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Personality and situational factors differently influence high Mach and low Mach persons' decisions in a social dilemma game

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ABSTRACT

In the present experiment, we simultaneously examine the effect of personality and situational factors on decisions in a social dilemma game. Our first question is what temperament and character factors would make Machiavellian people successful in social interactions? The second question refers to situational factors: how does the composition of the group influence the Machiavellians' decisions? Using Temperament and Character Inventory (TCI) scales, the scores on Mach IV test showed a positive correlation with Novelty Seeking and a negative correlation with Reward Dependence, Self-Directedness, Cooperativeness, and Self-Transcendence. We found that the Mach scores negatively correlated with the players' contribution over the game, and positively with the total profit they gained by the end of the game. Regression analyses revealed that the contribution of high Mach persons (those who had relatively high scores on Mach scale) to the public good were primarily influenced by the number of altruists in the group, whereas low Machs' decisions were influenced more by a temperament factor (Persistence). We assume that, compared to others, Machiavellians may be more sensitive to situational factors and take the behavior of their playmates into account to a greater degree, which may lead to their success in the exploitation of others.

1. Introduction

Machiavellianism is indicative of an attitudinal personality predisposition to see people as exploitable in interpersonal situations (Christie & Geis, 1970; Sutton & Keogh, 2000). It has three core components: endorsement of deception and manipulation in interpersonal interactions, a cynical view of human nature (seeing others as weak and untrustworthy), and a disregard for conventional morality (Fehr, Samsom, & Paulhus, 1992; Hawley, 2006). Machiavellian people behave in a self-interested way in that they manipulate others for personal gain (Gunnthorsdottir, McCabe, & Smith, 2002; Wilson, Near, & Miller, 1996). Individuals with high scores on Mach-scales (so-called high Mach people) have a tendency to be callous, selfish, and malevolent in their interpersonal dealings (Paulhus & Williams, 2002). They choose the adequate strategy coolly and sensibly in each situation and they do not get involved in emotional decisions (Jones & Paulhus, 2009).

Former studies have revealed that Machiavellianism is associated with certain personality features. Machiavellianism was found to be negatively correlated with Agreeableness (Austin, Farrelly, Black, & Moore, 2007; Jakobwitz & Egan, 2006; Paulhus & Williams, 2002), which coincides with the findings that Machiavellians have a broadly negative view of other people, and that they are dominant, narcissistic persons who are less likely to be concerned about other people beyond their own self-interest (Christie & Geis, 1970; Hawley, 2006; Jakobwitz & Egan, 2006). Machiavellianism is also negatively correlated with Conscientiousness (Austin et al., 2007; Jakobwitz & Egan, 2006), which reflects the Machiavellians' egocentrism: they have lower ethical standards and stronger intentions to behave unethically, especially in situations that offer various rewards for them (Christie & Geis, 1970; Jones & Kavanagh, 1996). They are considered to be goal oriented rather than person oriented (Christie & Geis, 1970; Hawley, 2006).

These studies found that Machiavellianism is related to certain personality factors, that is, Machiavellian people, in general, can be described as having a low level of prosocial character. However, as far as we know, no study has been conducted so far on the personality correlates of the Machiavellian *strategy*. The question is what temperament and character factors make Machiavellian people successful in social interactions? What personality scores should correspond with high Mach scores for the efficient exploitation of others? This is the first question that we want to address in the present study.

The second question is linked to the contextual variables involved in the Machiavellians' decisions. Several studies have

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examined the impact of situational factors on the Machiavellians' behavior. One of these factors is the presence of others. In a study, it was found that more than twice as many Machiavellians applied for voluntary charity work when their offers were made in the presence of others than when offers were made anonymously (Bereczkei, Birkas, & Kerekes, 2010). Thus, they disguised their selfishness and feigned altruism when being observed (which made the non-altruistic behavior costly in the group), but enforced their self-interest when others could not observe their behavior. Another study examined the effect of punishment on decisions in a social dilemma game in which players were allowed, at a certain stage of the game, to punish (impose a fine on) their partner who they believed transferred too little money to them (Spitzer, Fischbacher, Herrnberger, Grön, & Fehr, 2007). By the end of the game, Machiavellians made the largest profit, which was due to the fact that they paid little money in the non-punishable phase (and kept a high amount of money in their private account), while in the punishable phase they increased their contributions in order to avoid punishment.

