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Theory of Mind and Empathic Explanations of Machiavellianism: A Neuroscience Perspective

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We study theory of mind (ToM) and empathic underpinnings of Machiavellianism by use of functional magnetic resonance imaging, where account managers are used as participants in 3 studies. Study 1 finds evidence for activation of the medial prefrontal cortex, left and right temporo-parietal junction, and left and right precuneus regions; all five regions are negatively correlated with Machiavellianism, suggesting that Machiavellians are less facile than non-Machiavellians with ToM skills. Study 2 presents evidence for activation of the left and right pars opercularis, left and right insula, and left precuneus regions; the former four regions of the motor neuron system were positively associated, and the latter negatively associated, with Machiavellianism, implying that Machiavellians resonate more readily with the emotions of others than non-Machiavellians. This is the first study to our knowledge to show a negative correlation between perspective taking and emotional sharing in empathic processes in general and Machiavellianism in particular. Study 3 tests implications of managerial control on both

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performance and organizational citizenship behaviors, as moderated by Machiavellianism in the field. Our study grounds the functioning of Machiavellianism in organizations in basic neuroscience processes, resolves some long-standing ambiguities with self-report investigations, and points to conditions under which Machiavellianism both inhibits and promotes performance and citizenship behavior.

Keywords: *Machiavellianism; theory of mind; empathy; functional magnetic resonance imaging; neuroscience; organizational behavior*

The last decade was marked by a number of corporate scandals (e.g., Enron, Halliburton, Madoff Investment Securities LLC, Lehman Brothers Holdings Inc.) that contributed to a financial crisis in the U.S. and negatively affected the global economy. The seeming lack of business ethics and uncontrolled striving for personal profits of employees working in the firms involved are believed to be important reasons for these scandals (e.g., Podolny, 2009). As a consequence, research on the ethical dimension of organizational behavior has experienced increased attention in the past decade (see Treviño, Weaver, & Reynolds, 2006), and researchers have begun to investigate "darker" aspects of organizational behavior (e.g., Machiavellianism: Dahling, Whitaker, & Levy, 2009; narcissism: Rosenthal & Pittinsky, 2006; and psychopathy: Paulhus & Williams, 2002; see Griffin & O'Leary-Kelly, 2004).

One trait that is argued to be part of the "dark triad of personality" (Paulhus & Williams, 2002) is one's degree of Machiavellianism. Machiavellianism is defined as "social conduct that involves manipulating others for personal gain, often against the other's self-interest" (Wilson, Near, & Miller, 1996, p. 285). More recently Dahling, Whitaker, and Levy (2009) published a review showing that Machiavellianism is related to a number of organizational behavior and management topics such as leadership, counterproductive work behavior, use of influence tactics that politicize organizations, job dissatisfaction, and (lack of) organization citizenship behaviors. For instance, Machiavellians were found to be unsupportive and inconsiderate as leaders (Drory & Gluskinos, 1980), show little regard for partners and focus only on maximizing their own profits (Sakalaki, Richardson, & Thépaut, 2007), are more likely to steal and violate trust (Fehr, Samson, & Paulhus, 1992), and show less helping behavior (Becker & O'Hair, 2007). These findings suggest that Machiavellianism is a construct of relevance for management scholars and practitioners alike, and organizations should be wary about hiring Machiavellian employees.

Yet a closer look at the literature reveals that judgments about Machiavellianism are not always consistent; some researchers indicate that Machiavellians might also offer advantages (e.g., reveal an ability to build coalitions within firms, or even be prosocial if needed; Hawley, 2003) for people in the organization and for the organization as a whole (Wilson et al., 1996). In this regard, researchers offer different explanations and interpretations of Machiavellianism ranging from possession of a set of effective social skills to dysfunctional personality traits (see Dahling et al., 2009; Wilson et al., 1996, for overviews). A better understanding of Machiavellianism and its underlying mechanisms might help to reconcile the conflicting views in the literature and actually better predict under which circumstances Machiavellianism might be linked to desirable organizational behavior, and when it might lead to undesirable outcomes.

A number of scholars have suggested that a deep understanding of the human brain can benefit the science and practice of management (e.g., Becker, Cropanzano, & Sanfey, 2011; Butler & Senior, 2007; Senior, Lee, & Butler, 2011). Becker et al. (2011: 934) take an organizational neuroscience (ON) point of view "to understand and incorporate the cognitive machinery behind our thoughts and actions into organizational theory." As Lee, Senior, and Butler (2012: 923) point out, the ON approach is a "neuroanatomical perspective . . . concerned with the role that brain anatomy plays in the mediation of organizational decisions." Lee et al. (2012: 924) propose a comprehensive orientation in what they term, an organizational cognitive neuroscience (OCN) approach:

> In the OCN approach, the management scholar is interested in understanding how the biological systems as a whole (rather than solely the activation of specific brain regions) operate to mediate social processes . . . OCN is conceptualized as a perspective that incorporates multiple levels of analysis . . . [and] is interested not only in the structures and systems within the brain that are of relevance to organizational behavior but also in the interaction between those biological systems and cognition itself.

An underlying theme for both OCN- and ON-based perspectives for understanding organization behavior is that experiences and behaviors of individuals and groups in organizations (which are higher order concepts) are not only dependent on such underlying psychological concepts as personality or information processing but in the end fundamentally rest on lower level brain systems that bring about psychological and social responses (Senior et al., 2011: 805; see also Cacioppo & Bernston, 1992). As Senior et al. (2011) note, the benefits of using a neuroscience approach do not depend solely on the use of sophisticated technologies such as brain scanners. Rather, the multidisciplinary theoretical foundations of OCN and ON provide researchers with the ability to explore heretofore unexamined organizational phenomena and also help researchers to decide amongst competing explanations for the same phenomena in a robust manner (Senior et al., 2011, p. 806). In this article, we explore incongruous perspectives and research on Machiavellianism, using an OCN approach, and in so doing we believe that insights drawn herein can help researchers and managers better grasp Machiavellianism and how it functions in organizations.

Consistent with the OCN and ON approaches, we focus on two psychological dimensions frequently used in organization theory and psychology that are thought to undergird Machiavellianism in organizations. The first is related to social intelligence (e.g., Wilson et al., 1996: 286) and the second to emotional intelligence (e.g., Barlow, Qualter, & Stylianou, 2010). With respect to social intelligence, we focus on theory of mind (ToM) or mentalizing (i.e., "the ability to read the desires, intentions, and beliefs of other people"; Frith & Frith, 2008: 504); with regard to emotional intelligence, we scrutinize empathy (i.e., "an affective state, caused by sharing the emotions or sensory states of another person"; Hein & Singer, 2008: 154). After reviewing recent research in psychology on these two phenomena, as they apply to Machiavellianism, we point out the need to take an OCN perspective and then develop our conceptual framework and hypotheses for a ToM and empathic understanding of Machiavellianism. Next we present our empirical studies. Studies 1 and 2 are neuroscience investigations, respectively, of ToM and empathic processes underlying Machiavellianism and performed on actual employees. Study 3 is a field

investigation demonstrating implications of managerial control for performance and organizational citizenship behaviors, as regulated by Machiavellianism of real account managers.

Psychological Research Concerning Theory of Mind and Empathy and Its Relationship to Machiavellianism

Theory of Mind

Researchers claim that Machiavellians are highly successful across a wide spectrum of situations ranging from economic games to work behaviors (e.g., Wilson et al., 1996). Nichols (2001) suggests that such success rests, at least in part, in skills associated with taking the perspective of others. Similarly, Langdon (2003) speculates that Machiavellians succeed because of their ability to read the minds of interaction partners. By contrast, others observe that Machiavellians are insensitive to the plight of others and tend to be selfish (Repacholi, Slaughter, Pritchard, & Gibbs, 2003) and exhibit emotional disengagement in interactions (e.g., Rushton, Chrisjohn, & Fekken, 1981). What does recent research reveal concerning these conflicting predictions, as to ToM capabilities of Machiavellians?

Paal and Bereczkei (2007) hypothesized that Machiavellianism should be positively associated with ToM skills:

> Our argument is . . . that people who can place themselves into others' thoughts and understand their intentions, views and knowledge more easily, can use this knowledge more effectively to achieve their own goals than people with weaker mindreading capacity. (pp. 544-545)

Using the 20-item Mach-IV scale (Christie & Geis, 1970) and a 53-item adult ToM scale and 14 real life stories based in part on research by Kinderman, Dunbar, and Bentall (1998), Paal and Bereczkei (2007) found that Machiavellianism and ToM were unrelated ($r = –.07$, n.s.), where respondents were undergraduates.

Lyons, Caldwell, and Shultz (2010) measured ToM skills with two methods: the eyes test, where respondents are required to match 36 pictures of pairs of eyes with emotion words (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001); and the imposing memory task (Kinderman et al., 1998; Stiller & Dunbar, 2007), where respondents (an unspecified "mixture of students and the general public") read three stories and answered eight questions for each, measuring levels of intentionality. The authors found that, contrary to hypotheses, high Machiavellians performed significantly worse than low Machiavellians on both the eyes test and the imposing memory task, where the 20-item Mach IV scale was used.

In still another study, Ali and Chamorro-Premuzic (2010) investigated ToM by use of three procedures: a face test consisting of 20 images, where participants (undergraduates) were required to choose a target word from two words describing what the target person was thinking or feeling (Baron-Cohen, Wheelwright, & Jolliffe, 1997); the eyes test (Baron-Cohen et al., 2001); and a voices test (Golan, Baron-Cohen, Hill, & Rutherford, 2006), where respondents were asked to choose a word that best matched each of 25 verbalizations. For each test, analyses were performed on total scores and scores broken down for positive,

neutral, and negative emotional valences. The findings showed that (1) scores on the 20-item Mach IV scale had low negative correlations with scores on the positive ($r = –.24$, $p < .01$) and neutral ($r = –.20$, $p < .05$) faces test, but not with the negative valence or total scores; (2) no significant correlations occurred with any of the four eye tests; and (3) a low negative correlation ($r = –.19$, $p < .05$) resulted with the voices neutral test, but nonsignificant correlations happened with the other three voices tests. When the ToM tests were each regressed on Machiavellianism, psychopathy, and empathy, however, all coefficients for Machiavellianism were nonsignificant.

In sum, the findings for associations between Machiavellianism and ToM are rather mixed, with some studies showing no significant associations, and others revealing small negative associations. We will have more to say by way of interpretation below, following presentation of results for the relationship between Machiavellianism and empathy.

Empathy

Over the years, conflicting predictions have been made with regard to the associations between Machiavellianism and empathy. Anecdotal and indirect evidence has been marshaled in support of Machiavellians being empathic based on the belief that they are charismatic, charming, ingratiating, and strategically prosocial (e.g., Deluga, 2001; Hawley, 2003; Wilson et al., 1996). On the other hand, other researchers posit that Machiavellians are emotionally detached from other people (e.g., Cooper & Peterson, 1980; Deluga, 2001, p. 342) and show unempathic characteristics (e.g., Mc Ilwain, 2003). Recent research has directly addressed the relationship between Machiavellianism and empathy-like responses.

