



# The manipulative skill: Cognitive devices and their neural correlates underlying Machiavellian's decision making



Tamas Bereczkei

*Institute of Psychology, University of Pécs, Ifjúság u. 6, Pécs H-7624, Hungary*

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## ABSTRACT

Until now, Machiavellianism has mainly been studied in personality and social psychological framework, and little attention has been paid to the underlying cognitive and neural equipment. In light of recent findings, Machiavellian social skills are not limited to emotion regulation and “cold-mindedness” as many authors have recently stated, but linked to specific cognitive abilities. Although Machiavellians appear to have a relatively poor mindreading ability and emotional intelligence, they can efficiently exploit others which is likely to come from their flexible problem solving processes in changing environmental circumstances. The author proposed that Machiavellians have specialized cognitive domains of decision making, such as monitoring others' behavior, task orientation, reward seeking, inhibition of cooperative feelings, and choosing victims. He related the relevant aspects of cognitive functions to their neurological substrates, and argued why they make Machiavellians so successful in interpersonal relationships.

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## 0. Introduction

Machiavellianism is a strategy of social conduct that involves manipulating others for personal gain (Wilson, Near, & Miller, 1996). Machiavellians behave in a self-interested way, in that they are more willing and better able to exploit others (Paulhus & Williams, 2002). The level of Machiavellianism is frequently assessed by using the Mach-IV scale (Christie & Geis, 1970), but other scales are also used (Dahling, Whitaker, & Levy, 2009). Individuals with high Mach scores (that is “Machiavellians” or “high Machs”) have a tendency to be callous, selfish and malevolent in their interpersonal dealings. Three core components underlie their behavior: endorsement of deception 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). They can easily separate themselves from moral percepts, especially in situations that offer material reward for breaking norms. Emotional detachment combined with lack of adhering to moral rules might imply a willingness to exploit others (Geis, 1970).

## 1. Emotional coolness

The Machiavellian orientation toward others is frequently described as cognitive as opposed to emotional. High Machs are

assumed to have a detached, impersonal orientation toward others (Geis & Christie, 1970). This leaves them free to analyze the situation dispassionately and proceed according to strategy. A recent analysis of narrative reports showed that high Machs use significantly fewer verbs when referring to emotional involvement, highlighting the importance of their cool and rational character (Czibor, Vincze, & Bereczkei, 2014).

Whereas almost all the authors emphasized the Machiavellians' emotional coolness, no clear analyses have been done so far, and no convincing data have been found that would provide details about the cognitive content of this attitude. Very little is still known as to what emotional coolness and detachment exactly means, what components it constitutes, and which emotional abilities, or the lack of which emotional abilities, can contribute to the cool attitude of Machiavellians.

The prevailing assumption is that Machiavellians are not influenced by the partner's intentions and emotions (Wai & Tiliopoulos, 2012). They are unmoved by the system of social relations, and do not experience intense emotions in situations in which others become angry, disappointed or happy. However, recent data seem to contradict these statements. A study, using Big Five Inventory, found a significant positive relationship between Machiavellianism and the variables of Neuroticism (Szijarto & Bereczkei, 2015). This means that Machiavellian persons are characterized by high emotional instability that is likely to be linked to the experience of more negative emotions and greater difficulty to bear distress. It is possible, then, that

E-mail address: [bereczkei.tamas@pte.hu](mailto:bereczkei.tamas@pte.hu)

emotionally stressful situations wear them out more than others that may contradict the widespread notion about their cold-minded thinking.

An fMRI study may reinforce this assumption. Using the Trust Game, elevated activities were found in high Machs', as first players, anterior cingulate cortex (ACC) (Bereczkei, Deak, Papp, Perlaki, & Orsi, 2013). This region of the brain is known to monitor cognitive conflicts and particularly to eliminate conflicts between brain modules (Rilling et al., 2002). According to the conflict monitoring theory, ACC as a kind of conflict detector monitor for response conflicts in the ongoing processing stream and signals the need for reducing response interference (Carter & van Veen, 2007; Dreisbach & Fischer, 2012). Moral judgments were also associated with activation in ACC, suggesting that such judgments may involve emotional conflict (Kahane et al., 2012). ACC is typically engaged when individuals make decisions in which there is conflict between social norms and personal interests (Sanfey, Rilling, Aronson, Nystrom, & Cohen, 2003).

