Leadership, creativity and innovation: A meta-analytic review

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Abstract

This paper reports the most comprehensive meta-analytic examination of the relationship between leadership and both followers' creative and innovative performance. Specifically, we examined thirteen leadership variables (transformational, transactional, ethical, humble, leader-member exchange, benevolent, authoritarian, entrepreneurial, authentic, servant, empowering, supportive, and destructive) using data from 266 studies. In addition to providing robustly estimated correlations, we explore two theoretically and pragmatically important issues: the relative importance of the different leadership constructs and moderators of the relationship between leadership and employee creativity and innovation. Regrading creative performance, authentic, empowering, and entrepreneurial leadership demonstrated the strongest relationships. For innovative performance, both transactional (contingent reward) and supportive leadership appear particularly relevant. The current study synthesizes an important, burgeoning, diverse body of research, and in doing so, generates nuanced evidence that can be used to guide theoretical advancements, improved research designs, and up-to-date policy recommendations regarding leading for creativity, and innovation.

Keywords: Leadership; creativity; innovation; LMX; empowerment

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Organizational growth depends on the ability to generate novel ideas and to select and implement the most promising of those novel ideas. In short, creativity (idea generation) and innovation (idea implementation) are essential for organizational survival and success (Anderson, Potocnik, & Zhou, 2014). Accordingly, organizational research has focussed on identifying antecedents of workplace creativity and innovation (Zhou & Hoever, 2014) in order to develop theoretical models and evidence-based guidance for enhancing workplace creativity and innovation. Leadership is posited as a crucial antecedent because leaders shape the working environment, resource allocation, the nature of work tasks (e.g., Liden, Sparrowe, & Wayne, 1997), and influence employee behavior by leveraging existing employee assets (e.g., motivation) or developing new ones (e.g., learning: Fischer, Dietz, & Antonakis, 2017).

Numerous studies have explored the relationship between leadership and employee creativity and innovation (see Hughes, Lee, Tian, Newman, & Legood, 2018 for a review), however, the number of highly intercorrelated leader variables studied has produced a complex literature that hinders understanding and the development of evidence-based practical recommendations (DeRue, Nahrgang, Wellman, & Humphrey, 2011; Hughes, et al., 2018). Studying multiple leader variables concurrently should allow us to begin to identify which are most strongly associated with workplace creativity and which are most strongly associated with innovation. Further, the boundary conditions of these relationships are not well understood (Hughes et al., 2018). A lack of clarity regarding these issues means three major questions currently undermine the utility of research in this field:

1. Which (if any) leadership variable(s) is the strongest predictor of creativity and innovation?

2. What is the relative importance of different leadership variables with creativity and innovation?

3. What are the boundary conditions influencing the relationship between a given leadership variable and creativity and innovation?

The goal of this meta-analysis is to provide a quantitative review of the current literature in relation to these three questions. Previous reviews have examined leadership and creativity, but have tended to be narrative in design (e.g., Anderson et al., 2014; Hughes et al., 2018; Mainemelis, Kark, & Epitropaki, 2015; Reiter-Palmon & Ilies, 2004; Rank, Pace, & Frese, 2004; Zhou & Shalley, 2003) or provided theoretical overviews and identified 'gaps' in the literature (Klijn & Tomic, 2010; Shalley & Gilson, 2004). In contrast, we seek to examine the relative importance of thirteen leadership variables for individual-level creativity and innovation and investigate several methodologically and theoretically derived moderators of the relationship between leadership and creativity and innovation.

Literature review and research question development

Creativity and innovation

We define creativity and innovation according to a recent systematic and critical review of existing definitions:

> "*Workplace creativity concerns the cognitive and behavioral processes applied when attempting to generate novel ideas. Workplace innovation concerns the processes applied when attempting to implement new ideas*" (Hughes et al., 2018, p. 3).

Evident from this definition, creativity and innovation are distinct but related constructs. Creativity is largely an intrapersonal activity concerned with the generation of truly novel ideas, whereas innovation is a largely interpersonal activity concerned with introducing new ideas (which can come from anyone/anywhere) that fit the context, garnering support from others, and ultimately implementing the new ideas (Hughes et al., 2018). Typically, the

leaders' role is to facilitate employees by providing them with the appropriate resources and environment. However, because creativity and innovation are fundamentally different (see Hughes et al., 2018, Table 2), and are driven by different antecedents (e.g., Axtell et al., 2000; Hughes et al., 2018; Magadley & Birdi, 2012), it would be surprising if a single leadership style were appropriate for both (Hughes et al., 2018; Perry-Smith & Mannucci, 2017). Indeed, recent conceptual frameworks suggest that when creating, employees require psychologically safe and motivating spaces that enable them to engage in cognitively flexible thought (Perry-Smith & Mannucci, 2017). In contrast, when innovating, employees need social influence and legitimacy which can be provided through leader support and endorsement (Perry-Smith & Mannucci, 2017). Creative ideas rarely lead to innovation unless shared with relevant and/or influential organizational members. It is possible, then, that certain leader variables will be of differential importance to creativity and innovation.

Despite the conceptual and empirical uniqueness of creativity and innovation, previous meta-analyses have tended to combine them into a single variable (e.g., Kim, Beehr, & Prewett, 2018; Lee, Willis, & Tian, 2018; Lee, Lyubovnikova, Tian, & Knight, 2019). However, we follow contemporary theoretical and empirical arguments and consider creativity and innovation separately (Anderson et al., 2014; Hughes et al., 2018), enabling the exploration of differential associations with the leader styles examined.

Leadership, creativity and innovation

Previous meta-analyses examining leadership variables have often ignored creativity and innovation as outcomes (e.g., Banks, Gooty, Ross, Williams, & Harrington, 2018; Hoch, Bommer, Dulebohn, & Wu, 2018; Martin, Guillaume, Thomas, Lee, & Epitropaki, 2016), focused on a limited range of leadership predictors, or have combined creative and innovative performance into a single variable (Banks, McCauley, Gardner, & Guler, 2016; Hammond, Neff, Farr, Schwall, & Zhao, 2011; Lee et al., 2018; Lee et al., 2019; Rosing, Frese, &

Bausch, 2011; Wang, Oh, Courtright, & Colbert, 2011). Here, we extend these findings by examining and comparing the correlations between thirteen leadership variables and individual-level employee creativity and innovation, separately. In doing so, we seek to address three pertinent issues regarding the main effects between leadership and employee creativity and innovation.

First, there is notable variation in the magnitude and even direction of reported effect sizes (Hughes et al., 2018), rendering interpretation difficult, especially when they are derived from moderately sized samples. Meta-analytic investigations, such as this, provide a much more robust estimate of population effects. Second, the increased power provided by meta-analytic investigations allows for robust estimation of moderating effects that are not possible within individual studies. Therefore, we also address the call made by Hughes and colleagues (2018) to explore possible moderating variables in the categories of study design, broad context (e.g., industry type), and local context (e.g., follower gender). Third, it is unclear whether the many contemporary leadership variables in the literature (e.g., ethical, benevolent) account for unique variance in creative and innovative behavior when considered alongside other leadership variables.

Our review identified thirteen leadership variables which have been repeatedly found to be associated with creativity and/or innovation. It is well established that certain leadership styles draw upon common theoretical arguments when explaining how their effects are transmitted (e.g., Lemoine, Hartnell, & Leroy, 2019). Accordingly, we grouped the thirteen leadership variables into five theoretically homogenous categories - the full-range model, moral leadership, motivational leadership, relational leadership, and negative leadership – and discuss how they are expected to relate to creative and innovative performance, below.

Full-Range Leadership Model

The full-range leadership model (Avolio & Bass, 1991), comprises transformational, transactional, and laissez-faire leadership. The model stems from Bass's (1985) argument that theories of the time focused only on basic exchanges with followers (transactional) and failed to explain how leaders influence followers to transcend self-interest for the greater good of the organization (transformational). In response, Bass proposed a model encompassing four transformational and two transactional leadership factors.

Transformational leadership (Bass, 1985) consists of four dimensions: idealized influence (i.e., leader behavior that is admirable and charismatic), inspirational motivation (i.e., articulating an appealing and inspiring vision), intellectual stimulation (i.e., challenging follower assumptions and listening to their ideas), and individualized consideration (i.e., mentoring and coaching according to follower's unique needs). In relation to creativity and innovation, transformational leadership is said to be beneficial for two main reasons. Firstly, transformational leaders tend to inspire and motivate through expressing an energizing vision which in turn "motivate[s] people to do their best" (Avolio & Bass, 1988, p. 33). Second, the intellectual stimulation element encourages followers to think divergently, question assumptions, and take risks (Bass, 1985). Such actions tend to promote an open and explorative mindset (Keller, 2006) and empower followers to experiment with ideas and undertake active problem solving (e.g., Jung, Chow, & Wu, 2003; Shin & Zhou, 2003).

Transactional leadership is focussed on achievement-related exchanges: Contingent reward describes the provision of incentives following successful performance, whereas management by exception describes the degree to which leaders take corrective action either in an active or passive manner (Bass, 1985; Yukl, 1999). As such, transactional leaders achieve influence by clarifying goals, the use of rewards and incentives, and intervening only when necessary (Bass, 1985). Although the rewarding of goal-attainment may foster extrinsic motivation, transactional leadership is unlikely to instil intrinsic motivation, unlike

transformational leadership, which actively encourages experimentation. Thus, it is often suggested that transformational leadership will be more strongly associated with creative and innovative behaviour than transactional leadership (Hughes et al, 2018). Further, the transactional component may be perceived as controlling and demotivating, thus dampening innovation further (Deci & Ryan, 1987). Despite this, the contingent reward component may be effective in promoting creativity and innovation when the rewards are contingent on employee creativity (Rickards, Chen, & Moger, 2001).

The other two dimensions of transactional leadership are grouped under the term management by exception. The management-by-exception category includes monitoring employee performance and taking corrective action when problems arise. Active management by exception refers to the extent to which leaders strive to identify, and then redress, poor performance or errors. Passive management by exception describes leaders who avoid involvement until these shortfalls or errors arise. Followers of leaders who employ management-by-exception tend to be dissatisfied and demotivated and, as such, this style is unlikely to foster creativity or innovation (Kim & Lee, 2011).

Transformational and transactional aspects of the full-range model are argued to be unique and additive such that transformational leadership augments the effect of transactional leadership (Bass & Avolio, 1993). Evidence of the relative importance of transformational over transactional leadership is mixed. For instance, a meta-analysis examining the relative importance of the full-range leadership model demonstrated that transformational leadership explained more variance in group performance, perceptions of leader effectiveness, and satisfaction with leader, whereas contingent rewards were most strongly associated with follower job satisfaction (Derue et al., 2011). Similarly, Piccolo, Bono, Heinitz, Rowold, Duehr and Judge (2012) concluded, based on primary data, that transformational leadership and contingent reward leadership are highly correlated but empirically distinct factors that

explain significant incremental variance in outcomes. Studies exploring the relative effects of the components of the full-range model on creativity and innovation are rare (e.g., Kim & Lee, 2011), but what evidence there is, suggests that transformational leadership has stronger effects on both follower creativity (Kark, Van Dijk, & Vashdi, 2018) and innovation (e.g., Lee, 2008).

Moral Leadership: Authentic, servant, ethical, and humble

Authentic, servant, and ethical leadership represent three morally based forms of positive leadership (Hoch et al., 2018) which are often grouped together (Lemoine et al., 2019). We also consider humble leadership, a new addition to the field, within this category. Ethical Leadership (Brown, Trevino, & Harrison, 2005) focuses on the demonstration of normatively appropriate conduct through personal actions and interpersonal relationships (i.e., modelling behavioral standards for followers). Authentic leaders (Walumbwa, Avolio, Gardner, Wernsing, & Peterson, 2008) are said to have a relatively heightened level of self-awareness, an internalized moral perspective, process information in a balanced and ethical manner, and deal with followers in a transparent and fair way (i.e., relational transparency). Servant leadership (e.g., Ehrhart, 2004) emphasizes personal integrity in life, work, family, and community (Ehrhart, 2004). Humble leadership concerns a willingness to be self-aware in social interactions, an appreciation for others' strengths and contributions, and teachability (Owens & Hekman, 2012). Humility is an important trait for an ethical leader to possess (de Vries, 2012), and thus, humble leadership also reflects an ethical/moral style. When explaining the effects of moral leadership styles, most studies draw upon social learning theory or social exchange theory (Lemoine et al., 2019).

In line with social learning theory (Bandura, 1986), ethical and humble leaders model behaviors such as acknowledging their personal limits and mistakes, and being open to inputs from others, that when emulated by followers are believed to foster creativity and innovation

(Lemoine et al., 2019; Owens & Hekman, 2012). Similarly, authentic and servant leadership utilize social learning explanations. For instance, the self-awareness at the heart of authentic leadership allows leaders to exhibit openness in their behavior and 'lead by example' (Walumbwa et al., 2008), which, when emulated by followers, is believed to stimulate followers to engage creatively with their work (Seibert, Kraimer, & Liden, 2001).

Social exchange theory is also frequently evoked. For example, Ilies, Morgeson and Nahrgang (2005) argue that authentic leaders demonstrate unbiased processing of self-relevant information, personal integrity, and authentic relations that contribute to positive social exchanges with followers (i.e., positive emotions, trust and respect), which in turn fosters a degree of emotional and psychological safety that empowers employees to propose unconventional ideas (Avolio, Gardner, Walumbwa, Luthans, & May, 2004; Edmondson, 1999; Prati, Douglas, Ferris, Ammeter, & Buckley, 2003; Rego, Sousa, Cunha, Correia, & Saur-Amaral, 2007).