Based on expectations that Machiavellians would be "cold" and unempathetic, Paulhus and Williams (2002) examined correlations between scores on the Mach IV scale and the Big Five personality inventory on a sample of undergraduate students (John & Srivastava, 1999). The findings showed that Machiavellianism was significantly negatively correlated with agreeableness ($r = –.47$, $p < .001$) and conscientiousness ($r = –.34$, $p < .001$). Machiavellianism was positively associated with narcissism ($r = .25$, $p < .001$) and psychopathy ($r = .31$, $p < .001$). Research by Baron-Cohen (2011) suggests that narcissism and psychopathy both reflect empathy deficits.

Austin, Farrelly, Black, and Moore (2007) expanded the measurement of empathy-like variables to include emotional intelligence (Bar-On, 2002) and interpersonal/social skills, as well as the Big Five personality traits on a sample of university students. In Study 1, they found that Machiavellianism was negatively correlated with emotional intelligence ($r = –.33$, $p < .01$) and interpersonal/social skills ($r = –.46$, $p < .001$). Replicating the findings of Paulhus and Williams (2002), Austin et al. (2007) showed that Machiavellianism was negatively associated with agreeableness ($r = –.51$, $p < .001$) and conscientiousness ($r = –.20$, $p < .01$). In Study 2, Machiavellianism correlated negatively with emotional intelligence ($r = –.25$, $p < .001$), agreeableness ($r = –.43$, $p < .001$), and conscientiousness ($r = –.24$, $p < .001$).

The final study relating Machiavellianism to empathy with undergraduates was conducted by Ali, Amorim, and Chamarro-Premuzic (2009). Here Machiavellianism was found to be negatively related to trait emotional intelligence ($r = –.23$, $p < .05$), where the latter

was a 30-item scale measuring the ability to identify and manage one's own emotions and the emotions of others (Petrides & Furnham, 2006). The authors also administered a nonverbal pictorial assessment method (Bradley & Lang, 1994) to measure felt vicarious emotions in response to the emotions of others and discovered that Machiavellianism was positively related with affective responding to sad facial expressions ($r = .23$, $p < .05$) and negatively associated with responding to neutral faces ($r = –.22$, $p < .05$), but unrelated to responding to happy expressions ($r = –.15$, n.s.). However, regressions of responding to sad and neutral expressions on Machiavellianism, while controlling for psychopathy and other traits, showed no significant effects for Machiavellianism.

In sum, the results for correlations of Machiavellianism with empathy-like traits generally show negative relationships. However, it should be stressed that, with the possible exception of the nonverbal pictorial assessment method findings in Ali et al. (2009), which focused on behavioral responses, empathy as currently defined in psychology (cf. Eisenberg, 2000) was not measured and related to Machiavellianism, and the seemingly similar traits studied to date (i.e., agreeableness, conscientiousness, emotional intelligence) may not entail the same psychological mechanisms as found with empathy. Furthermore, the study investigating processes closest to empathy (Ali et al., 2009) found that Machiavellianism had no relationship with these processes, once other nonempathic variables were controlled for.

Commentary on Psychological Research and Its Relevance for Organization Research

While perhaps suggestive of ToM and empathetic processes undergirding Machiavellianism, the above mentioned studies reveal four serious shortcomings. First, all six studies reviewed used student samples, not adult employees or managers, thereby leaving open the questions of generalizability and relevance to organization research. Second, the findings from the studies are generally mixed, modest, and based on correlational evidence. When more demanding methods were employed (multiple regression), Machiavellianism was found to be unrelated to ToM and empathy. Third, some research showed contradictory or counterintuitive findings to hypotheses proposed by some researchers. For example, Lyons et al. (2010) found that high Machiavellians are less facile with ToM skills than low Machiavellians; Ali et al. (2009) discovered evidence for associations of Machiavellianism with one form of empathy (response to sadness) but not another (happiness), plus unexpected (or what they term "inappropriate") reactions to neutral faces (i.e., respondents displayed negative affect to neutral faces).

Finally, all six studies reviewed above relied on self-report data. As Becker et al. (2011: 950) point out, such methods "tend to overestimate the role of conscious deliberation and intention and underestimate the role of nonconscious influences." There is reason to believe, as we argue below, that ToM and empathy processes have strong nonconscious properties (e.g., Lillard & Skibbe, 2005; see also Lieberman, 2007, 2010). Another shortcoming of reliance only on self-report methods is the inability to capitalize on knowledge from multilevel research. Becker et al. (2011: 937) recognize the value of such an approach when they state, "interactions between higher and lower levels are necessary to explain the complexities

of human cognition and behavior." Organizational cognitive neuroscience is uniquely positioned to inform the study of ToM and empathy at the nonconscious level and benefit from integrating neuroscience mechanisms with social psychological and other conscious processes.

The Need for Neuroscience Within the Field of Organizational Behavior

The application of neuroscience to social and organizational behavior is relatively new, and different definitions have been proposed. Lieberman (2010: 143) uses the terminology, *social cognitive neuroscience*, and defines this as the use of "the tools of neuroscience to study the mental mechanisms that create, frame, regulate, and respond to our experience of the social world." In a parallel manner, Butler and Senior (2007: 8) define *organizational cognitive neuroscience* as the application of "neuroscientific methods to analyze and understand human behavior within the applied setting of organizations" (see also Senior et al., 2011). Likewise Becker et al. (2011) accommodate cognitive and affective processes in their treatment of *organizational neuroscience*. Indeed, the spirit of discussions in Senior et al. (2011) and Becker et al. (2011) are compatible with wider biological perspectives, such as characterized by Cacioppo and Decety (2011: 163) in their definition of *social neuroscience*: "Social neuroscience seeks to specify the neural, hormonal, cellular, and genetic mechanisms underlying social behavior, and in so doing to understand the associations and influences between social and biological levels of organization." Lee et al. (2012) provide additional commentary on such an orientation in organizational research.

For our study of ToM and empathetic foundations of Machiavellianism, an OCN and ON perspective offers at least three advantages. First, as developed below under hypotheses, neuroscientists have identified multiple, distinctive regions of the brain in their specification of the theoretical grounding of ToM and empathetic processes. These processes are largely nonconscious and automatic, making self-report measures less useful in testing hypotheses. Neuroscience procedures—functional magnetic resonance imaging (fMRI) methods in our particular case—are well suited to uncovering the nonconscious processes implied.

Second, a multilevel approach can be implemented within the purview of an OCN and ON perspective. That is, Machiavellianism in managers can be linked to ToM and empathetic processes at the social level, and the concepts and processes implied therein can be broken down into component processes at the neural level. Becker et al. (2011, p. 936) point out that by "hierarchically integrating 'higher' and 'lower' explanations, our overall accounts become richer and more robust . . . [and] explanation at one level of abstraction will inevitably lead to questions that are better answered at other levels." See also Lee et al. (2012).

More specifically, Cacioppo and Decety (2011: 169) capture the logic of multilevel research in this sense as follows: "Breaking down the component processes of the psychological construct of interest and showing how, based on the prior literature on the brain, different predictions about what circuits should be activated can be derived from two or more theories." One principle that grounds organizational neuroscience, when behaviors across levels of mental organization are investigated, is termed the *principle of multiple*

determinism (e.g., Cacioppo & Bernston, 1992; Cacioppo & Decety, 2009). The principle of multiple determinism maintains that any behavior at one level of organization can have multiple antecedents within or across levels of organization. This implies also that any behavioral phenomenon at one level of organization can function to explain another variable at the same level or across levels. The further *principle of nonadditive determinism* claims that the whole is not necessarily predicted by the simple sum of its parts. For example, a psychological response may not be decomposable and explicated by specification of other physiological processes by themselves, but only in conjunction with differences in behavior at the social level (see Cacioppo & Bernston, 1992: 1024, for a specific case). The *principle of reciprocal determinism* asserts that mutual influence can occur between biological and social variables to determine behavior. This typically occurs recursively, rather than simultaneously, such as might happen when social variables influence psychological variables through their effects on neural processes. Other sequences and directions of effects might transpire, we would suggest, such as reflected in so-called downward causation or emergent phenomena.

A third advantage of an ON and OCN approach is in its implications as "a paradigm or interpretive framework." Becker et al. (2011: 937-938) propose three such implications (see also Senior et al., 2011). That is, ON and OCN perspectives can resolve existing disputes, extend extant theories, and generate new research questions. Each of these is achieved to one degree or another in our research and will be considered in the Discussion.

Hypotheses

Theory of Mind

Frith and Frith (2008) term mentalizing "low-level automatic processes," and point out that they serve such functions as maintaining joint attention, sharing knowledge, and sharing action in social interactions (see also Frith & Frith, 2006). They also note that they promote a kind of altruism rather than selfishness in social relationships. Thus ToM processes facilitate social interactions and are particularly pertinent to organizational contexts where communication, cooperation, trust, and coordinated actions are necessary.

Lieberman (2010: 153-156) reviews research into the neural correlates of mentalizing with regard to four classes of stimulus materials: verbal (e.g., false-belief paradigm, short stories), nonverbal (e.g., animation of geometric shapes, cartoons, target eyes), judgments of psychological characteristics of others, and strategic games. In our study of boundary spanning agents who deal with customers of their firms, we desired to create experimental stimulus and control conditions that, as realistically as possible, simulated their everyday work encounters. As described under Method below, we constructed stories as experimental stimuli that describe scenarios of typical agent-customer interactions that contain mentalizing and stories for two kinds of control conditions, with no mentalizing represented therein. Therefore, with regard to neural regions of relevance to our ToM hypotheses, we focus primarily on the six studies with stories as stimuli that Lieberman (2010) reviews. We supplement these below with mention of studies from other research where relevant as well.

With regard to mentalizing studies, a number of regions in the brain are consistently implicated and potentially relevant to our study: the medial prefrontal cortex (MPFC) in the frontal lobe, temporo-parietal junction (TPJ), temporal pole (TP), and precuneus (e.g., Frith & Frith, 2006; Lieberman, 2007, 2010; Saxe & Wexler, 2005). For readers wishing to view the location of the above mentioned regions of the brain and regions mentioned hereafter, Figure 2 presents spatial locations.

In an investigation similar to our Study 1, Dietvorst et al. (2009) found that the MPFC and TPJ bilaterally, but not the TPs, were differentially activated between high and low mentalizing groups. Based on Dietvorst et al. (2009), we do not expect activity in the TP regions to be associated with Machiavellianism.

We hypothesize that the amount of neural activity occurring in the TPJ, MPFC, and precuneus regions of the brain will show differential activation between experimental and control conditions in our ToM experiment (see Saxe, Moran, Scholz, & Gabrieli, 2006, for supporting evidence). Lieberman (2010: 153) found six studies that used verbal tasks with short stories, where the TPJ was implicated in ToM processes: Fletcher, Happé, Frith, and Baker (1995); Gallagher et al. (2000); Happé et al. (1996); Hynes, Baird, and Grafton (2006); Saxe and Kanwisher (2003); and Völlm et al. (2006). Eighteen of 39 other studies reviewed, which used nonverbal stimuli, also found evidence for the role of the TPJ in ToM processing. For key studies showing the role of the TPJ in selective sensitivity for the onset of cues about mental states of others and in constructing coherent models of others with whom one interacts, see Saxe and Wexler (2005).