As a possible interpretation, it could be argued that because Machiavellian people do not trust others, they are likely to transfer a low amount of money as the first and the second player. At the same time, however, they must be aware that if they break the norm of cooperation that may elicit negative feelings in them. Therefore they may feel an intense conflict between the general expectation to obey the social norms and wish to desert the partner, which may be the reason why their ACC has higher activity at the moment of their decision. Furthermore, a positive correlation was found between high Mach persons' reaction times and ACC activity which could indicate that high Machs have a longer reaction time pertaining to greater conflict than low Machs (Bereczkei et al., 2013).

Whereas Machiavellianism may involve intense emotional responses in certain conditions, several studies revealed that it is inversely linked with emotional expressivity and the ability to send emotional display (McHoskey, Worzel, & Szyarto, 1998; McIlwain, 2003). Furthermore, Machiavellians are not capable of identifying and distinguishing feeling states (Wastell & Booth, 2003). A more recent study found a negative correlation between Machiavellianism and Emotional Expression (EE), in the Schutte Self-Report Emotional Intelligence Scale (SSREI) (Szijarto & Bereczkei, 2015). Persons with higher Mach scores admittedly cannot express their emotions in a subtle and precise way in verbal and non-verbal communication, compared to those with lower scores. Although a poor ability to express emotions may be a kind of deficit, it can be advantageous for deceiving and manipulating others. The emotional coolness deriving from such a "primary" deficit in emotional control creates favorable conditions for the exploitation of others. If Machiavellians do not get involved in the situation emotionally and can make a rational decision, they have more opportunity for influencing their partner, and for controlling the situation more effectively. In sum, the inability to express and share emotions with others may help Machiavellian persons conceal their feelings, and thus successfully manipulate others.

## 2. Mindreading

The pioneers of Machiavellian studies were convinced that since high Machs have a cognitive, impersonal orientation toward others, they are more accurate in evaluating others' personality character and thinking mode than low Machs (Christie & Geis, 1970). Later, when the conceptions of mentalization prevailed in cognitive psychology, the majority of authors assumed that theory of mind is necessary for skilled deceptive manipulation (McIlwain, 2003; Paal & Bereczkei, 2007). It seems very obvious; those who have an above average ability to understand others' intentions,

beliefs and knowledge can mislead them more easily than those with lower mindreading ability. Furthermore, the Machiavellian Intelligence hypothesis postulated that origins of human intelligence stem from advantages related to the ability to manipulate and deceive conspecifics, therefore manipulative tendencies have co-evolved with mind-reading ability (Byrne & Whiten, 1988). It is not a surprise, then, that the authors predicted that people who can be characterized as Machiavellian – those with high scores on the Mach IV test – make fewer mistakes in theory of mind tests than those who are characterized as less Machiavellian.

However, this is not the case. The studies in the last decade did not find significant relationships or even found negative associations between Machiavellianism and mindreading abilities, regardless of the kind of methods used. Machiavellianism was negatively correlated with the ability to infer others' mental states either from stories, or from pictures of eyes, or from voices (Ali & Chamorro-Premuzic, 2010; Lyons, Caldwell, & Schultz, 2010; Paal & Bereczkei, 2007). Additionally, Machiavellianism was found to be negatively correlated with self-report and performance on Emotional Intelligence, and with empathy (Austin, Farrelly, Black, & Moore, 2007; Paal & Bereczkei, 2007; Wastell & Booth, 2003). It is not surprising, then, that in fMRI studies, using social dilemma tasks, high Mach persons did not show elevated activation in brain areas thought to be linked to mentalization processes, such as medial prefrontal cortex, temporo-parietal junction, and putamen (Bereczkei et al., 2013; Spitzer, Fischbacher, Herrnberger, Gron, & Fehr, 2007). Another recent study that used specific methods for measuring mentalization (stories, visual stimuli) found a negative association between Machiavellianism and the activation of these brain areas (Bagozzi et al., 2013).

These results demonstrated that instead of Machiavellians having high cognitive abilities, they possess deficits in understanding other people's intentions, feelings, and thoughts. The results concerning their relative poor social cognitive skills have been interpreted in several ways. Some authors criticized the tests used in former studies, saying that they could not measure all aspects of the complex mindreading ability (Paal & Bereczkei, 2007). Others stated that the lack of understanding others might even be beneficial for the successful manipulation because Machiavellians do not have to face other people's needs and suffering (Lyons et al., 2010).

Several authors argued that the Machiavellians' superiority may not necessarily result from their high cognitive abilities, but rather from their emotional coolness (Sullivan & Allen, 1999). As a result, a Machiavellian person is able to concentrate on a goal, and not be distracted by the presence of a partner or by his/her own emotions. According to this view, all the manipulative strategies derive from superior impulse regulation rather than any special cognitive ability like mindreading (Jones & Paulhus, 2009). Since low Mach persons are more focused on personal relations and its ethical aspects, and show less vigilance and determinism in attaining their own aspirations, Machiavellians will have an advantage in spite of their poorer cognitive capacities (Pilch, 2008).

