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What is This?

The evolutionary psychology of leadership: Theory, review, and roadmap

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Abstract
Evolutionary leadership theory (ELT) argues that humans possess specialized psychological mechanisms for solving coordination problems through leadership and followership. We discuss the evolutionary functions and psychological processes underlying leadership, and how to study leadership and followership from an integrated evolutionary perspective. An evolutionary perspective offers novel insights into major barriers to leadership effectiveness in organizations. These obstacles include (a) mismatches between modern and ancestral environments, (b) evolved cognitive biases affecting leader selection and decision-making and (c) innate psychological mechanisms designed to dominate and exploit other individuals. Understanding the evolved psychological mechanisms underlying leadership, in terms of adaptive functions, mismatches, and psychological processes, is critical for the development and integration of leadership theory, research, and practice.

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Good leadership matters for the survival and prosperity of organizations (Day & Antonakis, 2012). Yet for many organizations it is frustratingly difficult to achieve. Climate surveys routinely show that 60–70% of employees in work organizations report that the most stressful aspect of their jobs is the interaction with their immediate boss (R. Hogan, 2006). Further, the failure rate of managers in corporate America is estimated to be as much as 60% (R. Hogan & Kaiser, 2005). Evolutionary psychology offers a unique perspective into the obstacles that must be overcome to achieve efective leadership and improve organizational welfare and employee satisfaction. These insights are based on a deeper understanding of how the human mind works, and the nature of its evolved functions.

In this review we forward a new theoretical perspective on leadership, evolutionary leadership theory (ELT)—inspired by evolutionary psychology—and discuss the core assumptions underlying this framework. We discuss some of the major research tools and methodologies available to evolutionarily minded psychologists for testing hypotheses derived from ELT. We use this theory to highlight three major barriers for effective leadership in organizations, (a) mismatches between modern and ancestral environments, (b) leader decision-making biases, and (c) evolved psychological mechanisms for dominance. For each obstacle we outline ideas for further research and intervention.

The evolutionary psychology of leadership: Theory and assumptions

Evolutionary leadership theory (ELT) studies leadership from the perspective of evolutionary psychology, which applies the principles of evolutionary biology and behavioral ecology to better understand human psychology (Barkow, Cosmides, & Tooby, 1992; Buss, 2005; Schaller, Simpson, & Kenrick, 2006). The core assumption underlying evolutionary psychology is that the human mind is the product of a process of evolution through natural selection. As such, evolutionary psychology contends that over many thousands of years the human mind has been shaped in the same way as has the human body, as well as the bodies and minds of all organisms.

Evolutionary psychology further proposes that the human mind contains many specialized psychological mechanisms that have enabled early humans to solve recurrent problems affecting their chances of survival and reproduction. Adaptations for foraging, self-protection, mating, parenting, collaboration, and conflict resolution are but a handful of these mechanisms (Buss, 2005; Kenrick, Li, & Butner, 2003; van Vugt & Kameda, 2012). One could conceive of these evolved psychological mechanisms as ''if-then'' decision rules or psychological heuristics that evolved because they provided reproductive benefits to individuals adopting these rules. For instance, a decision rule to ''follow an individual that one trusts'' is clearly superior to a decision rule to ''follow any one individual'' (van Vugt, 2006). Such decision rules need not be conscious, and in fact much of our behavior is guided by highly automated decision rules (Bargh & Chartrand, 1999). Furthermore, because biological evolution is a slow and gradual process, decision rules that provided adaptive benefits in past environments may no longer produce adaptive outcomes in environments if they underwent rapid change. This idea is referred to as mismatch (van Vugt, Johnson, Kaiser, & O'Gorman, 2008) and it has special implications for studying leadership.

Inspired by evolutionary psychology we propose that leadership and followership evolved in humans, and in other species too, to solve recurrent coordination problems. We define leadership in terms of the coordination of the actions of two or more individuals to accomplish joint goals (Hollander, 1992; van Vugt, Hogan, & Kaiser, 2008). The classic coordination problem that gave rise to the emergence of leadership is group movement. Social animals stay alive by moving

together. But how do group members decide where to go and when? Such coordination problems can be solved easily by some individuals seizing the initiative and others following them. Such leadership has been observed in a long list of social species, including honeybees, guppies, hyenas, dolphins, and baboons (for a review see King, Johnson, & van Vugt, 2009). A deceptively simple decision rule such as ''follow the individual that moves first'' can produce something akin to leadership. Furthermore, if we assume individual differences in the likelihood to move first this will then automatically produce consistent leaders and followers (van Vugt, 2006).

Evolutionary leadership theory proposes that in addition to group movement, leadership also served additional functions in ancestral human groups, including conflict resolution, punishment, leading in warfare, teaching, and promoting social cohesion. As humans started to live in increasingly large, socially complex societies perhaps some 200,000 years ago (Dunbar, 1993), conflicts between genetic stra-ngers became paramount and this required some form of conflict management in which leaders may have taken on the role of punishers (O'Gorman, Henrich, & van Vugt, 2009). Our closest relatives, the great apes, all practice some form of conflict resolution and therefore it is almost certain to be a feature of human leadership too (Boehm, 1999; de Waal, 1996). As population densities started to rise in human history, intensifying contact between groups, leadership became useful in managing intergroup relations too. This paved the way for the emergence of war and peace chiefs which have been documented in various traditional societies such as the Navajo Indians (Spisak, Homan, Grabo, & van Vugt, 2011). Finally, ancestral leaders played a role in hunting and food sharing practices. Within traditional societies Big Men leaders often take on such roles (van Vugt, Hogan, et al., 2008). For a large part of human evolutionary history, leadership was informal and based on charisma and personalized influence—what we regard as weak leadership. The transition from weak to strong leadership where leaders have formalized, coercive powers is a relatively novel phenomenon in human history.

The evolutionary toolkit

To test evolutionary hypotheses about leadership we can work with a diversity of methods, research tools, and analytical approaches (Buss, 2005; van Vugt & Schaller, 2008). Evolutionary psychology is a diverse field, attracting behavioral scientists with an unusually diverse range of scholarly backgrounds, including psychology, evolutionary biology, primatology, anthropology, economics, sociology, organizational and political sciences. As it is impossible to collect data in ancestral environments to track the evolution of alleged adaptations for leadership and followership, evolutionary minded researchers must rely on a multitude of indirect sources of evidence to test their hypotheses (Schmitt & Pilcher, 2004).

General evolutionary theories can be invoked to guide attention towards potential psychological adaptations for leadership. Common theories include kin selection theory, multilevel selection theory, parental investment theory, life-history theory, reciprocal altruism theory, and costly signaling theory (van Vugt & Schaller, 2008). If a hypothesized psychological mechanism for leadership flows directly from a theory under the general paradigm of evolution, then we can have some confidence in its existence. For instance, a higher parental investment from females leads to the hypothesis that women are interested in male partners who signal social dominance. This then leads to the prediction that men in leadership positions are deemed more (sexually) attractive by women and that men will be more likely to assume leadership positions in the presence of women—both predictions have received support (Jensen-Campbell, Graziano, & West, 1995).

In addition, we can employ mathematical and evolutionary game theory models to study the evolution of leadership and compliment the insights gleaned from these models with computer

simulations. Evolutionary game theory shows that genes coding for leadership and followership traits can stabilize in a population at a relative frequency (van Vugt, 2006). Mathematical models show that democratic decision-making processes work better than despotic decision making—where one leader makes the decision on behalf of the group—when many individuals possess unique information (Conradt & Roper, 2003). Simulation data reveal that a few informed agents can coordinate the actions of a large group of uninformed individuals (Couzin, Krause, Franks, & Levin, 2005), producing something akin to leadership.

Experimental methods from behavioral economics and social psychology can be used to further test evolutionary hypotheses about leadership. The experimental games method reveals basic principles of leadership through studying interactions between players in standard games such as the prisoner's dilemma, the ultimatum game, the dictator game, and the public good game. For instance, a recent study suggests that in pure coordination games prosocial personality types are more likely to emerge as leaders than selfish personality types (Gillet, Cartwright, & van Vugt, 2011).

Neuroscience methods may be used to identify proximate leadership and followership mechanisms. Brain imaging studies provide data attesting to the specific physiological structures involved in leader decision-making (Adolphs, 1999). For instance, fMRI research shows that there is activation in the reward areas of the brain when bystanders witness leaders being punished when they behave unfairly (Singer et al., 2006). Transcranial magnetic simulation (TMS) can be used to disrupt activity in specific brain areas and might therefore be used to reveal which brain regions are involved in, for instance, successful coordination between actors.