The MPFC has also been implicated in ToM processes (e.g., Fletcher et al., 1995; Grèzes, Frith, & Passingham, 2004; for a review, see Amodio & Frith, 2006). Lieberman (2007: 260) notes that the MPFC is an example of controlled processes and is associated with "awareness, intention, effort, and the capacity for interruption." Furthermore, as a region of the brain connected to reflective processes, the MPFC typically is involved in serial processing, linguistics, behavior altered by cognitive load, impairment by high arousal, and engagement in abstract concepts (Satpute & Lieberman, 2006). Research also finds the MPFC involved with the interpretation and prediction of the behavior of opponents in strategic games (e.g., Gallagher, Jack, Roepstorff, & Frith, 2002). The MPFC is thus intimately connected to mentalizing.

Likewise the precuneus is engaged in controlled processes and is located in the medial parietal cortex. Saxe et al. (2006) found that the precuneus region was activated when people reason about another person's thoughts, as well as when they attribute a personality trait to themselves, which are processes related to ToM. Ries et al. (2006) also provide evidence for activation of the precuneus region for the cognitive functions associated with autobiographical episodic memory. This too is related to ToM, and it has been suggested that autobiographical memory depends on ToM (Perner, 2001), and ToM depends on autobiographical memory (Adams, 2001). In addition, Saxe et al. (2006) review research relating self-reflection to both autobiographical memory and ToM.

Thus we hypothesize:

Hypothesis 1: A comparison of the brain activity in subjects exposed to stories high versus low in mentalizing content will show greater activations of the TPJ (bilaterally), MPFC, and precuneus regions.

To investigate cross-level hypotheses, we predict that Machiavellians (measured with self-report items) will exhibit impaired ToM processing (measured with fMRI techniques). This is consistent with the weak findings based on self-reports by Lyons et al. (2010) and Ali and Chamorro-Premuzic (2010) presented above. Hence, we hypothesize:

Hypothesis 2: The greater the level of Machiavellianism, the lower the activation of the TPJ (bilaterally), MPFC, and precuneus regions of the brain.

Empathy

A key to understanding the functioning of empathy lies in the operation of the mirror neuron system (MNS). The MNS is located in the premotor and parietal areas of the brain, more specifically in the posterior part of the inferior cortex and the anterior part of the inferior parietal lobule (Iacoboni & Dapretto, 2006). It plays an important role in human understanding and in reacting (e.g., mimicking) to both emotions and intentions of other people.

Gallese (2001, 2003) provides a social psychological interpretation of the MNS that is particularly useful for our purposes. He proposes that "a shared manifold of intersubjectivity" makes possible meaningful interpersonal communication, social imitation, and ascription of intentionality to other people, and defines what he terms an s-identity. Gallese posits that the s-identity (contrasted with an individual, personal i-identity) helps people form "implicit certainties" when they interact with each other:

> These certainties deal with our implicit knowledge about other individuals, encompassing the way they look, the way they act, and ultimately, the way they feel and think. These implicit certainties are constitutive of the intersubjective relation, and contribute to the sense of oneness, the sense of identity with the other, which basically makes s-identity possible. (Gallese, 2003: 172).

Gallese (2003) characterizes the functioning of the MNS as follows. When we observe or hear another person performing an action, premotor sectors in the brain become active that are similar to those that would become activated had we performed the action ourself. These premotor activations are in addition to visual system activations and show that motor circuits in common to observer and observed are simultaneously shared so to speak. Such processes are characteristic of nonconscious mimicry of facial expressions, posture, gestures, and mannerisms observed in self and others when we interact with them. At the same time, in addition to action recognition, mirror neurons code and interpret the intentions of others under observation (hence people come to remember a common representation or ideomotor program; Iacoboni, 2009); this occurs in the posterior part of the inferior frontal gyrus and the adjacent sector of the ventral premotor cortex (Iacoboni et al., 2005). The actual emotional reactions happen in the limbic system, which is linked to the mirror neuron system through the pars opercularis (Iacoboni & Dapretto, 2006) and insula (Carr, Iacoboni, Dubeau, Mazziotta, & Lenzi, 2003; Lamm, Batson, & Decety, 2007) regions of the brain.

Gallese (2001, 2003) goes on to explicate the shared manifold of intersubjectivity on three levels: (1) At the phenomenological level, people experience a sense of similarity with

others, "of being individuals within a larger social community of persons like us" (Gallese, 2003: 177). (2) In an empathic manner, Gallese (2003: 177) notes that "actions, emotions and sensations experienced by others become *implicitly meaningful* to us because we can *share* them with others" (emphasis in original). At the functional level, models of self-other are created and characterized in "*as if* modes" of interaction. Gallese maintains that a functional logic occurs through as-if-modes and is at work during both self-control and the experience of other people's actions. By producing a self-other identity, as-if-modes of interaction in the shared manifold enable the system to "detect coherence, regularity, and predictability." (3) Finally at the subpersonal level, a "series of mirror matching neural circuits" exist to produce intentional shared spaces which "allow us to appreciate, experience, and implicitly and prereflexively understand the emotions and the sensations we take others to experience" (Gallese, 2003: 177). Although the shared manifold "does not entail we experience others as we experience ourselves" per se, it does make what Gallese calls the "bootstrapping of mutual intelligibility" possible.

Empathy arises from the apprehension or comprehension of another person's emotional state (e.g., Eisenberg, 2000). From a psychological perspective, empathy consists of three components: (1) an emotional reaction that might include a sharing of the other's feelings, (2) a cognitive capacity to take the perspective of the other, and (3) a monitoring mechanism that registers the source of the experienced affect in a way differentiating self from other (Lamm et al., 2007: 42). We link these psychological components of empathy to neural mechanisms below as follows.

The emotional response associated with empathy can be one of two kinds. Empathic concern consists of focus on the plight of another person and feeling compassion-like or sympathetic-like emotions. Personal distress consists of a projection of the self into an adversive situation and feeling fear-like emotions. The insula, anterior medial cingulated cortex (aMCC), and amygdala are three key brain regions that are activated in emotional aspects of empathy (Decety & Lamm, 2006: 1152).

Decety and Lamm (2006: 1151) point out that taking the perspective of another person "allows us to overcome our usual egocentricism, tailor our behaviors to others' expectations, and thus make satisfying interpersonal relations possible" (see also Davis, 1994). When people take the perspective of others, similar neural circuits are activated in the self, as in the other person, undergoing an experience or action under observation. We will discuss the common neural processes in the next paragraph. For now, we wish to point out that perspective taking entails top-down information processing (i.e., controlled or executive functions) that regulates cognition and emotion through such processes as selective attention and self-regulation. The executive functions occur in such parts of the prefrontal cortex as the medial region and in the inferior parietal lobule (e.g., Decety & Jackson, 2004; Decety & Lamm, 2006: 1151). In addition, the precuneus region has been implicated in perspective taking (e.g., Cavanna & Trimble, 2006; Ruby & Decety, 2001; Vogeley et al., 2001, 2004). Our ToM hypotheses focus on these processes.

A third aspect of empathy, the monitoring mechanism, which registers the source of experienced affect in terms of self-other, is important for differentiating empathic concern from emotional distress, where the former is part of the meaning of empathy, whereas the latter is a personal reaction not constitutive of empathy. In other words, empathy is an

other-oriented emotional reaction, but personal distress is a self-oriented emotional reaction. The balance between self and other perceptions and the experience of agency in disentangling one's own feelings from the feelings shared with others have been observed in the inferior parietal lobule (e.g., Decety & Lamm, 2007).

Empathy can be thought to occur in one or more of three component processes: affective arousal sharing, emotion awareness and understanding, and self-regulation (Decety, 2011a, 2011b). In our experiments for empathy, we tried to reduce the chances of ToM processing and thus used stimuli less likely to induce emotion understanding and self-regulatory responses. We also avoided use of stimuli for perception of pain in others because these entail activation of wider neural events in the "pain matrix" than for the induction of the work-related empathy we wish to explore. Our stimuli are therefore limited to the video presentation of facial expressions of anger, disgust, happiness, and surprise in our experimental conditions; and neutral faces and moving geometric shapes in our control conditions. A somewhat similar perspective that uses similar stimuli can be found in Van der Gaag, Minderaa, and Keysers (2007).

The neural activations we expect are those found in the insula, which Decety (2011a: 94) maintains is relevant to emotion awareness; in the pars opercularis, which research supports for subjects viewing or hearing actions performed by others (e.g., Bastiaansen, Thioux, & Keysers, 2009: 2392); and in the precuneus region, which is a controlled processing area and particularly involved in self-processes (Lieberman, 2010: 161-165) and self-other differentiation (Schulte-Rüther, Markowitisch, Fink, & Piefke, 2007).

As a consequence, we hypothesize:

Hypothesis 3: A comparison of the brain activity of subjects during the viewing of positive and negative emotional facial expressions in video form versus neutral faces and moving geometric shapes will show greater activation of the insula, pars opercularis, and precuneus regions.

To investigate cross-level hypotheses, we predict that Machiavellians (measured with self-report items) will show enhanced empathetic processing (measured with fMRI techniques). This is based on our speculation that Machiavellians have a relative advantage over non-Machiavellians in emotionally resonating with others, despite lacking relatively in ToM skills and despite self-report research showing that Machiavellianism is negatively related to agreeableness (e.g., Austin et al., 2007; Paulhus & Williams, 2002) and positively related to psychopathy and narcissism (Allsopp, Eysenck, & Eysenck, 1991; Chabrol, van Leeuwen, Rodgers, & Séjourné, 2009; McHoskey, Worzel, & Szyarto, 1998; Paulhus & Williams, 2002). We surmise that the self-report research failed to tap nonconscious processes associated with the emotional response aspects of empathy. The finding of a positive correlation between Machiavellianism and affective responding to sad faces by Ali et al. (2009) suggests the possibility of heightened sensitivity to negative emotions by Machiavellians. For relationships between boundary spanning agents and their customers, such emotional resonance could give Machiavellians an advantage over non-Machiavellians in detecting negative reactions to one's product offering and resistance to one's selling efforts. Thus we propose:

Hypothesis 4: The greater the level of Machiavellianism, the higher the activation of the insula and pars opercularis regions and the lower the activation of the precuneus region.

Notice that our cross-level hypotheses predict a dissociation or negative relationship between ToM and empathetic processes in Machiavellians. The classic psychological literature and the neuroscience literature have tended to assume that these processes work in tandem and make both ToM (especially emotion recognition and perspective taking) and (emotional) empathetic responding the defining characteristics of empathy (e.g., Eisenberg, 2000; Lamm et al., 2007; cf. Tager-Flusbert & Sullivan, 2000). We will consider this issue further in the Discussion.

Method

Study 1: ToM

Subjects. Respondents in Study 1 were 43 customer boundary spanners from a variety of firms working in the professional services, information technology, banking, manufacturing, and other industries. They all were contacted while attending a management training institute associated with a university. A total of 37 men and 6 women participated (mean age = 36.0 years, *SD* = 8.23). All were right-handed and provided written consent, and the study was approved by the institutional review board at the university medical center where the research was conducted.