Although the presence of others and punishment are important factors in determining decisions in the social dilemma task, other situational factors may be equally crucial in this respect. As far as we know, no study has examined the effect of the *composition* of the group on the Machiavellians' decisions: how the particular strategies of playmates influence their behavior over the game. In the present study, we take two types of behavioral strategies into consideration: altruism and defection. When subjects recognize the behavioral styles of the others in the group, do they adjust their decisions accordingly? How do Machiavellians and non-Machiavellians react to the perceived signals of altruism and defection during the game?

In the present experiment, we simultaneously examine the effect of personality and situational factors on decisions in a social dilemma game. The question is which of these factors are crucial in the behavioral tactics of individuals and how do they influence the players' contributions and profits during the game? What is the difference between Machiavellians and non-Machiavellians in their personality features related to their behavioral tactics and in their reactions to the situational factors?

2. Methods

2.1. Participants

One hundred and fifty students (69 males and 81 females, M_{age} = 22.2 years, SD = 2.61) participated in the study. All of them were volunteers. They received remuneration in the form of the amounts they won in the experimental games.

2.2. The public good game (PGG)

The participants had to face a social dilemma situation in the experiment. They formed groups of five individuals who were staying in the same room, separated from each other. Each individual was given a monetary endowment and they had to decide how much of this amount of money they would keep for themselves and how much of it they would transfer to the group account. The experimenter then doubled the amount that had been spent on the group and distributed it equally among the members, irrespective of their actual contribution. This process was repeated over five rounds. By the end of the game, the players kept their earned balance and could take it home. Each of the participants could observe the contribution of their group members – identified by a code and listed on a board – to the public account and the profit they netted. We used folding screens to ensure that the players could not identify who was behind the codes.

We distinguished two types of playmates in a group: altruist and free rider. An altruist is a player who transfers at least 80% of their monetary endowment given at the beginning of each round to the group account. A free rider is a player who contributes a maximum 20% of this initial capital to the public good. This distribution is based on the method applied by Kurzban and Houser (2001). The number of altruists/free riders in a group represents contextual variables in our analysis that are expected to strongly influence the subjects' decisions. The number of altruists and free riders were not experimentally manipulated, and their influence on the others' decision was not controlled.

2.3. Temperament and Character Inventory (TCI)

The Temperament and Character Inventory (TCI) is designed to measure seven personality traits. The temperament factors represent inherited patterns of processing environmental information and define the characteristic patterns of automatic responses by an individual to emotionally loaded stimuli. The four temperament factors (Novelty Seeking, Harm Avoidance, Reward Dependence, and Persistence) are partly innate and relatively stable throughout people's entire life, independent of culture and social influence. The other group of personality traits, the character factors (Self-Directedness, Cooperativeness, and Self-Transcendence), involves individual differences that gradually develop as a result of the interaction between temperament, family environment, and personal experience (Cloninger, Przybeck, Svrakic, & Wetzel, 1994).

2.4. Mach-IV test

Machiavellianism was assessed by using the Mach-IV scale (Christie & Geis, 1970). This scale consists of 20 items which cover the use of deceit in interpersonal relationships, cynical attitude to human nature, and a lack of concern for conventional morality. Participants indicate their response on a seven-point scale ranging from strongly disagree (1) to strongly agree (7), with higher scores indicating higher levels of Machiavellianism.

In the present study, the mean score on Mach-IV was 102.56, the standard deviation was 16.3, and the Cronbach's α was .77. In order to trace Machiavellians' decisions we compared the behavioral outputs of Machiavellians and non-Machiavellians. We selected people with high scores on the Mach-IV test from the total sample and regarded them as Machiavellian people. Following the methods of previous studies (Burks, Carpenter, & Verhoogen, 2003; Christie & Geis, 1970; Gunnthorsdottir et al., 2002), we divided the distribution of the total scores into ranges along the half standard deviation above and below the mean. Individuals scoring below 94 were grouped into the low Mach (LM) category and those scoring above 109 were classified as high Mach (HM) persons. By using this transformation, we categorized 49 individuals as low Machs (LM) and 54 individuals as high Machs (HM). In some of the analyses, we used the full continuum of the Mach scale (N = 150), while some analyses were made with a narrowed sample containing only HM and LM individuals (N = 103).