Although servant, authentic, ethical, and humble leadership have conceptual similarities, each is argued to have unique qualities or at least unique emphases. For instance, Lemoine et al. (2019) note that servant leadership emphasizes a focus on benefiting multiple stakeholders and the wider community, authentic leadership emphasizes self-awareness and internal consistency, and ethical leadership emphasizes normative standards. Typically, moral styles explain unique variance in outcomes when modelled alongside transformational leadership (e.g., Banks et al., 2016; Hoch et al., 2018; Lee et al., 2019; Ng & Feldman, 2015).

Motivating Leadership: Empowering and Entrepreneurial

Empowering leadership involves highlighting the significance of followers' work and communicating confidence in their ability by delegating authority, encouraging self-directed and autonomous decision making, coaching, sharing information, and asking for input (e.g., Kirkman & Rosen, 1999). Such leadership behaviors are conceptually relevant to both

creativity and innovation through the development of self-determination and intrinsic motivation (e.g., Zhang & Bartol, 2010). For instance, participation in decision making and perceptions of autonomy are vital preconditions for creative outcomes (e.g., Amabile, 1996) because they encourage autonomous exploration of different approaches and problem solutions (Li & Zhang, 2016). Intrinsically motivated followers are also more likely to be prepared to leveraging their existing knowledge (Parker, Wall, & Jackson, 1997), which leads to increased performance on tasks requiring creativity (e.g., cognitive flexibility, conceptual understanding; Kehr, 2004) and exhibit greater persistence in face of obstacles that arise when innovating (Deci & Ryan, 2000).

Entrepreneurial leadership encourages followers to identify and exploit entrepreneurial opportunities for value creation (Renko, 2018), and thus aims to motivate employees to contribute to creative activities (Chen 2007; Cai, Lysova, Khapova, & Bossink, 2019). Further, entrepreneurial leaders provide creative support, for example, by designing and adjusting achievable goals aimed to rouse follower perseverance and by working with employees to generate different perspectives. Thus, in line with social cognitive/learning theory, entrepreneurial leaders foster employees' creativity and innovation through three main pathways: role modelling entrepreneurial behaviors (vicarious learning), encouraging and directing followers to engage in entrepreneurial activity (subjective persuasion and enhanced affective states), and providing opportunities for followers to be entrepreneurial (mastery experiences) (Newman, Tse, Schwarz, & Nielsen, 2018; Renko, Tarabishy, Carsrud, & Brännback, 2015).

Empowering and entrepreneurial leadership styles overlap because both encourage followers to go beyond the status quo and to do things differently. However, although empowering leaders involve followers in the processes of problem-solving and decision-making (Miao, Newman, Schwarz, & Xu, 2013), they do not necessarily provide specific

role-modeling and guidance aimed at encouraging creative or innovative behavior. In contrast, entrepreneurial leaders demonstrate entrepreneurial behaviors to followers and thus directly encourage the implementation of creative ideas at work (Newman et al., 2018).

Relational Leadership: LMX, Supportive, Benevolent

LMX, benevolent, and supportive leadership, which we categorize as relational variables, focus on building positive relationships by demonstrating care and concern for followers. LMX is inherently relational and defined as the quality of exchange between leader and employee (Graen & Cashman, 1975). Recent studies suggest that because followers with a high-quality LMX relationship are likely to feel obliged to reciprocate the positive exchanges with their leader (Blau, 1964; Gouldner, 1960), they are more likely to engage in discretionary processes such creative (e.g., Meng, Tan, & Li., 2017) and/or innovative behavior (Pan, Sun, & Chow, 2012; Turunc, Celik, Tabak, & Kabak, 2010). According to the social exchange theory, followers will work hard, undertake creative activities and exhibit high creativity in exchange for support, trust and other resources from leaders (Xu, Huang, Lam, & Miao, 2012). It is also argued that in a high-quality LMX relationship the follower should have more autonomy and decision-making latitude (Graen & Uhl-Bien, 1995), which are positively related to creativity and innovation.

Supportive leadership describes a cluster of leader behaviors that aim to provide access to resources, assistance, and encouragement in the face of difficulties. Supportive leaders' encouragement may enhance followers' creative self-efficacy, an important antecedent of creativity and innovation (Tierney & Farmer, 2002), that is malleable and can be reinforced by social support (e.g., Bandura, 1997). Further, supportive leaders should also increase creative behavior by increasing employee's interest at work (Oldham & Cummings, 1996). Thus, supportive leadership should be positively related to both creativity and innovation.

Benevolent leadership is characterized by exhibitions of individualized and holistic concern and care for followers (Farh & Cheng, 2000). In line with social exchange theory (Blau, 1964), the positive treatment provided by the benevolent leader to followers leads them to reciprocate by engaging in behaviors they feel are desired (Lin, Ma, Zhang, Li, & Jiang, 2018). Although some studies have argued that this may result in less creativity and innovation as subordinates follow their leaders orders without questioning them (Wang, Xue, & Su, 2010), researchers have generally argued for a positive relationship between benevolent leadership and both creativity and innovation because leaders generally state that they are valued (Dedahanov, Lee, Rhee, & Yoon, 2016; Lin et al., 2018). The relationship aspect of benevolent leadership overlaps with LMX and supervisor support, but the involvement in followers' personal lives and treatment of followers 'as family' distinguishes benevolence from these variables (e.g., Hiller, Sin, Ponnapalli, Ozgen, 2019).

Negative Leadership: Destructive and Authoritarian

Typically, leadership research has focused on finding the most effective leadership methods and has focused on positive forms of leadership (Schyns & Schilling, 2013), perhaps to the detriment of our understanding of ineffective or negative leadership. In the category of negative leadership, we focus on two leadership styles: authoritarian and destructive. An authoritarian leader ''asserts absolute authority and control over subordinates and demands unquestionable obedience" (Cheng, Chou, Wu, Huang, & Farh, 2004, p. 91). Authoritarian leaders exert control over followers by initiating structure, issuing rules, promising rewards for compliance, and threatening punishment for disobedience (Aryee, Chen, Sun, & Debrah, 2007). Authoritarian leaders' demand absolute obedience from followers and, produce a climate of fear and caution (Pellegrini & Scandura, 2008), meaning that followers are less likely to show initiative and proactivity to generate novel approaches to perform their tasks.

Therefore, authoritarian leadership decreases the expression of personal ideas or participation in problem solving, thereby inhibiting employee creativity and innovation.

Destructive leadership refers to voluntary acts committed towards followers that most people would perceive as harmful, such as, mocking, belittlement, rudeness, and breaking promises (Tepper, 2000). The experience of abusive supervision typically evokes negative emotions, such as fear (e.g., Kiewitz, Restubog, Shoss, Garcia, & Tang, 2016), and promotes avoidance and self-protection in followers (Kiewitz et al., 2016). Because followers are required to invest large amounts of psychological resources to cope with the stress resulting from abusive supervision, they are more likely to experience emotional exhaustion (Wu & Hu, 2009) and reduce their emotional and psychological investment in their jobs (Chi & Liang, 2013). As a result, followers of abusive leaders are less likely to create useful and novel ideas, thereby decreasing their creativity (Gu, Song, & Wu, 2016). This is supported by meta-analytic research showing that negative, activating moods with an avoidance motivation and a prevention focus (fear, anxiety) were associated with lower levels of creativity (Baas, De Dreu, & Nijstad, 2008). A related form of destructive leadership is despotic leadership (e.g., Naseer, Raja, Syed, Donia, & Darr, 2016). Despotic leaders are self-interested, morally corrupt, have low ethical standards (De Hoogh & Den Hartog, 2008), and egoistic motives designed to manipulate and exploit followers for personal gain (Naseer et al., 2016). Followers of despotic leaders are argued to indirectly retaliate by reduced engagement in desired behaviors. Therefore, followers are likely to withhold creative behaviors to thwart a despotic leader. Reduced creative performance may also result from the notion that when a leader's ethical character is dubious, they are less able to persuade followers to achieve individual and/or organizational objectives (Kanungo, 2001). Studies investigating the effects of destructive leaders have focused on the effects on creativity rather than innovation (e.g., Gu et al., 2016; Naseer et al., 2016).

Authoritarian and destructive leadership are viewed as negative leadership variables because of their association with an array of socially and organisationally undesirable effects (Kiazad, Restubog, Zagenczyk, Kiewitz, & Tang, 2010). Although authoritarian and destructive leadership are clearly conceptually distinct from positive leadership styles, such as transformational leadership, there is little empirical work that compares the relative effects of authoritarian and destructive leadership to each other or positive leadership styles. Looking at meta-analytic correlations (without directly testing the relative importance), Schyns and Schilling (2013) reported that most correlations with follower outcomes are higher for positive (e.g., transformational leadership) rather than negative leadership styles.

Leadership and Creativity Summary

As discussed, numerous leadership variables are theorized and have been shown to correlate with followers' creative and innovative behavior. A key aim of the current meta-analysis is to summarize this vast literature and to better understand the relationships these leadership styles have with both outcomes. Relatedly, we seek to determine which variable(s), has the strongest relationship with creativity and innovation.

Research question 1: Which leadership style(s) is most strongly associated with creativity and innovation

Relative Importance of Leadership Style on Creativity and Innovation

The second aim of this meta-analysis is to explore the relative importance of different leadership variables on creativity and innovation. This is important because it is currently unclear whether the many leadership variables are redundant or have unique effects, and which variable(s), if any, is most strongly related to creativity and innovation (Hughes et al., 2018). This is reflective of wider concerns in the leadership literature regarding construct proliferation and construct redundancy (DeRue et al., 2011; Shaffer, DeGeest, & Li, 2016). Put simply, many ostensibly distinct leadership variables share considerable conceptual and

empirical overlap, often correlating between .7- .9 (e.g., Banks et al., 2018; Lemoine et al., 2019; Shaffer et al., 2016). In response, there have been several studies attempting to identify if various leadership styles are distinct and in which circumstances the distinct elements are important. For instance, five recent meta-analyses have examined whether authentic (Banks et al., 2016), ethical (Ng & Feldman, 2015), servant (Lee et al., 2019) and empowering (Lee et al., 2018) leadership explain incremental variance over and above established variables such as transformational leadership (see also Hoch et al., 2018) on various employee outcomes. These studies found that different leadership styles are relatively more important than transformational leadership for some outcomes but not others.

Extending this work, we meta-analytically compare the relative effects of thirteen leadership varaibles on creativity and innovation. In doing so, we answer recent calls for comparative examinations of different leadership styles (e.g., Piccolo et al., 2012) in a comprehensive examination of leadership, creativity and innovation. Because typical study designs examine just a single leader variable (see Hunter, Bedell-Avers, & Mumford, 2007; Piccolo et al., 2012), too few primary studies exist for us to examine the relative contribution of all thirteen leadership variables in one model. Instead, we explore their relative importance in two steps. First, we examine the relative variance explained by each variable over and above that explained by the full-range leadership model (transformational and transactional leadership). The full-range model represents a broad model that is also the most studied. Second, we examine the relative predictive validity of leadership variables within the different leadership categories. For example, we compare the effects of ethical, servant, authentic and humble leadership within the moral leadership category.

Research question 2: Which leadership variable(s) have the largest relative association with creativity and innovation above transformational and transactional leadership?

Research question 3: Which moral leadership variable(s) have the largest relative association with creativity and innovation.

Research question 4: Which relational leadership variable(s) have the largest relative association with creativity and innovation.

Research question 5: Which motivational leadership variable(s) have the largest relative association with creativity and innovation.

Research question 6: Which negative leadership variable(s) have the largest relative association with creativity and innovation.

Leadership and Creativity: Moderation

In their recent review, Hughes and colleagues noted that "the magnitude of the relationship between leadership and creativity and innovation is hugely variable… In some cases from near-zero to large, and in others, ranging from moderately negative to moderately positive." (p. 554). To illustrate, some studies find large associations between transformational leadership and creativity (e.g., Rickards et al., 2001) and innovation (e.g., Slatten, 2014), whereas other find non-significant associations (e.g., Cai et al., 2019; Chen, Farh, Campbell-Bush, Wu, & Wu, 2013). This pattern is common across leadership variables and Hughes and colleagues (2018) note three likely reasons for the variability. First, the use of sub-standard and variable study designs (e.g., cross-sectional vs. longitudinal) and varied assessments of creativity and innovation (e.g., employee self-rating, leader rating, 'objective' metric). Second, Hughes et al. (2018, p.554) argue that "the variation might represent the fact that the very nature of creativity and innovation differs across organizational sectors and roles". Third, they argue that the variation might reflect the presence of moderating variables within the organizational context (e.g., dynamics of specific leader-follower relationships). The current meta-analysis provides a unique opportunity to explore a small number of variables from each of these three potential causes of variation. We chose moderators that are

largely exogenous (e.g., sex, industry) in nature and thus are relatively free from endogeneity

biases (i.e., common method, missing variable, reciprocal effects). As a result, any

moderating effects can be interpreted as relatively reliable (see Antonakis, Bendahan,

Jacquart, & Lalive, 2010; 2014; Hughes et al., 2018).

Methodological Moderators

From this category, we explore whether leadership-creativity/innovation correlations

are moderated by the use of common-source (i.e., self-rated creativity or innovation) versus

non-common source (i.e., other-rated or objective measures) data and cross-sectional (i.e.,

leadership and creativity/innovation are measured concurrently) versus time-separated (i.e.,

creativity or innovation is measured at a later time point than leadership) designs. The use of

time-separated designs and/or non-common source data represent two methods frequently

employed to try and reduce endogeneity biases arising from the use of common methods (see

Podsakoff, MacKenzie, & Podsakoff, 2012).

Industrial Context

Hughes et al. (2018) suggest that creativity and innovation might look somewhat

different across industrial contexts and note that "no papers have empirically examined cross-

industry effects, thus, direct comparisons across industry boundaries would be an interesting

avenue for future research." (p. 554). Accordingly, we explore knowledge intensity as an

industrial-level moderator. Work within high knowledge-intensive industries uses a body of

complex knowledge (von Nordenflycht, 2010) to "produce qualified objects and/or services

by utilizing the knowledge of the personnel as the major resource" (Alvesson, 2000, p. 1101).