Stimuli and procedures. The stimuli and procedures were as follows and are similar in structure to that used by Nieminen-von Wendt et al. (2003). The study consisted of three conditions: ToM (mentalizing) stories, process stories with little or no ToM content (control), and unlinked sentences with no ToM content (control). Each respondent heard 5 stories in each of the three conditions for a total of 15 stories (see the appendix for the actual stories employed). Each story took between 33 and 36 seconds to hear and was followed by a question asking about the content of the story. Subjects were given 6 seconds to silently formulate an answer to each question. During the experiment, a new story was presented every 42 seconds, where in the final 3 seconds, subjects heard a beeping sound signaling an interstimulus interval. In earlier administrations of the study, where subjects were asked to read the stimuli, we discovered that there was too much head movement for purposes of analysis, and thus we turned to oral presentations of stimuli. The 5 ToM stories contained professional interactions between a protagonist customer boundary spanner and a customer in which the cognitive task involved the use of mentalizing to understand why and how the characters in the story interact. The 5 process stories served as closely matching control conditions, where the cognitive task was similar to the ToM stories but did not rely on analysis of mentalizing content. The 5 unlinked sentences "stories" consisted of control conditions of unrelated sentences that required the use of language and memory skills but did not entail coherent narratives, as in the other conditions, and hence were devoid of mentalizing content.

A separate group of 25 respondents who were informed about the purpose of the study were asked to evaluate the 15 scenarios. After being given definitions of the stimuli, the respondents identified each of the 15 scenarios as being interpersonal-mentalizing, process, or unlinked sentence scenarios. They were also asked to describe the scenarios and were recorded as having given a correct response if their descriptions were sensible and could be interpreted. Finally they rated on 10-point scales their own confidence in the classification and how clear they believed the scenarios were. The three respective scenarios were correctly classified with 96.8%, 99.2%, and 99.2% accuracy. Answers to the stories were correct for 92.0%, 95.6%, and 100% of interpretations, respectively. The respective average confidence ratings were 8.26 (*SD* = 0.94), 8.22 (*SD* = 1.16), and 9.54 (*SD* = 0.72). The average clarity ratings were 8.16 (*SD* = 1.12) for the interpersonal-mentalizing and 7.86 (*SD* = 1.15) for the process scenarios. Clarity ratings for unlinked sentences were not meaningful, given their nature.

Study 2: Empathy

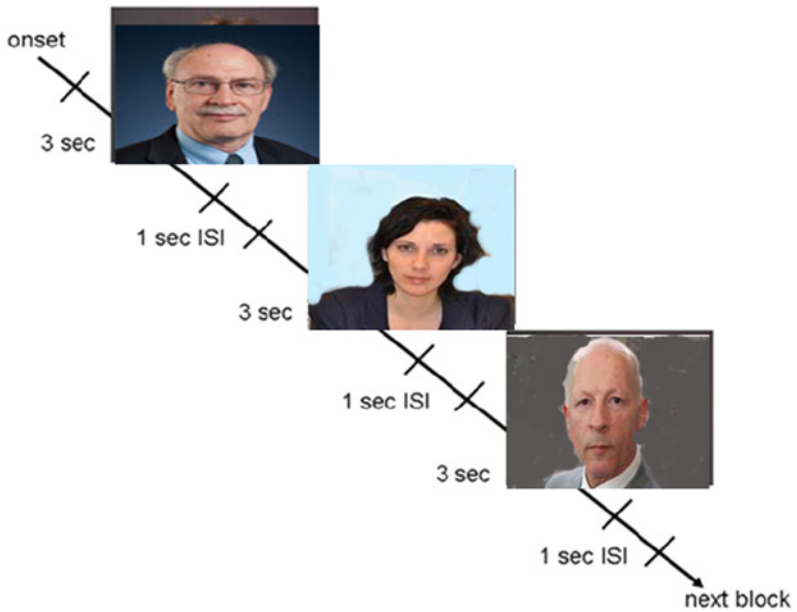
Subjects. Respondents in Study 2 were 24 customer boundary spanners from the same range of firms as noted in Study 1 and were recruited while attending a university management institute training program. A total of 16 men and 8 women participated (mean age = 34.4, *SD* = 6.13). All were right-handed and provided written consent, and the study was approved by the institutional review board. Eighteen participants were common to both Studies 1 and 2.

Stimulus and procedures. The experimental stimuli consisted of full-face, full-color video clips of five males and five females displaying various emotional states (anger, disgust, happiness, and surprise). The control stimuli were video clips of neutral faces and moving geometric shapes. Thus, the four experimental conditions were (1) positive emotional facial expressions: happy and surprised; (2) negative emotional facial expressions: angry and disgust; (3) neutral faces; and (4) moving geometric shapes. Each clip was played for 3 seconds in 12-second blocks of three clips plus interstimulus intervals of 1 second. Each block consisted of either only positive, negative, or neutral emotions or moving geometrical shapes (see Figure 1). Counterbalanced versions of the stimuli were employed. This design is similar in structure to that employed frequently in the neuroscience literature (e.g., Wicker et al., 2003).

The experiment was performed in near darkness with all lights turned off except for the video projector. Visual stimuli were shown by means of back projection with a video projector onto a translucent screen in front of the scanner. Participants viewed this screen with a mirror system on top of the head coil. The total field of view extended 21 degrees horizontally and 17 degrees vertically. Stimuli were presented by the stimulation software package Presentation (Neurobehavioral Systems).

Observing and executing facial expressions evokes activity in a neural network extending from the inferior frontal gyrus (pars opercularis), temporal parietal junction, superior temporal sulcus, insula, and amygdala (Dapretto et al., 2006; Van der Gaag et al., 2007). These findings show that the same neural structures that are active during execution of facial expressions are also active when the same facial expressions are detected in others.

Figure 1
Example of a Block With Neutral Faces



Note: The experiment used video clips, not photos. Also people in the photos above are not those used in the experiment but are presented for purposes of illustration.

Functional image acquisition and analysis for Studies 1 and 2. All imaging was performed on a 3T MRI scanner (General Electric, Milwaukee, USA) using a dedicated eight-channel head coil. For the anatomical image, a 3D high-resolution inversion recovery fast spoiled gradient recalled echo sequence (echo time (TE)/repetition time (TR)/inversion time = 2.1/10.4/300 ms, flip angle = 18°, matrix = 416 × 256, field of view (FOV) = 25 cm, slice thickness 1.6 mm with 50% overlap) was required. A foundational source for functional image acquisition can be found in Senior, Russell, and Gazzaniga (2009).

For functional imaging, a single-shot gradient-echo echo-planar imaging (EPI) sequence in transverse orientation was used in each study that is sensitive to blood oxygenation level dependent (BOLD) contrast. The imaging volume covered the entire brain (TR/TE 3000/30 ms. 64 × 96 matrix with a rectangular field of view of 22 cm, 2.5 mm slice thickness, 39 contiguous slices; voxel size of 3.5 × 3.0 × 2.5 mm^3). For Study 1, acquisition time was 10:45 minutes with a time series of 210 imaging volumes; for Study 2, acquisition time was 9:51 minutes with a time series of 192 images volumes (both functional runs included 15 seconds of dummy scans that were discarded).

The functional imaging data were analyzed using statistical parametric mapping software (SPM 5, distributed by the Wellcome Department of Cognitive Neurology, University

College London, UK) implemented in MATLAB (Version 6.5, Mathworks, Sherborn, MA, USA). Motion correction and coregistration were done according to the methodology provided by SPM5. Brain volumes were normalized to the standard space defined by the Montreal Neurological Institute (MNI) template. The normalized data had a resolution of $2 \times 2 \times 2$ mm and were spatially smoothed with a three-dimensional isotropic Gaussian kernel, with a full width half maximum of 8 mm.

Statistical parametric maps were calculated for each subject. Movement parameters resulting from the realignment preprocessing were included as regressors of no interest to further reduce motion artifacts. The model was estimated with a high pass filter with a cutoff period of 128 seconds. For each participant, contrasts between the experimental conditions versus the control conditions were calculated between each condition, the individual contrast maps were used for a second level random effects analysis in the regression analyses. Other contrasts such as process stories versus unlinked sentences, neutral faces versus moving geometric shapes, or positive emotional expressions versus negative emotional expressions do not isolate neural activations associated with mentalizing or empathy in mirror neuron areas per se, and are therefore excluded from the present investigation.

In order to investigate Hypothesis 1, we performed a second level random effect analysis, so that the ToM stories evoke activity in regions implicated in mentalizing. Two contrast maps are used for the second level analysis: ToM stories versus process stories and ToM stories versus unlinked sentences.

For the correlational analysis (Hypothesis 2), we extracted the mean percentage signal change during the listening to ToM stories, compared with the process stories and unlinked sentences, and then we examined their correlations with participants' Mach scale scores. We used the 20-item Mach IV scale for measuring Machiavellianism (Christie & Geis, 1970). The Cronbach alpha reliability was .72.

In order to investigate Hypothesis 3, we first performed a second level random effect analysis, to show that the positive and negative emotional expressions activate regions implicated in the MN system. Four contrast maps are used for the second level analysis: positive emotional expressions versus neutral faces and moving geometric shapes, and negative emotional expressions versus neutral faces and geometric shapes.

For correlational analysis (Hypothesis 4), we extracted the mean percentage signal change during the viewing of emotional expressions, compared with the control conditions, and then we examined their correlations with participants' Mach scale score. We used the 20-item Mach IV scale for measuring Machiavellianism (Christie & Geis, 1970). The Cronbach reliability was .73.

Because the predictions were limited to specific anatomical regions based on the literature, we adopted a region-of-interest (ROI) approach (Poldrack, 2007) in order to test the significance of the activation. Such an approach tests the contrasts only in those specific regions rather than across the entire brain, and by reducing the degree of correction needed for multiple comparisons, allows greater sensitivity in detecting effects. Thus, small-volume corrections (SVC; Worsley et al., 1996) were applied to the a priori regions of interest. Specifically, activations of the following key regions of the brain were measured: ToM activations in the MPFC, TPJ, and precuneus for Study 1; and MN activations in the precentral gyrus, pars opercularis, and TPJ in conjunction with the insula and the amygdala (which are activated when emotions are involved) for Study 2. At these locations, significance of the interactions

Table 1
Theory of Mind Activations With Whole Brain Analysis, Plus Correlations With Machiavellianism

	Hemisphere Laterality	MNI Coordinates			Cluster Size	Statistics	
Anatomical Region	L/R	x	y	z	k	*Z*-value	*r*
Theory of mind versus unlinked sentences							
Temporo-parietal junction (TPJ)	R	48	–68	30	65	3.31#	–.49**
Medial prefrontal cortex (MPFC)	R	8	64	20	21	2.76#	–.41**
Temporo-parietal junction (TPJ)	L	–52	–72	30	2	2.13 ($p < .10$)	–.33*
Precuneus	R	8	–48	24	4	2.10 ($p < .10$)	–.32*
Insula	L	–40	–22	–2	85	2.60 ($p < .10$	–.23
Insula	R	42	–20	–6	280	3.31#	–.12
Theory of mind versus process conditions							
Medial prefrontal cortex (MPFC)	R	10	64	18	14	2.62#	–0.40**
Precuneus	L(Z-score)	–6	–50	20	5	2.46#	–0.37*

*$p < .05$. **$p < .01$. #$p < .05$ corrected for multiple comparisons at cluster level with small volume corrections of a sphere of 5 mm radius.

was tested by constraining the analysis to the ROI derived from the WFU-Pick Atlas software package. Unless otherwise specified, all results were threshold $p = .005$ (uncorrected).