Hormone data can identify the hormonal correlates of particular leadership experiences. For instance, Josephs, Sellers, Newman, and Mehta (2006) showed in an experimental study that high testosterone individuals perform better on cognitive tasks when in a high status position, whereas low testosterone individuals perform better in low status positions. In addition, research suggests that individuals higher up in the hierarchy of an organization produce less cortisol than those at lower levels of the hierarchy (G. D. Sherman et al., 2012). Behavioral genetics studies may help to provide an indication of whether leadership carries a substantial heritable component. A high heritability suggests that there may be important individual differences in these traits. Although there is unlikely to be a single gene responsible for leadership, several studies show a substantial heritable component underlying general personality and ability differences predicting leadership such as extraversion, conscientiousness, and intelligence (Ilies, Arvey, & Bouchard, 2006).

Developmental psychology studies could examine if cognitive leadership prototypes are culturally learnt or perhaps innate. A recent study found that children as young as 5 years old can pick the winners of political elections based only on information about the faces of the candidates (Antonakis & Dalgas, 2009). Cross-cultural data are also useful. For instance, surveys from societies around the globe show that some traits—vision, integrity, and trustworthiness—are universally linked to good leadership, whereas other traits such as generosity and status conscious are culture specific (Den Hartog, House, Hanges, Ruiz-Quintanilla, & Dorfman, 1999).

Anthropological and ethnographic databases may provide further evidence for the universality of leadership mechanisms. This kind of evidence is necessary to differentiate between phenomena that are evolutionary adaptations, and those that are more superficial, culture-specific manifestations. Research on existing hunter-gatherer societies such as the Kung San or the Hadza can tell us more about leadership in environments in which humans evolved (Boehm, 1999).

Finally, cross-species evidence is instrumental in testing speculations about the evolutionary history of any alleged adaptation such as leadership.

In elephants, for instance, the oldest individual in the herd takes on a leadership position during group movement to a waterhole that only she can remember (King et al., 2009). In humans too there is an age bias in leadership (Bass, 1990). This finding implies that the underlying evolved heuristic—"follow a more experienced individual if you are uncertain what to do"—may be the result of convergent evolution.

When considered in conjunction, the findings emerging from these diverse lines of inquiry can produce new insights into the evolutionary functions of leadership. Although no single finding will allow us to accept or refute a hypothesis derived from ELT, together through a process of comparative analysis they may point to the existence of specialized psychological mechanisms underlying leadership and followership in humans.

Barriers to improving leadership

Evolutionary leadership theory produces several novel insights into obstacles that need to be overcome to improve the quality of leadership in modern work organizations. These include (a) discrepancies between modern and ancestral environments (mismatch), (b) evolved cognitive decision-making biases of leaders, and (c) evolved psychological mechanisms designed to dominate and exploit other individuals. In this section we look at each of the obstacles through the lens of ELT, and discuss ideas for future research and application.

Mismatches between modern and ancestral environments

The modern work environment has provided many benefits to humans in recent history. Our better health, greater wealth, and superior technology are all products of an intensification and diversification of labor that started several millennia ago and which culminated in the creation of large-scale corporate structures after the Industrial Revolution. At the same time the

modern organizational structures that we live and work in have also produced many social problems such as stress and alienation among employees, inequalities in access to wealth and health care, crime and overpopulation, and threats to global environmental sustainability.

Evolutionary leadership theory argues that this discrepancy between modern and ancestral organizational environments is the result of an evolutionary mismatch (Hagen & Hammerstein, 2006; van Vugt, Johnson, et al., 2008). All organisms, animals and plants, possess physical and behavioral traits that have been passed down through generations, preserved by natural selection because of their adaptive function in a given environment. However, over time environments change, and so all organisms face the risk of finding themselves perfectly equipped to deal with challenges that may no longer exist, and ill-equipped to deal with a host of new challenges. Traits that were at one time adaptive can be "mismatched" to the environment in which the organism currently resides. Because evolution through natural selection is a slow, cumulative process mismatches are particularly likely if environments undergo rapid change.

Such is the case for humans. The environment that most of us live in is very different from the environment that our ancestors lived in only some 13,000 years ago, before the advent of agriculture. From 2.5 million years ago—when the first hominids appeared in Africa—until the agricultural revolution humans lived in relatively small nomadic band societies of around 150 individuals, leading a hunter-gatherer life style. Further, fossil evidence indicates that human brain size has remained remarkably stable for at least the last 200,000 years (Dunbar, 2004; Foley, 1997). This leads some evolutionary psychologists to conclude that "our modern skulls house a Stone Age mind" (Tooby & Cosmides, 1997) with the potential for significant mismatches.

One mismatch example is the widespread availability of sweet and fatty foods in modern society. Human bodies evolved to respond to

the taste of fat and sugar by feeling immense pleasure. Our ancestors evolved to quickly devour all available sweet or fatty foods because such foods were perpetually scarce and perishable in an ancestral world. Yet, now that these foods are widely and cheaply available in supermarkets our evolved tendencies to take in calories produce all sorts of health problems such as obesity, diabetes, and cardio-vascular problems. Needless to say, modern environments do not only pose mismatches for humans but for many other species too. Many of the environmental changes caused by human intervention such as overfishing, deforestation, and climate change create new selective environments which many species are not adapted for (Griskevicius, Cantu, & van Vugt, 2012).

Thus, the discrepancy between modern and ancestral environments potentially creates mismatches between aspects of human evolved psychology and the challenges of modern society. This may well be the underlying cause of a wide range of problems causing failures in leadership and organizational management. Mismatches can pertain to both the selection of leaders and to their functioning and effectiveness in modern organizations. Consider the selection of leadership in modern organizations. This is often a top-down process in which managers at a lower level are appointed by managers at levels higher up in the hierarchy. Or individuals are "flown in" from outside the organization to be appointed as managers. The selection process for leaders consists of an assessment of an individual candidate's personality, skills, and competencies based on some formalized tests, their CV, and an interview, usually with individuals higher up the hierarchy rather than with the subordinates whom they may lead (Colarelli, 2003).

This is very much at odds with leadership emergence in ancestral human groups. Extrapolating from the anthropological evidence of past and present hunter-gather societies such as the Kung San in Southern Africa, the Hadza in Tanzania, and the Ache in Paraguay we have a fairly good idea of what leadership may have looked like in the environment in which humans evolved (Boehm, 1999, 2012). Such bands do not have formalized leadership. Instead there are individuals of influence who emerge as leaders when they embark on some specialized activity such as hunting, making weapons, defending the group, or preparing a new campsite for which they have some specialized expertise and need to recruit other individuals to cooperate. These individuals have no overall authority over the group, rather they exercise influence in narrowly defined areas of expertise and only through persuasion are they able to emerge as leaders in a temporary group activity. With the next activity leadership selection begins again.

This bottom-up approach selects for leaders with certain characteristics that are universally valued. Universally positive leader characteristics—which are also prominent in hunter-gatherer groups—include such qualities as integrity, persistence, humility, competence, decisiveness, and vision (Den Hartog et al., 1999; Epitropaki & Martin, 2004; R. Hogan & Kaiser, 2005; Lee, Ashton, & de Vries, 2005; Lord, Foti, & De Vader, 1984; Nicholson, 2005). It is noteworthy that so-called "derailed" executives—bright, ambitious, and talented managers who nonetheless fail—are often described as lacking these traits (McCall & Lombardo, 1983; Padilla, Hogan, & Kaiser, 2007). Their selection may be due primarily to their ability to please their superiors. In modern industrial and bureaucratic organizations, however, leaders are accountable to, and often appointed by, managers senior to them in the organizational hierarchy and subordinates have little power to sanction their bosses. Modern organizational ethnographers report that most managers implicitly understand that pleasing superiors is more important to career success than pleasing subordinates (Sayles, 1993). It is noteworthy that executives are more likely to succeed if subordinates are included in the selection process (Colarelli, 2003; Sessa, Kaiser, Taylor, & Campbell, 1998).

A different mismatch pertains to what we are we looking for in our leaders. Implicit leadership theories (ILT) argue that humans possess certain prototypes about what constitutes good leadership based on learning and individuals who match these prototypes are more likely to emerge as leaders (Lord et al., 1984). Unlike ILT, evolutionary leadership theory assumes that these leadership prototypes have evolved features and that different prototypes are automatically activated in adaptively relevant environments. Yet because the environment in which these prototypes evolved looks so different from the modern world, there remains the potential for a mismatch (van Vugt & Ahuja, 2010). Leadership in ancestral humans was often a physical activity such as in hunting or warfare. Leaders led by example and often from the front, and so there would have been selection on cues of health, stamina, and an imposing physique (van Vugt, 2006). Although it may have been beneficial for groups in the past to endorse a more physically formidable leader, this might not be the case in a modern environment in which individuals are often leading from the back—e.g., the president in the Oval Office.