Examples of knowledge-intensive industries include high-tech service (e.g.,

telecommunication, computer design), professional service (e.g., law and accounting,

banking and insurance, consultancy, education, information service industries), and high-tech

manufacturing (e.g., pharmaceuticals, aerospace, biotechnology) (Alvesson, 2000; Liao, Fei, & Chen, 2007).

We argue that it is possible that knowledge-intensive organizations require different leadership styles than traditional labor-intensive (e.g., hospitality) or capital-intensive industries (e.g., low-tech manufacturing) (Terpstra & Rozell, 1993). In knowledge-intensive work contexts, leadership focusing on fostering employees' feeling of intrinsic motivation, trust, and empowerment, is likely to be more effective at encouraging knowledge sharing and creativity/innovation (Donate & de Pablo, 2015). For example, supportive and empowering leadership should be more effective in enhancing employee creativity and innovation, than authoritarian leadership, in high knowledge-intensive industries (Chuang, Jackson, & Jiang, 2016; Srivastava, Bartol, & Locke, 2006).

National Culture – Power Distance

As an additional contextual variable, we explore the possible moderating role of culture because what is expected of leaders varies due to cultural expectations (House, Javidan, Hanges, & Dorfman, 2002) meaning that national culture can influence the effectiveness of different leadership styles (e.g., Dorfman, Sully de Luque, Hanges, & Javidan, 2010; Hofstede, 2001; House & Aditya, 1997; Sully de Luque, Javidan, Hanges, & Dorfman, 2011). Here, we use the Hofstede cultural dimensions to examine national cultural based on the geographic locations where studies were drawn (Hofstede, 2001). We focus on power distance, which refers to beliefs about status, authority, and power in organizations and therefore has a stronger theoretical link to followers' reactions to different leadership styles than many other cultural values (Kirkman, Chen, Farh, Chen, & Lowe, 2009; Ng, Koh, Ang, Kennedy, & Chan, 2011). Societies with a high-power distance orientation expect more and are more receptive to top-down direction from their leaders (Javidan, House, Dorfman, Hanges, & De Luque, 2006). For instance, Den Hartog et al. (1999) suggest that in high

power distance societies there should exist a less negative attitude towards authoritarian

leadership. By contrast, in low power-distance cultures, people are argued to be less

respectful of authority and more likely to view leaders as equal in status to others (Rockstuhl,

Dulebohn, Ang, & Shore, 2012). Thus, the norms of low power-distance cultures should be

more compatible with leadership styles that promote equality and delegation between leaders

and followers (Hale & Fields, 2007).

Follower Gender

Finally, we consider follower gender as a possible within-context moderator.

Typically, compared to females, males are more likely to attain creative eminence across

various domains in the arts and sciences (Abra & Valentine-French, 1991; Cole &

Zuckerman 1987; Piirto, 1991). There are many potential reasons for this effect (see Baer &

Kaufman, 2008; Abraham, 2016) but the most promising explanations seem to revolve

around what has been entitled a "male hubris-female humility" bias (Furnham, Fong, &

Martin, 1999). That is, males typically rate themselves better at most things than women

including having greater creative self-efficacy, especially within scientific and competitive

contexts (Hughes, Furnham, & Batey, 2013; Kaufman, 2006). Because "self-assessments of

our abilities influence what we attempt to do and how much effort we expend … [they] are

important not just to self-perception but also to performance" (Hughes et al., 2012, p. 76).

Similarly, males' creative efforts are typically more resilient to the nature of feedback and

rewards. For example, studies of creative writing have demonstrated that introducing reward-

based extrinsic motivators or performance evaluations had no discernible effect on the males'

creative output but negatively affected female performance (Baer, 1998). Thus, it is possible

that by working to increase the confidence of their employees and motivating in the

'appropriate' way, leaders might have a relatively more important role to play for female

followers. In other words, male creative hubris perhaps acts as a buffer, regardless of how a leader behaves.

Moderation summary

To summarize, meta-analytic studies provide a unique opportunity to explore moderators that are difficult to test in single studies. To that end the current research seeks to explore boundary conditions that might help to explain some of the variation in effect sizes found across primary studies (Hughes et al., 2018).

Research question 7: To what extent do study design features, national culture, industrial context and follower gender impact the strength of the relationship between different leadership styles and creativity/innovation?

Method

Literature Search and Study Inclusion

A thorough search was conducted in order to identify published and unpublished samples that examined the relationship between leadership variables with creativity or innovation. To ensure completeness, we used electronic databases, EBSCOHost, Emerald, ProQuest, PsycINFO, and ScienceDirect, which collectively include a wide range of management and applied psychology journals. We included the search terms: *lead*, creativity, creative behave*, innovate*, innovative behav*, idea generation, idea implementation, idea promotion*. This process yielded a total of 10,043 results including journal articles, dissertations, books, conference papers and proceedings, and working papers. In addition, we examined the reference lists from any relevant review articles and most recent papers (Hughes et al., 2018; Mainemelis et al., 2015; Reiter-Palmon & Ilies, 2004; Wang et al., 2011; Watt, Steele, & Den Hartog, 2019). Finally, we searched for possible unpublished and in-press studies by sending email solicitations to members of the Academy of Management OB listserv.

A study had to meet several criteria to be included in our final analysis. First, it had to include a zero-order correlation between a leadership variable and either creativity or innovation at the individual-level. Individual creativity was assessed with 'objective' measures (e.g., creativity bonuses: Liao, Liu, & Loi, 2010) or leader-, peer-, customer- and self-ratings of commonly used creative behavior scales (e.g., Zhou & George, 2001). Innovation was assessed with leader-, customer- and self-ratings of commonly used innovative behavior scales (e.g., Janssen, 2000; Scott & Bruce, 1994). We only included studies that used follower ratings of leadership variables. While a handful of studies in the search used leader-rating of their own style (e.g., Van Dyne, Jehn & Cummings, 2002), the overwhelming majority used follower-rating and thus we chose to focus only on these studies. The second inclusion criteria for our analyses was that the study included the sample size used to arrive at the correlation. Third, the sample had to be independent from other studies; if a sample overlapped with another study, it was only included once. After coding these papers, we looked for the most common leadership variables examined. Like other researchers (e.g., Cole, Walter, Bedeian, & O'Boyle, 2012; Hoch et al., 2018), we made an *a priori* decision that we would include a leadership variable if it was included in four or more samples with either creativity or innovation. This criterion ruled out several leadership variables that were represented by fewer than four studies, including inclusive (2), ambidextrous (2) or empathetic (1) leadership. Our final sample included studies related to transformational, transactional, LMX, empowering/participative, servant, ethical/moral, authentic, humble, supportive, benevolent, entrepreneurial, authoritarian, and destructive leadership. In total, 255 publications and 266 independent samples (several publications reported multiple samples) met these criteria. Appendix C provides details of the studies included for every meta-correlation produced in our analyses.

In addition to exploring the correlations between the leadership variables, creativity and innovation, the current study is also concerned with relative effects of different leadership variables and moderators. For moderation analyses we coded pertinent information from the studies, such as the national culture in which each study was conducted, the percentage of leaders and/or followers that were males, and the average age of followers. In order to determine the relative effects of the different leadership variables, we required meta-analytic correlations between leadership variables. For some of these relationships we were able to rely on recently published meta-analytic papers to get the required correlation. For example, recent studies provided meta-analytic correlations between leadership styles such as ethical and empowering leadership and transformational leadership (e.g., Hoch et al., 2018; Lee et al., 2018). For other leadership variables, no previous meta-analyses were available and thus we conducted a separate search to find correlations between styles. Appendix A highlights the source of all these meta-analytic correlations.

Meta-Analysis Procedure

The meta-analysis utilized the Hunter and Schmidt (2015) approach. This method produces a sample weighted mean correlation (r) and a mean correlation corrected for unreliability in both independent and dependent variables, henceforth referred to as the corrected population correlation (ρ). Missing values (i.e., reliability of either predictor or criterion) were estimated by adding the average value across the studies in which information was provided (Hunter & Schmidt, 2015). If a study included multiple operationalisations of either creativity or innovation, we averaged the correlation to create a single correlation. For example, a study by Harris and colleagues (2014) included both supervisor and co-worker ratings of employee creativity (Study 2), which was averaged. The 95% confidence intervals (95% CI) of the sample-weighted mean correlation and the 80% credibility intervals (80% CV) of the corrected population correlation were also reported. Confidence intervals estimate

variability in the sample-weighted mean correlation that is due to sampling error; credibility intervals estimate variability in the individual correlations across studies that is due to moderating variables (Whitener, 1990). If the 95% confidence interval does not include zero, we can be confident that the sample-weighted mean correlation differs from zero. Confidence intervals can also be used to determine whether two estimates differ from each other; two estimates are considered different when their confidence intervals are non-overlapping.

If the 80% credibility interval of the corrected population correlation is large it is indicative of the fact that there is considerable variation across studies, and moderators are likely to be operating. We also estimated the percentage of variance accounted for in the corrected population correlation by sampling and measurement error (% VE, Hunter & Schmidt, 1990). Typically, moderators are likely to be present when sampling and measurement error accounts for less than 75% of the variance (Hunter & Schmidt, 1990). To explore moderators between the different leadership variables and creativity and/or innovation we ran random effects meta-regression. Meta-regression explores whether there is a significant difference between studies according to different levels of either continuous or categorical moderators (Borenstein, Hedges, Higgins & Rothstein, 2011). We conducted these moderator analyses using the meta-analytic software, Comprehensive Meta-Analysis (version 2.2.064, 2011, Biostat, Englewood, NJ). We first tested several methodological moderators, including: rater (whether creativity/innovation was self- or other-rated/objective); time (whether the creativity/innovation was measured at the same time or later than the leadership variable); and whether the studies were published or unpublished (to test for any publication bias). After testing these methodological moderators, we then explored theoretical moderators, including the national culture in which the studies were conducted, the industry context, and the gender of the followers. For national culture, each study was given a score for power-distance, ranging from 1 (representing very low power-

distance) to 100 (indicating very high power-distance) based on the culture taxonomies obtained from Hofstede (2001). For example, according to Hofstede's research, Austria has very low power distance with a score of 11. Malaysia, on the other hand, has a score of 100. We took two steps to code the industry knowledge intensity. First, we coded the studies' industry if the information was available. We then coded the studies' industry type as a dichotomous/nominal variable where 1 represents high-knowledge intensity, and 0 represents low-medium-knowledge intensity. We coded industry knowledge intensity based on Alvesson's (2000) and OECD's definition of knowledge intensive industries (Liao et al., 2007; Miles, 2008). For example, industries that are considered to be high knowledge intensity typically include high-tech service (e.g., telecommunication, computer and related activities), professional service (e.g., law and accounting, banking and insurance, health and social work, management, consultancy, education, information service industries), and high-tech manufacturing (e.g., pharmaceuticals, aerospace, and biotechnology industries). Industries that are considered low-medium industry knowledge intensity typically include retail trade, wholesale trade, and textile and clothing manufacturing (Miles, 2008). Additionally, we followed the categorization used by Classification of Economic Activities in the European Community (NACE) to categorise industries based on Alvesson's definition if the industry appears as a sub-category of the main knowledge intensive industry categories. For example, computer and related activities category can include industries such as industries reported as database activities and software/IT service. Finally, follower gender was coded as the proportion of the followers in the study that were male.

To test for relative predictive validity of the different leadership variables, we conducted relative weights analysis (Johnson, 2000). Relative weights analysis tests the relative contribution (i.e., relative importance) among multiple (often correlated) predictor variables in a regression analysis. Relative weights analysis converts the total variance

predicted in a regression model (R squared) into weights that accurately reflect the proportional contribution of the various predictor variables. Specifically, these weights represent an additive decomposition of the total model and can be interpreted as the proportion (percentage) of variance explained in the outcome (e.g., creativity) that is appropriately attributed to each leadership variable. As such relative weights analysis considers *only* the relative contribution of a variable to total variance explained. The analysis addresses the problem caused by correlated predictors by using a variable transformation approach that takes into account a variable's contribution to an outcome by itself and in combination with other predictor variables (see Johnson, 2000; Johnson & LeBreton, 2004; LeBreton & Tonidandel, 2008; Tonidandel & LeBreton, 2011, for a detailed discussion of relative weight analysis). The use of relative weights in meta-analyses has gained great popularity and is common in management literature (see Hoch et al., 2018; Kurtessis, Eisenberger, Ford, Buffardi, Stewart, & Adis, 2017; Lee et al., 2018). To conduct the analysis, we first created a correlation matrix, which included meta-analytic correlations between all study variables (where possible). To reduce common source variance and common method bias, the correlations between leadership and creativity and/or innovation, were based on non-common source estimates (cf. Podsakoff et al., 2012). In other words, we did not include self-rated creative or innovative performance in these analyses. Using this correlation matrix, we conducted relative weights analyses, using Tonidandel and LeBreton's (2011) guidelines.

Results

Meta-analytic coefficients between the various leadership variables and individual-level creativity and innovation are displayed in Table 1. We formulated effect sizes using all studies, studies using only self-reported creativity and innovation, and studies using only non-self-report creativity and innovation.

All the leadership variables, except transactional leadership, were significantly associated with creativity. Entrepreneurial leadership and authentic leadership shared the largest correlation with creativity ($\rho = .47$). As indicated by non-overlapping 95% confidence intervals, authentic leadership had a significantly larger association than transformational, benevolent, humble, supportive, authoritarian, and destructive. The association between transactional leadership and creativity was found to be more variable – with confidence intervals that crossed zero. To better understand the effects of transactional leadership we examined its dimensions separately. Of the 12 studies examining transactional leadership and creativity, 5 examined contingent reward as a separate dimension, while 3 focused on management by exception. We found that contingent reward was positively and significantly associated with creativity, whereas management by exception had a non-significant association with creativity (See Table 2). Table 2 also shows the meta-analytic coefficients for the dimensions of transformational leadership; no significant differences were found across the four dimensions of transformational leadership ($\rho = .20 -.22$).