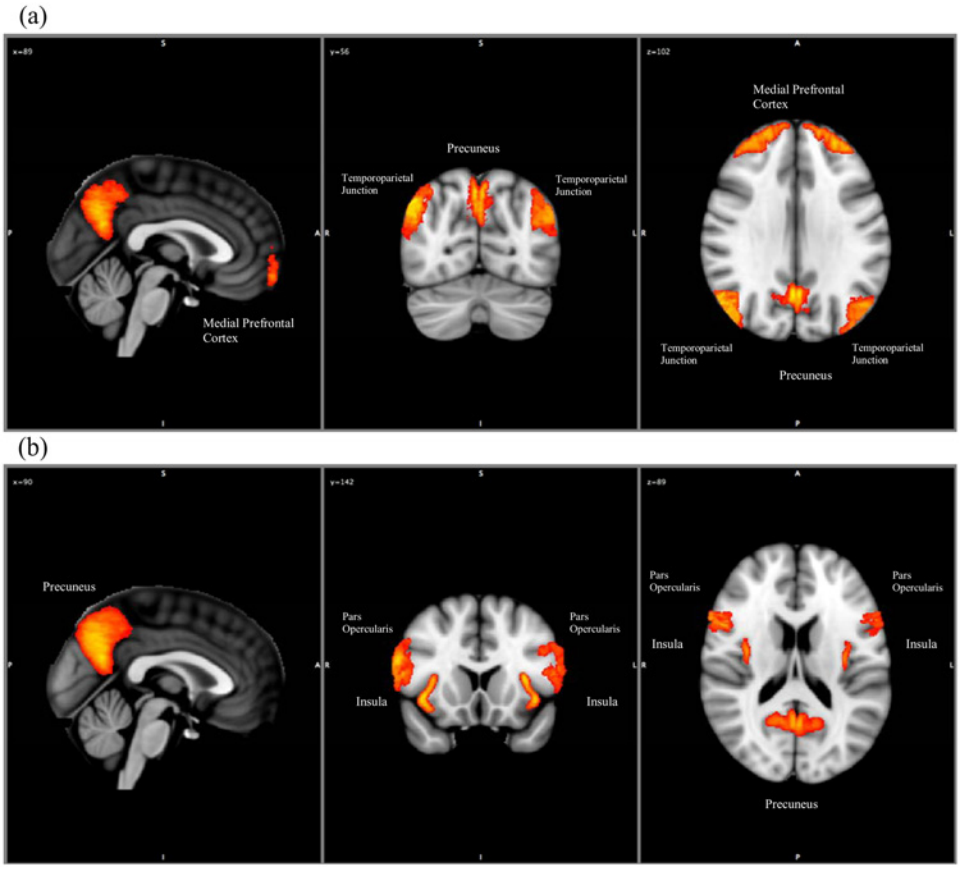
Results

Study 1: ToM

We hypothesized (H1) that the TPJ, MPFC, and precuneus regions will be activated more highly for the ToM mentalizing task condition than for either the process control or unlinked sentences control conditions. As predicted and shown in Table 1, where the findings for the whole-brain analysis are presented, greater activation for the contrast of ToM versus unlinked sentences was found for the right TPJ ($x = 48$, $y = –68$, $z = 30$, Z=3.31), right MPFC (8 64 20, $Z = 2.76$), left TPJ (–52 –72 30, $Z = 2.13$), and precuneus (8 –48 24, $Z = 2.10$). These regions were also identified in ROI analyses. For the contrast of ToM and process conditions, the findings demonstrate that greater activation ensued for the right MPF (10 64 18; $Z = 2.62$) and the left precuneus (–6 –50 20; $Z = 2.46$). Notice in Table 1 that the whole-brain analyses also show that the left and right insula differ between the ToM and unlinked sentences conditions (–40 –22 –2, $Z = 2.60$; 42 –20 –6, $Z = 3.31$). The insula is implicated in emotional reactions, but we did not hypothesize changes here (see next paragraph with respect to correlational findings concerning the insula). Figure 2a shows the spatial locations of the relevant activations for ToM.

Hypothesis H2 predicted that the greater the Machiavellianism, the higher the activation of the TPJ, MPFC, and precuneus regions of the brain. As hypothesized and shown in the final column of Table 1, Machiavellianism and activation of the right TPJ, right MPFC, left TPJ, and precuneus regions reveal correlations of –.49 ($p < .01$), –.41

Figure 2
Activation Maps ToM and Mirror Neuron Networks



Note: Represents the location of the significantly activated areas in both the Theory-of-Mind (ToM) task (a), and the Mirror Neuron (MN) task (b), using FSL and the Harvard-Oxford Cortical structure atlas to pinpoint these locations. Abbreviations: L (Left Hemisphere), R (Right Hemisphere), A (Anterior part of the brain), P (Posterior part of the brain), S (Superior part of the brain), I (Inferior part of the brain). X, Y, and Z are the slice coordinates in the XYZ-plane. It might seem counterintuitive that Right and Left are mirrored; however, in medical imaging this is common practice to present images in this manner.

($p < .01$), –.33 ($p < .05$), and –.32 ($p < .05$), respectively, for the contrast of ToM and unlinked sentences; and similar correlations were found for the right MPFC ($r = –.40$, $p < .01$) and left precuneus ($r = –.37$. $p < .05$), for the contrast of ToM and process conditions. Machiavellianism was not significantly related to the left or right insula activations ($r = –.23$, n.s.; $r = –.12$, n.s., respectively).

Table 2
Mirror Neuron Activations With Whole Brain Analysis Plus Correlations With Machiavellianism

Anatomical Region	L/R	x	y	Z	k	*Z*–value	*r*
Negative emotional expressions versus moving geometric shapes							
Insula	R	50	18	–12	62	3.36#	.64**
Insula	L	–38	16	40	13	2.88#	.56**
Precuneus	L	–2	–48	40	13	2.58#	–.52**
Pars opercularis	R	42	20	4	3	2.53#	.48*
Pars opercularis	L	–48	18	4	3	2.52 ($p < .10$)	.51**
Amygdala	R	–24	0	–22	55	2.70 ($p < .10$)	.14
Amygdala	L	26	0	–22	9	2.67 ($p < .10$)	.18
Positive emotional expressions versus moving geometric shapes							
Insula	L	–44	14	–2	81	3.34	.40**
Insula	R	50	18	–10	66	3.08#	.36**

*$p < .05$. **$p < .01$. #$p < .05$ corrected for multiple comparisons at cluster level with small volume corrections of a sphere of 5 mm radius.

Study 2: Empathy

We proposed (H3) that the insula, pars opercularis, and precuneus regions will be activated more highly for the emotion tasks than for the neutral faces and moving geometric shapes conditions. As hypothesized and presented in Table 2, where again whole-brain results are presented, greater activation for the contrast of negative faces versus moving geometrical shapes was found for the right insula (50 18 −12; $Z = 3.36$), left insula (–38 16 –40; $Z = 2.88$), left precuneus (–2 –48 40; $Z = 2.58$), right pars opercularis (42 20 4; $Z = 2.53$), and left pars opercularis (–48 18 4; $Z = 2.52$). For the contrast of positive faces and moving geometric shapes, the results show that greater activation occurred for the left insula (–44 14 –2; $Z = 3.34$) and the right insula (50 18 –10; $Z = 3.08$). The above mentioned regions were also identified in ROI analyses. The whole-brain analyses also show that the right and left amygdala differ between the negative faces and moving geometric shapes conditions (–24 0 –22; $Z = 2.70$; 26 0 –22; $Z = 2.67$, respectively). The amygdala is implicated in observing and executing facial expressions (Dapretto et al., 2006), as well as playing a possible role in empathy (Decety & Lamm, 2006: 1152), but we did not hypothesize this in our study because it may be limited to, or more common with, the response to perceiving others feeling pain, which we did not manipulate (see also below the lack of correlation of activation of the amygdala with Machiavellianism). Figure 2b presents the spatial locations of the pertinent activations for empathy.

Hypothesis H4 predicted that the greater the Machiavellianism, the higher the activation of the insula and pars opercularis regions of the brain, and the lower the activation of the

precuneus region. As proposed and shown in the final column of Table 2, Machiavellianism and activation of the right insula, left insula, left precuneus, right pars opercularis, and left pars opercularis regions yielded correlations of .64 ($p < .01$), .56 ($p < .01$), –.52 ($p < .01$), .48 ($p < .05$), and .51 ($p < .01$), for the contrasts of negative faces and moving geometric shapes; and similar correlations were found for the left and right insula ($r = .40$, $p < .01$; $r = .36$, $p < .01$), for the contrasts of positive faces and moving geometric shapes. Machiavellianism was not significantly related to activity in the right or left amygdala ($r = .14$, n.s.; $r = .18$, n.s., respectively). No significant findings occurred for the contrasts of positive or negative faces with neutral faces.

Discussion

The first two studies provide insights into the neuroscience foundation of Machiavellianism and in their course resolve some of the ambiguities and inconsistencies in findings based on self-report studies. We showed that ToM and empathetic processes undergird Machiavellianism. But rather than Machiavellians being characterized by high scores on both ToM and (affective) empathy, as frequently speculated but seldom found in the psychology literature based on self-reports, we found evidence for a negative association or trade-off between ToM and affective empathy, such that high Machiavellians appear to exhibit relatively lower capabilities in ToM processing but relatively greater automatic emotional resonance than low Machiavellians. Our findings were based on fMRI experiments and cross-level associations with self-reported data (e.g., Becker et al. 2011; Cacioppo & Decety, 2011; Lee et al., 2012).

The mental foundation of Machiavellianism emerging from our research is the following. Machiavellians versus non-Machiavellians experience reduced activation of the MPFC, TPJ, and precuneus regions of the brain. These areas have been shown to be underdeveloped in people with autistic spectrum disorders, where abilities to infer the thoughts, feelings, and intentions of others are impaired, and interpersonal communication is compromised (e.g., David, Aumann, et al., 2008; David, Gawronski, et al., 2008; Frith, 2008; Saulnier & Klin, 2007). The speculation frequently made that Machiavellians display stronger ToM skills thus appears to be unfounded (cf., Langdon, 2003; Nichols, 2001; Paal & Bereczkei, 2007), and conclusions drawn from the modest, mixed results based on self-report research, finding that Machiavellians score lower on ToM-like processes, seem valid (e.g., Ali & Chamorro-Premuzic, 2010; Lyons et al., 2010).

Machiavellians versus non-Machiavellians display enhanced activation of the pars opercularis and insula regions of the brain. These areas have been shown to be crucial in the perception of emotions in others and emotion sharing, with the MNS believed to play an important role. Decety (2011a, p. 99) cautions, however, that the existence and nature of mirror neurons are still in need of specification, special experimental conditions are required to activate the MNS, and it is possible to confuse MN activation with activation of other neurons in the same regions. Our findings appear to support the argument that Machiavellians attune to the emotions of others to a greater extent than non-Machiavellians. The enhanced ability to feel the emotions of others, particularly negative affect, could facilitate the manipulation of others. This clarifies the mixed findings with self-reports by studies looking at empathy-like variables (Ali et al., 2009; Austin et al., 2007; Paulhus & Williams, 2002) and

the conflicting speculations in the literature (e.g., Deluga, 2001; Hawley, 2003; McIlwain, 2003), and implies that three neural mechanisms lie behind the enhanced emotional responding: the MNS (especially the pars opercularis), an emotional pathway from the pars opercularis to the amygdala (i.e., the insula), and control of self-other responding (especially as manifest in the precuneus).