However, this explanation does not seem to be satisfactory given Machiavellians' sophisticated skills in various social circumstances. Even the early studies in the middle of the last century revealed that Machiavellians not only showed a tendency to manipulate or exploit partners but also that they were more effective in influencing others in various bargaining games, job performance, and alliance formation (Exline, Thiabaut, Hickey, & Gumpart, 1970; Geis, 1970). Furthermore, as seen below, recent studies revealed that high Machs can outperform low Machs under changing environmental circumstances. Their successful exploitation in the long run can hardly be explained alone by their emotional coolness or impulse regulation.

### 3. Flexibility

Across the decades, Machiavellianism has primarily been characterized by a “first strike” strategy (Wilson et al., 1996). Machiavellians seek instantaneous profit and their behavior is mostly governed by directly attainable rewards, whereas they pay little attention to potential long-term costs (Christie & Geis, 1970; Gunthorsdottir, McCabe, & Smith, 2002). They can successfully disguise their deceptive character in short-term interactions but their behavior may be very costly in the long-term in that they are frequently rejected as social partners for most relationships (Wilson, Near, & Miller, 1998).

However, recent studies revealed that, compared to low Machs, high Machs have better interpersonal skills with regard to effective influence over other people even in the long run (Jonason & Webster, 2012; Jones, 2014; Spitzer et al., 2007). They are more likely to distinguish between one-shot and repeated games – that is, strategic situations (where their decisions can influence the decisions of their partners) and non-strategic situations (where they cannot) (Curry, Chesters, & Viding, 2011). A real-life study revealed that three times 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). They realized their self-interest when others could not observe their behavior but disguised their selfishness and pretended to be altruistic in the presence of others, possibly in order to raise their long-term reputation in their group.

I propose that the core of Machiavellians’ long-term strategies is flexibility. They permanently evaluate the social situation and their partners, and adjust their behavior accordingly to the changing circumstances. In a study, using Public Goods Game, the contributions of Machiavellians were strongly influenced by the number of altruists and free-riders in their groups, whereas low Machs’ decisions were primarily influenced by personality factors (Bereczkei & Czibor, 2014). The authors concluded that 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. Similar flexibility appeared in a study examining 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 et al., 2007). By the end of the game, Machiavellians had the largest profit, which was due to the fact that they won a lot in the non-punishable phase by transferring as little money as possible, while in the punishable phase they avoided punishment by raising their contributions. When Machiavellians were given an opportunity to gamble, they did not take unnecessary risks under threat of punishment that led to their long run winning (Jones, 2014).

Using brain imaging techniques, Spitzer et al. (2007) found that Mach scores were positively correlated with brain activations in the left anterior orbitofrontal cortex (OFC) that plays a special role in detecting and evaluating punishing stimuli. Lateral OFC is also involved in the motivational control of goal-directed behavior and has a fundamental role in making behavioral choices, particularly in unpredictable situations (Decety, Jackson, Sommerville, Chaminade, & Meltzoff, 2004). Also, Mach scores were related to an elevated activation in the right insula. It is interesting because a number of findings indicate the insula’s involvement in emotional experiences such as anger, fear, pain, and sadness. Machiavellian subjects might have experienced stronger negative affect during the punishment condition, which may have contributed to their more intensive behavioral response in this situation.

Jonason and Webster (2012) assumed that Machiavellians (as well as the other parts of the Dark Triad) may be characterized as a protean attitude. They possess a variety of tactics of social influence, creating a veritable toolbox to manipulate others. This flexible cognitive equipment may reduce predictability and help manipulators to avoid detection. This flexibility is supported by findings on the relatively low heritability of Machiavellianism (Vernon, Villani, Vickers, & Harris, 2008). Since the development of Machiavellian personality is strongly influenced by environment (especially shared environment), Machiavellian behavior can highly be modified by experience.