<div style="text-align:center">Insert Table 1 about here</div>

<div style="text-align:center">Insert Table 2 about here</div>

Innovation was significantly associated with all the leadership variables. However, we did not find enough primary studies to explore the associations between innovation and authentic, humble, authoritarian, or destructive leadership. Further, we did not find enough primary studies that explored the dimensions of transformational leadership in relation to follower innovation. The largest association was found between supportive leadership and innovation ($\rho = .38$). To better understand the effects of transactional leadership we examined its dimensions and found that contingent reward was positively and significantly associated with creativity ($\rho = .30$), however we were unable to find enough studies that examined the effect of management by exception on individual innovation (See Table 2).

Moderation Analysis

Table 3 displays the results of our moderation analyses. Further, the meta-analytic correlations between the leadership variables and creativity/innovation at different levels of the dichotomous moderators (i.e., published vs unpublished studies; high vs low knowledge intensive industry; cross-sectional vs time separated design) can be found in Appendix B.

First, we tested for the possibility of publication bias, by examining any difference in effect between published and unpublished studies. As highlighted in Table 3, we found no differences in the relationship between creativity and LMX, transformational, and empowering leadership dependent on whether the data was published or unpublished. Further we found no evidence for publication bias in the relationship between transformational leadership and innovation. The aforementioned relationships were the only ones with enough unpublished data to test for differences.

Regarding methodological moderators, we found some evidence that correlations were inflated when either creativity or innovation was self-rated as opposed to other-rated (e.g., leader-rated) or objectively assessed (See Table 3). For example, we found that the relationship between transformational leadership and both creativity and innovation was significantly larger when common-source data was used. We also found evidence for inflated correlations when leadership and creativity were assessed concurrently. Specifically, the link between creativity and both LMX and empowering leadership was weaker when these variables were time separated compared to measured simultaneously. For many leadership variables there were too few time-separated designs to conduct this moderation analysis.

Insert Table 3 About Here

We respect to knowledge intensity, we found little evidence that this aspect of industrial context influenced the strength of the relationship between leadership and either

creativity or innovation. However, LMX and supportive leaders had a weaker impact on innovation in knowledge intensive industries.

In terms of national culture, we explored the moderating effect of power distance. In most of the analyses power distance had no significant effect on the relationship between leadership and either creativity or innovation. However, for empowering leadership, we found that the relationship with creativity was weaker in cultures higher in power distance. Conversely, we found that the relationship between supportive leadership and creativity and was stronger in cultures higher in power distance. Similarly, the relationship between servant leadership and innovation was stronger in such cultures.

Finally, we found evidence that several leadership variables had stronger correlations when the proportion of female followers was higher compared to lower. Correlations between creativity and LMX, authentic, servant, and destructive leadership were weaker when there was a higher proportion of male followers. Correlations between LMX and innovation were weaker when there was a higher proportion of male followers.

Relative Weights Analysis

We explored the relative association between the leadership variables and creativity and innovation. We conducted this analysis in two steps. First, we compared the effect of each leadership variable to the full-range leadership model (i.e., transformational and transactional leadership). Where possible we did this for both creativity and innovation. For transactional leadership, we decided to focus on contingent rewards. Measures that combined contingent reward and management by exception had inconsistent effects on both creativity and innovation (i.e., 95% confidence intervals that overlapped zero) but the contingent reward dimension had positive and significant effects on creativity/innovation (See Table 2). The second step focused on comparing the effect of leadership variables within the different categories. For instance, we examined the relative importance of authentic, servant, ethical

and humble leadership on creativity to ascertain which of these "moral styles" had the strongest relationship to creativity. For all these analyses, we decided to exclude self-rated creativity and innovation because our moderation analyses suggested that self-rated creativity and innovation was often significantly more strongly related to leadership – suggesting the potential for common-method bias (Podsakoff et al., 2012).

Insert Table 4 about here

Table 4 shows the relative weight analyses comparing each of the leadership variables with transformational and contingent reward leadership. Relative weights analysis considers the relative contribution of a variable to total variance explained by the model tested. Regarding creativity, empowering (75%), LMX (51%), servant (47%), ethical (62%) and authentic (77%) leadership explained relatively more of the total predictable variance explained by the model than did transformational leadership or contingent reward leadership, whereas authoritarian (13%), destructive (26%), and supportive (15%) leadership accounted for relatively less of the total predictable variance explained than did transformational and contingent reward leadership. For humble and benevolent styles of leadership, we could only find enough studies to compare with transformational leadership. Humble leadership explained slightly more of the total predictable variance (53%) in creativity compared to transformational leadership, whereas benevolent explained much less (27%). These findings suggest that authentic and empowering leadership have the strongest relationship to creativity over transformational and contingent reward leadership. It is also interesting to note that apart from authoritarian and supportive leadership, contingent reward accounted for the smallest proportion of the variance explained in creativity.

Regarding innovation, a different pattern was evident, with only supportive leadership (58%) explaining relatively more of the total predictable variance than the full-range leadership model. It is interesting to note that except for supportive leadership, the use of

contingent rewards accounted for the greatest proportion of the variance explained in innovation. As far as data allowed, we conducted additional relative weights analysis within the categories of leadership. As shown in Table 5, we explored the relative weights of the relational oriented leadership variables: LMX, supportive and benevolent leadership. Of these, LMX (59%) explained a larger proportion of the variance explained than either supportive (19%) or benevolent leadership (22%). However, supportive leadership (80%) explained a greater proportion of the variance explained in innovation compared to LMX (20%). Of the moral-based leadership styles, we found that authentic leadership accounted for the largest proportion of the variance explained in creativity (54%), whereas compared to servant leadership, ethical leadership (74%) accounted for most of the variance explained in innovation. For the two motivational styles, empowering leadership (60%) was the strongest predictor of innovation, explaining a higher proportion of the explained variance compared to entrepreneurial leadership (40%). Finally, of the negative leadership styles, destructive leadership (82%) explained a much larger proportion of the variance explained in creativity compared to authoritarian (18%).

Additionally, as shown in Table 5, we compared the relative importance of the different dimensions of transformational leadership on creativity. Of the 4 dimensions, individualized consideration explained the largest proportion of the variance explained in creativity (29%), however generally speaking the 4 dimensions accounted for similar proportions of the variance explained.

Insert Table 5 about here

Discussion

To date, leadership, creativity and innovation research has produced a complex literature that hinders understanding and the development of evidence-based practical recommendations. We aimed to add clarity to the area by synthesizing empirical work to

produce robust estimates of the correlations between thirteen leadership variables and employee creativity and innovation, explore the relative importance of different leader variables, and explore some potential moderators. We discuss our findings in relation to our three key aims below.

Research question 1: Which leadership variable(s) is(are) most strongly associated with creativity and innovation?

Several previous meta-analyses reported positive correlations between authentic, servant, transformational, and empowering leadership and either creativity, innovation, or some combination of the two (Banks et al., 2016; Lee et al., 2018; Lee et al., 2019; Rosing et al., 2011; Wang et al., 2011). Our findings help to further clarify the field in two main ways. First, we estimated correlations for creativity and innovation, separately. Second, because we estimated reliable correlations between thirteen leadership variables and creativity and innovation, we were better able to summarise the vast literature.

Before we discuss some of the more nuanced results, we first offer a broad overview of the main trend in the analysis, namely, that almost all leader variables are modestly correlated with employee creativity and innovation. In pursuit of parsimony, we sorted the thirteen variables into five theoretically-informed categories: the full-range model, moral leadership, motivational leadership, relational leadership, and negative leadership. We found that twelve of thirteen leadership styles had significant associations with creativity regardless of where they were categorized. Transactional leadership was the only style not to share a significant correlation. Due to data limitations, we were unable to estimate the association between innovation and authentic, destructive, or humble leadership. All the nine remaining variables (i.e., transformational, transactional, LMX, servant, ethical, entrepreneurial, authoritarian, benevolent, and supportive leadership) shared significant correlations with innovative behaviour. This is an interesting finding that can be interpreted in different ways.

One interpretation is that any of the leadership variables highlighted above will help leverage followers' creativity or innovation. Indeed, the same theoretical mechanisms have been posited to explain the effects of many different leadership variables (Hughes et al., 2018). For example, employee psychological empowerment (i.e., feelings of competence, purpose, autonomy, and impact) has been found to mediate the effects of transformational (e.g., Sun, Zhang, Qi, & Chen, 2012), transactional (Wei, Yuan, & Di, 2010), empowering (e.g., Zhang & Bartol, 2010), and ethical (e.g., Javed, Khan, Bashir, & Arjoon, 2017) leadership on creativity.

An alternative, perhaps more likely, explanation is that many leader variables are redundant, and their assessment tools assess overall attitudes regarding leaders rather than actual behaviors (Lee, Martin, Thomas, Guillaume, & Maio, 2015). Current study designs preclude firm conclusions because they are plagued by endogeneity biases (i.e., the predictor variable is correlated with the error term of the outcome variable),which mean that ratings of leadership often correlate with outcomes such as employee creativity or innovation in two or more ways: (i) as a meaningful cause and (ii) due to errors such as common method bias, reciprocal effects, or relationships with a common cause (Antonakis et al., 2010, 2014; Banks et al., 2018; Hughes et al., 2018). However, it is likely that at least some leader variables are redundant and future research should prioritize efforts to identify which leader variables are unique and useful. Doing so would involve at least two steps. First, researchers should continue to identify overlap and uniqueness between leadership variables (e.g., Lemoine et al., 2019). Our relative weights analysis, discussed below, can also begin to shed some light on this matter by highlighting that while there is empirical overlap between the leadership variables, their correlations with creativity and innovation suggest there are also unique elements that can be drawn out. Arguably, the field would benefit most from a single taxonomy of important, behaviourally-focussed, leader variables that could then be combined

in different ways to produce more complex 'styles'. Such an approach would allow for both parsimony and emergent complexity. Second, researchers would need to use methods that are resistant to endogeneity bias in order to establish causal links between leadership and creativity/innovation. This would involve the use of experimental studies or by using instrumental variables and longitudinal designs (see Hughes et al., 2018).

Turning to some more nuanced findings. First, authentic (a moral style) and entrepreneurial (a motivational style), two rather different leadership styles, had the largest association with individual creativity. Entrepreneurial leaders are often creative themselves and focus their resources on enabling followers to experiment and challenge the status quo (Renko et al., 2015). In contrast, authentic leaders focus on developing their followers in a more holistic manner, by role-modelling personally expressive and authentic behavior and providing opportunities for skill development and autonomy (e.g., Hoch et al., 2018). This would suggest that leaders can effectively influence creativity through behavioural modelling, providing autonomy, and being encouraging and honest.

Second, for individual innovation, supportive, empowering, and servant leadership had the strongest correlations. These findings tentatively suggest that employees are better able to innovate (i.e., promote and implement novel ideas) when their leaders become less 'leader-like' in the traditional sense. That is, when leaders act as facilitators and support and empower employees.

Third, "negative" leadership (i.e., authoritarian and destructive) typically had weaker associations with creativity compared to "positive" leadership, suggesting that the effects of negative leaders are less pronounced that the effects of more positive leadership styles, such as those focused on morals, relationships, or motivation. These results add to the growing literature on negative leadership and specifically to results from a previous meta-analysis

which found that destructive leaders had stronger effects than constructive leaders for some follower outcomes, but not others (Schyns & Schilling, 2013).

Research questions 2-6: Which leadership variable(s) have the largest relative association with creativity and innovation?

We used our uniquely comprehensive data set to conduct a series of analyses to address the fact that **"**it is unclear which leadership approaches are the strongest predictors because the literature has largely failed to examine the relative contribution of different leadership variables." (Hughes et al., p. 564). Two previous meta-analyses, using a combined creativity and innovation variable, have examined relative effects, finding that empowering leadership had stronger effects than transformational leadership (Lee et al., 2018) and servant leadership (Lee et al., 2019) had stronger effects than transformational, ethical, or authentic leadership. Our study builds on these initial findings by testing a wider range of variables and considering their effects on individual-level creative and innovative behavior separately. Specifically, we estimated the relative effects of each leadership variable in comparison to the full-range leadership model (i.e., transformational leadership and contingent reward) and we estimated the relative effects of each leader style within the five theoretical categories (as far as data allowed). The findings of both analyses converged to present an interesting picture.

For creativity, the leader variables that had the strongest relative effects, when compared to the full range leadership model, were authentic, empowering, ethical, and LMX, whereas contingent reward was a particularly weak contributor. Overall, authentic leadership showed the largest relative effect over transformational and contingent reward leadership. Although spread across different theoretical groupings the commonality across these variables is that they focus on developing genuine and close relationships with followers through social exchanges including coaching, participative decision-making, showing concern, and relational transparency. Similarly, when compared within theoretical groupings,

LMX and Authentic leadership were found to be particularly prominent. This suggests the same mechanism is at play, namely, that in order to facilitate creativity, leaders should develop close relationships with their employees which allow them to better leverage existing employee resources (e.g., cognitive skills, motivation; Fischer et al., 2017). This interpretation is consistent with current empirical evidence and theory (e.g., Amabile, 1996; Perry-Smith & Mannucci, 2017) which shows that when creating, employees require psychologically safe environments characterised by a high degree of trust in which they feel able to engage in cognitively flexible thought and potentially spend time generating novel but useless ideas.

