Individual Differences as Antecedents of Leader Behavior:

Towards an Understanding of Multi-Level Outcomes

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Introduction

Observations about the link between an individual's stable characteristics and behaviors have been made throughout the history of mankind. Since ancient times, people have been interested in the individual differences that make some leaders more effective than others. Indeed, selecting, supporting and following the right leaders has always been one of the major dilemmas that people have faced, because of the huge impact these influential individuals can have on the lives of their followers as well as on the well-being and survival of their collective entities, such as groups, organizations and societies (i.e. multi-level outcomes). Consider the following time-honored example of individual differences in political leadership:

> "We note that [leaders] pursue the ends they have in view...by different ways. One uses caution while another is impetuous, one resorts to violence while another relies on craft, one acts patiently while another does the contrary; and each reaches his goal by a different route"
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> - *Machiavelli, The Prince, 1513/2003*

The contemporary academic literature on traits has had significant success in developing the knowledge base required to account for a wide assortment of persistent differences in leadership behaviors. For instance, concerning the quote above, the literature on chronic regulatory focus (Higgins, 1997, 1998; Haws, Dholakia, & Bearden, 2010) can provide elaborate explanations of why some leaders are almost always more cautious or impetuous (e.g., McMullen, Shepherd, & Patzelt, 2009), why some vigilantly show great attention to detail and others advance aggressively towards the goals in the big picture (e.g., Förster & Higgins, 2005) , or some are patient while others behave somewhat recklessly (e.g., Hamstra, Bolderdijk, & Veldstra, 2011) in pursuing their goals.

While leadership research on traits had slowed down somewhat over the last decade or so, due to the recent efforts of the *Leadership Quarterly* it is once again becoming a vibrant area of inquiry. In line with the journal's goal of reviving leadership research on individual differences (especially since the special issue in 2012), numerous articles on this theme have been published in the last couple of years (e.g., Bendahan, Zehnder, Pralong, & Antonakis, 2015; Cavazotte, Moreno, & Hickmann, 2012; Stulp, Buunk, Verhulst, & Pollet, 2013; Spisak, Grabo, Arvey, & van Vugt, 2014; Tuncdogan, van den Bosch, & Volberda, 2015). However, with this rapid growth comes a high degree of fragmentation, for at least two reasons. First, unlike the institutional theory literature, which has a paradigm with relatively clearly-defined boundaries and key concepts (e.g., legitimization, isomorphism, etc.), the literature on individual differences is multi-paradigmatic and contains a very large number of relevant concepts. Second, this field is not only multi-paradigmatic but also multidisciplinary, with many of its concepts originating from different knowledge bases, including but not limited to psychology (e.g., personality traits, regulatory focus), psychiatry (e.g., dark-triad personalities, general quality of sleep), physiology (e.g., facial morphology, vocal characteristics), endocrinology (e.g., sex hormone levels), and genetics (e.g., DAT1 gene, research on twins).

This fragmentation prevents these different literature streams from communicating effectively with each other and synthesizing the rapidly expanding body of knowledge, and that presents a threat for the continued growth of the individual differences literature. When we examine how this problem has been dealt with recently in other interdisciplinary literatures such as behavioral strategy (e.g., Powell, Lovallo, & Fox, 2011), two complementary solutions stand out: (1) providing regular summaries of research in the field, including the classification of the relevant constructs and their interrelationships, and (2) unifying the research efforts around a relatively small number of conceptual baseline models. The first approach is achieved through literature reviews

and also through the use of meta-analyses and bibliometric studies. The second is more complex, as it is generally quite difficult to create consensus in any scientific literature. However, those literatures that can achieve some level of consensus around a relatively small number of baseline models are able to focus their efforts. For example, achieving some level of consensus around the theory of reasoned action/theory of planned behavior (e.g., Ajzen & Fishbein, 1980; Fishbein, 1979) played a role in the rapid growth of the literature on attitudes. Another example is the particle physics literature, which benefited from the fact that there are only two predominant baseline models (Einstein's deterministic model and quantum mechanics), allowing focused efforts on arriving at a detailed understanding of the theoretical and practical implications of these two models. Efforts that diverge from each other by using too many models prevent the development of in-depth understanding, a problem known as inadequate paradigm development (e.g., Powell et al., 2011).

Following these two complementary solutions found in other literatures, we aim to help sustain and contribute to the rapid growth in the leadership literature on individual differences in two ways. First, we will classify the main streams in the literature and the key constructs within them, and build a research agenda based on this. In recent years, there have been articles initiating research on almost all the relevant differences between individuals. For instance, at least one article was published on genetic factors (e.g., Li, Wang, Arvey, Soong, Saw, & Song, 2015), one on hormonal factors (e.g., Bendahan, Zehnder, Pralong, & Antonakis, 2015), facial morphology (Haselhuhn, Wong, Ormiston, Inesi, & Galinsky, 2014), voice characteristics (DeGroot, Aime, Johnson, & Kluemper, 2011), psychological traits and trait-like features (e.g., O'Reilly, Doerr, Caldwell, & Chatman, 2014), and so on. In other words, the building blocks are already in place, and future research will rest upon the current foundations. Thus, at this point, we believe that it will be helpful to provide researchers with a classification of these different research streams. More

specifically, doing so will help us to establish the current situation, which is necessary in order to determine how to proceed. Second, we will build this literature review around a simple but powerful model that has recently been developed which links leaders' individual differences to multi-level outcomes (i.e. Antonakis, Day, & Schyns, 2012). It is worth noting that the review section of this paper will focus mainly on the literature addressing the relationship between leaders' traits and different leadership outcomes, as providing a satisfactory summary of research on all components of this model is likely to be beyond the scope of a single paper. The model will, however, serve as the main organizing framework for the future research agenda we propose following our review. By doing so, we aim to help reduce fragmentation and facilitate communication between different streams of literature by unifying at least some of the future research efforts around a recent and recognized conceptual model.

The paper is structured as follows. First, we discuss the model which underlies this review and its components, and focus in depth on the role of leaders' individual differences. After that, we provide a classification of different streams within the leadership literature on leaders' individual differences, with examples of their effects on leadership outcomes. We end this review by proposing a research agenda, around the leadership process model, that will enable a better understanding of the effects of leaders' traits and behaviors on multi-level outcomes.

The Model Underlying this Review

The leadership process model by Antonakis et al. (2012) consists of three main groups: distal predictors, proximal predictors, and the multi-level outcomes of these predictors. The distal predictors part of the model focuses on the individual differences between leaders, which in turn are expected to predict leaders' behavior. In this review, we use the term 'individual differences' to refer to measurable individual characteristics that vary between leaders, but that remain stable over

time and in different situations for a given leader (e.g., Antonakis, 2011; Antonakis et al., 2012). These differences include trait and trait-like chronic variables that can predict a leader's attitudes and behavior. The proximal predictors part of the model addresses follower effects, which are predicted by both leader behaviors and follower traits. In line with the follower-centered approach to leadership, this part of the model acknowledges that follower attitudes and behavior – which are predicted by their traits – can shape leadership effectiveness together with leader behavior (e.g., Oc & Bashshur, 2013; Grant, Gino, & Hofmann, 2011). The final part of the model, multi-level outcomes, focuses on the consequences of these distal and proximal predictors at different levels of analysis. In other words, this part suggests that because of their effect on leader behavior and followers, the traits of a leader influence outcomes at the individual, group and organizational level. As a whole, the model depicts the complex mechanisms through which individual differences of leaders impact multi-level outcomes (see Figure 1, which was taken from Antonakis et al. [2012]).

Insert Figure 1 here

We believe there are three reasons why there is value in basing our review on this particular conceptual model. First, this model was published as a part of the *Leadership Quarterly* special issue on individual differences in 2012, and therefore, most researchers in our field are now familiar with this model. Second, because the special issue attracted considerable scholarly attention, a number of papers have already been based on or made use of ideas from this model (e.g., Offord, Gill, & Kendal, 2016; Samnani & Singh, 2013; Tuncdogan et al., 2015). For instance, Offord, Gill and Kendal (2016) applied a grounded theory approach to generate a better understanding of the leadership process model. Third, like the theory of reasoned action/theory of planned behavior, this model is simple, straightforward, and commonsensical. It therefore provides an opportunity to

create some level of consensus in the field, helping us to keep the level and rate of fragmentation under control.

In this paper, we review different streams of literature investigating individual differences that predict leader behavior. As such, this review examines which distal predictors leadership scholars have focused on, and how these predictors may affect proximal predictors and multi-level outcomes. Here, we would like to also briefly explain why we decided to begin with leaders' individual differences rather than some other component of the model. Essentially, given our focus on understanding the consequences of individual differences within the domain of leadership, we had two options; we could either examine the effects of leaders' individual differences on leadership outcomes, or we could examine the multilevel outcomes of the interaction between followers' individual differences and leader behaviors. We chose the first option for at least two reasons. First, there is already a considerable body of research on that area, making a summary particularly necessary, whereas interest in the other area is only beginning to emerge. That is, leaders' individual differences have received considerably more research attention and from a greater variety of disciplines than is currently the case for followers. The risk of fragmentation that we note earlier may therefore be greater for the literature on leaders' individual differences. Secondly, because a leader trait is the most distal predictor in the process model, research on leaders' individual differences is expected to include a greater variety of leadership outcomes (e.g., leader behavior, follower behavior, and multilevel outcomes). In other words, the breadth of outcomes that followers' individual differences may influence is naturally more limited, because it is a more proximal predictor in the model. Focusing on leaders' traits enabled us to review (and integrate) a broader set of individual differences and leadership outcomes, and we therefore considered it to be a more appropriate starting point at this stage, although the differences of both leaders and followers are obviously necessary and important components of the leadership process

model. Following the review, in our agenda for future research, which is based on this model as a whole, we aim to bring together hitherto fragmented streams of research to show where there are potentially valuable connections between them which could be explored.

In an attempt to categorize scores of studies from different paradigms that explored how individual differences impact on leadership, we classified each individual difference either as a physiological or psychological characteristic. We preferred this categorization because it was intuitive and could be used to cover all the paradigms that we review here. This categorization was also helpful for distinguishing between individual differences based on their *distance* to leader behavior (i.e., physiological differences are deeper, or more distant, to behavior, than psychological differences). Each of these two main categories had a number of sub-categories. The physiological characteristics were drawn from research on genetics, endocrinology, physical attributes, biological sex and neuroscience. Psychological characteristics consisted of the psychology literature on traits and trait-like variables. While discussing psychological characteristics, we will also briefly touch upon the background variables. Table 1 shows an overview of the research areas that we reviewed:

Insert Table 1 here

Physiological Differences

Genetics and Leadership

Research on leadership and genetics has mainly sought to understand the extent to which genetic and environmental factors explain leadership emergence. Drawing predominantly on studies of twins (see Zyphur, Zhang, Barsky, & Li, 2013, for a critique of this methodology), scholars found that a significant portion of the variance in leadership role occupancy (i.e., whether an individual is

in a leadership position) – around a quarter to a third in most studies – could be explained by genetic factors (Arvey, Rotundo, Johnson, Zhang, & McGue, 2006; Arvey, Zhang, Avolio, & Krueger, 2007; De Neve, Mikhaylov, Dawes, Christakis, & Fowler, 2012; Li, Arvey, Zhang, & Song, 2012). However, some other studies reported a lower or higher explanatory power of genetic factors (Chaturvedi, Zyphur, Arvey, Avolio, & Larsson, 2012; Ilies, Gerhardt, & Le, 2004).

Scholars have also extended our understanding of genetics and leadership by going beyond leadership role occupancy and exploring different types of leadership behavior. Specifically, researchers have focused mainly on transformational and transactional leadership, and found evidence to suggest that genetic factors have a greater explanatory power in these leadership styles. It has been shown that somewhere between 50 to 60% of the variance in transformational leadership, and about 50% in transactional leadership, is explained by genetic factors (Chaturvedi, Arvey, Zhang, & Christoforou, 2011; Johnson et al., 1998; Johnson, Vernon, Harris, & Jang, 2004). Researchers have also looked at whether transformational and leadership role occupancy share a common genetic basis, and found that a large part of the covariance between the two variables was due to genetic factors (78%), with the rest being attributable to environmental factors (Li et al., 2012). The findings also suggested, however, that unique genetic factors were still important for these two variables – suggesting that these two are differentially heritable.