2.5. Procedure

Five subjects participated in the experiment on each occasion. First, we asked them to fill out the TCI and a 20-item Mach-IV test. Subsequently, they participated in a public goods game (PGG) under the guidance of an experimenter. After the game, the experimenters collected all the test sheets and the sheets with the amounts offered, each of which contained the codes of the

participants. Finally, we paid the amounts of money that players kept after the fifth round.

3. Results

Since the independent variables are continuous and the moderator variable (Machiavellianism) is dichotomous, we used a "protocol" in our analyses, as suggested by Baron and Kenny (1986). In the first step the relationship between personality factors and Machiavellianism, and between situational factors and Machiavellianism is examined. The second step assesses the effect of personality and situation on the contribution to the public goods. The third step examines how Machiavellianism mediates the effect of personality and situation on the individual contributions. We expect that persons with high and low scores on Mach-scale will show different behavioral patterns that may result from their different decision making processes.

3.1. Personality characteristics, situational factors and Machiavellianism

Pearson's correlation was used to analyze the relationship between the TCI temperament and character factors and the Mach scores. The Mach scores showed a positive correlation with Novelty Seeking ($r = .275$, $p < 0.01$). There was a negative correlation between the Mach scores and Reward Dependence ($r = -.235$, $p < 0.01$), Self-Directedness ($r = -.351$, $p < 0.01$), Cooperativeness ($r = -.544$, $p < 0.01$), and Self-Transcendence($r = -.170$, $p < 0.05$). No significant relationship was found with Harm Avoidance ($r = .086$, $p > 0.05$), and Persistence ($r = .142$, $p > 0.05$).

No relationship has been found between the number of altruist and Machiavellianism Beta = −.11, $p > 0.05$), and between the number of free riders and Machiavellianism (Beta = .05, $p > 0.05$). Therefore, the number of people with cooperative and defecting strategies in a group had no effect on the individuals' scores on Mach scale.

3.2. The effect of personality and situation on the contribution to the public goods

Persistence and Cooperativeness significantly influenced the total payment the individuals transferred to the public account (Beta = .20, $p < 0.05$; Beta = .28, $p < 0.01$, respectively). The effect of the other personality factors on the contribution were not significant.

Both the number of altruists and free riders in the group had a significant effect on the amount of money the individuals transferred to the public account by the end of the game (Beta = .35, $p < 0.001$; Beta = −.30, $p < 0.001$, respectively).

3.3. Machiavellianism, contributions and profit

A significant negative correlation was found between the total amount of contribution to the public goods and the scores of Mach-IV ($r = 0.29$, $p < 0.001$). That is, as Fig. 1 shows, the higher scores one had on the Machiavellian scale, the lower contributions she/he made at the end of the game. Comparing low and high Machs, the average difference in payout (measured in HUF) was significant (642.8 ± 339.4 vs. 450.1 ± 330.5; $t = 2.93$, $p < 0.005$).

Next, we compared the amount of money gained by the players by the end of the game. In order to ensure objective comparability, we calculated individual profits in proportion to the average amount of profit gained by the group members (individual profit/average profit in the group), rather than their face value. Positive association was found between the scores on the Mach IV and the players' total profit. ($r = 0.26$, $p < 0.005$). Compared to low Mach persons, High Machs collect a higher amount of money (in HUF) by the end of the game (1648.5 ± 235.5; $t = 2.66$ vs. 1501.1 ± 251.2 vs., $p < 0.01$).

3.4. Personality and situational factors influencing decisions in the social dilemma

One of the main goals of our study was to explore the relationship between the players' behavioral strategies and the personality and situational factors that influenced their decisions in the public