In almost direct contrast were the relative weights analyses for innovation. Authentic leadership and LMX were relatively unimportant, whereas supportive leadership showed the strongest relative effects. Interestingly, contingent reward was one of the most important leadership variables for innovation. The difference in the importance of contingent reward between creativity and innovation is one of the most striking findings, and again, consistent with theory and empirical evidence. Previous research has demonstrated that extrinsic rewards do little to provide the safe, autonomous conditions suited to generating novel ideas (Amabile, 1996; Perry-Smith & Manucci, 2017) but that innovative work behaviour (i.e., promoting and implementing novel ideas) is not hampered by the presence of extrinsic rewards (Hughes et al., 2018; Perry-Smith & Mannucci, 2017). It is probably the case that whereas creativity requires unbounded mental exploration that can be constrained by extrinsic rewards (e.g., Baer, Oldham, & Cummings, 2003; Malik, Butt, & Choi, 2015), the tasks central to innovation require a more focused, targeted, and persistent behavioural approach that is incentivised by tangible rewards (Behrens & Patzelt, 2018). Equally, because innovation is applied in nature, it is probably easier to assess and to design appropriate

performance-contingent rewards. Thus, it is perhaps unsurprising that extrinsic rewards are effective in promoting innovative work behavior (e.g., Honig-Haftel & Martin, 1993).

Another notable finding was that supportive, empowering and entrepreneurial leadership proved to be strong predictors of innovative behavior. It is not surprising that entrepreneurial leadership was relevant because its scale assesses the degree to which the leader themselves innovates or explicitly encourages innovative employee behaviour. Similarly, empowering leaders tend to encourage employees to use their initiative in a self-directed manner and provide the autonomy required to do so. Further, it seems that both empowering and supportive leadership scales are relatively unique from other scales in their categories because they contain a greater proportion of items that refer to the provision of instrumental, goal-directed-support (e.g., My leader is concerned that I work in a goal-directed manner; My supervisor takes pride in my accomplishments; My leader coordinates his/her goals with my goals; My supervisor supports my work group's effort; Help is available from my supervisor when I have a problem; Helps my work group focus on our goals) as opposed to social or emotional support focussed on meeting relational goals and improving employee wellbeing that is typical of other styles in those categories (e.g., servant, LMX, authentic). Thus, it appears that these leader styles encapsulate three important avenues through which leaders can facilitate employee innovation: role-modelling, providing autonomy, and providing instrumental, goal-directed support (e.g., social influence when attempting to promote and implement ideas; Perry-Smith & Mannucci, 2017).

In sum, because creativity and innovation are fundamentally different (see Hughes et al., 2018, Table 2), and driven by different antecedents (e.g., Axtell, Holman, Unsworth, Wall, Waterson, & Harrington, 2000; Hughes et al., 2018; Magadley & Birdi, 2012) our separate analysis has revealed some interesting nuances. Specifically, leadership that focuses upon building close leader-follower relationship, characterized by a high degree of trust

appear most effective in facilitating employee creativity. In contrast, leader behaviors characterized by providing by active role-modelling, providing autonomy, goal-directed support, and performance-contingent rewards appear most effective in facilitating employee innovation.

Research question 7: To what extent do study design features, national culture, industrial context, and follower gender impact the strength of the relationship between different leadership variables and creativity/innovation?

Previous studies have noted that a large amount of variation exists in the relationship between leadership and creativity/innovation (e.g., Hughes et al., 2018). This was echoed in our findings, as indicated by large 80% credibility intervals regarding the correlations between the leadership variables and both creativity and innovation. As such, we sought to explore some potential methodological and substantive moderators of the correlations between leadership and creativity and innovation.

Methodological Moderators

To test whether the main effects found in our analysis were influence by the methodology employed in the primary studies, we explored the effect of the two most common practices employed to reduce common method bias (see Podsakoff et al., 2012). The relationship between leadership and follower creativity and innovation was often larger when the outcome was self-rated compared to supervisor-rated or objectively measured and when studies were cross-sectional as opposed to time-lagged. However, for many leadership variables there were no significant differences based on these study design issues. It is also important to note that the two methods are inadequate to deal with all endogeneity biases (see Antonakis et al., 2010), which do influence effect sizes in the leadership, creativity, and innovation field, making it difficult to make firm conclusions (Hughes et al., 2018). Thus, we echo calls for future research to use stronger designs, including, experimental studies, proper

longitudinal designs, and instrumental variables (see Hughes et al., 2018 for specific

recommendations).

Substantive moderators

Industrial setting did not moderate correlations between most leadership variables and

creativity and innovation. Thus, regardless of whether studies were conducted in knowledge

intensive sectors or not, effects were largely consistent. However, we did find that supportive

leadership and LMX (both relational variables) had a weaker relationship with innovation in

more knowledge intensive industries. It is possible that these findings are spurious and due to

chance but we can also speculate that because knowledge-intensive work is of an "intellectual

nature" and the majority of employees are "well-educated" (Alvesson, 2000, p. 1101), they

may feel less need for relational leadership and instead prefer leadership styles that promote

self-reliance and initiative. Indeed, a strong supportive leadership style in this context could

even make knowledge workers, feel less independent, less trusted, and as a result, use their

competencies to be creative to a lesser extent (Burnett, Chiaburu, Shapiro, & Li., 2015).

Another contextual variable examined was national culture. Focusing on societal-level

power-distance, we found that culture moderated the correlations between empowering,

servant, and supportive leadership and creativity (empowering and supportive) and

innovation (servant). For empowering leadership, we found that higher levels of power

distanced weakened the relationship with creativity. This is not surprising as cultures high in

power distance may perceive empowering behavior such as the delegation of responsibility to

be inconsistent with societal norms suggesting that only those with formal power should have

authority and discretion, whereas the role of low power individuals is to carry out the explicit

orders of superiors (Rockstuhl et al., 2012). As such individuals in high power distance

societies may be less willing to accept and exercise discretionary power granted by leaders

(e.g., Chow, Lo, Sha, & Hong, 2006).

In contrast, supportive and servant leadership had stronger effects on creativity and innovation, respectively, when power-distance was higher. High power-distance cultures adopt policies and norms that consider followers to be less important than leaders (Tyler, Lind, & Huo, 2000) and expect followers to show deference and obedience (Li & Sun, 2015). Thus, when leaders demonstrate individualized support to followers, it is likely perceived as a kindness that surpasses expectations and is received with gratitude (Lin et al., 2018). By contrast, followers in lower power-distance societies likely expect individualized support as the norm, meaning that supportive efforts confer weaker effects on behavior.

With regards to follower gender, five correlations were moderated. The higher the proportion of males in a team, the weaker the correlations between creativity and innovation and LMX, Authentic, Servant, and Destructive leadership. These results are in line with the "male hubris-female humility" bias (Furnham et al., 1999) and suggest that, on average, females' creative and innovative performance is more heavily aided and hindered by their leaders. This effect seems to be particularly pronounced for leader variables that have a strong social exchange component, suggesting that leaders' social interactions might be particularly important for harnessing the creative potential of female employees. Given these findings we argue that a fruitful area for future research is to further examine gender in relation to leadership, creativity and innovation. Research could, for example, explore the effect of gender dissimilarity between leaders and followers and continue to explore when the "male hubris-female humility" bias is observed.

Limitations and Future Research Directions

As with any meta-analysis, the results are bound by the data available in the primary studies. The leadership, creativity, and innovation literature is characterized by an over-reliance on cross-sectional and correlational data, which are unable to provide robust estimates of causal effects, due to endogeneity biases (e.g., Antonakis et al., 2014; Fischer et

al., 2017; Hughes et al., 2018). Thus, it is impossible to draw conclusions related to causality in our analyses. That said, there are strong theoretical grounds and mounting experimental evidence (e.g., Sosik, Kahai, Avolio, 1999; Jaussi & Dionne, 2003) to suspect that leadership influences follower creativity and innovation

For some of the relationships in our analyses we had to rely on a small number of primary studies. For example, the relationship between entrepreneurial leadership and creativity was particularly strong but based on only three studies (N = 820) and there were too few studies using non-common source data, to include entrepreneurial in our relative weight analysis. The lack of primary studies makes it impossible to derive strong conclusions since the results may have been strongly influenced by particularly strong or weak correlations. This limitation also highlights clear areas for future research by demonstrating which outcomes particularly require further investigation.

It is important to consider our meta-analytic findings in relation to the wider leadership literature. The literature has been subject to much evaluation in recent years – with high profile critiques of the conceptualization and measurement of prominent leadership variables (e.g., Alvesson & Einola, 2019; Antonakis, Bendahan, Jacquart, & Shamir, 2016; Bank et al., 2018; van Knippenberg & Sitkin, 2013) and the way in which leadership studies are typically designed (e.g., Antonakis et al., 2010; Hughes et al., 2018). For instance, there have been recent and compelling critiques regarding the conceptualization and measurement of authentic leadership (Alvesson & Einola, 2019), transformational leadership (van Knippenberg & Sitkin, 2013), and charismatic leadership (Antonakis et al., 2016) which suggest that they are in some cases, "ill-defined, tautological, ideological and resist rigorous study" (Alvesson & Einola, 2019, p. 12).

More generally, the leadership literature suffers from construct redundancy (Shaffer et al., 2016), with high correlations being observed between "different" leadership variables

(e.g., Banks et al., 2018). The findings of our meta-analysis should be interpreted with these critiques in mind and even add weight to the argument. Appendix A shows the high meta-analytic correlations between the different leadership variables that we examined in relation to creativity and innovation. Our findings also show that all leadership variables, except for transactional leadership, showed significant relationships with creativity and innovation that were often hard to distinguish. These findings can be interpreted as indicative of construct redundancy, but they could also be due to factors that inflate and attenuate effects, such as endogeneity biases (see Banks et al., 2018). For instance, the high correlations observed in primary studies between transformational and entrepreneurial leadership (e.g., Newman et al., 2018) could be due to the fact that both measures are lack accuracy and precision (Hughes, 2018) meaning they capture overall positive leader evaluations (see Lee et al., 2015). Indeed, our results, which show differential effects of different leadership variables, suggest some uniqueness within some leader variables. If the uniqueness for each leader variable was identified and only that was assessed (i.e., remove construct irrelevant content) then scales would offer more nuanced and accurate assessments of the target constructs (Hughes, 2018). Accordingly, we echo the call for better measurement and study design than can reduce endogeneity biases and provide more accurate estimates of the relationship between leadership variables (e.g., Antonakis et al., 2010; Banks et al., 2018; Hughes et al., 2018; Lemoine et al., 2019).

Practical Implications

Although the limitations noted are non-trivial (see Hughes et al, 2018), our synthesis suggests some tentative implications for leaders. There are two notable findings in this regard that emanate from the fact that creativity and innovation are fundamentally different (see Hughes et al., 2018, Table 2).

For enhancing individual-level creativity, leaders should try to enact behaviors that focus upon building close leader-follower relationship, characterized by a high degree of trust, as would be indicative of the relatively important leader variables of LMX, authentic, and empowering leadership. To help in this regard, organizations might wish to train leaders in such styles (see Baron & Parent, 2015, for a recent evaluation of such training). In addition, leaders should be careful if trying 'buy' creativity through contingent rewards and would probably be better served to allow employees the autonomy and time needed to generate novel ideas – many of which will likely be of little tangible value yet important in the overall process. Similarly, organizations must create appropriate processes to allow for idea generation at work.

In contrast, when seeking to help employees innovate, leaders should behave in a manner that is characterized by actively role-modelling desired behaviors, providing autonomy, goal-directed support such as ensuring adequate resources and lending social influence to followers when required. Perhaps the key finding that emerged from our analysis relates to strong relationship between the use of a contingent rewards and innovation. Clearly, organizations should design their reward systems carefully and/or allow leaders to have the discretion to offer innovation-contingent rewards, when appropriate.

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Table 1 *Meta-Analytic correlations between leadership styles, creativity and innovation.*

Variable	k	N	r	95% CI		ρ	SD_ρ	%VE	80% CV	
				Lower	Upper				Lower	Upper
Transformational Leadership										
Creativity	55	18122	0.28	0.23	0.33	0.31	0.20	7.51	0.05	0.57
Creativity: Self-rated	21	7483	0.32	0.23	0.41	0.36	0.22	5.61	0.08	0.64
Creativity: Other-rated	34	11010	0.25	0.19	0.30	0.27	0.18	9.80	0.04	0.51
Innovation:	34	14043	0.26	0.21	0.31	0.29	0.16	9.30	0.08	0.50
Innovation: Self-rated	19	9806	0.29	0.23	0.34	0.33	0.13	11.19	0.16	0.49
Innovation: Other-rated	16	3946	0.23	0.14	0.26	0.26	0.22	8.62	-0.02	0.54
Transactional Leadership										
Creativity	12	5041	0.12	-0.03	0.26	0.14	0.29	3.57	-0.23	0.51
Creativity: Self-rated	4	2556	0.28	0.12	0.44	0.34	0.19	5.29	0.10	0.57
Creativity: Other-Rated	8	2485	-0.04	-0.20	0.12	-0.04	0.26	5.96	-0.37	0.29
Innovation	11	7186	0.19	0.10	0.27	0.23	0.17	7.12	0.02	0.45
Innovation: Self-rated	6	5746	0.20	0.10	0.30	0.24	0.14	6.53	0.06	0.43
Innovation: Other-rated	6	1440	0.14	-0.03	0.32	0.18	0.24	8.53	-0.13	0.49
Authentic Leadership										
Creativity	16	5088	0.42	0.34	0.51	0.47	0.18	7.32	0.24	0.71
Creativity: Self-rated	7	2905	0.43	0.35	0.52	0.48	0.11	13.17	0.33	0.63
Creativity: Other-rated	9	2184	0.41	0.26	0.56	0.47	0.25	5.56	0.15	0.79
Servant Leadership										
Creativity	11	4490	0.34	0.21	0.47	0.38	0.25	3.83	0.06	0.70
Creativity: Self-rated	5	2385	0.40	0.22	0.58	0.45	0.24	3.30	0.15	0.75
Creativity: Other-rated	6	2105	0.27	0.09	0.45	0.31	0.24	5.17	0.00	0.61
Innovation	7	1491	0.30	0.18	0.42	0.34	0.18	13.87	0.11	0.56
Innovation: Self-rated	4	811	0.40	0.27	0.54	0.46	0.16	16.16	0.26	0.66