The flexibility of Machiavellianism could even be highlighted by comparing it with subclinical psychopathy, another member of Dark Triad. A lot of studies have revealed the similarities between them in terms of disagreeableness, social exploitativeness and callousness (Furnham, Richards, & Paulhus, 2013; Jones & Figueredo, 2013; Jones & Paulhus, 2011). Both are negatively associated with Agreeableness but, combining with a low level of anxiety, psychopaths appear the most malevolent individuals within Dark Triad (McHoskey et al., 1998; Paulhus & Williams, 2002). Whereas Machiavellianism is loosely associated with antisocial personality traits and aggression, psychopathy strongly predicts a wide variety of self-report and behavioral measures of antisocial behavior (McHoskey, 2001). They are ready to respond in a reckless manner to provocation that is due to a deficit in inhibiting their aggressive impulses (Jones & Paulhus, 2010). Psychopathy is closely associated with dysfunctional impulsivity that entails distraction, inaccurate decision making, even suicide ideation. By contrast, neither form of impulsivity plays a role among Machiavellians (Jones & Paulhus, 2011). All of these results suggest that individuals high in psychopathy seek immediate gratification, engage overly aggressive and impulsive behavior, and have little concern for the consequences of their actions. Whereas Machiavellianism is linked to long-term strategy, planning, and flexibility, psychopathy is much more characterized by violence, short-term-thinking, and rigidity.

### 4. Specific cognitive abilities

The above mentioned results suggest that flexible cognitive problem-solving processes are at work in the Machiavellians’ decision-making. They have rationalistic thinking that is more linked to strategy and long-term planning rather than to short-term thinking and risk-taking (Jones & Paulhus, 2009). However, this statement may contradict other findings concerning the Machiavellians’ cognitive deficits. As we have seen, Machiavellians are characterized by a worse than average mind-reading ability, lower emotional intelligence and empathy, and are probably also less able to understand and express emotions. Furthermore, they do not appear to have above average general intellectual abilities (Paulhus & Williams, 2002). A recent meta-analytic review of studies using various measurements has not found consistent relationship between Dark Triad, including Machiavellianism, and general mental ability (O’Boyle, Forsyth, Banks, & Story, 2013). How could they successfully manipulate others if they lack superior mental equipment?

The research evidence seems to suggest that Machiavellians have specific cognitive equipment. The Machiavellians’ poorer skills in mindreading on the one hand and their flexibility in adaptation to the social circumstances on the other hand would imply that their manipulative strategies are performed at both lower and higher cognitive levels. The former mainly represents fast and intuitive information processing mechanisms (frequently called as heuristics), that are responsible for making judgments and decision-makings when people face complex tasks, have

limited cognitive ability and time, and deal with incomplete information of the world (Todd & Gigerenzer, 2003; Tversky & Kahneman, 1981). This Type 1 cognitive system, as the Dual Process Theories describe (Evans & Stanovich, 2013), is mostly based on evolved dispositions that play important roles in emotional regulation, implicit learning and autonomous cognitive biases. The higher cognitive level involves much more reflective problem solving processes that are related to rule-based thinking, rational choice, and consequential decision making. This kind of cognitive system or Type 2 thinking (Evans & Stanovich, 2013) implies central working memory resource and highly correlates with fluid intelligence. Recent research indicates that two evolutionary distinct brain systems are responsible for these two types of processing (Evans, 2010).

Machiavellians may have specialized cognitive domains of planning and decision that involve both types of thinking. The related cognitive rules and algorithms enable Machiavellians to make predictions about the future reward in a basically risky and unpredictable situation. What kinds of cognitive abilities are involved in the Machiavellian decision making? The following list are ones I propose as the most important.

#### 4.1. Monitoring

In spite of their lower mindreading ability, Machiavellian people may permanently monitor their partners and make responses accordingly, which renders their exploiting behavior as very efficient. During a five-round Public Goods Game, high Mach persons were found to take into account the previous steps of their partners to a greater extent than low Machs (Czibor & Bereczkei, 2012). The regression analyses revealed that they evaluated the decisions made by the group mates in the previous round and chose a strategy that implied an optimally low contribution to the public goods and, as a consequence, yielded the most benefit for them by the end of the game. This result suggests that Machiavellians process the clues related to the behavior of partners and adjust their actual behavior accordingly. As if they would follow the heuristic rule: 'Start with a relatively low investment, keep watching what the others are doing, and do not exceed the others' contributions over the transaction'.

This ability may be strictly linked to certain neural processes. A recent study found that, compared to low Machs, the high Mach players during the decision-making phase of the Trust Game showed a higher activity in the inferior frontal gyrus (Bereczkei et al., 2013). The inferior frontal gyrus is involved in goal directed cognition, e.g. making predictive inferences during various tasks (Liakakis, Nickel, & Seitz, 2011; Virtue, Haberman, Clansy, Parrish, & Beeman, 2006). A study, using a conflict resolution task, found that right inferior frontal gyrus may be related to reward-expectancy required in social competition as the participant played in order to win (Polosan, Baci, Perrone, Pichat, & Bougerot, 2011). According to the authors, the activation of this area may reflect the subjects' efforts to observe the competitors' actions. Other studies revealed that the activation of this brain area, corresponding with behavioral data, is involved in analyzing intentionality of the partner's behavior during social interaction, and rational reasoning during decision-making (Steinmann et al., 2014; Sutter, 2007).