Some studies shed light on why the level of heritability of leadership may vary in different studies by identifying moderators of this link. Gender, for example, is found to be a moderator of this link (Chaturvedi et al., 2012). Another interesting moderator is the social environment: genetic influences are significantly weaker for those in enriched social environments than for those in poor social environments (e.g., higher vs. lower socioeconomic status, parental support) (Zhang, Ilies, & Arvey, 2009).

Researchers have also recently started to explore what specific genes are responsible for

leadership role occupancy. Specifically, scholars have identified the rs4950 marker on a neuronal acetylcholine receptor gene (CHRNB3) and the dopamine transporter DAT1 gene as predictors of leadership role occupancy (De Neve et al., 2012; Li et al., 2015). Clearly, identifying a specific genotype that is responsible for leadership would be an important step forward in gaining a better understanding of the physiological sources of leadership emergence. This may help in explaining variation in leadership in a more nuanced manner and in finding potential mediating processes between genetic factors and leadership. Li and colleagues (2015), for example, have found that proactive personality and moderate rule-breaking mediates the link between the dopamine transporter DAT1 gene and leadership role occupancy. It is also worth noting that a few other studies have also investigated the mediating processes between genetic factors and leadership. Ilies et al. (2004) found that the links between genetic factors and leadership emergence are mediated by intelligence and Big Five personality traits. In regard to transformational leadership, another study has shown that dispositional hope is a mediator (Chaturvedi et al., 2011). Researchers have also found that genetic factors play an important role in explaining psychological traits such as intelligence and personality, which are shown to have an impact on leader behavior and effectiveness (e.g., Cavazotte, Moreno, & Hickmann, 2012; Judge & Bono, 2004), suggesting that these traits may mediate the influence of genetic factors on various leadership outcomes (see Ilies, Arvey, & Bouchard, 2006 for a review of the role of behavioral genetics in organizational behavior, including leadership).

As a whole, leadership researchers have made encouraging progress in explaining the role of genes in leadership. However, the field is still relatively young, and more research is needed to answer a number of key questions. A considerable portion of this research focused on explaining whether leaders are *born* or *made,* and *to what extent.* This research made it clear that genomic variation (in terms of nucleotide sequence in DNA) is related to certain leadership outcomes, but we

have only limited knowledge regarding the significance of genes for outcomes beyond leadership emergence and some specific leadership behaviors (i.e., transformational and transactional leadership). Similarly, we still do not know what specific genotypes are responsible for outcomes other than leadership role occupancy. Moreover, despite some promising efforts, we know little about the mechanisms by which genes affect leadership.

Importantly, extant leadership research often does not take into account the possibility of dynamic and complex interplay between genes and environment in shaping an individual's behavior (see Z. Zhang, Ilies, & Arvey, 2009, for a notable exception). Research in molecular genetics suggests that environment plays a crucial role in determining how genetic factors affect an organism's traits, behavior, and other observable characteristics, and that this relationship may vary under different environmental conditions and across different segments of a population (Caspi & Moffitt, 2006; Manuck & McCaffery, 2014; Moffitt, Caspi, & Rutter, 2006; Rutter, 2007). This body of research indicates that the role of various specific genes identified in previous leadership research (e.g., gene DAT 1) in explaining leadership outcomes may unfold differently depending on the environmental factors. Likewise, the relative importance of genetic and environmental factors for leadership may vary in different environments. It is therefore of great importance to investigate whether and how environmental factors (such as culture or previous life experiences) moderate the relationship between genes and leadership outcomes.

Environment may also have a direct influence on the activity of our genes through epigenetic modifications. Such modifications mainly concern changes to chemical properties and the structure of the DNA that alter gene expression without changing the underlying DNA sequence (Berger, Kouzarides, Shiekhattar, & Shilatifard, 2009; Bird, 2007; Russo, Martienssen & Riggs, 1996; Waddington, 1957). Drawing on animal and human studies, epigenetics research provides convincing evidence that environmental factors may bring about a change to the functioning of

DNA – through epigenetic mechanisms such as methylation of DNA and histone modification (Bernstein, Meissner, & Lander, 2007; Hackman, Farah, & Meaney, 2010; McGowan et al., 2009; Weaver et al., 2004; Yan et al., 2014). Fraga et al. (2005), for example, have reported that monozygotic twins (i.e., twins who are genetically identical) demonstrate epigenetic differences (in terms of DNA methylation and histone acetylation) and that such differences increase over time. In addition, they have found that twins who spend more time apart exhibit greater differences. Zhang and Meaney (2010) provide an excellent review of epigenetics literature that is relevant for psychology research while also concisely explaining key biological concepts (see also Masterpasqua, 2009, for another review). To conclude, research on epigenetics indicate that at least some of the experiences of leaders throughout their lifetime leave their mark on the leaders' DNA, and may in turn influence their traits and behavior. As such, epigenetics may be a key area to consider when studying the dynamic interplay between genes and environment in leadership, and exploring the role of the epigenome in shaping leadership outcomes may be a promising avenue for future research.

Physical Attributes and Leadership

The role of physical attributes on leadership has been attracting great interest in the recent literature. In particular, drawing mainly on evolutionary psychology, this stream of literature focuses mainly on how physical size and facial appearance affect leader emergence and performance, and followers' perceptions of leadership.

Physical height has often been associated with leadership. Scholars found, for example, that taller presidential candidates in the US are likely to attract more votes than shorter rivals and to be re-elected (Stulp, Buunk, Verhulst, & Pollet, 2013). Judge and Cable (2004) conducted one of the most extensive studies on this subject, combining a meta-analysis and four large-scale studies, and

found that there is a significant association between physical height and leader emergence and performance. It is worth noting, however, that in some contexts this physical height was not a predictor of leadership – in sport, for example, where team captains were not significantly taller than their teammates (Elgar, 2016).

Facial cues also play a central role in perceptions of whether an individual make a good leader (Todorov, Olivola, Dotsch, & Mende-Siedlecki, 2015). Even children were found to be able to predict the actual winners of elections just by looking at their pictures, and to do so as accurately as adults (Antonakis & Dalgas, 2009). One of the strongest aspects of facial appearance is the degree of masculinity or femininity. Masculine-looking faces – those characterized by features such as "squared face, strong jawline, pronounced eyebrows, and thin eyes and lips" (Van Vugt & Grabo, 2015, p. 485) – are often perceived as more dominant (Re, DeBruine, Jones, & Perrett, 2013; Todorov et al., 2015), and this in turn is associated with being perceived to be leaders and attaining leadership roles (Mazur, Mazur, & Keating, 1984; Spisak, Homan, Grabo, & Van Vugt, 2012). Feminine-looking faces – those characterized by features such as "round face, big eyes, small eyebrows, and full lips" – are perceived, on the other hand, to be more trustworthy (Van Vugt & Grabo, 2015, p. 486). Another important element of facial appearance is older- vs. younger-looking faces. People often associate an older look with competence and leadership (Spisak, Grabo, Arvey, & van Vugt, 2014). The attractiveness of the face was also found to be an important facial cue which can, for example, predict electoral success or managerial pay awards (Banducci, Karp, Thrasher, & Rallings, 2008; Berggren, Jordahl, & Poutvaara, 2010; Fruhen, Watkins, & Jones, 2015; Rosenberg, Bohan, McCafferty, & Harris, 1986).

Researchers also investigated how the width-to-height ratio of the face relates to leadership. A positive association was found between the width of a male CEO's face relative to its height and the financial performance of the firm (Wong, Ormiston, & Haselhuhn, 2011). This ratio was also

linked to outcomes that are important for leadership emergence and leadership effectiveness, including negotiation performance (Haselhuhn, Wong, Ormiston, Inesi, & Galinsky, 2014), dominance (Valentine, Li, Penke, & Perrett, 2014), and self-perceived power (Haselhuhn & Wong, 2012), although it was also associated with lower trustworthiness (Stirrat & Perrett, 2010) and more unethical behavior (Haselhuhn & Wong, 2012). On a related note, prior research found that symmetrical facial features (and other parts of body such as the length of fingers or width of wrists which are commonly used indicators of developmental stability) were significantly correlated with transformational leadership (but not with transactional leadership) and leadership effectiveness (Senior et al., 2012).

Recently, vocal characteristics have also been observed to be related to leadership outcomes. For instance, the attractiveness of the leader's voice is associated with perceptions of greater leadership effectiveness (DeGroot, Aime, Johnson, & Kluemper, 2011) and followers have been found to prefer leaders with lower-pitched voices (Klofstad, Anderson, & Peters, 2012). Likewise, another study of 792 male CEOs suggests there is a relationship between the voice pitch of CEOs, the size of company they run, and the compensation they receive (Mayew, Parsons, & Venkatachalam, 2013). More specifically, CEOs with deeper voices not only run larger companies and earn more, but also stay in their position for longer. That said, high-pitched voices may also have advantages which research has not yet discovered. For example, an ongoing study of lawyers by Chen, Halberstram and Yu (working paper) shows that less masculine-sounding men and more feminine-sounding women have an advantage in the US Supreme Court.

Recent studies have also provided insight into the moderators of the relationship between physical attributes and leadership outcomes. One such moderator is gender: the 'height effect' (i.e., the positive effect of height for leader emergence) was present both for men and women, but it was stronger for men (Blaker et al., 2013). Another example finding concerns 'babyfaceness', which

was found to be positively related to success for black male leaders, whereas for Caucasian male leaders the association was negative (Livingston & Pearce, 2009). Importantly the leadership preferences were strongly influenced by context. Studies found that taller and more masculine-looking leaders were preferred more in competitive settings (e.g., in wartime) whereas in cooperative settings (e.g., in peace time) the preference was for feminine-looking leaders (Re et al., 2013; Spisak et al., 2012). In addition, people prefer older-looking leaders in times of stable exploitation, but prefer younger-looking leaders when exploratory change is required (Spisak et al., 2014). Finally, conservatives prefer dominant-looking leaders more than liberals (Laustsen & Petersen, 2015).

To conclude, there has been a large body of research on how physical features play a role in leadership. This line of research, perhaps naturally, has a strong emphasis on how leaders are perceived (i.e., it focuses on what characteristics followers attribute to their leaders), rather on actual leader behavior or effectiveness. A potentially fruitful direction to develop a more comprehensive understanding of the link between physical features and leadership would be to identify the boundary conditions for these well-established relationships. Although a number of promising studies have shown that the interpretations placed on the physical features of leaders may depend on individual characteristics of leaders and followers, and on contextual factors (e.g., Laustsen & Petersen, 2015; Livingston & Pearce, 2009; Spisak et al., 2012), more research in this area is needed.

Biological Sex, Gender and Leadership

How women and men differ in terms of leadership emergence, style and effectiveness has long been of interest to researchers and policy-makers. Women are clearly under-represented in managerial roles in organizations, despite notable increases in recent years (Lemoine, Aggarwal, & Steed,

2016). The meta-analyses conducted by Eagly and Karau (1991) confirms this: men were more likely than women to emerge as leaders, although in another meta-analytical study both were found to be equally effective (Eagly, Karau, & Makhijani, 1995). Recent research has indeed found that men over-emerge (or inappropriately emerge) as leaders – that is chances of men becoming leader of a group when in fact they should not is greater than women (Lanaj & Hollenbeck, 2015). This discrepancy is suggested to be due to the social stereotypes of the role of men and women which create a barrier and a negative bias for women as leaders (Eagly & Karau, 2002; S. K. Johnson, Murphy, Zewdie, & Reichard, 2008). That is, scholars have noted that followers perceive women as insufficiently agentic (i.e., competent and dominant) and too emotional to be a successful leader (Brescoll, 2016; Eagly & Karau, 2002; Heilman, 1983; Rosette, Koval, Ma & Livingston, 2016). Furthermore, women who do not act in accordance with the gender stereotypes experience a backlash effect – i.e., they are evaluated negatively and penalized for gender-incongruent behavior (e.g., Heilman & Okimoto; 2007, Okimoto & Brescoll, 2010; Rudman & Phelan, 2008). For example, a recent large-scale study has shown that engaging in ineffective interpersonal behaviors, which is strongly related to gender stereotyping about communality (i.e., women are perceived warmer and kinder than men), is more damaging for female leaders than for male leaders, despite these leaders having similar performance evaluations (Bono et al., 2016).