Our experiments strove to look as specifically as possible at cognitive ToM processing and affective empathetic responding. Thus our stimuli and control conditions in Study 1 focused primarily on mentalizing content, not affective processes, and our stimuli and control conditions in Study 2 concentrated on affective aspects of empathy, not perspective taking.

It should be noted that definitions of ToM and empathy are not consistent in the literature. For example, some neuroscience researchers focus on cognitive empathy (e.g., Schnell, Bluschke, Konradt, & Walter, 2011) or differentiate between affective and cognitive aspects of empathy (e.g., Dziobek et al., 2011; Nummenmaa, Hirvonen, Parkkola, & Hietanen, 2008). Similarly, Völm et al. (2006) define empathy affectively as "the ability to infer emotional experiences" (p. 90) or "the attribution of emotion to another individual" (p. 91). Other researchers, such as Hein and Singer (2008) quoted near the beginning of our article, interpret empathy as an affective state of sharing emotions with others. The different perspectives should not create confusion as long as one is mindful of the meanings implied by the definitions people use; nevertheless, two issues should be mentioned in this regard.

First, psychologists have used a compound conceptualization of empathy where empathic concern and taking the perspective of another person are together the defining qualities of empathy (e.g., Eisenberg, 2000). Sometimes a third aspect is added by psychologists, where empathetic distress is specified to be low in empathetic individuals. Thus, empathy as studied by many contemporary neuroscientists generally focuses on one or more subcomponents of what psychologists consider to be empathy, and permits for discovering independence or even negative associations between components that psychologists believe highly and positively covary. We have followed the neuroscience perspective and in the process found that, for Machiavellians at least, cognitive and affective aspects similar to taking the perspective of others and emotionally resonating with others are inversely related. This appears to be an original observation in both the psychological and neuroscience literatures.

Second, it is important to recognize, when reading the neuroscience literature, that the study of empathy and its interpretation depend on the stimuli used, and findings from one study may tap different types of empathy or subprocesses of empathy than findings from other studies. For example, the perception of pain in others (e.g., viewing a needle being stuck into the thumb of a person [Lamm et al., 2007] or seeing a person strangled with a chain or threatened with a baseball bat or pistol [Nummenmaa et al., 2008]) would be expected to elicit overlapping but also distinct brain regions with other stimuli such as viewing emotional facial expressions or being exposed to frightening or disgusting stimuli. Likewise, some studies explicitly instruct people to empathize with a victim (Nummenmaa et al., 2008) or aim to uncover overlap between ToM and empathy (Völlm et al., 2006), thereby likely identifying areas of the brain involved with a wide range of cognitive and emotional responses at the same time. Or in still another research paradigm linking Machiavellianism to neural processes, researchers study people interacting in game situations where one party can punish the other (e.g., Spitzer, Fischbacher, Hermberger, Grön, &

Fehr, 2007). In our study, we desired to control for many of the effects examined by other researchers and at the same time provide as natural an experience as found in the field for customer boundary spanners as possible, so we explicitly did not instruct participants in Studies 1 or 2 to place themselves in the place of protagonists or to empathize with them, and we controlled as much as possible for affective content in Study 1 and cognitive content in Study 2. Furthermore, our ToM tasks focused on hearing stories of typical customer boundary spanner-customer interactions with and without mentalizing, and our affective empathy tasks concentrated on viewing emotional expressions versus nonemotional expressions, as might be observed in actuality by customer boundary spanners with customers. So we believe that our ToM and affective empathy processes are more focused than many studies in the neuroscience literature and at the same time relate more directly to the work situation at hand. In addition, we used as participants real customer boundary spanners, which added to the external validity of our findings for organization research. Finally, it might be claimed that an OCN or ON perspective as we implemented it has an advantage over traditional self-report data by not confounding different types or subprocesses of empathy.

Now that we have a better understanding of the building blocks of Machiavellianism, we can better understand, and make hypotheses about, what happens when Machiavellians interact in an organizational environment. The findings suggest that Machiavellians are less facile in ToM skills but more able to resonate empathetically (i.e., emotionally, but not necessarily cognitively in a perspective taking sense) than non-Machiavellians. Given that people use their capabilities consciously as well as nonconsciously to fit their environment (O'Reilly, Chatman, & Caldwell, 1991), we expect that low versus high Machiavellians will, depending on the managerial control systems in place, display contrasting reactions to in-role and extrarole performance opportunities. Specifically, it might be expected that Machiavellians will exploit work relationships more when managerial control is low versus when it is high. We study this topic in the next section.

Study 3: Implications of ToM and Empathy of Machiavellians in a Field Study

In Study 3, we take the cross-level findings from Study 1 and 2 and develop and test hypotheses at the social level in a field investigation.

Hypotheses

Customer boundary spanners of the sort we investigate in Study 3 (see Method below) must navigate in a social world between the constraints and expectations imposed by their organization and the constraints and expectations imposed by their customers. The first hypothesis we examine is the effect of management control on in-role performance, as moderated by Machiavellianism. The impact of management control depends, in part, on the abilities of supervisors to communicate effectively with subordinates in terms of feedback, interaction, and evaluation (e.g., Jaworski, Stathakopoulos, & Kirshman, 1993). Study 1 showed that customer boundary spanners who were low versus high in Machiavellianism had greater ToM capabilities: namely, they exhibited enhanced skills in processing the

thoughts, feelings, and intentions of others. This should put boundary spanners low versus high in Machiavellianism at an advantage in detecting and understanding manager's control efforts, and therefore lead to greater in-role performance. Similarly, Study 2 demonstrated that boundary spanners high versus low in Machiavellianism resonate more readily in an automatic sense to the feelings of others, especially negative emotional content. This should lead boundary spanners high versus low in Machiavellianism to better register subtle disapproval and sanctions conveyed by managers, against the tendencies of Machiavellians to use manipulation, deceit, and similar tactics. Because boundary spanners high versus low in Machiavellianism should therefore be hampered in using such tactics to which they are accustomed, we expect lower performance for them (e.g., Shultz, 1993). This effect should be especially salient, because high versus low Machiavellians strive more to make good impressions on their supervisors (e.g., Becker & O'Hair, 2007; Bolino & Turnley, 2003). Therefore, we posit:

Hypothesis 5: Management control will lead to greater in-role performance for those customer boundary spanners low versus high in Machiavellianism.

Another area where Machiavellianism should affect organizational behavior is in relations with coworkers, especially as manifest in organizational citizenship behaviors (OCBs) (e.g., MacKenzie, Podsakoff, & Fetter, 1991; Podsakoff, MacKenzie, Paine, & Bachrach, 2000). OCBs are extrarole, altruistic acts that employees perform to help fellow workers and the organization; but unlike in-role performance, which is specified in job descriptions, OCBs are not required, but discretionary, and are subject especially to elective motivation and values of employees. Customer boundary spanners perform OCBs in interaction with coworkers and typically under the observation of supervisors to one degree or another. We expect that Machiavellianism will moderate the effects of management control on OCBs, depending on the nature of OCBs.

Individual-directed OCBs (i.e., OCB-Is, e.g., helping orient new employees, engaging in informal mentoring, touching bases with coworkers before initiating actions that might affect them) especially require ToM skills. Given the findings of Study 1, we expect that management control will have a relatively greater effect for boundary spanners low versus high in Machiavellianism, because feedback, encouragement, and suggestions by managers should be relatively more effective in boosting the activation of individual-oriented OCBs for boundary spanners better able to apply ToM skills. By the same token, because engagement in OCB-Is should rest on capabilities and inclinations to read the needs of others, and in general exhibit rapport (e.g., Dietvorst et al., 2009), we anticipate, consistent with findings in Study 1, that boundary spanners low versus high in Machiavellianism should engage in more OCB-Is. At the same time, given the relative hidden aspects of OCB-Is, and consistent with findings in Study 2, we expect that boundary spanners high versus low in Machiavellianism will be less able to realize their advantage to resonate with the emotions of others in an automatic sense, and therefore those low versus high in Machiavellianism will be more susceptible to managerial control and inclined to perform OCB-Is. Moreover, customer boundary spanners high in Machiavellianism should realize that OCB-Is are relatively easy to avoid because participation in them is less public and visible by supervisors than with organizationally directed OCBs (see below). Because of the relative low visibility

of OCB-Is for supervisors, supervisors are less able to convey signals of disapproval to employees who show low degrees of OCB-Is; Machiavellians are thus less able to realize their empathetic resonation advantages here. Hence, we hypothesize:

Hypothesis 6: Management control will lead to increased application of OCB-Is for those customer boundary spanners low versus high in Machiavellianism.

Organizationally directed OCBs (i.e., OCB-Os, e.g., participating conscientiously in committees, attending organizational functions that are not required but help the organization in its relationships with stakeholders), which are especially visible to supervisors, require relatively less ToM skills than OCB-Is, and at the same time, given their greater visibility, there is greater chance that indirect, subtle negative affect will be conveyed by supervisors to boundary spanners. Thus, based on the results of Study 1, where those high versus low in Machiavellianism exhibit lower ToM skills, and from Study 2, where those high versus low in Machiavellianism are more sensitive to affective content communicated subtly by others, especially negative affect, we predict that those high versus low in Machiavellianism will conduct more OCB-Os because their relative disadvantage in ToM skills should not be a factor; whereas their relative advantage in emotional resonance should make them sensitive to expectations of supervisors conveyed affectively and thus more likely to commit OCB-Os, which are more visible than OCB-Is to managers. Moreover, Machiavellians are known to be high in the use of ingratiation and impression management tactics, which participation in OCB-Os should engender and facilitate (e.g., Bolino & Turnley, 2003; Liden & Mitchell, 1988; Reimers & Barbuto, 2002; Zin et al., 2011). Likewise, OCB-Os are especially under control of extrinsic motivation, to which Machiavellians seem especially prone (e.g., Deci & Ryan, 2009). Thus, we propose:

Hypothesis 7: Management control will lead to increased application of OCB-Os for those customer boundary spanners high versus low in Machiavellianism.

Notice that hypotheses H5 through H7 predict opposite patterns for the effects of Machiavellian tendencies under supervisory control. Such predictions are less susceptible to demand characteristics and method biases.