In light of our interpretation, inferior frontal gyrus (IFG) may be a neural correlate of the Machiavellians' behavioral flexibility. This brain region is probably involved in the Machiavellians' decision making to follow the partner's steps, and in selection of information among competitive alternatives in a social dilemma situation. A stronger hypothesis may be that IFG represents a neural correlate of a limited theory of mind that enables Machiavellians to understand the partners' intentions and goals, and plan a future action

in the hope of the material and social benefits. In other words, Machiavellians – although they have a relatively limited capacity to make specific predictions about others' mental states – may be skilled in estimating the partner's possible acts, anticipating their subsequent decisions, and adjusting their behavior accordingly in the social dilemma situation.

A greater neural activation in the left IFG area was found to correspond with a high working memory capacity (Virtue et al., 2006). It is not surprising, then, that a recent study found positive correlations between working memory scores (measured in the Wechsler Adult Intelligence Scale-Revised) and Mach IV scores, especially on the interpersonal tactics subscale (Bereczkei & Birkas, 2014). The authors interpreted this finding as evidence that the advanced cognitive skills of high Machs are associated with the ability to process information rapidly and with above average skills in manipulating and organizing information. The other finding that Arithmetic, but not Digit Span performance was related to Machiavellianism, suggested that Machiavellians' behavioral opportunism and fluid adaptation to the changing social circumstances is linked to computational ability, but not simple storage of acquired knowledge.

#### 4.2. Task orientation

Machiavellians are considered to be goal oriented rather than person oriented (Christie & Geis, 1970; Hawley, 2006). They are not concerned about other people beyond their own self-interest. Instead, they steadily proceed on their own route and bother neither with their partner's nor their own feelings. It is not surprising that one of their main personality characteristics is a high level of persistence that is unique to individuals who are ambitious, strive for higher accomplishments, and tend to intensify their efforts in response to anticipated reward (Bereczkei & Czibor, 2014). The related cognitive algorithm says: 'Choose the strategy that is supposed to be efficient and keep it against the disturbing and obstructive environmental effects'. I think, this rule would not be used by psychopaths who are mainly characterized by immediate gratification, impulsivity, and short-term thinking, instead of task orientation and long-term thinking (Jones & Paulhus, 2010).

The Machiavellians' task orientation should be strongly associated with their effort to filter out the information irrelevant for goal direction, and inhibit all the acts that may not lead to the anticipated reward. Accordingly, a study found increased activity in the high Mach subjects' bilateral middle frontal gyrus, compared to low Machs (Bereczkei et al., 2013). This region of the brain is related to inhibitory control in terms of inhibiting a tendency to do something, filtering irrelevant information, and in a virtual situation of competition (Goel & Dolan, 2004; Picton et al., 2007; Polosan et al., 2011). It is also known to anticipate beneficial decisions. Several authors suggest that the middle frontal gyrus plays a role in the manipulation and the active maintenance of information in working memory as required for high level planning. (Cairo, Liddle, Woodward, & Ngan, 2004; Liu et al., 2012; Vidal, Mills, Pang, & Taylor, 2012). It is possible that these neural activities enable Machiavellians to choose effective means of manipulation and hinder the unsuccessful plans.

Similar roles in task orientation could be played by the middle occipital gyrus and the superior frontal gyrus that have also shown elevated activities in high Mach persons during the decision phases of the Trust Game (Bereczkei et al., 2013). The former is required in sensory inhibition processing, e.g. blocking attention from returning to the previously attended location (Tian & Yao, 2008), and the latter is involved in attentional control in responding conflict situation (Aarts, Roelofs, & Turennout, 2009).



#### 4.3. Reward seeking

The majority of experts in the field agree that one of the Machiavellians' most characteristic features is reward seeking (Birkás, Csathó, Gács, & Bereczkei, 2015; Jones & Paulhus, 2009; Wilson et al., 1996). They usually gain the most money in the Trust and Public Goods Game, and accept the lowest offer from the partner in the Ultimatum Game (Bereczkei & Czibor, 2014; Gunnthorsdottir et al., 2002; Meyer, 1992). Individuals high in Machiavellianism were found to have typical intrinsic motives (e.g. achievement, financial success, status, sex, etc.) (Fehr et al., 1992).

