*, how many times a participant acted as a leader (Half Information condition); Extrav, NEO-FFI, extraversion, Agree, NEO-FFI, agreeableness; Consc, NEO-FFI, conscientiousness; Neuro, NEO-FFI, neuroticism; Open, NEO-FFI, openness to new experience; Alpha, Cronbach's alpha. *N* = 100 unless otherwise stated.
* $p < .05$.
** $p < .01$.

tally anonymous setting did not enable group members to form status and dominance hierarchies as you see in the real world. We are not claiming that leadership-as-dominance does not exist but that there are specific situations in which alternative, more social leaders emerge.

Finally, studying leadership-by-example in the lab has its drawbacks. The artificial nature of the proceedings makes simple translation of the results to the real world difficult. On the other hand the artificial nature – the fact that the participants interact with each other in a restricted computerised environment where they only observed each other's choices – allows for levels of control that make it possible for researchers to examine leadership personalities in situations in which the incentives are systematically varied. We found evidence for the servant leadership hypothesis and further research will have to be conducted to examine the determinants of servant leadership further and when it turns into selfish leadership.

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