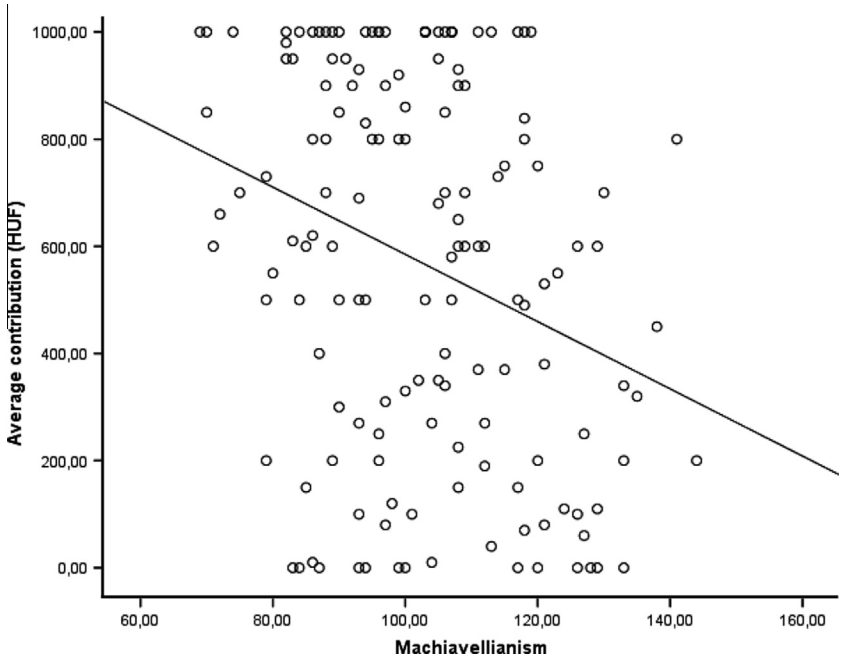

Figure 1. Relationship between Machiavellianism (measured on Mach IV scale) and the players' average contribution over the five rounds of Public Goods game.

good game. We have showed in the former analyses that significant relationships exist among the dependent and independent variables in question, therefore we can examine whether there are differences between high Mach and low Mach groups in terms of the effects of personality and situational factors on their decisions.

Table 1 shows the results of multiple regression tests for the contribution of low Machs and high Machs to the public good, including personality and situational factors.

In the total sample we found Harm Avoidance, Persistence, Cooperativeness, Machiavellianism, and number of altruists and free riders predictive for the subjects' contribution to the public good. Machiavellianism and the number of free riders had a negative effect, whereas the rest of the variables showed a positive relationship with the players' average contributions.

Among low Machs, those who had higher scores on Persistence and lower scores on Self-Transcendence contributed more to the public good than those with opposite scores on these personality scales. As for contextual variables, the number of free riders had a weak negative effect on the LM players' contribution during the game, whereas the number of altruists had no effect on it. The personality and situational factors explain the 41.6% of the total variance in the total contribution.

High Mach people's contributions were also positively influenced by the level of Persistence. Cooperativeness had a positive effect: Machiavellians with higher scores on Cooperativeness contributed more to the group than those with lower scores. Among high Mach people, both the number of altruists and the number of free riders had a significant effect on their contribution. A strong relationship was found for the number of altruists and a weak relationship for the number of free riders. The personality and situational factors accounted for more than 50% of the total variance in the individual contributions to the public good.

Because of the surprising result concerning the positive relationship between Mach scores and Cooperation scores in the amount of money they offered, we compared the average contributions of high Machs with high Cooperation (along the standard deviation above the mean) and high Machs with low Cooperation (along the standard deviation below the mean). The result confirmed the finding of the regression analysis: the former group ($N = 7$) transferred a significantly higher amount of money to the group account than the latter group ($N = 29$) (701.0 ± 343.2 vs. 367.5 ± 340.6, $t = -2.31$, $p < 0.05$). Although the sample size is quite low in the high Mach/high Cooperation groups – which reflects the relatively rare combination of these traits – the result shows that Machiavellians who had a high cooperative inclination contributed more to the public good than Machiavellians with a low cooperative inclination.

4. Discussion

In accordance with the former studies using Big Five scales (Austin et al. 2007; Jakobwitz & Egan, 2006), we found that Machiavellian persons are characterized by certain personality traits. As far as we know, our study was the first that used Temperament and Character Inventory (TCI) in relation to Machiavellianism. Machiavellianism, measured on the Mach IV scale, was positively associated with Novelty Seeking, and negatively with Reward Dependence, Self-Directedness, Cooperativeness, Self-Transcendence.

Using an experimental game (public goods game) we found a negative relationship between Machiavellianism and the players' total contribution to the group account. We also found that, compared to low Mach people, high Machs gained a higher amount of money by the end of the game. This result confirms the findings of several former studies revealing that Machiavellians are very successful in various tasks, including social dilemma situations (Czibor & Bereczkei 2012; Gunnthorsdottir et al. 2002; Spitzer et al. 2007).