In general, those scoring high on the Mach scale devoted their time to acquiring money and status rather than developing meaningful social relationships (McHoskey, 1999; Wilson et al., 1998). However, reward-seeking was not limited to short-term interactions but extended to long-term strategies, as seen previously. High Machs may have a subset of social strategies, each of them devoted to a specific purpose (Jonason & Webster, 2012). In certain circumstances they could achieve their goal by acquiring an immediate reward, but in other conditions they use indirect tactics, and get rewarded via a long-run operation, (e.g. via pretend altruism). Especially difficult situations may be for them a high-risk social environment where the others' behavior is unpredictable and, therefore, the acquisition of reward is uncertain. In this case, an appropriate cognitive rule would be the following: 'Strive for getting the reward at any moment when the benefit outweighs the risk associated with its acquisition'.

In accordance with these empirical findings and theoretical considerations, increased activity was found in the right thalamus in high Mach persons, compared to low Machs, during the decision making phase of the Trust Game (Bereczkei et al., 2013). The thalamus is supposed to play an essential role in the processing of rewards, including monetary rewards (Delgado, Miller, Inati, & Phelps, 2005). A recent meta-analysis showed that this brain region was especially involved in reward anticipation (Liu, Hairston, Schrier, & Fan, 2011). A study has shown that the thalamus was required for a high-risk-assessment concerning winning or losing money in a blackjack scenario (Miedl, Fehr, Meyer, & Hermann, 2010). Other studies suggest that the thalamus is one of the brain areas that supports active instrumental avoidance that involves selecting, controlling and modifying risky external situations (Schlund et al., 2010). A more recent study has revealed that the thalamus is involved in error detection and feedback processing associated with uncertain reward (Winkler et al., 2013).

Since players exert no control over their partner's decisions, Trust Game, like other social dilemma tasks, has an element of unpredictability and risk. This situation compels players to make predictions about the future reward, and evaluate the reward value and potential risk of obtaining it. It is highly probable that Machiavellians who are well-known to permanently search for possible financial benefits show a higher skill at reward-related decision making. Since they are egoistically motivated, they are also expected to have good ability for detecting and evaluating threats to their self-interest (Jones & Paulhus, 2009). The increased thalamus activity in high Machs, therefore, may relate to the anticipation of success following a risky decision. This interpretation was supported by another result showing a strong relationship between thalamus activity and the amount of profit obtained by high Mach people at the end of the Trust Game. Machiavellians' financial success, thus, may be influenced by neural processes that are involved in processing monetary rewards (Bereczkei et al., 2013).

#### 4.4. Inhibition of cooperative impulses

Machiavellians are supposed to inhibit their rapid, "spontaneous" emotional reaction to a cooperative initiation made by a

partner (McIlwain, 2003). This inhibition may enhance the efficiency of exploitation because it promotes developing a more rational, self-oriented answer. Studies, using the Trust Game or Public Goods Game, demonstrated that Machiavellians did not return the partners' cooperative offers, in contrast with non-Machiavellians who were ready to approve and accept cooperative initiatives (Czibor & Bereczkei, 2012; Gunnthorsdottir et al., 2002). Machiavellians are expected to overcome their immediate reciprocal answer to others' cooperative initiatives in order to make rewards. In these cases, Machiavellians behaved in accordance with a rule such as: 'Do not obey your immediate and premature impulses and feelings that would prevent you from obtaining maximum benefits'.

These findings coincided with the results of brain imaging studies. Increased activity was found in the high Mach people's anterior dorsolateral prefrontal cortex (superior and medial frontal gyri, BA10) when their partner (presented by the computer) gave a fair return in the previous round of the Trust Game (Bereczkei et al., 2015). In general, the dorsolateral prefrontal cortex is typically engaged when individuals make decisions in which there is a conflict between social norms and personal interests (Sanfey et al., 2003) or when individuals make decisions that may be counter to their own response tendencies (Rilling et al., 2008). A study revealed that when participants broke their promise about their subsequent behavior in a Trust Game, they showed greater activity in the dorsolateral prefrontal cortex (DLPFC), amygdala, and ACC (Baugmgartner, Fischbacher, Feierabend, Lutz, & Fehr, 2009). Another study found that a personal moral dilemma (e.g. the "crying baby" dilemma) involved increased activity bilaterally in both the ACC (BA 24/32) and the anterior DLPFC, including the middle frontal gyrus and the superior frontal gyrus (BA 10) (Greene, Nystrom, Engell, Darley, & Cohen, 2004). The authors agreed that DLPFC is involved in cognitive conflict processes and plays an important role in abstract reasoning processes in favor of utilitarian judgments, i.e. its increased activity is linked to the acceptance of personal moral violation. In order to judge a personal moral violation to be appropriate one must overcome a prepotent social-emotional response (Knoch, Pascual-Leone, Meyer, Treyer, & Fehr, 2006).