Variable	k	N	r	95% CI		ρ	SD$_ρ$	%VE	80% CV	
				Lower	Upper				Lower	Upper
Innovation: Other-rated	3	680	0.18	0.09	0.28	0.20	0.06	59.56	0.13	0.28
Ethical Leadership										
Creativity	15	3982	0.31	0.24	0.39	0.36	0.14	16.16	0.18	0.55
Creativity: Self-rated	5	1250	0.29	0.16	0.41	0.34	0.14	19.10	0.16	0.52
Creativity: Other-rated	10	2732	0.33	0.24	0.41	0.37	0.15	15.16	0.19	0.56
Innovation	7	2349	0.24	0.16	0.32	0.28	0.12	19.76	0.12	0.44
Innovation: Self-rated	4	1396	0.25	0.12	0.38	0.28	0.15	13.13	0.09	0.47
Innovation: Other-rated	3	953	0.23	0.17	0.29	0.28	0.05	59.32	0.22	0.35
Humble Leadership										
Creativity	4	1347	0.24	0.15	0.33	0.28	0.10	27.38	0.15	0.40
Creativity: Other-rated	4	1347	0.24	0.15	0.33	0.28	0.10	27.38	0.15	0.40
Empowering Leadership										
Creativity	22	5810	0.32	0.26	0.39	0.36	0.17	11.06	0.14	0.58
Creativity: Self-rated	6	1174	0.40	0.31	0.50	0.44	0.12	24.01	0.29	0.59
Creativity: Other-rated	16	2892	0.38	0.31	0.45	0.42	0.15	11.81	0.22	0.62
Innovation	9	4595	0.31	0.25	0.37	0.35	0.10	16.35	0.22	0.48
Innovation: Self-rated	5	2450	0.37	0.30	0.44	0.43	0.08	24.88	0.33	0.53
Innovation: Other-rated	4	2145	0.24	0.18	0.31	0.27	0.06	39.07	0.20	0.35
Entrepreneurial Leadership										
Creativity	3	820	0.40	0.27	0.54	0.47	0.11	21.02	0.32	0.62
Innovation	5	1379	0.26	0.19	0.33	0.29	0.06	49.23	0.21	0.37
LMX										
Creativity	39	11671	0.30	0.26	0.35	0.34	0.14	15.46	0.16	0.52
Creativity: Self-rated	16	4846	0.36	0.31	0.42	0.41	0.12	18.68	0.26	0.56
Creativity: Other-Rated	27	7411	0.27	0.21	0.32	0.30	0.14	17.29	0.12	0.47
Innovation	22	6449	0.27	0.22	0.31	0.31	0.10	28.67	0.18	0.43

Variable	k	N	r	95% CI Lower	95% CI Upper	ρ	SD_ρ	%VE	80% CV Lower	80% CV Upper
Innovation: Self-rated	11	4257	0.29	0.22	0.36	0.35	0.11	19.34	0.20	0.49
Innovation: Other-rated	11	2192	0.21	0.18	0.24	0.24	0.00	100.00	0.24	0.24
Supportive Leadership										
Creativity	14	4261	0.21	0.13	0.29	0.24	0.18	11.05	0.01	0.47
Creativity: Self-rated	8	2760	0.27	0.17	0.37	0.30	0.18	9.49	0.07	0.53
Creativity: Other-rated	7	1779	0.08	-0.01	0.18	0.09	0.14	23.08	-0.08	0.26
Innovation	8	2770	0.31	0.24	0.38	0.36	0.12	17.60	0.20	0.51
Innovation: Self-rated	4	1419	0.27	0.15	0.40	0.31	0.15	12.55	0.12	0.50
Innovation: Other-rated	4	1351	0.35	0.31	0.39	0.41	0.05	60.97	0.35	0.47
Benevolent Leadership										
Creativity	6	1780	0.23	0.17	0.30	0.27	0.07	42.66	0.18	0.37
Creativity: Other-rated	4	1206	0.20	0.15	0.26	0.23	0.00	100.00	0.23	0.23
Innovation	5	1452	0.25	0.10	0.40	0.28	0.20	9.25	0.02	0.53
Innovation: Self-rated	3	741	0.23	-0.02	0.48	0.23	0.25	6.73	-0.08	0.55
Authoritarian Leadership										
Creativity	11	4367	-0.10	-0.20	-0.00*	-0.13	0.18	9.07	-0.36	0.11
Creativity: Self-rated	6	1422	-0.13	-0.30	0.03	-0.16	0.23	10.01	-0.45	0.12
Creativity: Other-rated	5	2945	-0.09	-0.21	0.04	-0.11	0.16	8.39	-0.31	0.09
Innovation	6	1619	-0.13	-0.22	-0.03	-0.15	0.11	27.70	-0.29	-0.01
Innovation: Self-rated	3	742	-0.24	-0.33	-0.14	-0.25	0.08	40.98	-0.35	-0.15
Innovation: Other-rated	3	877	-0.04	-0.09	0.01	-0.05	0.00	100.00	-0.05	-0.05
Destructive Leadership										
Creativity	14	4911	-0.20	-0.25	-0.14	-0.22	0.11	21.51	-0.36	-0.08
Creativity: Self-rated	5	1494	-0.24	-0.30	-0.19	-0.26	0.06	53.19	-0.33	-0.19
Creativity: Other-rated	9	3417	-0.18	-0.25	-0.10	-0.20	0.12	17.53	-0.35	-0.04

Note. Results are corrected for criterion and predictor unreliability. k = number of correlations; N= number of respondents; r = sample weighted mean correlation; ρ = corrected population correlation; SD_ρ = standard deviation of the corrected population correlation; % VE = percentage of variance attributed to sampling error in corrected population correlation; 95% CI = 95% confidence interval around the sample weighted mean correlation; 80% CV = 80% credibility interval around the corrected population correlation. * Rounded up from -0.0045

Table 2 *Meta-Analytic Results for the Relationship Between the Dimensions of Transformational and Transactional Leadership*

				95% CI					80% CV	
Variable	k	N	r	Lower	Upper	ρ	SD_ρ	%VE	Lower	Upper
Transformational - Creativity										
Idealized Influence & Charisma	7	2283	0.18	0.13	0.23	0.20	0.06	54.75	0.13	0.27
Inspirational Motivation	4	1149	0.17	0.14	0.20	0.20	0.00	100.00	0.20	0.20
Intellectual Stimulation	4	1174	0.18	0.06	0.31	0.22	0.13	20.88	0.05	0.38
Individualized Consideration	5	1888	0.19	0.14	0.24	0.22	0.05	53.93	0.15	0.29
Transactional - Creativity										
Contingent Reward	5	2511	0.30	0.16	0.43	0.36	0.18	7.21	0.14	0.59
Contingent Reward: Other-rated	3	849	0.15	0.04	0.26	0.19	0.03	83.26	0.16	0.23
Management by Exception*	3	1085	-0.01	-0.05	0.03	-0.01	0.00	100.0	-0.01	-0.01
Transactional - Innovation										
Contingent Reward	5	4349	0.25	0.23	0.26	0.30	0.00	100.00	0.30	0.30
Contingent Reward: Other-rated	3	1049	0.26	0.23	0.30	0.33	0.00	100.00	0.33	0.33

Note. Results are corrected for criterion and predictor unreliability. k = number of correlations; N= number of respondents; r = sample weighted mean correlation; ρ = corrected population correlation; SD_ρ = standard deviation of the corrected population correlation; % VE = percentage of variance attributed to sampling error in corrected population correlation; 95% CI = 95% confidence interval around the sample weighted mean correlation; 80% CV = 80% credibility interval around the corrected population correlation.
Due to lack of primary studies, it was not possible to examine management by exception passive and active or laissez faire.

Table 3- *Moderation Analyses*

Variable	k	N	r	β	*s.d.*	95%-CI-LL	95%-CI-UL	z-value	*p*-value	T^2	Moderator effect present?
Published vs Unpublished Studies											
Transformational - creativity	55	18122	.27	-.03	.07	-.17	.11	-.44	.66	.05	No
Transformational - innovation	33	10863	.28	-.01	.09	-.19	.17	-.14	.89	.03	No
LMX - creativity	39	11671	.32	-.05	.08	-.21	.11	-.58	.56	.02	No
Empowering - creativity	22	5810	.35	.02	.15	-.26	.31	.15	.89	.03	No
Common-source vs non-common source ratings of outcome											
Transformational - creativity	55	18122	.27	-.12	.06	-.24	-.00	-2.04	.04	.04	Yes, the correlation is smaller when the data is based on non-common source data.
Transformational - innovation	33	10863	.27	-.14	.07	-.27	-.01	-2.07	.04	.03	Yes, the correlation is smaller when the data is based on non-common source data.
Transactional - creativity	12	5041	.10	-.21	.15	-.50	.08	-1.40	.16	.06	No
Transactional - innovation	8	3062	.90	-.20	.19	-.58	.18	-1.04	.30	.07	No
LMX - creativity	39	11671	.32	-.11	-.05	-.21	-.00	-2.06	.04	.02	Yes, the correlation is smaller when the data is based on non-common source data.
LMX - innovation	21	6112	.26	-.09	.06	-.20	.02	-1.57	.12	.01	No
Authentic - creativity	16	5088	.44	.02	.12	-.22	.25	.13	.90	.05	No
Benevolent - creativity	6	1780	.25	-.11	.09	-.28	.05	-1.33	.18	.01	No

Variable	k	N	r	β	s.d.	95%-CI-LL	95%-CI-UL	z-value	p-value	T²	Moderator effect present?
Empowering - creativity	22	5810	.35	-.13	.09	-.31	.05	-1.49	.14	.03	No
Empowering - innovation	7	3727	.37	-.24	.10	-.43	-.04	-2.40	.02	.01	Yes, the correlation is smaller when the data is based on non-common source data.
Servant - creativity	11	4490	.26	-.07	.19	-.41	.29	-.35	.72	.08	No
Servant - innovation	7	1491	.28	.13	.15	-.17	.42	.85	.40	.03	No
Authoritarian - creativity	11	4367	-.14	-.01	.14	-.28	.25	-.10	.92	.05	No
Authoritarian - innovation	6	1619	-.14	0.22	0.07	0.09	0.36	3.2	0.00	0.00	Yes, the correlation is smaller when the data is based on non-common source data.
Ethical - creativity	15	3982	.35	.01	.10	-.19	.21	.12	.91	.03	No
Ethical - innovation	7	2349	.26	-.07	.11	-.23	.15	-.60	.55	.02	No
Supportive - creativity	14	4261	.23	-.21	.10	-.40	-.02	-2.20	.03	.03	Yes, the correlation is smaller when the data is based on non-common source data.
Supportive - innovation	8	2770	.31	.06	.10	-.13	.24	.58	.56	.01	No
Destructive - creativity	13	4796	-.21	.08	.08	-.07	.24	1.02	.31	.01	No
Cross-sectional vs Time-separated studies											
Transformational - creativity	50	16921	.23	-.01	.08	-.17	.16	-.09	.93	.05	No
Transformational - innovation	33	10863	.27	-.12	.08	-.27	.03	-1.59	.11	.03	No
LMX - creativity	39	11671	.32	-.11	.06	-.22	-.00	-1.96	.05	.37	Yes, the correlation is smaller for time-separated studies
LMX - innovation	21	6112	.26	-.00	.10	-.21	.20	-.03	.98	.01	No
Authentic - creativity	16	5088	.44	-.11	.17	-.45	.23	-.65	.52	.07	No

Variable	k	N	r	β	s.d.	95%-CI-LL	95%-CI-UL	z-value	p-value	T^2	Moderator effect present?
Empowering - Creativity	22	5810	.35	-.06	.03	-.13	-.00	-1.98	.05	.03	Yes, the correlation is smaller for time-separated studies
Servant - creativity	11	4490	.26	-.01	.20	-.40	.38	-.04	.97	.08	No
Destructive - creativity	13	4796	-.21	-.01	.08	-.16	.13	-.19	.85	.01	No
National Culture - Power Distance											
Transformational - creativity	51	16447	.21	.00	.00	-.00	.00	.91	.36	.03	No
Transformational - innovation	32	10542	.28	-.00	.00	-.00	.00	-.01	.99	.04	No
Transactional - creativity	11	3938	.10	.00	.00	-.00	.01	1.19	.23	.04	No
Transactional - innovation	7	2741	.10	.00	.01	-.01	.02	.72	.47	.13	No
LMX - creativity	39	11671	.32	-.00	.00	-.00	.00	-.35	.73	.02	No
LMX - innovation	19	5712	0.27	0.00	0.00	-0.00	0.00	1.03	0.31	0.01	No
Authentic - creativity	16	5088	.44	-.00	.01	-.01	.01	-.32	.75	.06	No
Benevolent - creativity	6	1780	.25	.00	.00	-.01	.01	.36	.72	.01	No
Empowering - creativity	21	5584	.30	-.01	.00	-.01	-.00	-2.03	.04	.02	Yes, the higher the power distance score, the smaller the correlation.
Empowering - innovation	7	3727	.37	-.00	.00	-.01	.00	-1.63	.10	.02	No
Servant - creativity	9	4121	.31	-.00	.00	-.01	.01	-.39	.70	.07	No
Servant - innovation	5	1191	.34	.01	.00	.01	.01	5.20	.00	.00	Yes, the higher the power distance score, the larger the correlation
Authoritarian - creativity	9	4026	-.12	.01	.01	-.00	.02	1.37	.17	.03	No
Authoritarian - innovation											
Ethical - creativity	15	3982	.35	.00	.00	-.00	.01	.94	.35	.03	No
Ethical - innovation	7	2349	.26	.01	.00	-.00	.01	1.28	.20	.01	No