There is some evidence that we are still stuck with these biases for ancestral leader prototypes. For example, height is one of the more consistent predictors of leadership emergence in business and politics. Taller individuals are perceived as higher in status, have higher levels of educational achievement, higher starting salaries, earn more money across their careers, and occupy higher positions in organizations (Blaker, Dessing, Rompa, Vriend, & van Vugt, 2013; Judge & Cable, 2004). Height even predicts the outcome of presidential elections where taller candidates get more votes and are more likely to get reelected (Murray & Schmitz, 2011; Stulp, Buunk, Verhulst, & Pollet, 2013). In terms of psychological properties, taller individuals are seen as more intelligent, healthier, and socially dominant, perhaps explaining why they are seen as more leader-like. A recent experimental study suggests that the height-leadership bias applies more strongly to male candidates than to female candidates (Blaker et al., 2013). There is no obvious reason why height and physical formidability would still gain individuals a leadership advantage in modern organizations. So selection on these cues seems to represent a mismatch.

Another mismatch may provide clues to the controversial issue of gender biases in leadership. Because of the physical aspects involved in ancestral leadership, masculine leaders were the norm. This gender bias remains the case in most modern organizations. For instance, although women make up half of the American labor force, in 2009 only 12 of the Fortune 500 companies had a female CEO, a meager 2%. It remains to be seen how beneficial the male leadership bias is in a global economy that emphasizes communication skills and networking (Eagly & Carli, 2003). For instance, there is evidence that women have better verbal memory, empathy, and social skills than men (van Vugt, 2006). Thus, women should perform better as leaders where these skills are important. It has been shown that women in executive functions adopt a more transformational leadership style than their male counterparts, and are more effective leaders as a result. Yet this effect might be due to self-selection forces where only the most talented females make it to the top (Antonakis, Bendahan, Jacquart, & Lalive, 2010; Eagly & Carli, 2003). Nevertheless, this "think leader, think male bias" may be a vestige of our ancestral past which is hard to overcome with socialization practices.

For instance, when women and men work together on group tasks, men are quicker to claim leadership roles even if the women are better qualified (Mezulis, Abramson, Hyde, & Hankin, 2004). Regardless of their talent, men are also more likely to assume leadership roles when being observed by women perhaps because women prefer high status in potential mates (Jensen-Campbell et al., 1995). In intergroup conflicts both men and women prefer a male or masculine leader. Recent studies show

that during war people prefer to vote for a leader who has more masculine facial features such as a strong jawline and narrow eyes (Little, Burriss, Jones, & Roberts, 2007; Spisak et al., 2011). This male leadership bias might also occur in highly competitive business environments that our minds may process as situations resembling wars between groups. Finally, there is a consistent but subtle bias in the way many executives—including those who espouse diversity—evaluate women leaders (Lyons & McArthur, 2007).

The scale and complexity of leadership also provides the potential for a mismatch. The small hunter-gatherer band societies of our ancestral past were essentially extended families: Members knew each other, understood their interdependencies, and had a genetic investment in one another's fate (Dunbar, 2004; Foley, 1997). These groups were held together by kinship and norms of fairness and reciprocity, which require that individuals can depend on each other for assistance and will return in kind (van Vugt & van Lange, 2006). There was room for particularly charismatic individuals to emerge as leaders. Charismatic leadership works in part by influencing followers to identify with a collective enterprise and internalize group aspirations (Shamir, House, & Arthur, 1993; van Knippenberg, van Knippenberg, De Cremer, & Hogg, 2004; van Vugt & De Cremer, 1999). Charismatic leaders change the way followers see themselves— from self-interested individuals to members of a cohesive group—through emphasizing the similarity and shared fate among group members as if they are kin. However, charismatic leadership is an exception in the modern world (Bass, 1985; Burns, 1978). In traditional societies the Big Men leaders are often extremely charismatic (A. W. Johnson & Earle, 2000). Being inspiring, persuasive, and visionary are important attributes of aspiring leaders in small face-to-face groups. In modern organizations it is extremely hard to get the same levels of intimacy between leaders and followers. Yet even in large bureaucratic organizations we still prefer leaders to adopt an inspirational and personalized leadership style, and such leaders tend to be more effective (Bass, 1985; Burns, 1978).

In past environments humans knew their leaders personally and there was no distinction between people's private and public lives. As a consequence, our minds may have difficulties separating the role of the leader from the person occupying this role in modern organizations. In the past, information about people's personality and their personal norms, values, and ambitions were critical in determining whether they should get the chance to lead the group because this was the only information available. In the modern world we crave this information but we do not often get it. We are quite aware that, for instance, middle-level managers have only limited influence because they are following orders of senior management. Because our psychological machinery is not very well adapted to these complex multilayer hierarchies, we hold them personally accountable for any decisions that are harmful to our interests ("My boss is a nasty person"). Making trait inferences about leaders is called the "leader attribution error" (Hackman & Wageman, 2007) and it might well be another aspect of our evolved leadership psychology, resembling a possible mismatch.

Finally, leadership in the ancestral environment was fluid, distributed, and situational. The individual most qualified for the task at hand had the greatest influence on collective actions. Rarely would one individual coordinate all group activity and make all group decisions. However, with modern bureaucracies and formal leadership roles, one individual—the "leader"—is responsible for managing all these functions. Leader versatility—the ability to perform multiple, even competing, roles—is increasingly associated with leadership effectiveness, but few leaders have the range of skills needed to perform such a wide array of duties (Kaiser, Lindberg, & Craig, 2007; Kaplan & Kaiser, 2006). This may contribute to the high failure rate of senior managers. Modern societies

attribute enormous importance to leadership and often hold leaders personally responsible for organizational success or failure even if this is not always warranted or fair. Thus, the so-called ''romance of leadership'' may well be a vestige of our ancestral past (Meindl, Ehrlich, & Dukerich, 1985).

These are just some examples that suggest that discrepancies between modern and ancestral conditions can impede leadership selection and effectiveness. Other possibilities for a mismatch include the sense of powerlessness modern humans feel in large anonymous organizations (Wenegrat, 1990), the opportunities for toxic leaders to move between organizations (Padilla et al., 2007), and the prejudice and suspicion against out-group leaders (van Vugt & De Cremer, 1999). These discrepancies between modern and ancestral environments may interfere with the quest for good leadership. More research is needed to study potential leadership mismatches and the extent to which they affect organizational functioning.

Implications for research and practice

The societies of our ancestors were essentially extended interdependent families in which everyone knew everyone else and their position in the group. Social networks with a maximum of around 150 individuals were held together by informal, consensual, and prestige-based, charismatic leaders, so-called Big Men (A. W. Johnson & Earle, 2000). This upper limit of 150 is about the maximum number of individuals that can held together informally without coercive control (Dunbar, 1993). The human mind might be adapted to organizations of this size. Some organizations like Toyota, GoreTex, and Virgin are designed and structured in a way—whether wittingly or not—that resembles hunter-gatherer bands. These companies delegate decision-making to managers far down the chain of command so that the size of functional units approximates that of a hunter-gatherer band (anywhere up to 150–200 individuals). Research is needed to examine if workers are indeed happier and more productive in small-scale, egalitarian teams and organizations. Some data suggest that decentralized decision-making improves employee morale and organizational commitment, which are in turn associated with greater productivity, financial results, and customer satisfaction (Harter, Schmidt, & Hayes, 2002; Padilla et al., 2007). An implication for leadership is that a charismatic, personalized, and transformational leadership style might be more effective to motivate followers, as this is the kind of leadership style that humans naturally crave. A combination of survey data, behavioral and neuroscience data might show if exposure to transformational leaders increases satisfaction and activates ancient reward areas in the brain.

Another area for further investigation is the notion of shared or distributed leadership. In ancestral human environments leadership was situational, fluid, and shared. The individual most qualified for the task at hand would exercise the greatest influence. Yet rarely would one individual coordinate all the group activities or make all the group decisions. With bureaucracy and formality reigning in the work place, however, the fate of an organization ultimately rests in one pair of hands. Echoing this, the ability to perform multiple, even competing leadership roles—leader versatility—is an important aspect of leadership effectiveness. But few modern leaders have the range of skills needed to perform a wide array of duties (Kaplan & Kaiser, 2006). The demands we make on our leaders to pull off multiple roles partly accounts for the high failure rate of senior managers.

Recent studies show that shared leadership can improve employee satisfaction, team productivity, and prosocial behavior in the workplace (Pearce & Conger, 2003; Wassenaar & Pearce, 2012). We hypothesize that organizations do better if they recognize that expertise is widely distributed within the organization. Organizations that utilize these wisdom-of-

crowd effects may indeed do better (Surowiecki, 2004). The advantages of group decision-making are obvious as it allows organizations to pool information from many brains. Furthermore, it ensures that extreme opinions do not gain too much credence, thus preventing group think (Janis, 1972). Yet we do not know enough about shared leadership models yet in how they affect team performance and cohesion. Modeling data in combination with team experiments could show under what conditions shared decision making works better than centralized decision making.