The main goal of our study was to measure the effect of personality and situational factors on the high Mach and low Mach subjects' contribution during the public good game. While several former studies have investigated the relationship between Machiavellianism and Big Five traits (Austin et al. 2007; Jakobwitz & Egan, 2006; Paulhus & Williams, 2002), in general, no former research focused on the personality characteristics underlying the Machiavellians' *strategies* in a social transaction. Consequently, we raised the following question: Which personality traits are linked to the Machiavellian character to ensure their success in making a high profit?

Our results showed that the high Machs' decisions were significantly (and positively) influenced by Persistence and Cooperativeness. The Machiavellians with high scores on these personality scales behaved in the most group oriented way, contributing the highest amount of money to the group account.

The positive relationship between the amount of money transferred by the Machiavellians' to the public account and their scores on Persistence and Cooperativeness seems surprising at the first

Table 1
Results of multiple regression analysis for individual contributions in the public goods game.

	All				Low Machs				High Machs			
	Equation 1		Equation 2		Equation 1		Equation 2		Equation 1		Equation 2	
Variables	*t*	Beta	*t*	Beta	*t*	Beta	*t*	Beta	*t*	Beta	*t*	Beta
Personality factors												
Novelty seeking	0.90	.08	0.52	.04	−0.95	−.15	−0.94	−.14	0.95	.15	0.36	.05
Hard avoidance	1.51	.16	2.24*	.21	0.42	.08	0.82	.14	0.88	.18	1.03	.18
Reward Dependence	−1.78	−.16	−1.14	−.09	−1.01	−.16	−1.09	−.17	−0.01	−.00	0.16	.02
Persistence	4.72***	.39	4.65***	.34	3.49***	.65	3.57***	.61	3.58***	.49	3.31**	.40
Self-Directedness	−0.24	−.02	0.09	.01	−0.14	−.03	0.08	.01	−0.51	−.08	−0.62	−.09
Cooperativeness	2.64**	.26	2.12*	.19	1.35	.24	1.32	.21	2.22*	.35	2.13*	.29
Self-Transcendence	−2.18*	−.18	−1.41	−.10	−2.46*	−.42	−2.21*	−.35	−0.02	−.00	0.48	.06
Machiavellianism	−2.14*	−.20	−2.04*	−.16	–	–	–	–	–	–	–	–
Situational factors												
Number of altruists			4.798***	.33			1.56	.21			3.69***	.40
Number of free riders			−3.59***	−.25			−2.08*	−.28			−2.06*	−.24
R2	0.243		0.437		0.270		0.416		0.284		0.510	

* p<0.05.
** p<0.01.
*** p<0.001.

sight. Former studies have revealed that high Mach people are characterized by a low level of Cooperativeness (Christie & Geis, 1970; McIlwain, 2003; Paal & Bereczkei, 2007). Our result in the present study also showed a strong negative correlation (0.54) between Mach scores and Cooperativeness scores in TCI.

However, besides this general relationship, a high individual diversity may exist for personality features. In spite of their selfish and malevolent characters, high Mach people who happen to show an above average capacity for cooperation are likely to take the interests of the others into account, to some degree. High cooperative inclinations may overcome the Machiavellians' negative social attitudes and urge players to behave in a more group-oriented way. This assumption was confirmed by another finding in this study: subjects with high Mach *and* high Cooperation scores contributed more to the public good than high Machs with low Cooperation scores.

From this perspective, it is interesting that although low-Mach people, in general, showed a much higher level of Cooperativeness than high-Machs, their decisions during the game did not appear to be influenced by the score on this personality factor (Table 1). It is probably their strong cooperative character that prompts them to obey the social norms related to the public good, and individual differences in these traits do not significantly influence this general attitude.

Persistence, but not cooperativeness, also influenced the low Mach persons' decisions. In the first round, the low Machs typically transferred 25–35% of their endowment to the public good (compared to 15–20% for high Machs) and maintained a relatively high contribution during the game. Regression analysis showed that Persistence had a large positive effect on the amount of money that the players contributed to the group. High Persistence is an adaptive behavioral strategy when rewards are intermittent but contingencies remain stable (Cloninger et al., 1994). Individuals high in Persistence are ambitious, active, and stable; they tend to cope with frustration, strive for higher accomplishments, manifest a high level of perseverance, and tend to intensify their efforts in response to anticipated reward.

As we seen, both low Mach and high Mach individuals with high Persistence yielded high benefit, compared to the others. At the same time, we did not find significant relationship between Machiavellianism and Persistence. Persistence, that is a high level of perseverance, seems crucial for the successful achievement in public goods game, in itself, regardless the players' scores on the Mach scales.