In addition to leadership emergence and effectiveness, scholars also explored whether there are gender differences in terms of leader behavior. Although an early meta-analysis suggested that women and men do not differ in their leadership styles (Dobbins & Platz, 1986), later meta-analyses covering more studies showed that women demonstrate a more democratic-participative, transformational, and laissez-faire style of leadership, whereas men demonstrated more autocratic-directive leadership (Eagly, Johannesen-Schmidt, & van Engen, 2003; Eagly & Johnson, 1990; van Engen & Willemsen, 2004). In light of these behavioral differences, some scholars argue for

“female leadership advantage“ (i.e., women make a more effective leader than men in contemporary environment) (Eagly and Carli, 2003a) although this has been debated (see Vecchio, 2002; and also the exchanges between Eagly and Carli, 2003a and 2003b, and Vecchio, 2003).

Environmental factors have also been shown to have an impact on whether people prefer women to men as leaders, and how effective women are as leaders. That is, female leaders were more preferred and effective in raising group investments during intragroup competition, whereas in intergroup competition male leaders were more preferred and effective (Van Vugt & Spisak, 2008). Another interesting study showed that whether women emerge as leaders depends on group composition in terms of personality traits and gender in that women are more likely to emerge as leaders when there are more men in the group and the group is high in extraversion (Lemoine et al., 2016).

In sum, the relationship between biological sex/gender and leadership has received growing academic (and public) interest in the past two decades. This line of research has established how perceptions of women leaders differ from those of male leaders, and how these leaders differ in their actual behavior. Although the large number of studies (and meta-analyses) in this area may indicate that the field is fairly mature, we think that it would benefit from some re-examination (especially of follower perceptions). For example, increased public awareness of the gender gap in leadership, thanks to the growing media focus on the issue, may have reduced stereotypical biases against women. Likewise, prominent women figures in leader roles in business and politics, such as Carly Fiorina, the former CEO of Hewlett Packard Corporation who then became a US presidential candidate or the German Chancellor Angela Merkel who was selected as TIME magazine’s ‘person of the year’ in 2015, may also have helped to reduce such biases. Finally, recent studies that have focused on when women leaders are preferred and when they are most effective (e.g., Lemoine, Aggarwal, & Steed, 2016; Van Vugt & Spisak, 2008) have helped to provide a more nuanced

understanding of gender and leadership, but more research is needed regarding the contextual moderators of gender effects.

Neuroscience and Leadership

Thanks to the recent technological advances, the neuroscience perspective in social science research is gaining momentum, and leadership scholars have begun using such tools as functional magnetic resonance imaging (fMRI) and quantitative electroencephalogram (qEEG) to examine the neurological micro-foundations of leadership behaviors (Waldman, Balthazard, & Peterson, 2011b). However, it is worth noting that not all neuroscience research in the field of leadership concerns individual differences. For example, some of these studies investigate followers' neurological reactions to certain kinds of leadership style (e.g., Boyatzis et al., 2012). On the other hand, although relatively few in number, there are some leadership-related studies which focus on stable differences between individuals in terms of brain structure, and these are therefore relevant to our review.

The idea of stable neurological differences goes back to 1970s. In an influential paper, Mintzberg (1976) suggested that people may differ in terms of how developed the right or left hemispheres of their brain are, and that such differences may have important implications for leadership. More specifically, he proposed that effective leadership relies mostly on the right hemisphere of the brain, and thus those with more developed right brains should make better leaders. Evidence from the field of behavioral neuroscience, however, now refutes the idea that individuals can be classified as right-brain or left-brain dominant (Nielsen, Zielinski, Ferguson, Lainhart, & Anderson, 2013). Recent studies provide more detailed examples linking neurological differences to leadership. Scholars have observed, for example, that power-spectral analysis measures based on EEG are 92.5% accurate in classifying transformational leaders (Balthazard,

Waldman, Thatcher, & Hannah, 2012). In another paper, it was found that right frontal coherence – the interconnectedness between the right hemisphere, where the focus is on imagination, creativity, and emotional response, and the frontal part of the brain, which is associated with expressing and regulating emotions – had significant association with socialized visionary communication and marginal association with inspirational/charismatic leadership (Waldman, Balthazard, & Peterson, 2011a). In another study, also focusing on connectivity of different regions in the brain, it was found that less coherence in the neural network of the frontal lobes of the brain is associated with greater adaptive decision-making for military leaders (Hannah, Balthazard, Waldman, Jennings, & Thatcher, 2013).

While neuroscience research focusing directly on leadership is scarce, neuroscience research on human decision-making may provide useful insights, given that decision-making is one of the core activities of leaders and making the right decisions has important implications for leaders' success (Finkelstein & Hambrick, 1996; Useem, Cook, & Sutton, 2005). Although most neuroscience studies are not directly relevant to a review on individual differences (as they often explore the areas in the brain that are activated in response to a sensory input in different decision-making contexts), the research on neuroanatomy is of relevance. This line of research addresses the relationship between brain structure and outcomes related to decision-making, and is promising as it has been shown extensively that the brain structure of an individual can be used to predict his/her decisions and behavior (Berkman & Falk, 2013; Gabrieli, Ghosh, & Whitfield-Gabrieli, 2015). In particular, this research stream can help in identifying how brain structure relates to individuals' decision-making tendencies and capabilities. A recent study, for example, found that gray-matter volume of a region in the right posterior parietal cortex of an individual was positively associated with his/her risk-aversion when making decisions (Gilaie-Dotan et al., 2014). Another study has found that metacognitive ability (defined as the ability to distinguish between correct and incorrect

decisions), which is considered as a key capacity for development of a leader (e.g., Avolio & Hannah, 2008; 2009), is associated with the gray-matter volume in anterior frontal cortex and the white-matter integrity of this area (Fleming, Weil, Nagy, Dolan, & Rees, 2010).

Prior research on neuroscience and decision-making is also particularly useful for identifying particular brain regions that may affect leadership outcomes. Perhaps most promising region in this respect is the ventromedial prefrontal cortex (vmPFC), as numerous studies have identified its central role in social, adaptive, and reward-guided decision-making (Damasio, 1994; Hannah et al., 2013; Rilling & Sanfey, 2011; Ruff & Fehr, 2014; Rushworth, Noonan, Boorman, Walton, & Behrens, 2011; Weller, Levin, Shiv, & Bechara, 2007). It is worth noting that the vmPFC is not the only region associated with decision-making. The studies cited above emphasize a number of other brain regions for specific decision-making processes which are potentially worthy of attention from leadership scholars. For example, the review by Rushworth et al. (2011) emphasized three other areas in the brain associated with reward-guided decision-making: (1) the lateral orbitofrontal cortex, (2) the anterior cingulate cortex, and (3) the anterior lateral prefrontal cortex. Once a region of interest in the brain has been identified, the structural properties of that region could be quantified by measuring its volume, thickness, or density (Gabrieli et al., 2015), and associations between these measures and constructs relating to leadership outcomes could be explored (see Ashburner et al., 2003; Mechelli, Price, Friston, & Ashburner, 2005; Mills & Tamnes, 2014, for more details of suitable neuroimaging techniques and software).

In addition to neuroscience research on decision-making, there are a number of relevant studies that are useful for the purposes of leadership research. For example, there is a significant relationship between personality traits – one of the key antecedents of various leadership behaviors and outcomes (e.g., Antonakis, 2011; Judge & Bono, 2004) – and the volume of different regions of the brain (DeYoung et al., 2010). A series of recent studies examined the neurological antecedents

of exploration and exploitation tendencies (e.g., Laureiro-Martinez, Brusoni, & Zollo, 2010; Laureiro-Martinez, Brusoni, Canessa, & Zollo, 2015), which can play an important role in terms of leadership performance (e.g., Jansen, Vera, & Crossan, 2009; Tuncdogan et al., 2015). Other leadership-related tendencies, behaviors and traits that can be explained by neurological variables include intelligence and its sub-components (e.g., episodic memory), attention control, emotions, emotional reactivity, emotion recognition, sleep patterns, and the successful employment of the executive function, which is strongly linked to self-regulation (e.g., Goel et al., 2010; Nestor et al., 2015; Smith et al., 2011). These studies clearly indicate that exploring the connections between trait theory and behavioral neuroscience offers enormous potential for advancing our understanding of leadership.

Endocrinology and Leadership

The literature on leadership (and the social sciences in general) has recently started to draw on insights from endocrinology by studying the role of hormones in leadership. As important regulators of behavior that influence neurological functioning, hormones hold the potential to extend our understanding of leadership (Antonakis, 2011). Although hormone levels can be manipulated exogenously or can fluctuate according to environmental factors, baseline hormone levels may be considered as an individual difference because they are heritable and exhibit high stability over time (Bendahan, Zehnder, Pralong, & Antonakis, 2015). The nature of the relationship between hormone levels and leadership outcomes is unlikely to differ, whether the hormone level is endogenous (i.e., baseline level) or exogenously manipulated. For example, both exogenous and endogenous testosterone are similar in terms of predicting outcomes (e.g., Bos, Terburg, & van Honk, 2010; Zak et al., 2009). In the light of this, and given the scarcity of research focusing on hormones and leadership, here we review the research without distinguishing between studies that

have focused on state or trait (i.e., baseline) levels.

Most research in this area has examined the role of testosterone and dopamine in influencing the empathy, dominance, or corruption of leaders. Testosterone was of particular interest for leadership as this hormone is linked to numerous social outcomes that are related to leadership, including dominance (e.g., Sellers, Mehl, & Josephs, 2007), entrepreneurship (White, Thornhill, & Hampson, 2006), risk-taking (Sapienza, Zingales, & Maestripieri, 2009), and negotiation performance (Mehta, Mor, & Yap, 2015). In terms of its direct effect on leadership, it was found that testosterone is associated with leaders' dominance when the leader also has a high level of cortisol (Mehta & Josephs, 2010), and that the relationship between power and corruption can be dependent on testosterone (especially when the leader has a great deal of power) (Bendahan, Zehnder, Pralong, & Antonakis, 2015). Notably, in both studies, the association between testosterone and the variables that are related to leadership were dependent on other factors (i.e., power and level of cortisol). In addition, dopamine was found to be related to leaders' empathy (Lee et al., 2009).

Clearly, the research on endocrinology of leadership is in its infancy. More studies are needed to understand what effects testosterone and dopamine may have on other leadership behaviors and outcomes. It is also important to identify the mechanisms through which these hormones impact leader behavior. In addition, there has as yet not been much interest in how other hormones might impact on leadership. One potentially relevant hormone to study may be oxytocin (Antonakis, 2011), as this was found to increase trust among people (Kosfeld, Heinrichs, Zak, Fischbacher, & Fehr, 2005), something that is widely considered to be a crucial element in leadership effectiveness (e.g., Burke, Sims, Lazzara, & Salas, 2007).

Psychological Differences

Personality Traits

Personality traits represent one of the key interfaces between psychological factors and leader behaviors (e.g., Antonakis, 2011), given that they are the precursors of a range of leader behaviors. There is a large body of research on how personality should be parsed into its components, and how many dimensions there should be (e.g., Eysenck's 'Big-Three', the five-factor model or the 'Big-Five', or HEXACO or the 'Big Six'). In this review, we focus on the five-factor model (FFM), given that there is extensive research on this and also some level of consensus around it (Ilies, Arvey, & Bouchard, 2006; Northouse, 2015)[2]. The factors of the FFM can be briefly defined as follows. Extraversion refers to the extent to which a person is energetic, assertive and social (Chamorro-Premuzic & Furnham, 2004). Agreeableness refers to the extent to which a person is helpful, selfless and tolerant (e.g., Witt, Burke, Barrick, & Mount, 2002). Conscientiousness refers to the extent to which a person is organized, self-disciplined and reliable (Bradley, Klotz, Postlethwaite, & Brown, 2013; Turban, Stevens & Lee, 2009). Neuroticism is the extent to which a person experiences negative emotions (Chamorro-Premuzic & Furnham, 2004). Openness to Experience captures the extent to which a person is flexible in thought, ready to imagine new things, and open to new feelings and experiences (Digman, 1990).