DLPFC may play an important role in inhibition processes during the Machiavellian decision-making. Machiavellian people are likely to judge moral violations to be appropriate, especially in situations that offer material reward for breaking norms (Christie & Geis, 1970). For gaining benefits, they may use cognitive control over emotions in accordance with their goals. Relying on abstract reasoning processes, they can overcome immediate social-emotional responses and handle moral dilemmas in a utilitarian manner. Therefore, the increased activity in high Mach people's DLPFC may be associated with the inhibition of the reciprocal answer to the partner's cooperative initiative. Machiavellian individuals may override their "spontaneous" cooperative reaction in a fair situation and maintain their self-oriented impulses in an unfair situation.

#### 4.5. Choosing a victim

Machiavellians frequently achieve success in the way that they choose the most appropriate potential victim in the given circumstances. They select those people whose misleading will impose the fewest costs and implies the lowest risk, whereas yield the highest possible benefit. 'Pick people from whom you are supposed to get the largest reward in a certain social scenario'.

This cognitive bias can manifest itself in several ways. A recent study showed that Machiavellians strive for gaining profit when they are aware of their partner's willingness to cooperate, but they do not have strong motivation for winning when the others are

known to compete for the same resources (Bereczkei, Czibor, & update references Bereczkei, in press). Every subject participated in both a cooperation-oriented social dilemma game (where everybody received the money they collected during the game) and a competition-oriented game (where only the winner received money). In the cooperative situation it was worthwhile for high Mach persons to exploit the others' abundant offers: compared to low Machs, they contributed less and won more by the end of the game. However, no significant relationship was found in the competitive condition that may result from the other adaptive strategy: when everyone is competing for a limited amount of profit, manipulation does not appear to be effective. Therefore, Machiavellians skillfully switched to a strategy when the social environment made the exploitation of others as potential victims possible.

Certain brain areas may play a role in the operation of this heuristic. A recent fMRI study showed elevated brain activities in the IFG in high Mach (but not low Mach) people (Bereczkei et al., 2015). However, this activation occurred only in the fair condition of the Trust Game (where the partner made a cooperative answer) but not in the unfair condition (in which the partners did not reciprocate). It is possible that IFG plays a crucial role in the evaluation of the signals associated with others' social behavior, and shows an elevated activity when the player faces a prosocial partner as a potential victim. This interpretation may be confirmed by former studies revealing that the IFG is involved in analyzing the behavioral output of the partner during social interaction, and rational reasoning during decision-making (Liakakis et al., 2011; Steinmann et al., 2014; Sutter, 2007).

## 5. Socialization

As we have seen, recent research indicates that Machiavellians have specific cognitive abilities that enable them to successfully mislead and exploit others. An important question has remained unanswered: how do these abilities develop during childhood and adolescence? The answer is very important because one must know how and why Machiavellianism as a personality character is linked to Machiavellianism as a behavioral strategy. I propose that the possible mediation between these variables is the development of specific cognitive equipment. Unfortunately, very few studies have been done thus far in this field.

Machiavellianism does not seem to be a fixed property of individuals but can primarily be shaped under the influence of environmental stimuli. Comparing monozygotic and dizygotic twins, Vernon et al. (2008) reported relatively low levels of heritability for Machiavellians. At the same time, a number of studies confirmed that Machiavellianism was highly correlated with primary psychopathy which is strongly heritable, and only moderately with secondary psychopathy that has a much lower heritability (Ali & Chamorro-Premuzic, 2010). Machiavellian-like behavior seems to some extent to be transmitted genetically but learning and socialization may play a more important role in its development.

Several authors have made attempts to clarify those family effects that would be responsible for the development of a Machiavellian character. A study revealed that loving and permissive behavior of parents is negatively related to their sons' Machiavellian orientation (Ojha, 2007). Láng and Birkás (2014) found that adult high Mach and low Mach individuals differed in their perception of family functioning during childhood. High Machs perceived their families as more disengaged, more chaotic, less rigid, and less cohesive. High Machs also reported poorer family communication, and less satisfaction with family life. It is possible, that under disadvantageous circumstances, individuals

cannot develop intimate relationships and they have fewer opportunities to train these social competences (Pilch, 2008). A more recent study, using a retrospective parental care questionnaire, revealed that low maternal care led to the development of Machiavellianism via the fearful attachment as a possible mediating factor (Jonason, Lyons, & Bethell, 2014). It is not surprising, then, that the young Machiavellians were characterized by distrust, dishonesty, and cynicism. They also lacked empathy and a faith in human benevolence (McIlwain, 2003; Slaughter, 2011; Sutton & Keogh, 2000).