A third area for investigation is leadership selection procedures. Modern organizations apply a form of artificial leader selection whereby senior managers appoint like-minded individuals who may be more interested in pleasing superiors than in leading their team (Nicholson, 2000). This is unlike our ancestral environment where leadership emerged bottom-up. We do not know yet what works better. Some research shows that hiring decisions for executives are more successful if subordinates play an active role in the hiring process (Padilla et al., 2007). Psychological studies suggest that when employees are given a voice in the leader selection process they are more satisfied with the outcome regardless of whether their favorite was selected (Tyler & Lind, 1992). This suggests that employee involvement in leadership recruitment is a good thing. The highly successful U.S. company GoreTex, which has an employee turnover of just 5% (Wassenaar & Pearce, 2012), has a particularly original way of choosing its CEO. It throws the post completely open and invites employees to nominate candidates with the assumption that the one attracting the most followers is the best leader.

Finally we need to find out more about whether mismatch produces leader selection biases. Many prototypical traits of good leadership are just as valid today as they were in our ancestral environment, such as integrity, vision, and competence (Den Hartog et al., 1999). Yet we should question whether such traits as height, weight, health, facial symmetry, a masculine appearance and strong physique are still functional leadership traits today (Blaker et al., 2013; Spisak et al., 2011). Today's managers and leaders rarely lead the group from the front in a battle and so are these qualities still critical for leadership success? It seems that in today's global village, interpersonal skills and networking are supremely valuable abilities and there is good evidence that women armed with better empathic and social skills, cope better in these novel environments (Eagly & Carli, 2003). So how could we bypass these potential ancestral prejudices? In some countries such as the USA, candidates omit their gender and age from job application forms, and we should study whether that produces the desired effects. Studies into how corporate leaders are hired show that validated psychometric assessment tools are rarely used and this may facilitate mismatch biases (Sessa et al., 1998). Third, does it help to frame the organizational context differently? For instance, if one frames a business as a highly cooperative and socially responsible, does a more feminine leadership prototype emerge (Spisak et al., 2011)? Fourth, we could investigate the influence of remuneration packages. High rewards for top managers might make it attractive for certain individuals to compete for these positions (Padilla et al., 2007). ELT hypothesizes that these tend to be males with a constellation of dark personality traits like Machiavellianism, narcissism, and psychopathy (Jonason & Webster, 2010). Hormonal studies could detect if these dark triad personalities have higher levels of baseline testosterone—the status hormone—and lower levels of cortisol—the hormone regulating stress.

Thus, modern organizational arrangements might impede good leadership because they are mismatched with our evolved followership psychology. Further research is needed into the benefits of small-scale organizations, shared leadership arrangements, and egalitarian practices

for improving leadership and team performance. Finally, researchers could study the extent to which ancestral cues of leadership affect management selection procedure.

Biases underlying leaders' selection and decision-making

Leaders often make decisions on behalf of their group and any biases in their decision-making will have great implications for the organizations that they lead, both positive and negative. There is a large body of work documenting how decision-making biases affect human judgments (e.g., Arkes & Blumer, 1985; Epley & Gilovich, 2006; Langer, 1975; Nickerson, 1998; Nisbett & Ross, 1980; Staw, 1976; Tversky & Kahneman, 1974; Wason, 1960). The question of why such cognitive biases should exist is one that has been explored by evolutionary psychologists through the lens of error management theory (EMT; Haselton & Buss, 2000; Haselton & Nettle, 2006). The crux of EMT is that any cognitive mechanism can risk the possibility of two types of errors—a false positive (assuming a false belief), and false negative (failing to assume a belief that is true). Critical to the theory is that the two types of errors may not always be equivalent in terms of their costs. For instance, falsely recognizing a stick to be a snake may produce a moment of unpleasant anxiety, but failing to recognize a snake when one is actually present can have far more costly and long-lasting consequences. Thus, humans have evolved to make more errors of the former variety than the latter. We suggest that this core principle of EMT has important implications both for who is being selected into leadership positions and the types of decision-making biases that leaders may be especially prone to.

Both historically and today one of the most critical problems faced by groups is how to best assess whether aspiring leaders possess the talents and skills necessary to lead the group towards their goals. As such, people are highly sensitive to displays of competence and one such display is that of confidence. Beyond

confidence in one's actual abilities, overconfidence too appears to offer advantages to aspiring leaders, resulting in higher social status (Anderson, Brion, Moore, & Kennedy, 2012; Berger, Cohen, & Zelditch, 1972; Driskell & Mullen, 1990), and contributing to the selection of overconfident team leaders (Reuben, Rey-Biel, Sapienza, & Zingales, 2012), and even CEOs (Goel & Thakor, 2008). Although there are potential costs associated with overconfidence, there may also be fitness benefits that arise from self- and group-enhancement. For instance, overconfidence is adaptive insofar as it motivates people and groups to enter competitions they would not otherwise contest (D. D. Johnson & Fowler, 2011). Thus, for many thousands of years overconfidence would have been less costly than an accurate appraisal of one's competence.

ELT suggests however that within contemporary organizations the cost to benefit ratio associated with overconfidence in leadership selection is such that modern leaders are likely to be particularly prone to this self-evaluative bias. Within ancestral environments, the costs associated with falsely attributing confidence to competence (i.e., overconfidence) would have been kept in check. Overconfidence in leadership would have been a regulated problem, as individuals could easily cease following overconfident leaders who provided more harm than benefit to groups (Boehm, 1999). Thus, for ancestral groups, the opportunity cost of failing to assume competence from displays of confidence would have been greater than the costs incurred by providing aspiring leaders with sufficient latitude to test their ostensible skills and abilities. However, as modern business environments are essentially dominance hierarchies, in which high-ranking individuals can unilaterally influence organizational deci-sion-making, leadership overconfidence is today less effectively observed and regulated from the bottom up.

If overconfident individuals are indeed more likely to be selected for positions of leadership, it is worth considering what other biases may be

expected to co-occur with an elevated perception of one's abilities. ELT suggests that leaders may be selected on the basis of the very qualities that ultimately threaten their capacity for effective leadership. These qualities include a number of traits that might emerge from overconfidence, such as lack of self-awareness, inflated self-evaluations, defensiveness in the face of error, and failure to learn from experience (J. Hogan, Hogan, & Kaiser, 2010). Such qualities might all be functional in maintaining one's positive public image and increasing the chances of promotion to a leadership role, but they may also make leaders more prone to a number of decision-making biases including hindsight biases, illusions of control, confirmation biases, anchoring and adjustment biases, and escalating commitment. Leaders may be particularly prone to these biases as they likely stem from the same self-enhancement tendencies that promote overconfidence (von Hippel & Trivers, 2011) and in turn increase one's chances for leadership selection.

Consider how overconfidence is likely to affect anchoring and adjustment. Following an initial estimate, adjustment can occur in response to new data as it comes to hand, but such adjustments are typically insufficient, with final decisions being "anchored" to initial values (Tversky & Kahneman, 1974). When people are overconfident in their initial estimates they may be more subject to anchoring biases. Leadership overconfidence might also intensify the dangers of escalating commitment, another adaptive decision-making bias. Once a significant amount of time and money is committed to a particular project, the likelihood of changing course usually decreases (Staw, 1976). When people receive feedback that a planned project is failing they often allocate *more* money and resources to the project than if they receive positive feedback (Staw, 1981). Overconfident leaders may be especially vulnerable to this bias as they may overestimate the chances of success despite the contrary evidence.

These are various examples of evolved decision-making biases that may impede effective leadership in modern organizations. More research is needed to examine the impact of these biases on leader decision making and how to avoid them.

Implications for research and practice

Testing the possible relationship between overconfidence, leadership selection, and decision-making biases might be achieved with a three-prong strategy. Firstly, future research should seek to show that individual differences in overconfidence do indeed increase the chances of selection to leadership positions within organizational settings. This could be achieved by assessing the overconfidence of those in more senior management roles and comparing it to the overconfidence of those they lead. Alternatively, future research might capture trait-level overconfidence of individuals as they pass through recruitment centers and use this as a predictor of selection and promotion over time.

Second, experimental work could seek to test the proposed positive relationship between overconfidence and increased errors in judgment and decision making on biases that are related to the elevation of one's personal sense of self (e.g., escalation of commitment). If this relationship were found to disassociate from more general decision-making biases (e.g., base-rate neglect) it would provide evidence of an underlying mechanism that may well drive both the chances of leadership selection and the chances of faulty decision making.