In addition to being an important antecedent of leadership behaviors, personality traits have two important roles in leadership research on individual differences. First, because personality traits have physiological traits as precursors, they can provide explanations of how physiological traits

[2] The number of dimensions personality should have has long been debated. This discussion was primarily guided by the theoretical and empirical considerations of explanatory power and robustness/universality. For instance, aiming to capture as much variance in behaviors as possible, most early models on personality traits (e.g., Catell, 1948) included many factors (e.g., 24 in Catell's model), but were not robust. Subsequent research at that time did not find a robust model with more than five dimensions, eventually resulting in the popular five-factor Model (FFM – see Digman, 1990, for a historical review). Today, although there is some level of consensus around the FFM model (Ilies, Arvey, & Bouchard, 2006; Northouse, 2015), the discussion continues. For instance, on the one hand, the more recent HEXACO model extends the FFM by adding the honesty-humility dimension to capture more variance in behavior, such as regarding ethical leadership (e.g., de Vries, 2012). However, on the other hand, in a new study of a largely illiterate, indigenous forager-farmer community living in the Bolivian Amazon, only three factors emerged – namely Extraversion, Agreeableness and Conscientiousness (Gurven, von Rueden, Massenkoff, Kaplan, & Lero Vie, 2013). In other words, these three factors may possibly be the only genuine 'traits' that exist universally across all human populations. That said, a detailed discussion and comparison of different models of personality is beyond the scope of this review.

affect leader behavior. For instance, the dopamine D4 receptor (DRD4) gene and face shape are significant predictors of the extraversion trait (Borkenau, Brecke, Möttig, & Paelecke, 2009; Munafò, Yalcin, Willis-Owen, & Flint, 2008), which is associated with a number of other leader behaviors such as transformational leadership (e.g., Judge & Bono, 2004; Reichard et al., 2011). Second, personality traits are the precursors of many other trait-like factors, such as regulatory focus (Gorman et al., 2012; Lanaj, Chang, & Johnson, 2012), which may have an effect on leader behaviors.

Due to the long-standing research interest in this area, the multifaceted nature of personality, and the vast number of different constructs in the leadership field, numerous links have been found between personality traits and leadership behaviors. Hence, the list of examples we provide below should be considered only as illustrative, not exhaustive. For instance, all five traits are associated with transformational leadership behaviors, all positively except for neuroticism, and extraversion has the strongest association (Judge & Bono, 2004; Reichard et al., 2011). In fact, not only are the leaders' levels of extraversion linked to their transformational leadership behaviors, but so too are the extraversion levels of their followers (Moss, Ritossa & Ngu, 2006). In contrast, the relationship between transactional leadership behaviors and traits is less direct, and agreeableness is found to be the strongest predictor of the contingent reward dimension of the transactional leadership construct (Judge & Bono, 2004). Agreeableness is also suggested to be an antecedent of servant leadership behaviors (Washington, Sutton & Feild, 2006). One of the benefits of openness to experience is that it stimulates increased engagement in creative behavior (George & Zhou, 2001), whereas conscientiousness is a key component of productivity both for the leader and the followers (e.g., Colbert & Witt, 2009). In contrast to the other four traits, the direct effects of leaders' neuroticism are generally undesirable, although under specific circumstances neuroticism can be beneficial as well. For example, in busy environments neurotic individuals tend to outperform their peers

(Smillie, Yeo, Furnham & Jackson, 2006), and in dynamic environments neurotic leaders are perceived to be more charismatic (De Hoogh, Den Hartog, & Koopman, 2005).

Traits are also found to be associated with the potential of an individual to become a leader. For example, a meta-analytical study by Judge, Bono, Ilies and Gerhardt (2002) found that extraversion, conscientiousness and openness to experience correlate positively with leader emergence, and that neuroticism correlates negatively. In a similar direction, a recent longitudinal study found that extraversion scores at the age of seventeen predicted leader emergence at the age of twenty-nine (Reichard et al., 2011).

The relationship between personality traits and leadership performance is quite complicated, for at least two reasons. Firstly, personality traits have effects on various leadership behaviors as well as psychological variables. These variables which mediate the effects of traits on leadership performance interact with each other as well as with external factors such as environmental dynamism (e.g., Jansen, Vera, & Crossan, 2009). Secondly, these also depend on how leadership and leadership performance are defined – for example, whether the object of study is assigned leaders (e.g., managers) or emergent leaders. For instance, an earlier meta-analytical study by Barrick and Mount (1991) had suggested that conscientiousness is by far the most important predictor of managerial performance. Likewise, a more recent study a more recent study which used 360-degree feedback with 67 management executives suggested that conscientiousness is the only trait which predicts leadership performance, when the ratings of superiors, peers and subordinates are looked at separately (Strang & Kuhnert, 2009). In contrast, the meta-analysis by Judge and colleagues (2002) included studies on both assigned and emergent leaders. Their findings suggest that, while conscientiousness is again a key variable, extraversion plays an even more important role in terms of leadership performance.

In sum, although the literature on personality is a mature one, its key role in explaining

behavior means that it still offers many opportunities for future research. For example, there has been only limited research to date examining the personality traits of followers or the interactions between the personality traits of the followers and the various characteristics of the leader (e.g., the physical and psychological differences we discuss in this review). Likewise, more research is needed on the relationship between physical traits and personality traits, and their leadership-related outcomes.

Dark-Triad Personality Traits

Research on dark-triad personality traits has focused on three socially aversive personality traits, namely psychopathy, narcissism, and Machiavellianism (Furnham, Richards & Paulhus, 2013; Petrides, Vernon, Schermer, & Veselka, 2011; Paulhus & Williams, 2002). Psychopathy refers to impulsiveness, thrill-seeking and a lack of empathy, narcissism refers to a grandiose view of the self and a feeling of entitlement, and Machiavellianism refers to a manipulative personality (Petrides et al., 2011; Paulhus & Williams, 2002). These are higher-order traits that have associations with, but are distinct from, normal personality traits, and most personality models, including the FFM, do not directly capture variance in this area[3]. Although the results are somewhat mixed, all three dark-triad personality traits tend to be negatively associated with agreeableness, Machiavellianism is generally associated with low conscientiousness, psychopathy with low neuroticism, and narcissism with high extraversion (e.g., Jonason & McCain, 2012; Lee & Ashton, 2005; Paulhus & Williams, 2002). Besides personality, other traits associated with the dark triad traits include low emotional intelligence (Jonason & Tost, 2010) and low self-control (Petrides et al., 2011). With the exception of high extraversion associated with narcissism, these associations

[3] In line with our focus on the FFM in the personality traits sections and due to space considerations, we only report associations between dark-triad personality traits and the FFM. It is, however, worth noting that prior research has shown that some factors in other personality frameworks are related to dark-triad personality traits. For instance, the honesty-humility factor of the HEXACO framework (Furnham et al., 2013), defined by such things as fairness, sincerity and greed-avoidance (e.g., de Vries, 2012), is found to have a strong negative correlation with the dark-triad traits (Jonason & McCain, 2012), and all three dark-triad traits loaded on the honesty-humility dimension when a factor analysis was conducted (Lee & Ashton, 2005).

are generally harmful for work and leadership purposes.

Dark-triad personality traits generally have a negative impact in terms of leadership performance (e.g., Furnham et al., 2013; Mathieu, Neumann, Hare, & Babiak, 2013). However, these traits can sometimes provide advantages to the individual, albeit at the cost of the followers or the organization. For instance, when coupled with high intelligence, dark-triad personality traits, especially Machiavellianism and narcissism, can be advantageous for leader emergence, which further amplifies the negative effects of dark-triad personalities (e.g., Spurk, Keller, & Hirschi, 2015; Paunonen, Lönnqvist, Verkasalo, Leikas, & Nissinen, 2006). A similar example is that narcissism is positively associated with CEO compensation but also with a larger pay gap between the CEO and the other members of the team (O'Reilly, Doerr, Caldwell, & Chatman, 2014). There also are circumstances under which a narcissistic leader can potentially benefit the organization. For instance, when a CEO identifies himself or herself strongly with the organization, narcissism serves to increase behavioral integration within the top management team, and increase firm performance (Reina, Zhang, & Peterson, 2014). Of these three, psychopathy seems to be the most harmful trait overall, with negative effects both for the leader (Spurk et al., 2015) and his or her followers (Mathieu et al., 2013).

To recap, most research until now has focused on the destructive effects of leaders' dark-triad personalities, and there are some recent papers that focus on potential advantages. However, there are many under-explored routes in this field of research. For example, we know relatively little about the interaction between the dark-triad personality traits of leaders and followers, and which external factors (e.g., organizational structures) moderate this interaction. For instance, leader–member exchange and performance may potentially be increased if both sides have similar levels of Machiavellianism and are subject to collective, as opposed to individual, performance evaluation. Moreover, it is necessary to better understand the prevalence of these (generally)

destructive characteristics in different populations and industries, as this information is crucial for organizations in deciding whether to deal with these individuals using appropriate organizational procedures or simply to try to avoid hiring them.

Intelligence

Intelligence is one of the key areas of research in individual differences, and it is considered by some researchers as the single most important construct in this area, or even in all of psychology (e.g., Schmidt & Hunter, 2000, p. 4). This strong research interest stems primarily from the explanatory and predictive powers of this construct. For instance, in comparison to numerous other constructs, intelligence has a superior ability to account for and predict academic, work and leadership performance among others (e.g., Cavazotte, Moreno, & Hickman, 2012; Lord, de Vader, & Alliger, 1986; O'Boyle, Humphrey, Pollack, Hawver, & Story, 2011). However, due to its complexity, intelligence has also been one of the most difficult concepts to define and measure.

When we examine the history of intelligence research, we see two dominant perspectives: general intelligence and Gardner's Theory of Multiple Intelligences. The first of these dates back more than a hundred years (e.g., Spearman, 1904), and considers intelligence as a unitary construct, known as the 'g factor' or the IQ. According to this perspective, intelligence refers to "the ability to reason deductively or inductively, think abstractly, use analogies, synthesize information, and apply it in new domains" (Kanazawa, 2010, p. 281). Criticizing this unitary intelligence perspective, Gardner suggested that each of the isolated abilities of the brain should be described separately as an intelligence, and identified a number of different intelligences which included linguistic, logical-mathematical, musical, bodily-kinesthetic, spatial, naturalistic, existential, interpersonal and intrapersonal intelligences (Gardner, 1985; 2000). Building upon Gardner's perspective, Daniel Goleman developed the concept of emotional intelligence (EI) which corresponds broadly to the

interpersonal intelligence and intrapersonal intelligence dimensions of Gardner's model (Goleman, 2011). Based on this definition, EI should explain a different part of variance observed in behavior and performance than the traditional IQ construct, and there are empirical studies which support this hypothesis (e.g., see O'Boyle, Humphrey, Pollack, Hawver, & Story, 2011, for a meta-analysis). Certainly, there also are numerous criticisms of this construct and of how the EI research is progressing so far (for critical reviews of the EI construct and its three main research streams, see Walter, Cole, & Humphrey 2011, Zeidner, Roberts, & Matthews, 2008, and Antonakis, Ashkanasy, & Dasborough, 2009). We will not delve further into this discussion as it is beyond the scope of this paper, but instead provide an overview of the research addressing how IQ and EI are related to leadership.

IQ has both direct and indirect links with leadership. First of all, "IQ is a very good predictor of work success, management performance, training success and leadership" (Antonakis, Ashkanasy & Dasborough, 2009, p. 248). Various studies and meta-analyses confirm that it is the best or one of the best predictors of performance in a range of tasks, including work, academia and leadership, and in a range of different contexts (e.g., Cavazotte et al., 2012; Judge et al., 2004; Lord et al., 1986; O'Boyle et al., 2011). For instance, a recent study on military leaders suggests that IQ is a significant predictor of leadership performance in terms of both domestic and cross-border responsibilities (Rockstuhl, Seiler, Ang, van Dyne, & Annen, 2011). Another study examines presidents of the United States, and finds a relationship between estimations of IQ and leadership performance (Simonton, 2006). Yet another study on middle managers finds that the effect of IQ on leadership performance is even stronger than that of any personality trait or of emotional intelligence (Cavazotte, Moreno, & Hickmann, 2012). In sum, there is a clear relationship between IQ and leadership performance.