The shaping of these personality and social characteristics may involve the development of the related cognitive abilities in children. Sutton and Keogh (2000) suggested that initially children do not necessarily differentiate manipulative from prosocial behavior. For example, children with higher scores on the Kiddie Mach scale tended to approve the statement: "The best way to get along with people is to tell them things that make them happy." Step by step children may adopt cognitive devices that may increase the chance of their prosperity in a disadvantageous social environment. For example, they could learn to attenuate their response to frustration and distress that, in turn, may promote their rational mode of thinking. Those who frequently experience insecure attachment with their parents may become unable to emotionally connect with others or to their own feelings. Children with cool affect will be unable to engage in emotions, and they are less likely to internalize social norms including reciprocity. Similarly, in an environment where mutual distrust and communication problems prevail, they will learn to permanently monitor others in order to adjust their behavior to the demands of the family environment. They may also develop a capability of searching for rewards in the hope of getting resources in a poor and unpredictable environment during childhood, and inhibiting their immediate social-emotional responses to avoid costly and unbeneficial interpersonal relationships.

In accordance with this particular developmental path, Machiavellianism was found to have a significant positive correlation with low moral development (Campbell et al., 2009). Low level of moral reasoning is linked to the Stages 2 and 3 of moral development in Kohlberg's model (Kohlberg, 1984). Accordingly, adult Machiavellians are aware of their best interest but do not consider their relationships to groups of people. They also may judge the morality of an action by evaluating its consequences but do not have a sense of obligation and duty to uphold laws and rules (Stage 4). They also ignore that people living in the different places of the world may have different opinions, rights and values (Stage 5). It is not surprising, then, that Machiavellianism (along with Narcissism and psychopathy) was found to correlate with immigrant threat perceptions, increased prejudice, and modern racist beliefs (Hodson, Hogg, & MacInnis, 2009; Jones, 2013).

A number of studies have shown that continuous interaction with the environment results in local changes in brain structures, including synapse formation, increases in dendritic length and spine density, and altered metabolic activity (for review, see Kolb & Whishaw, 1998). The specific interactions the Machiavellians may have with their social environment over decades can induce changes in their gray matter. A study using structural MRI revealed positive differences for high versus low Machiavellianism in the basal ganglia, left prefrontal cortex, insula, and hippocampus (Verbeke et al., 2011). The authors speculate that given their strong need for status and material rewards, Machiavellians experience frustration and stress as a result of their intensive competition for acquiring resources. In order to compensate for this state of tension, they develop a cynical worldview and a manipulative interpersonal orientation. As a possible result, those brain areas that are involved in reward seeking, social planning, and regulation of emotions will change.

## 6. Summary

I suggest that Machiavellian decision making is not limited to the emotion regulation and “cold-mindedness” as many authors have recently stated, but linked to specific cognitive abilities. The overwhelming majority of the Machiavellian studies have been achieved in the framework of personality and social psychology during the past decades but currently the research linked to the cognitive sciences yield a new and increasingly growing knowledge on Machiavellianism. Recent studies over the last five years have confirmed that (1) Machiavellian persons are able to flexibly adapt to the changing social environment; (2) they have superior cognitive skills in responding to others’ behavior in the service of efficient manipulation; and (3) specific brain areas are involved in these decision making processes. These characteristics also distinguish Machiavellians from psychopaths (another Dark Triad member with callous and manipulative traits) who have a rigid short-term behavioral style.

Although Machiavellians have been characterized by relatively poor mindreading capacity and a low level of emotional intelligence, they are able to permanently evaluate the social situation and adjust their behavior, accordingly, to the challenges of circumstances. I assume that instead of recruiting higher level cognitive abilities, Machiavellians have cognitive heuristics that enable them to make predictions about future rewards in a basically risky and unpredictable situation. They may have superior cognitive abilities in monitoring others, altering or keeping tactics in the actual environment, and inhibiting their prepotent emotional-social answers that would prevent them from successfully exploiting others. Future studies are needed to obtain deeper insight into their problem solving mechanisms, and analyze the possible developmental links between the social environmental effects and the Machiavellians’ cognitive abilities.

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