Method

A total of 198 customer boundary spanners from a variety of companies and industries, but primarily in business-to-business contexts, participated in a survey of opinions and reactions to their jobs. An 18-item version of the 20-item Mach-IV scale was used to measure Machiavellianism (Christie & Geis, 1970). More specifically, we dropped the 2 items that refer to people suffering from incurable disease and having the option of being put to death and that refer to people forgetting more easily the death of their father than the loss of their property as respondents, based on a pretest where respondents felt that these items were too extreme and/or inappropriate. The 3-item OCB-I (e.g., "I help others who have work-related problems even though it is not required") and 3-item OCB-O (e.g., "I attend meetings that are not mandatory")

Table 3
Multiple Regression Analyses on the Effects of Machiavellianism (Study 3)

	Dependent Variables		
	In-Role Performance	OCB-O	OCB-I
Step 1			
Machiavellianism	–.10	–.10	–.02
Supervisory control	.14+	.16*	.16*
R^2	.03	.04	.03
Step 2			
Machiavellianism	–.05	–.12	.01
Supervisory control	.15+	.17*	.15*
Interaction term	–.16**	.19**	–.15*
R^2	.05	.07	.05
F–change	3.96*	7.23**	4.55*

Note: Standardized regression coefficients (beta). OCB-O = organizationally directed organizational citizenship behaviors; OCB-I = individually directed organizational citizenship behaviors.
+$p < .10$. *$p < .05$. **$p < .01$.

Table 4
Means, Standard Deviations, Intercorrelations, and Reliabilities of the Variables Included in Study 3

	1	2	3	4	5
1. Machiavellianism	(.71)				
2. Supervisory control	–.01	(.79)			
3. Sales volume	–.11	.14+	(.91)		
4. OCB-I	–.02	.16*	–.02	(.75)	
5. OCB-O	–.10	.16*	.02	.04	(.79)
Mean	3.25	5.42	4.51	4.52	5.73
SD	0.65	1.04	1.10	0.78	0.85

Note: OCB-O = organizationally directed organizational citizenship behaviors; OCB-I = individually directed organizational citizenship behaviors.
+$p < .10$. *$p < .05$. **$p < .01$.

scales were used to measure OCBs (MacKenzie et al., 1991). The 5-item management control scale from Jaworski et al. (1993) was used to measure supervisory control (e.g., "My supervisor encourages cooperation between customer boundary spanners"; "My supervisor encourages job-related discussions between company boundary spanners"). In-role performance of customer boundary spanners was measured by 5 items from Behrman and Perreault (1984) in which supervisors provided evaluations of actual performance of their subordinates (such as sales volume). The reliabilities of the measures were .71 for Machiavellianism, .75 for OCB-Is, .79 for OCB-Os, .79 for supervisory control, and .91 for in-role performance.

Results

Multiple regressions were conducted with OCBs and in-role performance as dependent variables and Machiavellianism and degree of supervisory control as independent variables. Interaction effects between independent variables were included in the analysis by adding the multiplicative products of the scores of the interacting variables as interaction terms. All

Figure 3
Interaction Effect of Supervisory Control and Machiavellianism In-Role Performance

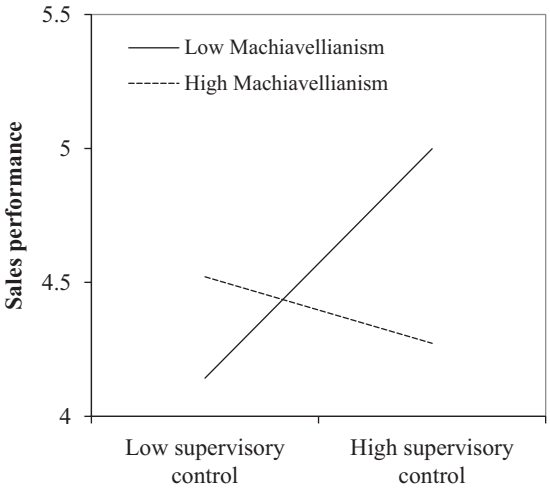
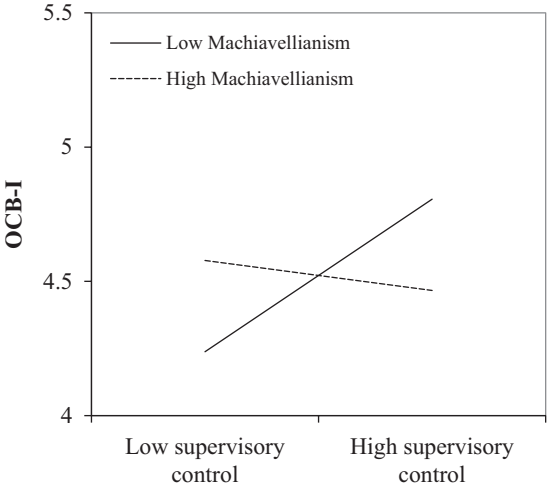
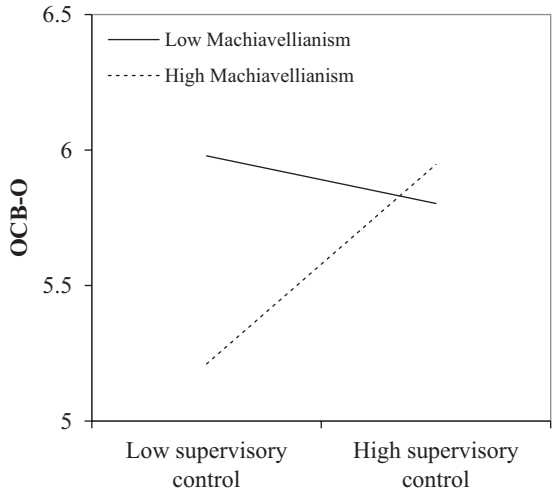


Figure 4
Interaction Effect of Supervisory Control and Machiavellianism on OCB-I



Note: OCB-I = individually directed organizational citizenship behavior.

Figure 5
Interaction Effect of Supervisory Control and Machiavellianism on OCB-O



Note: OCB-O = organizationally directed organizational citizenship behavior.

variables in the analysis were centered around their means before computing interaction terms, and the interactions were expressed graphically as recommended by Jaccard and Turisi (2003).

Table 3 shows a nonsignificant main effect of Machiavellianism and a significant main effect for management control for all three dependent variables (in-role performance, OCB-O, and OCB-I). Also, the interactions terms of Machiavellianism and management control were significant for all performance dimensions. Table 4 presents intercorrelations, means, and standard deviations for scales.

Figures 3 through 5 are the interaction plots of the analyses performed. They demonstrate that Machiavellianism moderates the effects of management control on the three dependent variables (in-role performance, OCB-I, and OCB-O). Figure 3 shows that high management control results in significantly greater in-role performance than low management control, for boundary spanners low in Machiavellianism. Management control did not increase performance for customer boundary spanners high in Machiavellianism. Figure 4 demonstrates that high management control produces significantly more OCB-Is than low management control for customer boundary spanners low in Machiavellianism. Management control did not influence OCB-Is for customer boundary spanners high in Machiavellianism. Figure 5 reveals that high management control induces greater OCB-Os than low management control for customer boundary spanners high in Machiavellianism. Management control did not influence OCB-Os for customer boundary spanners low in Machiavellianism. As a consequence, the findings support Hypotheses 5 through 7.

Discussion

Study 3 was a field investigation designed to look into implications of ToM and empathetic responding of customer boundary spanners while at work. Machiavellianism was found to interact with management control to regulate performance and the conduct of OCBs, where we used arguments based on the consequences of ToM and empathy for social relationships with supervisors and coworkers to interpret the effects. Although this was a survey study and therefore did not have the control for threats to validity found in our experiments, two facets of Study 3 strengthen the conclusions made. First, performance was measured by appraisals made by supervisors, not by self-reports of customer boundary spanners, and thus provides a relatively objective measure and introduces two different methods into the research design. Second, despite using self-reports for measures of OCBs and the independent variables, we believe that biases here are reduced in the sense that predictions were based on interaction effects, which make it difficult for respondents to anticipate and give responses that anticipate moderation effects. Also, scholars have noted that measurement error in predictor variables reduces the power to detect significant effects from product terms (Busemeyer & Jones, 1983). One rival hypothesis to consider in future research is the functioning of ethicality. We speculate that lower versus higher management control might allow Machiavellians to use unethical behavior in certain contexts and thereby perform better than low Machiavellians (e.g., in door-to-door sales transactions).

General Discussion

Our studies in general attempted to capitalize on advantages of multilevel or cross-level research of the sort advocated by Becker et al. (2011) and Lee et al. (2012) for neuroscience within organizations. We integrated a higher level social psychological explanation with lower level explanations by breaking down the component processes underlying Machiavellianism and relating these to specific regions of activation in the brain, induced experimentally, and identified with ToM and affective empathetic processes from the neuroscience literature (see Cacioppo & Decety, 2011). In doing so, we achieved three implications pointed out by Becker et al. (2011) (see also Cacioppo & Bernston, 1992; Senior et al., 2011). Namely, we resolved some inconsistencies and conflicting implications in the organizational science and psychological literatures, we extended and deepened the theoretical underpinnings of Machiavellianism by grounding them in ToM and empathetic processes, and we generated new research questions (see hereafter). We wish to reiterate that ToM and empathy ground Machiavellianism at the brain level. What can these insights contribute to management, and how can these stimulate future research? We discuss first managerial relevance and then pose future research suggestions below.

In an era of seemingly increasing unethical conduct in organizations, it is important to understand how and why people might take advantage of the organization. Dahling et al. (2009) propose that Machiavellianism has implications for organizational trust (where high Machiavellians are expected to be low in trust and to be risk avoidant), ethical management (where high Machiavellians are posited to devalue ethical behavior and to negatively impact corporate culture), and dysfunctional conduct in organizations (e.g., where high

Machiavellians use power and influence in self-serving, manipulative, unsanctioned, and unfair ways). So what can managers actually learn from our findings?

First, if Machiavellians lack ToM skills but are good at (automatic) empathic understanding, it could be that high versus low Machiavellians are less able to understand interaction partners, yet react emotionally to customer resistance by committing more manipulative acts, which might not be functional for their organization in the long run. A first step therefore is to make people who score high on Machiavellianism aware of their own inclinations and their effects. Further, and in general, the ability to infer the beliefs, feelings, and intentions of others is something that might be learned and cultivated to a certain extent. Educative strategies, role playing, training programs, coaching, and performance feedback could be tailored to enhance ToM skills and empathetic responding. However, the identification of ToM and empathetic processes underlying Machiavellianism might raise the question of whether this trait can be influenced at all. As Wilson et al. (1996: 285) note, Machiavellianism is best conceived as a matter of degree. Managers should therefore be aware that within their organization employees will show Machiavellian tendencies to different degrees and at different times. It is of course both a matter of further research and practical experience to what extent behavior of people who score high versus low on Machiavellianism can be changed at all.

Second, motivation and social preferences of Machiavellians may be difficult to detect (as reflected in OCB-Os over OCB-Is); for instance, managers might be impressed by seemingly charming abilities of Machiavellians during job interviews or upon entering the organization but have little basis to forecast OCB performance later on. Our findings might provide managers with insights useful in selecting employees with a level of Machiavellianism best suited for organization goals and the specific tasks at hand. For example, Machiavellian tendencies would be more detrimental to organizations attempting to build long-term relationships with customers than trying to make one-time sales. Or Machiavellians may be better at initial customer contact and making cold calls than non-Machiavellians. In addition, it is possible that, to the extent that Machiavellians are embedded in social networks, they may induce non-Machiavellians to be more manipulative because of social contagion and imitation effects (e.g., Brass, Butterfield, & Skaggs, 1998). Machiavellians may poison the moral climate of an organization.