In terms of leadership emergence, the relationship seems to be modest but positive and

significant (Judge et al., 2002), although there are some contradictory results as well. For instance, a recent study by Guerin and colleagues (2011) suggests that IQ (as measured during adolescence) does not predict one's potential to emerge as a leader. Likewise, they did not find an effect of IQ through its interaction with extraversion (Guering et al., 2011). One potential reason for these small to non-significant results observed between IQ and leadership emergence may be because IQ is not associated with the motivation to lead (e.g., Gottfried et al., 2011). On the other hand, considering the strong link between IQ and leadership performance, this raises the question of whether the individuals who tend to become leaders are the ones who are most capable of leading, which is one of the key dilemmas in the leadership literature (e.g., Hogg & Terry, 2000).

IQ also has a significant positive correlation with the openness to experience factor of personality (Chamorro-Premuzic & Furnham, 2004), which is associated with a number of behaviors relevant for leadership, such as creative behavior (George & Zhou, 2001) and transformational leadership (Judge & Bono, 2004; Reichard et al., 2011). In line with this, Cavazotte et al. (2012) report a positive relationship between IQ and transformational leadership. The correlations between other personality traits and IQ are very small, and observed possibly due to instrumentation effects, rather than actual associations between the constructs (Chamorro-Premuzic & Furnham, 2004).

The performance effects of EI are also almost always positive. For instance, a number of studies suggest a positive relationship between EI and performance in academic, work and leadership tasks (e.g., George, 2000; Van der Zee, Thijs, & Schakel, 2002; Wong & Law, 2002). In line with these examples, a recent meta-analysis of the literature suggested a positive significant association between EI and job performance (O'Boyle et al., 2011, p. 796). In contrast, another meta-analysis suggested that the association with performance is positive only if the job requires high emotional labor (Joseph & Newman, 2010), defined here as functions that involve

interpersonal relationships, such as leadership activities (e.g., influencing followers) (e.g., Gardner, Fisher, & Hunt, 2009; Humphrey, Pollack, & Hawver, 2008; Joseph & Newman, 2010, p. 69). Positive effects of EI on antecedents of performance include increased organizational citizenship behaviors, better mental health and improved interpersonal relations as well as lower levels of counter-productive work behaviors, deviant behaviors or stress (e.g., Brackett, Mayer, & Warner, 2004; Ciarroci, Deane, & Anderson, 2002; Jung & Yoon, 2012).

EI has also been found to have effects on specifically leadership-related behaviors and outcomes. For instance, a recent meta-analysis study suggested an association between EI and transformational leadership (Harms & Crede, 2010), and further research revealed a mediation effect of EI on team effectiveness via transformational leadership (Hur, van den Berg, & Wilderom, 2011). Cavazotte, Moreno and Hickman (2012) also observed a positive effect of EI on transformational leadership, although the effect disappeared when they controlled for cognitive intelligence and personality. EI also plays a key role in leadership emergence. For example, the study by Cote, Lopes, Salovey and Miners (2011) finds that high EI individuals are more likely to emerge as leaders in small groups. Moreover, EI is found to be associated with some or all of the dimensions of the FFM personality model, which, as discussed previously, are associated with various leadership behaviors and outcomes. For instance, using both self-ratings and ratings by others, the study by Van der Zee, Thijs and Schakel (2002, p. 116) suggests an association between the empathy dimension of emotional intelligence and extraversion as well as between the autonomy dimension of EI and openness of experience. Likewise, the findings of Lopes, Salovey and Straus (2003, p. 649) demonstrate a positive association between participants' total scores on the Mayer, Salovey, Caruso Emotional Intelligence Test (MSCEIT) and their scores on agreeableness, conscientiousness and openness to experience. The recent meta-analysis by O'Boyle and colleagues (2011) suggests that emotional intelligence is positively related to all dimensions of the FFM except

neuroticism, with which the relationship is negative.

All in all, intelligence variables are among the most powerful variables for explaining performance. However, there also is little consensus in the field regarding how intelligence, especially emotional intelligence, should be conceptualized. In other words, key challenges for future research on intelligence include clarifying the definitions of the relevant concepts within the intelligence literature and finding better ways of measuring them. Furthermore, until now research has focused primarily on leadership performance, emergence and style. Future studies should also investigate the effects on more specific behaviors and preferences as well as potential interactions with different external factors (e.g., environmental, contextual and organizational characteristics).

Self-Regulation

Self-regulation, self-control or 'willpower' refers to "the capacity to alter one's responses, such as by overriding some impulses in order to bring behavior in line with goals and standards" (Mead, Baumeister, Gino, Schweitzer, & Ariely, 2009, p. 594). In other words, actions such as responding kindly to an annoying customer despite being very frustrated, or getting yourself to work despite having no desire to do so, are examples of situations where an individual has to exert self-control. That is, because in these situations inner urges conflict with goals, the individual forces him- or herself to act in a way other than he or she naturally would. The capacity to exert self-control is different for every individual; this difference between individuals already exists at a very young age, and is a key predictor of performance and success (e.g., Mischel et al., 2011; Mischel, 2014). Research on self-regulation started in the 1960s, with the 'marshmallow tests' of Walter Mischel. More specifically, in a series of experiments, preschoolers were given a marshmallow, and were told that if they could wait for a period of time (e.g., 15 minutes) without eating it, they could have a second marshmallow. Life-span observation of these children revealed a remarkable

difference in terms of the extent to which these individuals were successful in later life. For example, by the time they were adults, the children that did not eat the marshmallow had a significantly better education, were less likely to be obese, to engage in crime, or to use drugs, and had better physical and mental health overall (Mischel et al., 2011; Mischel, 2014; Tangney, Baumeister, & Boone, 2004). This essentially suggests that there are relatively stable, trait-like differences between people regarding their capacity to self-regulate.

The capacity for self-regulation plays an important role in leadership processes. First, it is an important precursor of task and leadership performance (e.g., Ariely & Wertenbroch, 2002; Ashford & Tsui, 1991; Tangney et al., 2004). In terms of more specific leadership behaviors, a recent study suggests that factors which signify a depletion of self-regulatory resources, such as depression, anxiety and alcohol consumption in the workplace, are negatively associated with transformational leadership and positively associated with abusive supervision and other destructive leadership behaviors (Bryne et al., 2014). Sleep deprivation is another depleting factor. Recent studies suggest that depletion as a result of sleep deprivation is associated with abusive supervision, which negatively affects followers' work engagement (Barnes, Lucianetti, Bhave, & Christian, 2015). Self-regulation can also reduce the effects of other psychological variables on abusive supervision (e.g., Kiewitz, Restubog, Zagenczyk, Scott, Garcia, & Tang, 2012). Interestingly, because ethical leadership behaviors require the use of self-regulatory resources, especially when there are other factors that may deplete self-regulatory resources (e.g., sleep deprivation) they may subsequently result in abusive supervision as well (e.g., Lin, Ma, & Johnson, 2016). Depletion of self-regulatory resources is also associated with dishonest behaviors, such as cheating and deception (e.g., Mead et al., 2009). Furthermore, the desirable effects of various other concepts such as emotional intelligence, self-leadership and authentic leadership run partially or fully through the self-regulation processes of the leader and the followers (e.g., Christian & Ellis, 2011; Gardner, Avolio,

Luthans, May, & Walumba, 2005).

There are still a number of key areas which should be explored further in leadership research. First, most of the current research on self-regulation focuses on the effects of depletion, but in recent years there has been much debate on whether self-regulation is really subject to depletion (e.g., Job, Dweck, & Walton, 2010; Inzlicht, Schmeichel, & Macrae, 2014). In other words, the effects observed in these studies may potentially be explained better through other theoretical mechanisms. Secondly, the extent to which self-regulation is stable over an individual's lifetime is relatively unclear. For instance, it has been suggested that, like a muscle, the capacity for self-regulation can be trained and increased through regular exertion of self-control (e.g., Muraven & Baumeister, 2000). If such an effect can be demonstrated, the impact for leadership and leadership education would be significant. Finally, it has been theorized that leaders may be able to affect the self-regulatory processes of their followers through their influence on the followers' self-concepts (e.g., Lord & Brown, 2001), but again more research is needed in this area.

Chronic Regulatory Focus

Regulatory focus theory (Higgins, 1997, 1998) is an extension to the basic principle of avoiding pain and approaching pleasure, which underlies all motivational models in psychology (Higgins, 1998). According to regulatory focus theory, avoiding pain (prevention focus) and approaching pleasure (promotion focus) are two fundamentally distinct self-regulatory orientations (Johnson, Smith, Wallace, Hill, & Baron, 2015; Stam, van Knippenberg, & Wisse, 2010a). Chronically promotion-focused individuals aim to maximize their gains by means of eager strategies, whereas chronically prevention-focused individuals try to protect themselves from potential threats by using vigilant strategies (Higgins, 1997; Hamstra, Van Yperen, Wisse, & Sassenberg, 2011). In other words, because they are "concerned with advancement, growth,

aspirations and accomplishment" (Shah, Higgins & Friedman, 1998, p. 287), chronically promotion-focused individuals are inclined to try to reach maximal goals (Pennington & Roese, 2003; Wu, McMullen, Neubert, & Yi, 2008) by "insur[ing] 'hits' and insur[ing] against errors of omission" (Crowe & Higgins, 1997, p. 120). On the other hand, because they are "concerned with security, responsibilities and safety" (Shah et al., 1998, p. 287), chronically prevention-focused individuals have the inclination to reach minimal goals (Pennington & Roese, 2003; Wu et al., 2008), through "attain[ing] correct rejections and avoid[ing] errors of commission (i.e. making a mistake)" (Crowe & Higgins, 1997, p. 120).

This simple but powerful distinction has been examined as an antecedent of various behaviors relevant for leadership. For example, regulatory focus is an antecedent of transformational and transactional leadership, with promotion focus being associated with transformational leadership and prevention focus with transactional leadership (Kark & van Dijk, 2007). Promotion-focused leaders increase the creativity of followers (Wu et al., 2008), whereas prevention-focused leaders are better at recognizing impending threats (McMullen, Shepherd, & Patzelt, 2009). The regulatory focus of the CEO affects the performance level of small firms such that firms with a promotion-focused CEO are better off in more dynamic environments while those with a prevention-focused CEO fare better in more stable environments (Wallace, Little, Hill, & Ridge, 2010). Leaders' chronic regulatory foci are also associated with their exploration and exploitation activities (Tuncdogan et al., 2015). More specifically, regulatory focus mediates the effect of leaders' personality traits on their exploration and exploitation activities. Hence, regulatory focus is also related to personality traits. In particular, according to a recent meta-analysis, extraversion, openness to experience, agreeableness and conscientiousness are antecedents of promotion focus, whereas conscientiousness and neuroticism are antecedents of prevention focus (Lanaj, Chang, & Johnson, 2012). Other leadership-related constructs with which regulatory focus

is associated include leader–member exchange, innovative performance, organizational citizenship behaviors, counterproductive behaviors, continuance commitment, affective commitment, and job satisfaction (Gorman et al., 2012; Lanaj et al., 2012).

The fit or mismatch between leaders' and followers' chronic regulatory foci is also found to have important effects. For example, a promotion-focused appeal tends to be more effective with a promotion-focused follower, whereas a prevention-focused appeal is more effective with a prevention-focused follower (Stam, van Knippenberg, & Wisse, 2010b). Similarly, non-verbal cues (e.g., body language) that suggest a certain type of regulatory focus also increase the effectiveness of the message being conveyed when they match the recipient's own regulatory focus (Cesario & Higgins, 2008). Furthermore, as previously indicated, there is a relationship between promotion focus and transformational leadership as well as between prevention focus and transactional leadership (Kark & van Dijk, 2007). In line with this, another study has shown that the fit between the leadership style and the followers' regulatory focus makes followers less inclined to leave the organization (Hamstra et al., 2011). For instance, when a leader has a transformational leadership style (associated with promotion focus – e.g., Kark & van Dijk, 2007), promotion-focused followers are less likely to leave.

In brief, the widespread interest in regulatory focus theory within the leadership literature is relatively recent, and the effects of chronic regulatory focus on a range of leadership behaviors and styles have not yet been investigated. Likewise, we have very little knowledge regarding the consequences of the interaction between leaders' chronic regulatory foci and different external influences. For instance, while we know that promotion-focused leaders are better in dynamic environments (Wallace et al., 2010), there are many other environmental, contextual and organizational characteristics that may interact with chronic regulatory focus and affect performance. Moreover, there are many outcomes other than performance that may be affected by

the interaction between a leader's chronic regulatory focus and the external environment (e.g., leadership emergence). Finally, more research is needed regarding how different compositions of chronic regulatory focus and various moderating factors affect relationships between leaders and their followers, between leaders and other leaders (e.g., the behavioral integration of a management team), and between groups of leaders and groups of followers (e.g., between the national committee of a ruling political party and different groups of citizens).