Third, if overconfidence is indeed related to a general need to self-enhance, then meeting that self-enhancement goal should serve to attenuate overconfidence. Leader overconfidence might then be overcome through self-affirmation processes (D. K. Sherman & Cohen, 2006; Steele, 1988). Self-affirmation involves reminding people of their self-worth, making them less motivated to justify their decisions

and defend their position (Correll, Spencer, & Zanna, 2004; D. K. Sherman et al., 2009). Self-affirmation procedures have been found to reduce cognitive biases and improve decision making (Sivanathan, Molden, Galinsky, & Ku, 2008). Leaders who find themselves at the helm by virtue of their *over*confidence are inevitably going to encounter situations in which they are overstretched. Improving their self-worth temporarily through a self-affirmation manipulation might prevent them to sticking with a course of action that might damage the organization.

Thus, evolved cognitive biases such as overconfidence and anchoring effects might impede leadership in modern organizations. Further research is needed into the effects of these biases on leader decision making and how they can be avoided or suppressed.

Psychological adaptations for dominance

A third barrier to effective leadership, according to ELT, stems from the competition inherent to the process of evolution via natural selection. An individual's reproductive success is always relative: How well does an individual with a particular trait do compared to other individuals with alternative traits? Because natural selection operates on variation between individuals, one person's gain in reproductive success is often another person's loss. An implication is that humans have evolved psychological mechanisms designed to dominate and exploit others, ascend social hierarchies, and prevent rivals from achieving dominance.

ELT suggests that leadership encapsulates two different forms of hierarchies. The first is the traditional dominance hierarchy that results from competition for scarce resources, where the strongest and most determined individual in the group, usually a male, prevails and controls group resources and directs group activities (van Vugt, 2006; Wilson, 1975). Dominance is part of our primate heritage. Our closest

genetic relatives all live in groups characterized by dominance and power hierarchies. It is not surprising that modern humans retain the vestiges of these dominance hierarchies.

Yet, humans have taken a somewhat different evolutionary trajectory from other primates by going out to live on the savannah in which the best strategy to survive was to cooperate with each other in large groups (Dunbar, 2004; King et al., 2009). To be able to live and function in highly cooperative groups requires mechanisms and procedures for coordinating social activities, sharing resources, keeping groups together, and leveraging the benefits of participatory decision-making (van Vugt & Kameda, 2012). This phase of evolution caused attenuation of the traditional dominance hierarchy, replacing it with a decision-making hierarchy benefiting the entire group rather than a few powerful individuals (van Vugt, Hogan, et al., 2008).

Dominance was thus replaced by leadership, whereby individuals voluntarily coordinated their actions and goals with people they believed could help them achieve group goals. In return, individual leaders competed with each other to attract followers but this competition was based more on prestige and respect than on dominance and coercion. This move away from dominance to prestige-based leadership was a pivotal step in human evolution, accounting for the emergence of egalitarian hunter-gatherer societies with Big Men leaders. The anthropologist Mervyn Meggitt (1977) describes a decision-making process in the Mae Enga, a tribe in Papua New Guinea: (pp. 77–78)

> The major Big Man then solicits responses from the audience. Ideally everyone present has a voice and being among his own clansmen can speak with complete freedom. The task of the Big Man at this stage is to ensure that all have a chance to offer their opinions and facts in full and to make no attempt to cut off any but obviously irrelevant speeches. (pp. 77–78)

Nonetheless, dominance is still part of our ancient primate heritage and there is plenty of evidence from traditional and modern societies that leaders will coerce followers if they believe they can get away with it (Betzig, 1993; Padilla et al., 2007). To get your way as a leader it is much easier to dominate than to convince people to follow you. This makes the leader–follower relationship fundamentally ambivalent, for two different reasons (Hollander, 1992). First, many people with leadership aspirations do not become leaders (R. Hogan, 2006). Accession to leadership is itself a Darwinian process; through a series of events influenced by circumstances and luck one person prevails. The losers join the ranks of the followers and can scheme against the leader to gain power in the future. Second, when they get into power leaders can bully their own group for personal gain.

There are various mechanisms that enable leaders to increase or consolidate their power that are deeply rooted in our evolutionary history. Unfortunately, these mechanisms sometimes undermine effective leadership in organizations. First, individuals can achieve power through corruption, bribery, or nepotism. For instance, when leaders distribute resources between themselves and followers they tend to keep more for themselves (De Cremer & van Dijk, 2005). It makes good sense from an evolutionary perspective to benefit either oneself or individuals to which a person is closely (genetically) aligned—this is referred to as kin selection—and nepotism is a common strategy in both humans (Gandossy & Sonnenfeld, 2004) and chimpanzees (de Waal, 1982). Some political leaders in history turned their rule into a hereditary position to directly benefit their offspring (Betzig, 1993; Diamond, 1997; A. W. Johnson & Earle, 2000). This evolutionary strategy is also seen in family businesses that recruit their prospective leaders from a very small pool of candidates, usually sons or sons-in-laws, making them more prone to leadership failure (Nicholson, 2005).

Second, leaders can consolidate their power base through providing public goods generously to followers. In leadership competitions, individuals may be inclined to engage in conspicuous wasteful behaviors to impress rivals and potential followers, for example, by promising tax deductions for the rich or giving out food vouchers. This process is called competitive altruism and it is a common ritual in traditional societies where Big Men compete for status for example though organizing large feasts (Hardy & van Vugt, 2006). Similarly, some business leaders generously hand out bonuses and organize conspicuous company events to please their employees. However, it is a short-term strategy to curry favors and it may ultimately undermine the efficiency of an organization.

Third, leaders can strengthen their position through winning an intergroup competition. Legendary warlords like Alexander the Great, Genghis Khan, and Napoleon were military geniuses who increased their power base through invading their neighbor's territories. Dictators fed on wars and other external threats that justified their existence—swift military action requires a central command-and-control structure. Half of the 20th-century rulers engaged in battles at some point in their reign (van Vugt, Hogan, et al., 2008). Experimental social psychological research suggests that when a democratic leader feels his power position is being threatened, they are more likely to start a conflict with another group than when their position is secure (Padilla et al., 2007). The same might apply to business leaders. When they feel their power position is unstable, they might be more prone to start a price war to deflect attention but this tactic might have dire consequences for the organization.

Fourth, leaders can dominate groups by controlling the flow of information within an organization. Throughout history, leaders have tried to control the free press, fearing criticism and unrest. Leaders can shut down the media completely or they can turn it into a propaganda

machine for their regime. The former Italian Prime Minister Berlusconi owned nearly half of Italy's media, including national television channels, radio stations, newspapers, and magazines. These outlets carefully managed Berlusconi's public image and shielded him from criticism. The problem, of course, is that when leaders are protected from criticism they might make the wrong decisions and subordinates who cannot express their criticism get alienated from the organization.

Finally, leaders might decide to get rid of rivals in order to consolidate power. The African dictator Idi Amin who came to power after a military coup in Uganda decided to exterminate his political rivals and many of the people who supported them. He is estimated to have killed 300,000 people during his 8-year reign. His victims included cabinet ministers, judicial figures, bankers, intellectuals, and a former prime minister. Although this is an extreme example, getting rid of highly talented people in an organization because they are perceived as a threat may be attractive to leaders to strengthen their power base but it does little to serve the interest of the organization.

There are additional costs to dominance for organizations in terms of what power differences do psychologically. In ancestral environments, leaders were kept in check largely because there were only minimal status and wealth differences between leaders and followers (Boehm, 1999; Nicholson, 2000). Yet in modern businesses average salaries for CEOs are over 100 times the average worker's salary (van Vugt, Hogan, et al., 2008). Social psychological experiments show that giving someone power increases power abuse (Kipnis, 1972). Power also threatens leader–follower relations by decreasing the ability to empathize with subordinates (Galinsky, Magee, Inesi, & Gruenfeld, 2006) and increasing the use of stereotypes in the appraisal of subordinates (Fiske & Dépret, 1996). Finally, inequality in resources undermines the cohesion and the solidarity of teams and organizations. Thus,

highly asymmetric pay-offs between leaders and followers in many modern organizations may stimulate a kind of leadership that followers naturally resist and that may impede organizational welfare.

The propensity of leaders to use exploitative strategies might be augmented by the selection process of leaders and managers in organizations. When the privileges associated with leadership positions are substantial and there is intense competition for a scarce number of positions, this might select for the wrong kinds of leaders (Padilla et al., 2007). Power might be particularly appealing for individuals with selfish personalities because they can use this position to promote their evolutionary interests. The dark triad leaders are an example—leaders who score high on narcissism, Machiavellianism, and psychopathy. This triumvirate makes them self-centered, status-obsessed, emotionally cold, and aggressive. Unfortunately, part of their talent lies in image management. Outward they appear normal and even charming, yet they have difficulty empathizing with others. According to psychologists Babiak and Hare (2009) such personality types are overrepresented in top leadership positions in business.