Third, in Study 3 it was observed that people high versus low on Machiavellianism did not perform as well when managerial control was strong. There are ethical considerations to this observation: Lower versus higher management control might encourage Machiavellians to engage in unethical behavior, which leads to better performance. Stricter control environments might not be conducive for creativity and flexibility in organizations, but loosening up the control system has the trade-off of enhancing conditions for exploitation by Machiavellians. Managers need to consider the consequences and trade-offs of varying the level of control.

Fourth, person-job fit factors should be identified so as to guide selection of employees and their assignment to different tasks with an aim to enhancing the fit of employee individual differences to the tasks at hand. For instance, professional organizations differ in transparency such that Machiavellian tendencies pose greater risk in less transparent situations (Moore, Tetlock, Tanlu, & Bazerman, 2006).

The findings in our research have implications for future inquiry. First, in Dahling et al. (2009), with the exception of 3 out of 21 studies they reviewed on Machiavellianism (i.e., Deluga, 2001; Gunnthorsdottir, McCabe, & Smith, 2002; Sakalaki et al., 2007), the cited research all occurred over the course of three decades prior to 2000. We hope our study encourages new interest in the concept of Machiavellianism and provides researchers with new ways to operationalize Machiavellianism using scales validated by neuroscience procedures, for example. Dietvorst et al. (2009), for instance, used fMRI procedures to validate a ToM scale developed for boundary spanners.

Second, another question for future inquiry concerns the role of positive and negative emotions in empathy and whether Machiavellianism relates to both. We found strong evidence that Machiavellians attune to negative emotions of interaction partners but weaker evidence for positive emotions, and our design aggregated negative emotions into one group, positive emotions into another. It would be interesting to examine specific negative and positive emotions conveyed by interaction partners individually to uncover differential effects if any. Furthermore, more research is needed into the conditions under which emotional detection is facilitated or thwarted. For example, to what extent does emotional resonance depend on distinguishing between normal courtesies and pleasantries conveyed in social interactions and specific affective responses contingent on reactions to the qualities of a product/service offering or to what a customer boundary spanner says and how he or she says it as part of a persuasive communication? Research on visual and verbal emotion authenticity may provide insights here (e.g., Jurgens, Hammerschmidt, & Fischer, 2011; Sebe et al., 2007).

Third, our investigation focused on Machiavellianism of customer boundary spanners. It would be interesting to study Machiavellianism in supervisors. Likewise, an interesting topic for future research concerns the match between interaction partners in terms of Machiavellian tendencies. Will a Machiavellian (non-Machiavellian) supervisor be equally effective with Machiavellian and non-Machiavellian subordinates? What are the factors that govern success or create challenges for different combinations of Machiavellianism between supervisors and subordinates? Similarly, what are the consequences and contingencies promoting or interfering with social interactions between customer boundary spanners and their customers for different combinations of extent of match of Machiavellianism between the parties?

Fourth, now that we know something about the bases for Machiavellianism, as they lie in ToM and empathetic processes, it seems fruitful to open up inquiry into the many speculative behavioral tendencies associated with Machiavellianism over the years and to explore how ToM and empathy might explain these tendencies. For instance, Machiavellianism has been claimed to be associated with heightened social anxiety, unethical behavior, manipulation, deceitful actions, selfishness, the inability to maintain long-term relationships, mistrust of and by others, uncooperativeness, disloyalty, cynicism, exploitativeness, greater likelihood for occurring in men, and affinity to psychopathy and narcissism (e.g., Babiak & Hare, 2006; Baron-Cohen, 2011; Repacholi et al., 2003; Wilson et al., 1996; Wilson, Near, & Miller, 1998). These seem promising avenues for future research as well.

We acknowledge also that future research should investigate both ToM and empathetic processes dynamically in relationships. Our experimental manipulations can be considered

relatively limited because they do not capture processes as they occur in back and forth interpersonal interactions over time.

In summary, we believe that our study contributes to greater understanding of the functioning of Machiavellianism in employees. We showed that high versus low Machiavellians exhibited deficits in activation of regions of the brain associated with ToM skills and enhancements in activation of regions of the brain correlated with affective empathetic responding. These decoupled or even opposite patterns of responses suggest that the commonly believed coordination of perspective taking and emotional sharing in empathy needs rethinking to place focus on the components of empathy as separate processes, at least in the case of Machiavellians. Furthermore, we demonstrated that, consistent with the above mentioned brain activations, Machiavellianism moderates the effects of managerial control on in-role and extrarole behaviors of employees. That is, people low versus high in Machiavellianism achieved greater performance and conducted more individually directed OCBs, and people high versus low in Machiavellianism engaged in more organizationally directed OCBs. Such opposing patterns imply that Machiavellianism has complex effects on people and organizations and is not necessarily all bad or all good, as sometimes implied in the literature and in everyday presuppositions and folklore. Rather, Machiavellianism can be functional or dysfunctional, depending on the conditions under which people high or low in Machiavellianism operate. This means that Machiavellianism in the workforce is something that must be managed but can be harnessed for the benefit of employees and organizational goals.

Appendix

Auditorily Presented Scenarios in Three Task Conditions

All original versions of the following scenarios were presented in Dutch. In this appendix, they have been translated from the original language version into English, and therefore do not always reflect the same time length as the original language version.

Interpersonal Mentalizing Task

Scenario 1. Sjaak is a salesperson who has just explained to Renée his own perspective about future trends in their market. Renée is the buyer in a customer's firm and tries to sell Sjaak's perspective on the market to his colleagues. Suddenly Sjaak realizes that he has provided Renée with the wrong information, and he immediately calls Renée. Renée is irritated and responds, "Do you know that you may have hurt my reputation?" Sjaak apologizes and says, "I want to explain my mistakes to your colleagues personally."

Why is it that Sjaak wants to explain his mistakes in person?

Scenario 2. Before visiting a customer, Jacqueline always browses that customer's website. While browsing one of these websites she notices that the director, whom she has known for a long time, still works for the firm in question; but she also notices that many

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new people have joined the firm. Jacqueline is especially curious about what these new people think of her firm. However, Jacqueline first decides to talk with the director, the person she has known a long time; therefore she calls him to suggest having dinner together.

Why did Jacqueline ask the director to have dinner with her?

Scenario 3. Wouter is a street-smart salesperson and always tries to consider the personal interests of his customers. He mentions a customer's personal interests to his secretary so that she can look for a gift that fits the customer's needs exactly. He knows that when he surprises his customers, they invite him for dinner. Before sending a surprise present, Wouter calls the customer and says, "Hey, pal, take note: now I am not sending you a bill!"

Why does Wouter call the customer and make this statement?

Scenario 4. Henk talks to a buyer, Janine. As the conversation evolves, Henk realizes that Janine shies away from sensitive issues. He starts to realize that Janine's influence in the firm might be far less than he had assumed. Consequently, Henk considers how he can get around Janine without hurting her pride. He tells Janine, "During our next meeting perhaps it would be convenient to have a colleague from our technical staff join us, so would you also invite a colleague of yours?"

Why does Henk suggest that Janine invite other people to join the conversation?

Scenario 5. Ralph, who is a buyer, talks to Pieter and to Pieter's secretary. Ralph notices that Pieter is unfairly skeptical about his story while Pieter's secretary is more receptive to his arguments. Ralph then adds something to the conversation. He tells Pieter a funny anecdote about how his own secretary once provided him with an insight which allowed him to avoid a grave mistake.

Why does Ralph mention this anecdote about his own secretary?

Process Task

Scenario 1. In a steel company the buying process occurs via a well-defined method: The buyers first study how earlier firms supplied goods; and, in collaboration with the technical staff, they make up a request for a proposal. This RFP is then sent by e-mail to salespersons from different firms, who then indicate by e-mail whether they can match the request for proposal. Subsequently, using economical arguments, the buyers determine which salesperson will deliver the goods.

On what bases do buyers make decisions about which salesperson will deliver goods?

Scenario 2. An account manager visits his customers every year. According to a well-defined protocol he has to visit all the factory plants; and, in order to plan these visits, he uses a call-plan system. This planning system determines how different plants can be visited

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Appendix (continued)

in the shortest amount of time. The account manager studies the planning results and notices that the plant in Amsterdam is the last one he has to visit.

Why does the account manager visit the Amsterdam plant last?

Scenario 3. Long before the Christmas season, Mr. Versteeg, a salesperson, looks at the rules his company has devised for determining how much to spend on presents to be sent to his customers. Next he chooses two presents that match the set price. Another department then determines which present best fits the company policy rules; this evaluation process lasts a few weeks. Finally, presents are bought and are sent by mail to the customers.

Why does Mister Versteeg begin deciding so early what presents to buy for his customers?

Scenario 4. For the customer, the buying process occurs via well-defined protocols: The buying customer asks for a meeting with the company's technical staff via e-mail. During the meeting, alternatives from different suppliers are discussed in order to determine which supplier best meets the company strategy. The resulting information is then sent to a manager, who instructs others to design a checklist for the buying parties.

How does Miss Maartens, a customer, know that her buying follows the company policy?

Scenario 5. An account manager of a bio-logistics company visits the customer in order to solve a logistics problem. The problem is that two of the customer's three locations are being supplied by goods beyond the keeping abilities date. He explains to his customer that bio-logistics currently delivers the product in only one plant and that the other two plants are having their goods delivered internally. The account manager suggests that it would be best to have the goods delivered to all the plants.

Why will a customer make more profit with the expansion of this service?

Unlinked Sentences Task

Scenario 1. The company alignment has four plants spread over the Benelux. It is now already the second time that Mister Jansen has been invited to give a presentation. Frank has been account manager for 14 years, and he trains new buyers in his firm. Because of the intense competition from the Internet the future looks different. Peter's office is on the third floor. The problems with traffic jams have risen quickly in the Randstad.

On which floor is Peter's office?

Scenario 2. On Main Street there is a large parking lot from which one can reach the train station. The construction of a network causes delay in information services. Miss Versteeg is an accountant and a mother of three children. The bicycle repairman just repaired a tube. The vacation time planned for this year is a bit unlucky because it falls at the time of an ad campaign. When the train arrives in the station at 4 o'clock we have 4 more hours before the theater performance starts.

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Appendix (continued)

Who repaired the tube?

Scenario 3. This year the weather warmed so quickly that the skating rink closed one month earlier. The buyer today is not present; he is at the new plant. At the courtroom they say that they will come up with a verdict within 6 weeks. The e-mail did not arrive because many people are working with the server. There is a strike in the public transportation system.

Why did the e-mail not arrive?

Scenario 4. The new broadcast about the nuclear experiments will be repeated at 12 o'clock. Gerard read enough and now has fallen asleep. Education takes on average 5 years, but it also can be finished in 4 years. We now live in an information age. New bridges are always built higher and longer, but where does all this end? It is time to move because this house is past its prime. The shops close at 9 p.m.

Why is it time to move?

Scenario 5. People are working hard on the new block, and they expect it to be ready at the end of next year. People are starting to ask when they will come with the new folder? One can ask if our vision about the future will catch on in the marketplace. The number of customers is rising according to a pattern. The housing market at this time is a bit unstable because the future of the tax deduction for rent is unclear. Around the Christmas season, the days are always short.

Why is the housing market unstable?

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