Background Characteristics

Background characteristics are distal variables, and most of their effects run through other physiological and psychological traits and trait-like variables. The number of traits they are related to can be quite large, and their potential effects through these multiple other variables make them important trait-like characteristics which are worth investigating to understand leader behavior. In this review, we are going to consider two key background variables: date of birth (age) and family.

Date of Birth (Age). Date of birth is associated with numerous variables affecting leaders' behaviors, and these include variables relating to physiological and psychological characteristics as well as other background characteristics such as the generation into which one is born.

Physiologically, age has both visible and latent effects on the human body, and these affect leadership behaviors and outcomes. An example of visible physiological changes would be the association between age and height, not only because people start losing height around the age of 30 (Sorkin, Muller, & Andres, 1999), but also because the average human height has been increasing for quite a long time, with every generation getting taller (e.g., Cavelaars et al., 2000; Cline, Meredith, Boyer, & Burrows, 1989). Hence, this may put some older individuals at a relative disadvantage in terms of emerging as a leader, as height tends to be helpful in this area (e.g., Stulp

et al., 2013). Certainly, this relative disadvantage may potentially be compensated for by other factors, such as experience and expertise. An example of latent physiological change would be the relationship between age and hormone levels. For instance, sex steroids tend to decrease with age (Leifke et al., 2000). For the purposes of leadership, these changes may have both negative and positive consequences. For example, while a high level of baseline testosterone is known to have potentially useful effects in areas such as making individuals more dominant (Sellers, Mehl & Josephs, 2007) and better at negotiation (Haselhuhn, Wong, Ormiston, Inesi, & Galinsky, 2014), it is also associated with undesirable behaviors such as aggression (Mehta & Beer, 2010) and corruption (Bendahan, Zehnder, Pralong, & Antonakis, 2015).

Age also has effects on an individual's psychological profile. For instance, with age, intelligence shifts from being fairly fluid to becoming more crystallized (Craik & Bialystok, 2006), and both of these intelligence structures offer different kinds of benefits for leaders (e.g., Spisak, Grabo, Arvey, & van Vugt, 2014). In other words, leaders of different ages are better equipped for different types of cognitive task, and thus offer particular types of contribution to the organization. Age is also associated with changes in FFM personality profiles (Soto, John, Gosling, & Potter, 2011), and some of these changes, such as the continuous increase in conscientiousness and openness to experience or the decrease in neuroticism, are generally positive from a leadership point of view.

There are numerous other leadership-related effects of the date of birth/age factor. For instance, the date of birth also determines which the generation an individual belongs to, and that can affect the values of the individual (e.g., Noble, Haytko & Phillips, 2009). The values of an individual, in turn, affect his or her leadership behaviors and outcomes, such as the preference for a particular leadership style (e.g., Sosik, 2005), the salient values of followers (e.g., Hogg & Terry, 2000; Lord & Brown, 2001) and his or her effectiveness as a leader (e.g., Reave, 2005).

Furthermore, not only the year of birth, but also the month of birth can significantly affect individuals' general and leadership-related behaviors throughout their lifetime (Murphy & Johnson, 2011, p. 462). For example, children whose birthdays are earlier in the school year are more likely to do well academically (not only in elementary school, but at college as well – Bedard & Dhuey, 2006). They are also more likely to excel at sport (Musch & Grondin, 2001) and to emerge as leaders in high school (Dhuey & Lipscomb, 2008). A history of educational success is a well-known antecedent of progression to formal leadership positions (e.g., Kirschmeyer, 1998). More recent research suggests that participation in sports is also associated with higher leadership positions later in life (e.g., Kniffin, Wanskink, & Shimizu, 2015).

This sub-literature would benefit from more research in at least three directions. First, studies show that individuals of different ages are better suited to different tasks, but more research is needed in this area, especially regarding the advantages (as opposed to disadvantages) of being older. Second, more longitudinal studies are necessary to examine, for instance, the leadership-related tendencies and behaviors of the same individuals at different ages. Finally, while there are various studies which incorporate age as a variable, there are few connections between these studies. Hence, this sub-literature would benefit from comprehensive theoretical frameworks.

Family. Family background provides a set of developmental factors that are important in determining an individual's other traits, and therefore leadership behaviors. To begin with, family-related factors such as parenting style play a key role in the development of normal and dark-triad personality traits during infancy (e.g., De Clercq, Van Leeuwen, De Fruyt, Van Hiel, & Mervielde, 2008; Martin, Côté, & Woodruff, 2016; Reti, Samuels, Eaton, Bienvenu Iii, Costa Jr, & Nestadt, 2002). An individual's chronic regulatory focus also depends on his or her upbringing (Keller, 2008). Likewise, the parents' use of undermining behaviors (e.g., insults, silent treatment) during an

individual's upbringing increases his or her chances of becoming an abusive leader later on (Kiewitz et al., 2012). Intelligence as well as a wide range of physical traits depends on the genetic heritage of the family (e.g., Bates, Hansell, Martin, & Wright, 2016). Similarly, the development of emotional intelligence is contingent upon both genetic heritage and child–parent interaction (Zeidner, Matthews, Roberts, & MacCann, 2003). Culture is associated with the family's location and ethnicity among other factors, and these are in turn associated with the emergence of certain personality traits (Schmitt, Allik, McCrae, & Benet-Martínez, 2007).

Other family-related factors that affect the individual throughout life include socio-economic background, minority status, birth order, family size and parental attention (e.g., Hambrick & Mason, 1984; Martin et al., 2016; Murphy & Johnson, 2011). For instance, whether one comes from a group with majority or minority status has an effect on one's likelihood of emerging as a natural leader, or at least on the strategy one needs to employ to attain leadership status (e.g., Hogg & Terry, 2000).

Finally, it is not only an individual's family during childhood which has important effects on leadership behaviors, but also the subsequent family. For instance, marriage can change leaders' attitudes to risk, and decreases their inclination to invest aggressively (e.g., Roussanov & Savor, 2014). While there are various possible explanations for this phenomenon, one reason may be the legal side of the marriage contract itself. The behavior of their spouses can also affect leaders' behavior and performance. For instance, in family-controlled corporations, the type of role assumed by the CEO's spouse affects how long he or she is likely to remain as CEO (Poza & Messer, 2001). Similarly, individuals' relationships with their spouses affect their self-regulation capabilities in a variety of ways (e.g., Fitzsimmons & Finkel, 2010), with important consequences for leadership behaviors and performance (e.g., Barnes et al., 2015; Bryne et al., 2014; Tangney et al., 2004). Also the birth of a child can have a significant impact on leaders, especially on females (e.g., Smith,

Smith, & Verner, 2013; Tatli, Ozturk, & Woo, 2016). Surprisingly, whether the newborn baby is a boy or a girl also affects leaders' everyday behavior. For instance, a study of male CEOs suggests that when a CEO has a male child, this has a significant negative effect on employee salaries (Dahl, Dezső, & Ross, 2012). In contrast, the effect on salaries of a female child is either positive or less negative, depending on the birth order (e.g., whether it is the first child or the second one etc.). Similarly, for all CEOs, having a daughter has a positive effect on corporate social responsibility ratings (Cronqvist & Yu, 2015).

Research on family-related factors is conducted primarily under the umbrella of the upper-echelons literature (i.e. Hambrick, 2007; Hambrick & Mason, 1984), which has three important limitations in terms of the leadership literature. First, this stream of research focuses predominantly on assigned leaders (e.g., managers) but pays much less attention to emergent leaders. Second, by definition, the upper-echelons literature focuses on the individuals in top leadership positions, but leaders at lower levels of the hierarchy are also known to have effects on the whole system (e.g., Floyd & Lane, 2000). Finally, the upper-echelons literature focuses mainly on the characteristics of the leader, and less on those of the followers. In sum, from the perspective of the leadership literature, some aspects of family-related characteristics have been researched thoroughly, but others have been largely overlooked.

Towards an Understanding of Multi-Level Outcomes: A Research Agenda

We organize our research agenda around the leadership process model presented by Antonakis and colleagues (Antonakis, Day, & Schyns, 2012). We start by discussing a research agenda for all elements in the model – distal predictors (traits), proximal predictors (leader behavior and follower effects), and multi-level outcomes. We then also discuss issues related to context and to the dynamics of the model as a whole.

Distal Predictors of Leadership: Traits

Under-explored traits. In general, of the three types of individual differences we have discussed – physiological, psychological, and background – background differences and some of the physiological traits (e.g., hormones and neuroscience) seem to be the least investigated. Given that these traits can have a major influence on leadership outcomes (as we explained in detail in this review), we see a clear opportunity for more research in this area.

However, with the other categories there is also an opportunity for research on additional individual differences. First, while the dark triad has recently been investigated quite extensively, there seems to be less research on traits that have opposite effect to those in the dark triad, i.e. that cause leaders to act in line with morals and ethics, to be friendly, and to help others. Exceptions are the honesty-humility dimension of the HEXACO model of personality that explains variance regarding ethical leadership (e.g., de Vries, 2012) and possibly chronic pro-social value orientation (van Dijk and de Cremer, 2006). Identifying more traits that cause such positive effects is very important as a complement to the dark triad research.

Second, although, research on regulatory focus is an important addition to the field of leadership (see the section on self-regulation and regulatory focus), there are other constructs relating to self-regulatory strategies that also have the potential to explain unique variance in leader behavior. An obvious candidate is goal-orientation, the extent to which individuals are oriented toward performance or learning. Dragoni (2005) provides a good argument for how the goal orientation of leaders may be important (see also Hendricks and Payne, 2007).

Third, although there is a multitude of research covering the effect of leader scores on the 'Big Five', there is relatively little research on the more fine-grained sub-facets of this. Indeed underlying the five main dimensions of personality lie a number of other more fine-grained personality elements. For instance, elements related to conscientiousness include dutifulness, self-

discipline, order and achievement striving. These more specific elements may provide a more precise basis for hypothesizing and for predicting leadership outcomes. An example of this type of research is the study by Marinova and colleagues (2013) who find that two sub-facets of conscientiousness (duty and striving for achievement) influence leadership emergence in different ways.

Simultaneous Modeling Effects of Different Leader Traits. While it is important to investigate new or underexplored leader traits, it is also important for trait research not to focus on proliferating constructs (particularly psychological traits, given the extensive research on this area already), but on identifying the most significant traits (Antonakis, Ashkanasy, & Dasborough, 2009; DeRue, Nahrgang, Wellman, & Humphrey, 2011). A reasonable starting point for combining the enormous variety of different traits is to model them simultaneously as traits are often correlated with each other (Antonakis et al., 2012). Indeed, in order to estimate accurately what impact a trait may have on a particular leadership outcome and how it contributes incrementally to explaining that outcome relative to other traits, it needs to be modeled together with these other traits (Antonakis, Bendahan, Jacquart, & Lalive, 2010).

We therefore suggest that future studies should include physiological individual differences, psychological differences and differences in backgrounds simultaneously within their model in order to understand which traits *actually* explain leadership behavior and outcomes and which do not. For example, prior research has shown that intelligence and certain personality (i.e., openness to experience and extraversion) are significantly correlated with each other and with leadership effectiveness (Ackerman & Heggestad, 1997; Judge, Jackson, Shaw, Scott, & Rich, 2007; Judge, Bono, Ilies, & Gerhardt, 2002; Judge, Colbert, & Ilies, 2004). Given that intelligence and personality traits were not included simultaneously in most models that predict leadership outcomes, it is impossible to assess the relative validity of these individual differences. Indeed

DeRue et al. (2011) found that when intelligence is included together with Big Five personality traits in the model, the predictive capability of intelligence for leadership effectiveness is reduced – i.e., personality traits have greater relative validity than intelligence. Research which demonstrates a genetic overlap between leadership style and Big Five personality (Johnson et al., 2004), for example, indicates that it is crucial to include both physiological and psychological traits in leadership models in order to identify independent predictors of leadership outcomes and avoid construct proliferation that will hinder the advance of the trait theory of leadership.