Our results reinforce the results of former studies, showing that situational factors have a large influence on the Machiavellian players' decisions in a public good game (Czibor & Bereczkei, 2012; Spitzer et al., 2007). In the present experiment, we examined two contextual variables that have not been previously studied. The presence of altruists and the presence of free riders in the group must be crucial factors in the subjects' decisions in any social dilemma game. We found that the contributions of Machiavellians (high Machs) were weakly influenced by the number of free-riders and strongly influenced by the number of altruists in their groups, whereas the decisions of those with lower scores on the Mach-scale were weakly influenced by the number of free-riders, but not by the number of altruists. The fact that high Machs were more likely than low Machs to take situational factors into consideration coincides with the findings of several other studies. Machiavellians were found to be successful in avoiding punishment (Spitzer et al., 2007) and ambitious to monitor their playmates' decisions in the social dilemma game (Czibor & Bereczkei, 2012).

It is not surprising that the presence of free riders brings about a decrease in the individual contributions among both high and low Mach persons. The social norm of conditional cooperation prescribes cooperation if the other group members also cooperate, whereas the defection of others is a legitimate excuse for individual defection (Fehr & Fischbacher, 2004). In the absence of punishment for non-cooperation, the only way of defense against free riders is a decrease in contributions over time. If players maintained the previous level of contributions in the presence of free riders, sooner or later they would lose their profit. Therefore, the interest of both Machiavellians and non-Machiavellians is to shift to a strategy of decreasing their former contributions when they perceive playmates who permanently transfer low amounts of money to the group account.

A more interesting result was that high Mach persons' (but not low Machs') contributions were strongly influenced by the presence of altruists. However, in spite of our previous expectations, under such circumstances Machiavellians did not decrease their contribution to the public good but rather increased it. The regression analysis has revealed that the more altruists they perceived in the group, the higher amount of money they transferred to the group account. At the first sight, this strategy contradicts the Machiavellians' well-known selfish and rational character. One expects that in the presence of altruists, the Machiavellian persons will decrease their contribution because their individual profit mostly comes from the altruists' generosity. Decreasing their contribution may result in two benefits. First, a higher amount of money remains in their private account, and second, the even redistribution of the altruists' high contributions to the group account also increases the others' profit.

However, this is not what happened. When Machiavellians perceived persons in the group who behave altruistically, they *increased* their contributions. From an economic point of view, they made a rational decision that was justified by the fact that they did win in the game. The point is that in the presence of altruists, they gain the most if they increase their contribution to the public good. Since the experimenter doubled the total profit (which models a successful group project), the relatively high individual contributions resulted in high individual profit in the private account after the even redistribution. Under such circumstances, Machiavellians could get a higher profit in the long run if they radically decreased their contribution. Furthermore, their non-cooperative behavior would alert altruists to change their mind and decrease their contributions in order to avoid exploitation. Therefore, altruists may be the "gold laying hen" for the Machiavellians who must not be discouraged from being generous.

This strategy may represent the previously mentioned flexibility and opportunist character of Machiavellians. They are more likely than non-Machiavellians to monitor their partners and adjust their behavior accordingly in order to gain the most in a particular social situation. Yet, they can pretend to behave altruistically when the Machiavellian strategy would be costly, that is, when observers would recognize (and probably punish) the free riders (Bereczkei et al., 2010). Low Machs, on the contrary, do not appear to show such sensitivity to the signals associated with the others' cooperative behavior. They continuously contribute a relatively high amount of money, largely independently of how their playmates behave. They are likely to be motivated by their high cooperative incentives in the games.

In sum, we experienced significant differences in the motives and conditions underlying the decisions of low Mach and high Mach persons. The low Mach people's contributions to the public good were primarily influenced by a personality factor (Persistence) and were hardly influenced by the contextual variables examined in the study. We assume that they basically follow their cooperative inclinations in their behavior and the situational effects change their decisions to a lesser degree. Conversely, the high Mach people's decisions were influenced more by the situational effects (especially the presence of altruists) and a personality factor (Persistence). We assume that, compared to others, Machiavellians

may be more sensitive to situational factors and take the behavior of their playmates into account to a greater degree, which may be the reason for their success in the exploitation of others. They are likely to behave in a flexible and opportunist manner in order to maximize profit. These assumptions should be tested in future studies.

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