Variable	k	N	r	β	s.d.	95%-CI-LL	95%-CI-UL	z-value	p-value	T^2	Moderator effect present?
Supportive - creativity	11	3864	.15	.01	.00	.00	.01	2.98	.00	.01	Yes, the higher the power distance score, the larger the correlation
Supportive - innovation	8	2770	.23	-.00	.00	-.01	.01	-.11	.91	.02	No
Destructive - creativity	13	4796	-.21	-.00	.00	-.01	.00	-.20	.83	.01	No
Industry Knowledge Intensity											
Transformational - creativity	38	12561	.26	.01	.09	-.16	.18	.11	.91	.03	No
Transformational - innovation	29	10501	.26	-.02	.09	-.19	.16	-.18	.86	.04	No
Transactional - creativity	10	3779	0.05	0.18	0.16	-0.19	0.54	0.95	0.34	0.05	No
LMX - creativity	33	9462	.32	.05	.08	-.11	.20	.61	.54	.02	No
LMX - innovation	21	6112	0.26	-.24	0.06	-0.36	-0.13	-4.02	0.00	0.01	Yes, the correlation is smaller in knowledge intensive industries
Empowering - creativity	21	5358	.35	-.06	.10	-.25	.13	-.60	.55	.04	No
Authentic - creativity	12	3787	.41	-.31	.16	-.63	.01	-1.89	.06	.07	No
Supportive - creativity	10	3051	.21	-.16	.13	-.42	.11	-1.17	.24	.03	No
Supportive - innovation	8	2770	.31	-.19	.09	-.37	-.01	-2.14	.03	.01	Yes, the correlation is smaller in knowledge intensive industries
Destructive - creativity	12	3847	-.22	-.07	.10	-.27	.12	-.73	.47	.02	No
Follower Gender											
Transformational - creativity	41	12783	.27	.00	.00	-.00	.00	.53	.59	.04	No
Transformational - innovation	21	6545	.23	.00	.00	-.00	.01	.26	.79	.04	No
Transactional - creativity	9	3014	.06	-.00	.00	-.01	.01	-.03	.98	.04	No

Variable	k	N	r	β	s.d.	95%-CI-LL	95%-CI-UL	z-value	p-value	T²	Moderator effect present?
LMX - creativity	35	11098	.33	-.00	.00	-.00	-.00	-3.34	.00	.02	Yes, the higher the percentage of male followers, the smaller the correlation
LMX - innovation	17	5537	.27	-.00	.00	-.01	-.00	-2.18	.03	.01	Yes, the higher the percentage of male followers, the smaller the correlation
Authentic - creativity	13	4266	.43	-.01	.00	-.01	-.00	-2.46	.01	.04	Yes, the higher the percentage of male followers, the smaller the correlation
Benevolent - creativity	6	1780	.25	-.00	.00	-.01	.00	-.90	.37	.01	No
Empowering - creativity	21	5458	.34	-.00	.00	-.01	.00	-1.29	.20	.03	No
Empowering - Innovation	6	3872	.27	-.00	.01	-.01	.01	-.52	.60	.02	No
Servant - creativity	11	4490	.26	-.01	.00	-.01	-.00	-2.17	.03	.04	Yes, the higher the percentage of male followers, the smaller the correlation
Servant - innovation	6	1443	.27	.00	.01	-.01	.02	.34	.74	.05	No
Authoritarian - creativity	10	3980	-.12	-.00	.00	-.01	.01	-.20	.84	.03	No
Authoritarian - innovation	5	1464	-.12	0.00	0.02	-0.04	0.04	0.12	0.90	0.02	No
Ethical - creativity	12	3036	.37	.00	.00	-.01	.01	.20	.84	.04	No
Ethical - innovation	7	2349	.26	-.00	.01	-.01	.01	-.33	.74	.02	No
Supportive - creativity	13	4032	.13	-.00	.00	-.01	.01	-.52	.60	.04	No
Supportive - innovation	7	1984	.30	-.00	.00	-.01	.01	-.49	.62	.02	No
Destructive - creativity	13	4452	-.29	.01	.00	.00	.01	3.20	.00	.00	Yes, the greater the percentage of male followers, the smaller (i.e., less negative) the correlation

Note. k = number of correlations; N = number of respondents; r = sample-weighted mean correlation; b = Beta coefficient; SD = standard deviation of the beta coefficient; z-value = test of the null hypothesis that there is no difference in effect size between groups; p-value = tests for the significance of the z-value; T2 =Tau squared, the between-studies variance

Table 4 – *Relative weights analysis comparing different leadership style with the full-range model*

	Individual Creativity: Other Rated			Individual Innovation: Other Rated		
Leadership Style	Relative Effect	Transformational	Contingent Reward	Relative Effect	Transformational	Contingent Reward
Empowering	74.88	17.76	7.37	28.84	19.35	51.81
LMX	50.80	35.35	13.84	19.47	23.82	56.71
Servant	46.61	33.25	20.13	17.17	26.22	56.60
Ethical	62.23	23.85	13.92	28.81	21.65	49.54
Authentic	77.14	15.98	6.89	n/a	n/a	n/a
Authoritarian	12.69	57.14	30.17	13.74	23.84	62.42
Destructive	25.90	53.56	20.54	n/a	n/a	n/a
Supportive	14.88	62.90	22.22	57.93	14.47	27.61
Benevolent	26.82	63.18	n/a	n/a	n/a	n/a
Humility	53.26	46.74	n/a	n/a	n/a	n/a
Entrepreneurial	n/a	n/a	n/a	42.61	57.39	n/a

Table 5 – *Relative weights analysis comparing different leadership style within leadership categories*

Leadership Style	Individual Creativity: Other Rated	Individual Innovation: Other Rated
Relationship Orientated Leadership Styles		
LMX	58.96	20.43
Supportive	19.08	79.57
Benevolence	21.96	n/a
Morally Based Leadership Styles		
Servant	15.14	26.32
Ethical	21.27	73.68
Authentic	53.58	n/a
Humility	10.01	n/a
Motivational Leadership		
Empowering	n/a	59.86
Entrepreneurial	n/a	40.14
Negative Leadership		
Authoritarian	17.70	n/a
Destructive	82.30	n/a
Transformational Leadership Dimensions		
Idealized Influence & Charisma	24.06	n/a
Inspirational Motivation	20.09	n/a
Intellectual Stimulation	27.14	n/a
Individualized Consideration	28.70	n/a

Appendix A

Meta-analytic results for leadership intercorrelations needed for relative weights analysis

Variable	k	N	r	95% CI Lower	95% CI Upper	ρ	SD$_\rho$	%VE	80% CV Lower	80% CV Upper
Transformational – Contingent Reward[1]	87	22369	0.68	0.78	0.83	0.80			0.65	0.95
Transformational – Empowering[2]	5	1721	0.60	0.56	0.64	0.67	0.03	650.72	0.63	0.70
Transformational – Ethical[3]	20	3717	0.63	0.62	0.79	0.70	0.17		0.48	0.93
Transformational – Authentic[4]	23	5414	0.70	0.60	0.83	0.72	0.27		0.37	1.00
Transformational – LMX[5]	20	5451	0.66	0.49	0.97	0.73	0.19		0.49	0.97
Transformational – Destructive	8	1242	-0.49	-0.56	-0.41	-0.56	0.07	460.60	-0.65	-0.46
Transformational – Servant[6]	14	3867	0.45	0.40	0.51	0.52	0.11			
Transformational – Authoritarian[7]	12	3829	-0.29	-0.45	-0.13	-0.29	0.28		-0.65	0.06
Transformational - Entrepreneurial	2	583	0.85	0.79	0.91	0.93	0.04	17.64	0.88	0.98
Transformational - Humble	3	497	0.73	0.61	0.84	0.80	0.16	6.52	0.60	1.00
Transformational - Benevolent[7]	10	3671	0.66	0.64	0.78	0.71	0.10		0.58	0.84
Transformational – Supportive	4	1184	0.67	0.46	0.87	0.75	0.18	3.78	0.52	0.98
Contingent Reward – LMX[5]	6	1900	0.65	0.58	0.88	0.73	0.18		0.51	0.96
Contingent Reward - Empowering	5	1864	0.46	0.23	0.68	0.54	0.30	2.51	0.15	0.93
Contingent Reward – Ethical[8]	7	1156	0.63	0.64	0.86	0.75	0.15		0.50	1.00
Contingent Reward- Authentic	3	711	0.50	0.41	0.60	0.59	0.05	55.35	0.52	0.65
Contingent Reward- Destructive	4	907	-0.31	-0.45	-0.17	-0.34	0.16	15.32	-0.55	-0.14
Contingent Reward- Servant	3	475	0.70	0.60	0.79	0.80	0.14	10.65	0.62	0.97
Contingent Reward- Authoritarian	3	905	0.23	0.08	0.37	0.27	0.18	11.94	0.04	0.50
Contingent Reward- Supportive	3	788	0.61	0.35	0.88	0.71	0.26	2.76	0.38	1.00
Ethical – Authentic[6]	3	462	0.77	0.56	0.98	0.85	0.15			
Ethical – Servant[6]	4	3106	0.74	0.62	0.86	0.82	0.11			

				95% CI					80% CV	
Variable	k	N	r	Lower	Upper	ρ	SD$_\rho$	%VE	Lower	Upper
Authentic – Servant[6]	5	2686	0.78	0.67	0.89	0.84	0.11			
Authentic - Humble	3	796	0.59	0.47	0.71	0.68	0.15	9.02	0.49	0.87
Servant – Humble*	1	283				0.81				
Ethical - Humble	2	545	0.75	0.57	0.93	0.79	0.12	4.78	0.63	0.95
LMX – Benevolence[7]	7	2619	0.64	0.67	0.79	0.73	0.07		0.63	0.82
LMX - Supportive	7	2137	0.67	0.57	0.77	0.79	0.14	6.43	0.61	0.97
Supportive - Benevolence	5	1674	0.51	0.39	0.64	0.57	0.15	8.49	0.38	0.75
Empowering – Entrepreneurial*	1	346				0.71				
Destructive - Authoritarian	4	882	0.63	0.49	0.78	0.74	0.16	7.84	0.54	0.95

Note. Results are corrected for criterion and predictor unreliability. k = number of correlations; N= number of respondents; r = sample weighted mean correlation; ρ = corrected population correlation; SD_ρ = standard deviation of the corrected population correlation; % VE = percentage of variance attributed to sampling error in corrected population correlation; 95% CI = 95% confidence interval around the sample weighted mean correlation; 80% CV = 80% credibility interval around the corrected population correlation

1 = Judge & Piccolo, 2004; 2 = Lee, Willis, & Tian, 2018; 3 = Hoch, Bommer, Dulebohn, & Wu, 2018; 4 = Banks, McCauley, Gardner, & Guler, 2016; 5 = Dulebohn, Bommer, Liden, Brouer, & Ferris, 2012; 6 = Lee, Lyubovnikova, Tian, & Knight, 2019; 7 = Hiller, Sin, Ponnapalli, & Ozgen, 2019; 8 = Ng & Feldman, 2015

*- Correlation based on a single study only

APPENDIX B

Meta-analytic results for dichotomous moderators

Variable	k	N	r	95% CI		ρ	SD_ρ	%VE	80% CV	
				Lower	Upper				Lower	Upper
Transformational Leadership										
Creativity: Published	46	15800	0.29	0.24	0.34	0.32	0.21	6.81	0.06	0.59
Creativity: Unpublished	9	2322	0.22	0.13	0.30	0.23	0.13	19.65	0.07	0.40
Innovation: Published	27	9868	0.27	0.20	0.33	0.30	0.19	8.11	0.06	0.54
Innovation: Unpublished	6	995	0.22	0.07	0.36	0.25	0.17	18.94	0.03	0.47
Creativity: Cross-sectional	43	14850	0.28	0.23	0.34	0.32	0.19	7.72	0.07	0.56
Creativity: Time-separated	9	2602	0.28	0.15	0.40	0.31	0.21	7.61	0.04	0.57
Innovation: Cross-sectional	25	8082	0.29	0.23	0.35	0.33	0.17	10.06	0.10	0.55
Innovation: Time-separated	8	2781	0.18	0.07	0.30	0.20	0.19	8.89	-0.04	0.44
Creativity: High Knowledge Intensity	32	9567	0.16	0.20	0.32	0.29	0.19	9.36	0.05	0.52
Creativity: Low Knowledge Intensity	6	2994	0.24	0.19	0.30	0.29	0.07	33.43	0.20	0.37
Innovation: High Knowledge Intensity	23	8834	0.26	0.20	0.32	0.29	0.17	9.05	0.07	0.51
Innovation: Low Knowledge Intensity	7	1897	0.23	0.06	0.39	0.25	0.24	6.63	-0.06	0.56
Transactional Leadership										
Creativity: High Knowledge Intensity	8	2723	0.06	-0.07	0.20	0.08	0.22	7.56	-0.20	0.35
Creativity: Low Knowledge Intensity	2	1056	-0.07	-0.36	0.21	-0.10	0.23	4.61	-0.39	0.20
LMX										
Creativity: Published	34	10899	0.30	0.26	0.35	0.34	0.13	15.74	0.17	0.51
Creativity: Unpublished	5	772	0.28	0.11	0.45	0.30	0.19	14.59	0.05	0.55
Creativity: Cross-sectional	28	7651	0.33	0.28	0.38	0.37	0.13	17.17	0.20	0.54
Creativity: Time-separated	11	4020	0.25	0.17	0.33	0.28	0.13	15.70	0.12	0.44
Innovation: Cross-sectional	19	5752	0.27	0.22	0.32	0.31	0.11	25.20	0.18	0.45