Importantly, modeling different types of individual differences at the same time also allows us to investigate their relative place in a causal chain. An important step in getting to a stronger trait theory of leadership is to go beyond explaining whether or not a relationship between a trait and outcome exists, and to explain instead *why* a trait leads to a particular outcome – i.e., what the mediating mechanisms are (Whetten, 1989). Here we specifically emphasize the potential mediating role of psychological traits in the relationship between physiological or background traits and further leadership outcomes. Indeed, although we consider all types of traits (physiological, psychological and background traits) under distal predictors of leadership category, some of these traits are more *distal* to behavior than others. The most distal of all are leaders' genetics, which do not determine behavior directly but instead express themselves in other less *distant* variables such as endocrinology (White et al., 2006). Perhaps more importantly, physiological traits are deeper or more distant to behavior than psychological traits. It is quite possible that most physiological traits would express themselves in psychological traits, given that a significant number of individual differences are heritable (Johnson et al., 1998). This expectation is supported for some variables, as intelligence, for example, was found to mediate the genetic factors and leadership emergence (Ilies et al., 2004). Another example is that researchers have shown that there is a strong genetic overlap between leadership style and Big Five personality traits (Johnson et al., 2004).

Using multiple types of trait also allows scholars to explore potential interactions of individual differences. Understanding these interactions is of great importance for clarifying the conditions under which a specific leader trait influences outcomes. Although why a specific trait would strengthen, weaken or completely change a relationship between another trait and an outcome might not always be obvious, some moderators may help us to make sense of conflicting findings in the leadership literature. An example of research on interactions between various leader traits is a recent study that looked at the moderating role of age and gender in the link between genetic factors and leadership emergence (Chaturvedi et al., 2012). Another study found that the relationship between physical height and leadership depends on gender (Blaker et al., 2013). These recent studies are promising, and suggest that the interactions between physiological and psychological traits have the potential to help in advancing the trait theory of leadership. We strongly encourage leadership scholars to go beyond the single-trait approach that has been traditional in most trait research (Jensen & Patel, 2011; Witt, Burke, Barrick, & Mount, 2002).

From a methodological standpoint, including different types of traits in empirical models of leadership is also important. This is because individual differences are exogenous variables (i.e., variables that are independent from the other variables in the model such as biological sex), and including them in the model allow researchers to accurately estimate the association between two or more endogenous variables (i.e., variables that do not vary randomly and depend on other exogenous variables in the model such as leadership style and job performance) (Antonakis et al., 2012). Including important traits in models may therefore help to overcome omitted variable bias if incorporated accurately into the model (see Antonakis et al., 2012, for a more detailed discussion on suitable statistical models and examples of studies where this has been implemented successfully).

Proximal Predictors of Leadership: Leader Behaviors and Follower Effects

Leader Behaviors. Research on leader traits, if focusing on leader behaviors, seems to have concentrated on leadership styles, and mainly on transformational and transactional leadership. For example, research on genetics and leader behavior has focused almost exclusively on self-reported transformational and transactional leadership (e.g., Chaturvedi, Arvey, Zhang, & Christoforou, 2011; Johnson et al., 1998; Johnson, Vernon, Harris, & Jang, 2004). We believe that a broader representation of leader behavior would help to provide a clearer view of the actual effects of leader traits on leader behavior. This is all the more important, given the recent critique of the dominant use of leadership styles in leadership research and especially transformational leadership (Van Knippenberg & Sitkin, 2013). Here we present three alternative ways in which future research could complement the current research on leader traits.

First, one critique of leadership styles is that they are an average of a mixture of different behaviors (without a strong theoretical background or an appropriate aggregation model; van Knippenberg & Sitkin, 2013). One way around this would be to emphasize more specific behaviors of leaders. This could be done by investigating sub-facets of existing styles (for instance, transformational leadership is an aggregate of behaviors relating to communication of vision, role modeling, relationship management, etc.). For instance, recently researchers have looked at vision communication and identified several specific leadership vision communication behavior (for an overview, see Stam et al., 2014). Interestingly, although several of the specific leader behaviors were based on theories of individual differences (especially regulatory focus theory; Stam et al., 2010; Stam et al., in press), no research has as yet looked at how leader regulatory focus influences these more detailed behaviors relating to communication of vision. We believe this would be very beneficial for research on traits. Such research could also focus on other specific behaviors that relate to leadership but are not often emphasized in the current literature, such as listening behaviors

(Harris, 2006), or leading meetings.

A second way to address the critique of leadership styles, especially critique pertaining to the aggregation model behind leadership styles, concerns the way in which individual behaviors co-align. Specifically, rather than using a normative view and investigating leader behaviors that fit a particular leadership style, one could instead take a descriptive view, simply investigating whether diverse leaders' behaviors tend to follow specific patterns. This can be done through cluster analysis and therefore in the same way that cluster analysis can add value to trait research (Donnellan & Robbins, 2010), we believe it could also add value to research on leader behaviors by identifying common clusters of leader behaviors.

Finally, we would argue in favor of expanding research on leader behavior to include elements that have been largely ignored to date. Indeed, much of the research on leadership focuses on behaviors that directly influence followers (that either motivate or inspire them, or have the opposite effect), and this may be based on general definitions of leadership that have influencing followers at their heart (Yukl, 2000). However, leaders display important behaviors beyond those that directly influence followers. Examples of such behaviors are decision-making (Vroom & Yetton, 1973) and securing tangible and intangible resources (Ancona & Caldwell, 1992). We believe traits have the potential to explain a significant part of the variance in these behaviors as well, and there should be more research focusing on them.

Follower effects. Much of the leader trait research has looked at two types of follower effects: leader emergence and follower performance. Interestingly, research has found that these effects have different predictors. This begs the question, what types of follower effects exist, and which should we focus on? Although a multitude of effects may be important, this review of leader trait research leads us to pay particular attention to some of these effects. First, we would emphasize the importance of leadership endorsement, the acceptance of and cooperation with the leader (van

Vugt & de Cremer, 2003). Leader endorsement is the basis for leader emergence, and we therefore believe that leader endorsement research is vital to the leadership field. Second, and closely related, we would emphasize follower attributions and perceptions. Many of the trait effects that occur seem to be based on follower perceptions of leaders rather than other factors (such as the effects of leaders' height or facial appearance). As a consequence, we believe this to be an important category of follower effects.

Third, we highlight as a category motivation and striving for goals. This category, although potentially related to many leader traits, seems especially important for individual differences related to self-regulation, given emphasis in self-regulation on goal-striving tendencies. We believe all of these categories are important and would encourage researchers to include as many of them as possible. We note that we see follower performance as an outcome, rather than as a follower effect, and we discuss this below.

As indicated in the model developed by Antonakis and colleagues (2012), follower effects are influenced not only by leader behavior, but also by follower traits. An important principle here seems to be the match between the traits of leaders and followers (either a match between leader behavior and follower traits, or between leader traits and follower traits). For example, recent research has shown that followers' traits (e.g., self-concept, gender and narcissism) have an impact on their image of an ideal leader (Foti, Bray, Thompson, & Allgood, 2012). Indeed, leader categorization theory – which suggests that followers decide which leaders to support by comparing potential leaders to their ideal image of a leader (Lord, Foti, & De Vader, 1984; Lord, Foti, & Phillips, 1982) – provides a useful theoretical framework for studying such effects. This perspective underlies many of the findings in regard to regulatory fit in leadership: the more prevention-oriented followers are, the more they will like prevention-related behavior in their leader, while the more promotion-oriented followers are,the more they will like promotion-oriented behavior (Stam et al.,

2010). Moreover, matching effects may go beyond individual psychological differences. For example, leaders' coherence in the right frontal area of the brain may impact outcomes positively or negatively, depending on the followers' coherence in the same area of the brain (Boyatzis et al., 2012). It may, for instance, lead to positive effects but only if followers have high coherence in the same part of the brain. As such, there may be a 'physiological fit' for certain leader traits or individual differences.

Multi-Level Outcomes

What became very clear in our review of the literature on leader traits is that different studies are looking at very different outcomes. At the same time, however, many studies make use of self-report or other-report measures (especially of individual-level performance, etc.) as outcomes or do not use any outcomes, but rather stop at follower effects. In general, therefore, we would advise researchers to add outcome variables to their models. In choosing outcome variables, we would echo the advice we gave under leader behavior: choose a multitude of leadership outcomes (preferably at different levels), and include among those outcomes ones that are specific to the leader trait and leader behavior under investigation.

For example, take the recently popularized research on the dark side of leadership, which in the field of leader traits is represented by studies of the dark triad. We would advise researchers in this area to go beyond leader behavior (abusive supervision, for instance) and follower effects (job satisfaction, for instance) and also measure outcomes (such as team performance). we would encourage researchers to investigate outcomes that are specific to the trait (in the case of Machiavellianism, the number of cases of fraud within the team, for instance), but to add also a broad spectrum of measures at different levels (including, for instance, corruption at the individual and organizational level, and organizational-level CSR performance). Indeed, focusing on a broad spectrum of outcomes may lead to some very interesting findings. For example, in some

circumstances a dark-triad trait such as Machiavellianism might have a positive effect on important organizational outcomes such as sales performance (Ricks & Fraedrich, 1999).

Make Use of Different Types of Measures. The criteria used to assess leadership outcomes have important implications for how the results of a study are interpreted. Leadership may be assessed from the perspective of different people (e.g., self-report or evaluation by peers, followers, experts or superiors) or by using objective measures (e.g., company financial performance). These assessments may be different in terms of the results they generate, given that they depend on what is valued by the assessors. Leadership outcomes were also assessed using variety of data, including surveys, observations and/or archival records. Hiller et al. (2011) provide an excellent review of the measures used to assess leadership outcomes, and note that self-report measures and survey research have been the most common ways of assessing leadership in trait research. Their results show that a strong reliance on survey methods is common in leadership research in general; however, trait research differs from other domains in that it relies heavily on self-report measures (as opposed to follower assessments) (Hiller et al., 2011). This may be problematic, because self-reports may be prone to self-deception bias (Colbert, Judge, Choi, & Wang, 2012) and can be a source of common-method bias, particularly when the measurement of traits also relies on self-report (i.e., when traits are not measured objectively or assessed by others) (Podsakoff, Mackenzie, Lee, & Podsakoff, 2003). In addition, peer and superior assessment have hardly been used in trait research at all (i.e., they were only used in about 1% of studies) despite their suitability for assessing different elements of leadership. For example, superiors are likely to have a more strategic perspective, and are quite able to assess macro-level leadership outcomes.

It is also worth noting that using different measures concurrently may help in explaining the variance in leadership outcomes. For instance, as this review also shows, there is a substantial amount of research using leadership role occupancy as a leadership outcome measure. However,

using role occupancy as an outcome measure without concurrently using other measures provides a limited perspective on the issue and therefore is criticized in the literature (e.g., see Day, 2011). We strongly encourage future trait researchers to include a variety of perspectives when evaluating leadership and also to include methods other than surveys. This we think is important to gain a more nuanced understanding of the trait–outcome link.

Make Use of Multi-Level Models. Multi-level outcomes are called this for a reason: outcomes of leadership exist on multiple levels – individual, team, business unit, organization, industry, country, and so on. Antonakis and colleagues (2012) have provided a comprehensive explanation of the multi-level nature of leadership outcomes and we do not want to repeat their arguments, but we do want to point out one obvious consequence: a better understanding of multi-level outcomes requires statistical models that take into account the nested nature of the data to draw accurate inferences (Dansereau, Alutto, & Yammarino, 1984; Yammarino & Dansereau, 2008). From a review of over three hundred journal articles and book chapters Yammarino et al. (2005) concluded that there is a clear need to taking the multi-level nature of data into account. Specifically, they noted that less than 10% of studies addressed the level of analysis appropriately in their conceptual and analytical frameworks. Although there has been a encouraging move towards that – for example, the *Leadership Quarterly* Special Issue on *Multi-Level Approaches to Leadership* – more research is needed to accurately draw conclusions about multi-level outcomes. We encourage researchers to take this into account in future studies in their theory development and data analysis techniques (see Yammarino et al., 2005, for specific recommendations). Researchers could for example use techniques such as hierarchical linear modelling (HLM) or multi-level structural equation modeling (MSEM) techniques, for example, so that they can take the hierarchical structure of the data into account in their analyses (Preacher, Zyphur, & Zhang, 2010; Zhang, Zyphur, & Preacher, 2009).