Finally, the competitive selection process of leaders in large corporations might select for individuals, usually males, with high levels of baseline testosterone. According to research, high testosterone individuals thrive in high power positions (Josephs et al., 2006). Yet as leaders these individuals have difficulties empathizing with others, which undermines their effectiveness (Ronay & Carney, 2013). Furthermore, when high testosterone individuals feel their position is being undermined, they counter with aggression (Ronay & Galinsky, 2011; van Vugt, Johnson, et al., 2008).

These examples suggest that human adaptations to dominate may stand in the way of effective leadership. Our evolved tendencies to dominate, which we inherited from primate ancestors, might make us prone to corruption,

power abuse, aggression, and conflict when we find ourselves in leadership positions.

Implications for research and practice

Given that natural selection has fashioned powerful mechanisms that drive humans to seek dominance it seems exceedingly difficult to suppress dominance tendencies within organizations, and foster effective leader–follower relations. One strategy that has been proposed for suppressing dominance is the leveling of social hierarchies, such that inequality in power and access to resources is mitigated. Traditional hunter-gatherer societies are fiercely egalitarian and they have various "leveling" mechanisms in place to avoid being exploited and bullied by leaders (Boehm, 1999, 2012). Examples are gossip and ridicule, criticism, desertion, and exclusion. It would be interesting to see if such mechanisms are available in modern organizations, and how their presence or absence affects good leadership.

Should subordinates be forced to stick with a leader or manager that they do not want to work for? In a paradoxical way, ELT suggests that encouraging criticism, dissent, ridicule, disobedience, and exit options among employees is a recipe for healthy leadership and organizational outcomes.

Organizational and management studies could find out if these leveling mechanisms are common in organizations, and whether their absence undermines effective leadership. Social psychology experiments could investigate if gossip and ridicule tend to be focused on individuals in high status positions and if they undermine authoritarian leadership. Furthermore, ELT predicts that when exit options are unavailable leadership styles tend to be more authoritarian. Van Vugt, Jepson, Hart, and De Cremer (2004) found that the attrition rates in groups led by authoritarian leaders were four times greater than in democratically led groups. Finally, archive and case studies (e.g., ENRON) could find out if whistle-blowing mechanisms

are effective in decreasing power relations in organizations.

In traditional hunter-gatherer societies individuals develop prestige and authority based on the contributions they make to the welfare of the group (Henrich & Gil-White, 2001). Is that true in modern work organizations? Behavioral experiments show that individuals who make higher team contributions are more often chosen as group leaders (Hardy & van Vugt, 2006). It would be interesting to study if employees who display organizational citizenship behaviors (OCBs) in the workplace have a higher status within their organization. In general, it would be interesting to see if individual managers scoring high on either dominance or prestige (Henrich & Gil-White, 2001) lead their employees in different ways. Our research shows that prestigious leaders are mimicked more by followers, suggesting that people want to affiliate with them more.

Research on nepotism and corruption is also important. Humans have evolved to favor kin over nonkin, which encourages them, consciously or subconsciously, to favor relatives over genetic strangers. This is an obvious problem for large modern businesses in which genetic strangers must work closely together. In family businesses the practice of nepotism could lead to corruption and a waste of leadership talent. On the other hand: they are extremely successful because there are high levels of cooperation and trust. Around 90% of businesses in the USA are small family-owned concerns. It would be interesting to study small family businesses from an evolutionary perspective (Nicholson, 2008).

Taken together, evolved psychological mechanisms for dominance might undermine effective leadership. Anthropological studies suggest that traditional small-scale societies have leveling mechanisms in place to suppress dominance (van Vugt & Ahuja, 2010). We do not know enough about how such leveling mechanisms operate psychologically, and whether they are effective in controlling leaders. More studies are also needed to determine the extent to which workers displaying OCBs receive more status and

prestige in their organization. Finally, family-operated businesses seem to provide an ideal test case to study evolutionary hypotheses about kin selection and cooperation (Nicholson, 2008).

Conclusions

Inspired by evolutionary psychology thinking, evolutionary leadership theory (ELT) proposes that leadership evolved to solve important coordination problems among group living organisms. Hence, leadership is abundant in the social animal world, from ants to baboons and from honeybees to humans. ELT generates a wide range of research methods to test hypotheses. ELT also yields insights into some of the major obstacles to achieving effective leadership in organizations—mismatches between modern and ancestral conditions, decision-making biases that might be especially pronounced among modern leaders, and evolved mechanisms to dominate and exploit. Given these circumstances and constraints, improving leadership will not be easy or simple. Knowledge of evolutionary psychology is important for studying these obstacles, and ultimately, for overcoming them.

In terms of limitations, this article has only briefly touched on many of the complexities of leadership, such as the finding that there are individual differences in leadership (Judge, Colbert, & Ilies, 2002), that leadership is partly heritable (Ilies et al., 2006; Judge et al., 2004), and that cultures, societies, and organizations differ in what they regard as good leadership (Den Hartog et al., 1999; Hofstede, 1980; van Der Vliert, 2006). A full evolutionary theory of leadership will have to explain such individual and cross-cultural differences. A more complete theory must also explain why leadership styles differ between men and women, and between the same individuals at different stages of life as they confront predictably different adaptive problems such as finding a partner and parenting (Buss, 2005). Future work could profitably also include an account of the evolutionary psychology of trade-offs inherent in achieving leadership positions

such as the benefits of climbing up the hierarchy versus the costs of more responsibility and work. Humans have conquered many of the hostile forces of nature by creating large cooperative organizations consisting of leaders and followers (van Vugt, 2006). A deeper understanding of the evolved psychological mechanisms underlying leadership and followership may provide us with the knowledge to select the right leaders and design more effective organizations. Through applying insights from evolutionary psychology, and evolutionary leadership theory in particular, we may be able to better understand leadership and fulfill the need for effective leadership.

References

Adolps, R. (1999). Social cognition and the human brain. *Trends in Cognitive Sciences*, *12*, 469–479.

Anderson, C., Brion, S., Moore, D. A., & Kennedy, J. A. (2012). A status-enhancement account of overconfidence. *Journal of Personality and Social Psychology*, *103*, 718–735.

Antonakis, J., Bendahan, S., Jacquart, P., & Lalive, R. (2010). On making causal claims: A review and recommendations. *Leadership Quarterly*, *21*, 1086–1120.

Antonakis, J., & Dalgas, O. (2009). Predicting elections: Child's play! *Science*, *323*, 1183.

Arkes, H. R., & Blumer, C. (1985). The psychology of sunk cost. *Organizational Behavior and Human Decision Processes*, *35*, 124–140.

Babiak, P., & Hare, R. D. (2009). *Snakes in suits*. New York, NY: Harper

Bargh, J., & Chartrand, T. L. (1999). The unbearable automaticity of being. *American Psychologist*, *54*, 462–479.

Barkow, J., Cosmides, L., & Tooby, J. (1992). *The adapted mind: Evolutionary psychology and the generation of culture*. New York, NY: Oxford University Press.

Bass, B. M. (1985). Leadership and performance beyond expectations. New York, NY: Free Press.

Bass, B. M. (1990). From transactional to transformational leadership: Learning to share the vision. *Organizational Dynamics*, *18*, 19–31.

Berger, J., Cohen, B. P., & Zelditch, M., Jr. (1972). Status characteristics and social interaction. *American Sociological Review*, *37*, 1–55.

Betzig, L. (1993). Sex, succession, and stratification in the first six civilizations: How powerful men reproduced, passed power on to their sons, and used power to defend their wealth, women, and children. In L. Ellis (Ed.), *Social stratification and socioeconomic inequality* (Vol. *1*, pp. 37–74). Westport, CT: Praeger.

Blaker, N., Dessing, I., Rompa, I., Vriend, F., & van Vugt, M. (2013). The height leadership advantage in men and women: Testing some evolutionary psychology predictions. *Group Processes and Intergroup Relations*, *16*, 17–27.

Boehm, C. (1999). *Hierarchy in the forest*. London, UK: Harvard University Press.

Boehm, C. (2012). *Moral origins: The evolution of virtue, altruism, and shame*. New York, NY: Basic Books.

Burns, J. M. (1978). *Leadership*. New York, NY: Harper & Row.

Buss, D. M. (2005). *Handbook of evolutionary psychology*. Hoboken, NJ: Wiley.

Colarelli, S. (2003). *No best way: An evolutionary perspective on human resource management*. Greenwich, CT: Praeger.

Conradt, L., & Roper, T. J. (2003). Group decision-making in animals. *Nature*, *421*, 155–158.

Correll, J., Spencer, S. J., & Zanna, M. P. (2004). An affirmed self and an open mind: Self-affirmation and sensitivity to argument strength. *Journal of Experimental Social Psychology*, *40*, 350–356.

Couzin, I. D., Krause, J., Franks, N. R., & Levin, S. A. (2005). Effective leadership and decision making in animal groups on the move. *Nature*, *433*, 513–516.

Day, D. V., & Antonakis, J. (2012). *The nature of leadership*. London, UK: Sage.