Another recent alternative for investigating multi-level outcomes is agent-based modeling (e.g., Dionne, Sayama, Hao, & Bush, 2010; Fioretti, 2013; Serban et al., 2015). 'In this technique, cells in a grid that represent entities (e.g., individuals, leader–follower dyads, or organizations) are programed to behave in a certain way. This allows researchers to run theoretical experiments which deductively predict the multi-level consequences of micro-level phenomena (e.g., Serban et al., 2015). One classic example is the neighborhoods model, where even the slightest tendency of individuals to move closer to people of their own ethnicity eventually results in the emergence of ethnic neighborhoods and ghettos (e.g., Benenson, 2004). Hence, agent-based modeling can be used not only for theory-testing, but also for theory-building (Davis, Eisenhardt, & Bingham, 2007). Moreover, the models do not have to be based completely on theoretical assumptions; it is also possible to incorporate existing data and findings. For instance, if part of a multi-step model is examined empirically (e.g., the micro-level consequences of the interaction between leader behaviors and follower traits), agent-based modeling can be used to extrapolate the consequences of these findings at higher levels of analysis, which is useful considering the scarcity of multi-step, multi-level data.

The Model as a Whole

Although we have discussed the research on leader traits in terms of the elements that make up the process model of leadership (Antonakis et al., 2012), there are also some issues pertaining to the model as a whole, rather than to any single element. Here we discuss two of these: the value of a process model and additions to the process model.

The value of a process model. The process model is a valuable way to categorize and review the literature on leader traits because it is parsimonious and relatively comprehensive (although we would make some additions based on the literature we reviewed: see below). Indeed,

the model demonstrated nicely the processes by which leader traits can influence leader outcomes on various levels. Yet, looking at the literature on leader traits we found relatively few areas where the full range of elements discussed in the model were being investigated. For instance, the literature on leader personality has mainly investigated how leader personality affects leader emergence or leadership styles, but has not comprehensively discussed other follower effects or leader outcomes. We would encourage research on traits to argue in terms of causal chains and thus to investigate processes and outcomes. This has been done in some fields, most notably leadership and gender, and we believe others should follow suit.

Adding direct effects to the model. Much of the research on leader traits, and especially on traits such as gender, age and size, has investigated how leader traits influence how followers perceive leaders and subsequent how these perceptions influence leadership outcomes. This suggests that many traits may cause follower effects that are relatively independent of leader behavior (or at least are complementary to leader behavior effects). We would therefore suggest to add a direct effect of distal predictors to follower effects to the model. Moreover, although there is not much research investigating leader behaviors beyond leadership styles, we believe there to be a big opportunity to investigate other leader behaviors such as negotiation, decision-making, design and implementation of work procedures, etc. Importantly, although many of these behaviors influence followers indirectly, they also influence outcomes independent of followers. For instance, if a leader negotiates a good deal with a supplier, this may make followers happy and proud, but it also has a direct impact on the cost-efficiency of the organization, independent of what followers do. The emphasis of leadership research on the direct effects of leaders on followers has, we argue, led to an undervaluation of the direct effects of leader behavior on leader outcomes. Especially for a field interested in leader traits, these direct effects should matter. We therefore argue in favour of adding a direct effect of leader behavior to multi-level outcomes in the model.

The role of context. We also propose to model moderators of the effects of leader traits. We believe there are at least three good reasons to investigate moderation effects. The first is to better understand the mechanisms through which leader traits influence leadership, the second is to better understand the boundary conditions of the effects of leader traits, and the third is to align seemingly opposing results. Unfortunately, the current literature is not especially oriented toward moderation effects, although there are some exceptions. One excellent example is the research that showed that preferences for taller and more masculine-looking leaders differ in competitive settings (e.g., wartime) as opposed to cooperative settings (e.g., peace time) (Re et al., 2013; Spisak et al., 2012).

In order to help researchers identify potential moderators, we point out two important concepts: situational strength and trait activation. Situational strength (Meyer et al., 2010) represents the extent to which situational constraints are present in the environment, and is hypothesized to moderate the effects of all traits indiscriminately. Trait activation theory describes when and how specific traits effects occur, and to what extent. The theory discusses several processes through which traits affect behaviors and provides some idea of particular situations in which specific traits are more or less likely to become active (Tett & Burnett, 2003). Although describing these theories in full goes beyond the scope of this paper, there is evidence that both situational strength and trait activation accurately predict moderation effects for traits (Big Five in this case; Judge et al., 2015).

Summary and Future Research

In our research agenda, which was based on a review of diverse literature on individual differences, we set out a number of important next steps that could be taken to reach a more complete understanding of how leaders' individual differences influence multilevel outcomes. We organize the agenda around the leadership process model (Antonakis et al., 2012) and recommend three specific steps to help develop the model further. First, we suggest that leadership researchers

should investigate multiple causal steps in their empirical models linking leader traits, via leader behavior and follower effects, to (multilevel) outcomes. We cannot stress enough the importance of adding outcomes to research models. By including these various causal steps research can do a thorough investigation to determine which effects are direct and which are indirect, and hence provide more understanding of the process model. Second, we emphasize the value of adding moderators, not only in terms of follower traits (match-effects) but that inhibit or facilitate the relationship between a leader's traits and his or her behavior. There has been very little research on this last type of moderation, even though it is difficult to overstate its importance in determining the effects of leader traits. Finally, we recommend investigating various leader traits and behaviors that are currently clearly under-researched, including background traits, goal orientation, neurological characteristics, and specific leader behaviors beyond leadership styles. It is also important to model multiple traits and behaviors simultaneously in order to avoid proliferation of constructs.

This review of the literature also suggests some revision to the process model of Antonakis and colleagues (2012). Our suggested additions to the model are shown in Figure 2. The revised model includes two additional direct effects – one from leader traits to follower effects (e.g., how followers perceive leaders' traits independent of their behavior), and one from leader behavior to multilevel outcomes (e.g., when a leader affects financial outcomes through his/her negotiation with suppliers, independent of follower effects). The revised model also specifies two broad categories which can serve as an overarching framework to explain the moderating effects of contextual factors in the model. Specifically, in our revised model we include two moderators of the relationship between leader traits and behavior: situational strength (which may inhibit that relationship) and trait-activating situation (the extent to which a situation may activate a particular trait). We believe these additions help to better specify the relationships between different components of the process model and make the model more comprehensive as a general framework

for leadership research.

Insert Figure 2 here

Conclusion

Especially in the last few years, Interest in how individual differences influence leadership behaviors has been growing rapidly. Scholars from various disciplines ranging from behavioral genetics to sociology, and from endocrinology to psychology, have examined how stable differences among leaders can impact leadership emergence, behaviors and effectiveness. Indeed, scholars have highlighted the positive advances likely to be made in the near future, and have even described the field as being on the 'cusp of a renaissance' (Antonakis, Day, & Schyns, 2012) or as moving towards a new 'tipping point (Zaccaro, 2012). However, this growing interest from diverse fields also comes with an increased risk of fragmentation. In this paper, we aim to facilitate communication among scholars within the field by identifying and classifying the main literature streams which focus on individual differences between leaders. Likewise, in our research agenda, by using a well-known leadership process model we aspire to provide a structure that researchers can use for their future studies. We hope that this review will help address the issue of fragmentation and take us one step closer to the new tipping point or renaissance on the horizon for research on leadership and individual differences.

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TABLE 1. KEY AREAS OF LEADERSHIP RESEARCH ON INDIVIDUAL DIFFERENCES

Table 1
Key Areas of Leadership Research on Individual Differences

Domain	Key Areas of Research	Example Constructs	Example Finding from this Literature
Physiological Differences	Genetic Factors	*rs4950 marker on a neuronal acetylcholine receptor gene (CHRNB3), DAT1 gene*	Dopamine transporter DAT1 gene predicts leadership role occupancy (Li, Wang, Arvey, Soong, Saw, & Song, 2015)
	Physical Attributes	*Physical height, face morphology, vocal characteristics*	Width of a CEO's face relative to its height predicts the financial performance of the firm (Wong, Ormiston, & Haselhuhn, 2011).
	Biological Sex/Gender	*Preferences for female/male leaders, gender differences in leader behavior*	Female leaders are more preferred during intragroup competition, whereas male leaders during intergroup competition (Van Vugt & Spisak, 2008)
	Endocrinological Factors	*Dopamine, testosterone*	Endogenous testosterone interacts with power in predicting leader corruption in such a way that corruption is highest when both are high (Bendahan, Zehnder, Pralong, & Antonakis, 2015).
	Neurological Factors	*Volume of brain regions, neuronal coherence*	Power-spectral analysis measures based on EEG are 92.5% accurate in classifying transformational leaders (Balthazard, Waldman, Thatcher, & Hannah, 2012)
Psychological Differences	Personality Traits	*Big-Five Personality Traits, HEXACO*	In dynamic environments, neurotic leaders are perceived to be more charismatic (de Hoogh, den Hartog, & Koopman, 2005)
	Intelligence	*IQ, EQ, Gardner's Multiple Intelligences*	Intelligence is positively associated with transformational behaviors and leadership effectiveness (Cavazotte, Moreno, & Hickmann, 2012)
	Self-Regulation	*Capacity of self-regulation, depletion*	Because ethical leadership behaviors require the use of self-regulatory resources, they themselves might result in subsequent unethical behaviors, such as abusive supervision (Lin, Ma, & Johnson, 2016)
	Chronic Regulatory Focus	*Promotion/prevention focus, regulatory fit*	Chronic regulatory focus influences leaders' general tendencies towards exploration and exploitation activities (Tuncdogan, van den Bosch, & Volberda, 2015)
	Dark-Triad Personality Traits	*Narcissism, Machiavellianism, Psychopathy*	Narcistic CEOs can positively influence TMT behavioral integration and firm performance if they identify themselves strongly with the organization (Reina, Zhang, & Peterson, 2014)
	Background Variables	*Age, culture, family*	Young leaders are preferred for purposes of change, whereas older ones are preferred for purposes of stability (Spisak, Grabo, Arvey, & van Vugt, 2014)

FIGURE 1. THE LEADERSHIP PROCESS MODEL BY ANTONAKIS, DAY & SCHYNS (2012)

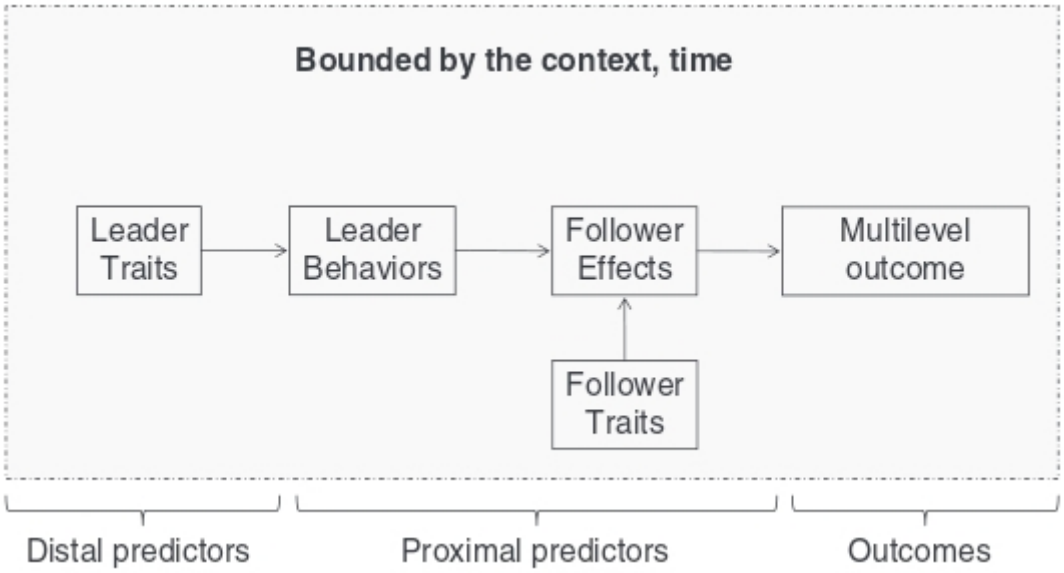

FIGURE 2. REVISED LEADERSHIP PROCESS MODEL