De Cremer, D., & van Dijk, E. (2005). When and why leaders put themselves first. *European Journal of Social Psychology*, *35*, 553–563.

Den Hartog, D. N., House, R. J., Hanges, P. J., Ruiz-Quintanilla, S. A., & Dorfman, P. W. (1999). Culture-specific and cross-culturally generalizable implicit leadership theories: A longitudinal investigation. *Leadership Quarterly*, *10*, 219–256.

De Waal, F. B. M. (1982). *Chimpanzee politics: Power and sex among apes*. New York, NY: Harper & Row.

De Waal, F. B. M. (1996). *Good natured: The origins of right and wrong in human and other animals*. Cambridge, MA: Harvard University Press.

Diamond, J. (1997). *Guns, germs and steel*. London, UK: Vintage.

Driskell, J. E., & Mullen, B. (1990). Status, expectations, and behavior: A meta-analytic review and test of the theory. *Personality and Social Psychology Bulletin*, *16*, 541–553.

Dunbar, R. I. M. (1993). Coevolution of neocortex size, group size and language in humans. *Behavioral and Brain Sciences*, *16*, 681–735.

Dunbar, R. I. M. (2004). *Grooming, gossip, and the evolution of language*. London, UK: Faber & Faber.

Eagly, A. H., & Carli, L. L. (2003). The female leadership advantage: An evaluation of the evidence. *Leadership Quarterly*, *14*, 807–834.

Epitropaki, O., & Martin, R. (2004). Implicit leadership theories in applied settings: Factor structure, generalizability and stability over time. *Journal of Applied Psychology*, *89*, 293–310.

Epley, N., & Gilovich, T. (2006). The anchoring-and-adjustment heuristic why the adjustments are insufficient. *Psychological Science*, *17*, 311–318.

Fiske, S. T., & Dépret, E. (1996). Control, interdependence, and power: Understanding social cognition in its social context. In W. Stroebe & M. Hewstone (Eds.), *European review of social psychology* (Vol. *7*, pp. 31–61). New York, NY: Wiley.

Foley, R. A. (1997). The adaptive legacy of human evolution: A search for the environment of evolutionary adaptedness. *Evolutionary Anthropology*, *4*, 194–203.

Galinsky, A. D., Magee, J. C., Inesi, M. E., & Gruenfeld, D. H. (2006). Power and perspectives not taken. *Psychological Science*, *17*, 1068–1074.

Gandossy, R., & Sonnenfeld, J. A. (2004). *Leadership and governance from the inside out*. London, UK: Wiley.

Gillet, J., Cartwright, E., & van Vugt, M. (2011). Selfish or servant leadership: Evidence for leadership personalities in coordination games. *Personality and Individual Differences*, *51*, 231–236.

Goel, A. M., & Thakor, A. V. (2008). Overconfidence, CEO selection, and corporate governance. *The Journal of Finance*, *63*, 2737–2784.

Griskevicius, V., Cantu, S. M., & van Vugt, M. (2012). The evolutionary bases for sustainable behavior: Implications for marketing, policy, and social entrepreneurship. *Journal of Public Policy and Marketing*, *31*, 115–128.

Hackman, J. R., & Wageman, R. (2007). Asking the right questions about leadership. *American Psychologist*, *62*, 43–47.

Hagen, E. H., & Hammerstein, P. (2006). Game theory and human evolution: A critique of some recent interpretations of experimental games. *Theoretical Population Biology*, *69*, 339–348.

Hardy, C., & van Vugt, M. (2006). Nice guys finish first: The competitive altruism hypothesis. *Personality and Social Psychology Bulletin*, *32*, 1402–1413.

Harter, J. K., Schmidt, F. L., & Hayes, T. L. (2002). Business-unit-level relationship between employee satisfaction, employee engagement, and business outcomes: A meta- analysis. *Journal of Applied Psychology*, *87*, 268–279.

Haselton, M. G., & Buss, D. M. (2000). Error management theory: A new perspective on biases in cross-sex mind reading. *Journal of Personality and Social Psychology*, *78*, 81.

Haselton, M. G., & Nettle, D. (2006). The paranoid optimist: An integrative evolutionary model of cognitive biases. *Personality and Social Psychology Review*, *10*, 47–66.

Henrich, J., & Gil-White, F. J. (2001). The evolution of prestige: Freely conferred deference as a mechanism for enhancing the benefits of cultural transmission. *Evolution and Human Behavior*, *22*, 165–196.

Hofstede, G. (1980). *Culture's consequences: International differences in work-related values*. Beverly Hills, CA: Sage.

Hogan, J., Hogan, R., & Kaiser, R. B. (2010). Management derailment. *American Psychological Association Handbook of Industrial and Organizational Psychology*, *3*, 555–575.

Hogan, R. (2006). *Personality and the fate of organizations*. Hillsdale, NJ: Erlbaum.

Hogan, R., & Kaiser, R. (2005). What we know about leadership. *Review of General Psychology*, *9*, 169–180.

Hollander, E. P. (1992). The essential interdependence of leadership and followership. *Current Directions in Psychological Science*, *1*, 71–75.

Ilies, R., Arvey, R. D., & Bouchard, T. J., Jr. (2006). Darwinism, behavioral genetics, and organizational behavior: A review and agenda for future research. *Journal of Organizational Behavior*, *27*, 121–141.

Janis, I. (1972) *Victims of groupthink*. Boston, MA: Houghton-Mifflin.

Jensen-Campbell, L. A., Graziano, W. G., & West, S. G. (1995). Dominance, prosocial orientation, and female preferences: Do nice guys really finish last? *Journal of Personality and Social Psychology*, *68*, 427–440.

Johnson, A. W., & Earle, T. (2000). *The evolution of human societies*. Stanford, CA: Stanford University Press.

Johnson, D. D., & Fowler, J. H. (2011). The evolution of overconfidence. *Nature*, *477*, 317–320.

Jonason, P. K., & Webster, G. D. (2010). The dirty dozen: A concise measure of the dark triad. *Psychological Assessment*, *22*, 420–432.

Josephs, R. A., Sellers, J. G., Newman, M. L., & Mehta, P. H. (2006). The mismatch effect: When testosterone and status are at odds. *Journal of Personality and Social Psychology*, *90*, 999–1013.

Judge, T. A., & Cable, D. M. (2004). The effect of physical height on workplace success and income: Preliminary test of a theoretical model. *Journal of Applied Psychology*, *89*, 428–441.

Judge, T. A., Colbert, A. E., & Ilies, R. (2004). Intelligence and leadership: A quantitative review and test of theoretical propositions. *Journal of Applied Psychology*, *89*, 542–552.

Kaiser, R. B., Lindberg, J. T., & Craig, S. B. (2007). Assessing the flexibility of managers: A comparison of methods. *International Journal of Selection and Assessment*, *16*, 40–55.

Kaplan, R. E., & Kaiser, R. B. (2006). *The versatile leader: Make the most of your strengths—without overdoing it*. San Francisco, CA: Pfeiffer.

Kenrick, D. T., Li, N. P., & Butner, J. (2003). Dynamical evolutionary psychology: Individual decision rules and emergent social norms. *Psychological Review*, *110*, 3–28.

King, A. J., Johnson, D. D. P., & van Vugt, M. (2009). The origins and evolution of leadership. *Current Biology*, *19*, R911–R916.

Kipnis, D. (1972). Does power corrupt? *Journal of Personality and Social Psychology*, *24*, 33–41.

Langer, E. J. (1975). The illusion of control. *Journal of Personality and Social Psychology*, *32*, 311–328.

Lee, K., Ashton, M. C., & de Vries, R. E. (2005). Predicting workplace delinquency with the HEX-ACO and five-factor models of personality structure. *Human Performance*, *18*, 179–197.

Little, A. C., Burriss, R. P., Jones, B. C., & Roberts, S. C. (2007). Facial appearance affects voting decisions. *Evolution and Human Behavior*, *28*, 18–27.

Lord, R. G., Foti, R. J., & De Vader, C. L. (1984). A test of leadership categorization theory. *Organizational Behavior and Human Performance*, *34*, 343–378.

Lyons, D., & McArthur, C. (2007). Gender's unspoken role in leadership evaluations. *Human Resource Planning*, *30*, 24–32.

McCall, M. W., Jr., & Lombardo, M. M. (1983). *Off the track: Why and how successful executives get derailed*. Greensboro, NC: Centre for Creative Leadership.

Meggitt, M. (1977). *Blood is their argument*. Palo Alto, CA: Mayfield.

Meindl, J. R., Ehrlich, S. B., & Dukerich, J. M. (1985). The romance of leadership. *Administrative Science Quarterly*, *30*, 78–102.

Mezulis, A., Abramson, L., Hyde, J. S., & Hankin, B. L. (2004). Is there a universal positivity bias in attributions? A meta-analytic review of individual, developmental, and cultural differences in the self-serving attributional bias. *Psychological Bulletin*, *130*, 711–746.

Murray, G. R., & Schmitz, J. D. (2011). Caveman politics: Evolutionary leadership preferences and physical stature. *Social Science Quarterly*, *92*, 1215–1235.

Nicholson, N. (2000). *Managing the human animal*. London, UK: Texere Publishing.

Nicholson, N. (2005). Meeting the Maasai: Messages for management. *Journal of Management Inquiry*, *14*, 255–267.

Nicholson, N. (2008). Evolutionary psychology, organizational culture and the family firm. *Academy of Management Perspectives*, *22*, 73–84.

Nickerson, R. S. (1998). Confirmation bias: A ubiquitous phenomenon in many guises. *Review of General Psychology*, *2*, 175.

Nisbett, R. E., & Ross, L. (1980). *Human inference: Strategies and shortcomings of social judgment*. Englewood Cliffs, NJ: Prentice-Hall.

O'Gorman, R. O., Henrich, J., & van Vugt, M. (2009). Constraining free-riding in public goods games: Designated solitary punishers can sustain human cooperation. *Proceedings of Royal Society-B*, *276*, 323–329.

Padilla, A., Hogan, R., & Kaiser, R. B. (2007). The toxic triangle: Destructive leaders, vulnerable followers, and conducive environments. *Leadership Quarterly*, *18*, 176–194.

Pearce, C. L., & Conger, J. A. (2003). *Shared leadership: Reframing the hows and whys of leadership*. Thousand Oaks: Sage.

Reuben, E., Rey-Biel, P., Sapienza, P., & Zingales, L. (2012). The emergence of male leadership in competitive environments. *Journal of Economic Behavior & Organization*, *83*, 111–117.

Ronay, R., & Carney, D. R. (2013). Testosterone's negative relationship with empathic accuracy and perceived leadership ability. *Social Psychological and Personality Science*, *4*, 92–99.

Ronay, R., & Galinsky, A. D. (2011). Lex talionis: Testosterone and the law of retaliation. *Journal of Experimental Social Psychology*, *47*, 702–705.

Sayles, R. (1993). *The working leader: The triumph of high performance over conventional management principles*. New York, NY: McGraw-Hill.

Schaller, M., Simpson, J. A., & Kenrick, D. T. (2006). *Evolution and social psychology*. New York, NY: Psychology Press.

Schmitt, D. P., & Pilcher, J. J. (2004). Evaluating evidence of psychological adaptation: How do

we know one when we see one? *Psychological Science*, *15*, 643–649.

Sessa, V. I., Kaiser, R., Taylor, J. K., & Campbell, R. J. (1998). *Executive selection: A research report on what works and what doesn't*. Greensboro, NC: Center for Creative Leadership.

Shamir, B., House, R., & Arthur, M. (1993). The motivational effects of charismatic leadership: A self-concept based theory. *Organization Science*, *4*, 577–594.

Sherman, D. K., & Cohen, G. L. (2006). The psychology of self-defense: Self-affirmation theory. *Advances in Experimental Social Psychology*, *38*, 183–242.

Sherman, D. K., Cohen, G. L., Nelson, L. D., Nussbaum, A. D., Bunyan, D. P., & Garcia, J. (2009). Affirmed yet unaware: Exploring the role of awareness in the process of self-affirmation. *Journal of Personality and Social Psychology*, *97*, 745–764.

Sherman, G. D., Lee, J. J., Cuddy, A. J. C., Renshon, J., Oveis, C., Gross, J. J., & Lerner, S. L. (2012). Leadership is associated with lower levels of stress. *PNAS*, *109*, 17903–17907.

Singer, T., Seymour, B., O'Doherty, J. P., Stepahn, K. E., Dolan, R. J., & Frith, C. D. (2006). Empathic neural responses are modulated by the perceived fairness of others. *Nature*, *439*, 466–469.

Sivanathan, N., Molden, D. C., Galinsky, A. D., & Ku, G. (2008). The promise and peril of self-affirmation in de-escalation of commitment. *Organizational Behavior and Human Decision Processes*, *107*, 1–14.

Spisak, B., Homan, A., Grabo, A., & van Vugt, M. (2011). Facing the situation: Testing a biosocial contingency model of leadership in intergroup relations using masculine and feminine faces. *The Leadership Quarterly*, *23*, 273–280.

Staw, B. M. (1976). Knee-deep in the big muddy: A study of escalating commitment to a chosen course of action. *Organizational Behavior and Human Performance*, *16*, 27–44.

Staw, B. M. (1981). The escalation of commitment to a course of action. *The Academy of Management Review*, *6*, 577–587.

Steele, C. M. (1988). The psychology of self-affirmation: Sustaining the integrity of the self.

In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. *21*, pp. 261–302). New York, NY: Academic Press.

Stulp, G., Buunk, A. P., Verhulst, S., & Pollet, T. V. (2013). Tall claims? Sense and nonsense about the importance of height of US presidents. *The Leadership Quarterly*, *24*, 159–171.

Surowiecki, J. (2004). *The wisdom of crowds*. New York, NY: Anchor Books.

Tooby, J., & Cosmides, L. (1997). *Evolutionary psychology: A primer*. Retrieved from http://www.cep.ucsb.edu/primer.html

Tversky, A., & Kahneman, D. (1974). Judgement under uncertainty: Heuristics and biases. *Science*, *185*, 1124–1131.

Tyler, T. R., & Lind, E. A. (1992). A relational model of authority in groups. In M. Zanna (Ed.), *Advances in experimental social psychology* (Vol. *25*, pp. 115–191). New York, NY: Academic Press.

Van Der Vliert, E. (2006). Autocratic leadership around the globe: Do climate and wealth drive leadership culture? *Journal of Cross-Cultural Psychology*, *37*, 42–59.

Van Knippenberg, D., van Knippenberg, B., De Cremer, D., & Hogg, M. A. (2004). Leadership, self and identity: A review and research agenda. *Leadership Quarterly*, *15*, 825–856.

Van Vugt, M. (2006). The evolutionary origins of leadership and followership. *Personality and Social Psychology Review*, *10*, 354–372.

Van Vugt, M. (2012). The nature in leadership: Evolutionary, biological and social neuroscience perspectives. In D. Day & J. Antonakis (Eds.), *The nature of leadership* (pp. 141–178). London, UK: Sage.

Van Vugt, M., & Ahuja, A. (2010). *Selected: Why some people lead and others follow, and why it matters*. London, UK: Profile.

Van Vugt, M., & De Cremer, D. (1999). Leadership in social dilemmas: The effects of group identification on collective actions to provide public goods. *Journal of Personality and Social Psychology*, *76*, 587–599.

Van Vugt, M., Hogan, R., & Kaiser, R. (2008). Leadership, followership, and evolution: Some lessons from the past. *American Psychologist*, *63*, 182–196.

Van Vugt, M., Jepson, S. F., Hart, C. M., & De Cremer, D. (2004). Autocratic leadership in social dilemmas: A threat to group stability. *Journal of Experimental Social Psychology*, *40*, 1–13.

Van Vugt, M., Johnson, D. D. P., Kaiser, R. B., & O'Gorman, R. (2008). Evolution and the social psychology of leadership: The mismatch hypothesis. In C. Hoyt, D. Forsyth, & A. Goethals (Eds.), *Social psychology and leadership* (pp. 267–282). New York, NY: Praeger Perspectives.

Van Vugt, M., & Kameda, T. (2012). Evolution and groups. In J. Levine (Ed.), *Group processes* (pp. 297–322). New York, NY: Psychology Press.

Van Vugt, M., & Schaller, M. (2008). Evolutionary perspectives on group dynamics: An introduction. *Group Dynamics*, *12*, 1–6.

Van Vugt, M., & van Lange, P. A. M. (2006). The altruism puzzle: Psychological adaptations for prosocial behaviour. In M. Schaller, D. Kenrick, & J. Simpson (Eds.), *Evolution and social psychology* (pp. 237–261). New York, NY: Psychology Press.

Von Hippel, W., & Trivers, R. (2011). The evolution and psychology of self-deception. *Behavioral and Brain Sciences*, *34*, 1–16.

Wason, P. C. (1960). On the failure to eliminate hypotheses in a conceptual task. *Quarterly Journal of Experimental Psychology*, *12*, 129–140.

Wassenaar, C. L., & Pearce, C. L. (2012). The nature of shared leadership. In D. Day & J. Antonakis (Eds.), *The nature of leadership* (pp. 363–392). London, UK: Sage.

Wenegrat, B. (1990). *The divine archetype: The sociobiology and psychology of religion*. Lexington, MA: Lexington Books.

Wilson, E. O. (1975). *Sociobiology: The new synthesis*. Cambridge, MA: Harvard University Press.

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