Variable	k	N	r	95% CI Lower	95% CI Upper	ρ	SD_ρ	%VE	80% CV Lower	80% CV Upper
Innovation: Time-separated	2	360	0.26	0.24	0.27	0.30	0.00	100.00	0.30	0.30
Creativity: High Knowledge Intensity	28	8197	0.30	0.25	0.35	0.33	0.14	16.22	0.16	0.51
Creativity: Low Knowledge Intensity	5	1265	0.26	0.19	0.34	0.30	0.06	54.60	0.22	0.38
Innovation: High Knowledge Intensity	18	5183	0.24	0.20	0.28	0.28	0.06	54.05	0.20	0.35
Innovation: Low Knowledge Intensity	3	929	0.44	0.35	0.53	0.50	0.06	39.63	0.42	0.58
Empowering Leadership										
Creativity: Published	20	5172	0.32	0.26	0.37	0.35	0.13	19.06	0.19	0.51
Creativity: Unpublished	2	638	0.38	-0.07	0.83	0.44	0.39	2.07	-0.06	0.94
Creativity: Cross-sectional	17	4569	0.33	0.25	0.42	0.36	0.18	9.56	0.13	0.60
Creativity: Time-separated	5	1241	0.29	0.18	0.40	0.33	0.12	23.60	0.18	0.48
Creativity: High Knowledge Intensity	16	4015	0.33	0.24	0.41	0.36	0.18	10.39	0.12	0.60
Creativity: Low Knowledge Intensity	6	1629	0.32	0.20	0.43	0.35	0.15	13.38	0.15	0.54
Servant Leadership										
Creativity: Cross-sectional	8	3819	0.35	0.19	0.52	0.39	0.26	2.84	0.06	0.73
Creativity: Time-separated	3	671	0.25	0.15	0.36	0.30	0.09	41.77	0.19	0.41
Supportive Leadership										
Creativity: High Knowledge Intensity	7	2381	0.15	0.04	0.26	0.16	0.17	11.42	-0.05	0.37
Creativity: Low Knowledge Intensity	3	670	0.34	0.19	0.49	0.41	0.16	18.23	0.22	0.61
Innovation: High Knowledge Intensity	6	2282	0.28	0.21	0.35	0.32	0.09	25.01	0.20	0.44
Innovation: Low Knowledge Intensity	2	488	0.45	0.35	0.55	0.53	0.09	33.62	0.42	0.64
Authentic Leadership										
Creativity: Cross-sectional	13	4291	0.48	0.41	0.55	0.53	0.13	11.14	0.36	0.70
Creativity: Time-separated	3	797	0.14	0.06	0.21	0.15	0.05	67.90	0.09	0.21
Creativity: High Knowledge Intensity	8	2297	0.35	0.20	0.49	0.40	0.23	6.19	0.10	0.69
Creativity: Low Knowledge Intensity	4	1490	0.50	0.38	0.63	0.55	0.13	10.12	0.39	0.71
Destructive Leadership										

| | | | 95% CI | | | | | 80% CV | |
Variable	k	N	r	Lower	Upper	ρ	SD_ρ	%VE	Lower	Upper
Creativity: Cross-sectional	6	1992	-0.19	-0.29	-0.10	-0.21	0.12	18.52	-0.37	-0.05
Creativity: Time-separated	7	2804	-0.19	-0.27	-0.12	-0.22	0.10	23.69	-0.34	-0.09
Creativity: High Knowledge Intensity	9	2986	-0.19	-0.28	-0.10	-0.22	0.14	14.83	-0.41	-0.03
Creativity: Low Knowledge Intensity	3	861	-0.17	-0.21	-0.13	-0.18	0.00	100.00	-0.18	-0.18

Note. k = number of correlations; N= number of respondents; r = sample weighted mean correlation; ρ = corrected population correlation; SD_ρ =

standard deviation of the corrected population correlation; % VE = percentage of variance attributed to sampling error in corrected population

correlation; 95% CI = 95% confidence interval around the sample weighted mean correlation; 80% CV = 80% credibility interval around the

corrected population correlation

APPENDIX C

List of papers used in meta-analysis

Transformational Leadership - Creativity		
Akinlade, 2014	Hirst, van Dick, & van Knippenberg, 2009	Moss & Ritossa, 2007
Arendt, 2009	Jaffer, 2013	Nguyen, 2017
Bae, Song, Park, & Kim, 2013	Jaiswal & Dhar, 2016	Qu, Janssen, & Shi, 2015
Cai, Lysova, Khapova, & Bossink, 2019	Jaussi & Dionne, 2003	Rickards, Chen, & Moger, 2001
Carmeli, Sheaffer, Binyamin, Reiter-Palmon, & Shimoni, 2013	Jyoti & Dev, 2015	Shin & Zhou, 2003
Chang & Teng, 2017	Kark, Van Dijk, & Vashdi, 2018 (2 studies)	Si & Wei, 2012
Chaubey, Sahoo, & Khatri, 2019	Kim, 2000	Sosik, Kahai, & Avolio, 1999
Charbonnier-Voirin, Akremi, & Vandenberghe, 2010	Khalili, 2016	Suifan, Abdallah, & Al Janini, 2018
Cheung & Wong, 2011	Kim & Lee, 2011	Sun, Zhang, Chen, 2012
Dong, Bartol, Zhang, & Li, 2017	Kollman, Stockmann, & Krell (2011)	Taylor, 2015
Eisenbeiss & Boerner, 2013	Koseoglu, Liu, & Shalley, 2017	Tse & Chiu, 2014
Ghafoor, Qureshi, Azeemi, & Hijazi, 2011	Li, Yu, Yang, Qi, & Fu, 2014 (2 studies)	Tse, To, & Chiu, 2017
Gilmore, Hu, Wei, Tetrick, & Zaccaro, 2013	Li, Zhao, & Begley, 2015	Tung, 2016
Golden, 2016	Luu, 2017	Wang & Rode, 2010
Gong, Huang, & Farh, 2009	Ma & Jiang, 2018	Wang & Zhu, 2011
Gumusluoglu & Ilsev, 2009	Miao & Wang, 2016	Wang, Tsai & Tsai, 2014
Henker, 2013	Mittal & Dhar, 2015	Zacher & Johnson, 2015
Henker, Sonnentag, & Unger, 2015	Monowar Mahmood, & Luo, 2019	Zhou & Pan, 2015

Transformational Leadership - Innovation

Afsar, Badir, & Bin Saeed, 2014	Kang, Solomon & Choi, 2015	Rank, Nelson Allen,& Xu, 2009
Basu & Green, 1995	Khalili, 2016	Sethibe & Steyn, 2017
Boerner, Eisenbeiss, & Griesser, 2007	Kang, 2013	Slåtten, 2014
Chang, Bai, & Li, 2015	Kao, Pai, Lin, & Zhong, 2015	Saeed, Afsar, Shahjehan, & Shah, 2019 (2 studies)
Choi, Kim, Ullah, & Kang, 2016	Lee, 2008	Turunc, Celik, Tabak, & Kabak 2010
Chen, Farh, Campbell-Bush, Wu, & Wu, 2013	Li, Mitchell, & Boyle, 2016	Vazquez, 2016
Craig, 2015	Miao, Newman, & Lamb, 2012	Weng, Huang, Chen, & Chang, 2015
Gross, 2016	Newman, Tse, Schwarz, & Nielsen, 2018	Zhang, Lepine, Buckman, & Wei, 2014
Günzel-Jensen, Hansen,Jakobsen & Wulff, 2018	Pieterse, van Knippenberg, Schippers, & Stam, 2010	Zhang, Zheng, & Darko, 2018
Hussain, Talib, & Shah, 2014	Pundt, 2015	Zhu, Wang, Zheng, Liu, & Miao, 2013
Iskandarani, 2017	Rada, 2018	Zhu & Mu, 2016

Transactional Leadership – Creativity

Kark, Van Dijk, & Vashdi, 2018	Moss & Ritossa, 2007	Sosik, Kahai, & Avolio, 1999
Kim, 2000	Rickards, Chen, & Moger, 2001	Tung, 2016
Kim & Lee, 2011	Sanda & Arthur, 2017	Wei, Yuan, & Di, 2010
Ma & Jiang, 2018	Si & Wei, 2012	Zacher & Johnson, 2015

Transactional Leadership – Innovation

Chang, Bai & Li, 2015	Günzel-Jensen, Hansen,Jakobsen & Wulff, 2018	Rank, Nelson, Allen, & Xu, 2009
Elenkov & Manev, 2005	Kang, Soloman, & Choi, 2015	Sethibe & Steyn, 2017
Elenkov, Judge, & Wright, 2005	Lee, 2008	Turunc, Celik, Tabak, & Kabak, 2010
Gross, 2016	Pieterse, van Knippenberg, Schippers & Stam, 2010	

Authentic Leadership – Creativity

Černe, Jaklič, & Škerlavaj, 2013	Mubarak & Noor, 2018	Semedo, Coelho, & Ribeiro, 2016
Chaudhary & Panda, 2018	Rego, Sousa, Marques, & Cunha, 2012	Semedo, Coelho, & Ribeiro, 2017
Li, Lu, Yang, Qi, & Fu, 2014 (2 studies)	Rego, Sousa, Maruques, & Cunha, 2014	Semedo, Coelho, & Ribeiro, 2018
Malik, Dhar & Handa, 2016	Ribeiro, Duarte & Filipe, 2018	Sercan, 2016
Meng, Cheng & Guo, 2016	Sanda & Arthur, 2017	Xu, Zhao, Li, & Lin, 2017

Empowering Leadership - Creativity

Al-Madadha, 2016	Fatima, Safdar, & Jahanzeb, 2017	Liu, Gong, Zhou, & Huang, 2017
Amundsen & Martinsen, 2014a	Harris, Li, Boswell, Zhang, & Xie, 2014 (2 studies)	Slåtten, Svensson, & Sværi, 2011
Amundsen & Martinsen, 2014b	Hon, 2011	Tung & Yu, 2015
Amundsen & Martinsen, 2015	Hon, Bloom, & Crant, 2014	Zhang & Bartol, 2010
Audenaert & Decramer, 2016	Hwang, 2013	Zhang, Ke, Wang, & Liu, 2018
Byun, Dai, Lee, & Kang, 2016	Kim, 2019	Zhang & Zhou, 2014 (2 studies)
Chow, 2018	Li & Zhang, 2016	

Empowering Leadership – Innovation

Chen, Sharma, Edinger, Shapiro, & Farh, 2011 (2 studies)	Günzel-Jensen, Hansen,Jakobsen & Wulff, 2018	Sagnak, 2012
De Jong & Den Hartog, 2010	Newman, Tse, Schwarz, & Nielsen, 2018	Slåtten, Svensson, & Sværi, 2011
Gkorezis, 2016	Odoardi, Montani, Boudrias, & Battistelli, 2014	

Servant Leadership - Creativity

Do, Budhwar, & Patel, 2018	Liden, Wayne, Meuser, Hu, Wu, & Liao, 2015	Williams Jr, Brandon, Hayek, Haden, & Atinc, 2017

Jaiswal & Dhar, 2017	Malingumu, Stouten, Euwema, & Babyegeya, 2016	Yang, Liu, & Gu, 2017
Jaramillo, Grisaffe, Chonko, & Roberts, 2009	Neubert, Hunter, & Tolentino, 2016	Yoshida, Sendjaya, Hirst, & Cooper, 2014
Karatepe, Ozturk & Kim, 2019	Neubert, Kacmar, Carlson, Chonko, & Roberts, 2008	

Servant Leadership - Innovation		
Krog & Govender, 2015	Searle, 2011	Weaver, 2017
Newman, Neesham, Manville, & Tse, 2017	Sun, 2016	
Panaccio, Henderson, Liden, Wayne, & Cao, 2015	Topcu, Gursoy, & Gurson, 2015	

Destructive Leadership - Creativity		
Choi, Anderson, & Veilette, 2009	Jiang, Gu, & Tang, 2017	Naseer,Raja, Syed, Donia, & Darr, 2016
Gu, Song, & Wu, 2016	Lee, Yun, & Srivastava, 2013	Rasool, Naseer, Syed, & Ahmad, 2018
Guo, Decoster, Babalola, Schutter, Garba, & Riisla, 2018 (2 studies)	Liu, Liao, & Loi, 2012	Zhang, Kwan, Zhang, & Wu, 2014
Han, Harms, & Bai, 2017	Liu, Zhang, Liao, Hao, & Mao, 2016	
Jiang & Gu, 2016	Meng, Tan, & Li, 2017	

Authoritarian Leadership - Creativity		
Dedahanov, Lee, Rhee, & Yoon, 2016	Guo, Decoster, Babalola, Schutter, Garba, & Riisla, 2018 (2 studies)	Wang, Chiang, Tsai, Lin, & Cheng, 2013
Gu, He, & Liu, 2017	Hwang, 2013	Wang, Tang, Naumann, & Yang, 2019
Gu, Wang, Liu, Song, & He, 2018	Pan, Wu, Zhou, & Lou, 2015	Wu, 2018

Authoritarian Leadership - Innovation		
Dedahanov, Bozorov, & Sung, 2019	Mansur, 2016	Wang, Chang, & Wang, 2018
Karakitapoğlu-Aygün, Gumusluoglu, & Scandura, 2019	Tian & Sanchez, 2017	Wu, 2018

Entrapreneurial Leadership - Creativity		
Bagheri, 2017	Bagheri & Akbari, 2018	Cai, Lysova, Khapova, & Bossink, 2019
LMX - Creativity		
Akinlade, 2014	Lee, Scandura, Kim, Joshi, & Lee, 2012	Ramos, 2003
Aleksić, Mihelič, Černe, & Škerlavaj, 2017	Khalili, 2018	Pan, Wu, Zhou, & Lou, 2015
Atwater & Carmeli, 2009	Kong, Xu, Zhou, & Yuan, 2019	Sercan, 2016
Chughtai, 2016	Li, Chen, & Cao, 2017	Son, Cho, & Kang, 2017
Gong, Kim, Lee, & Zhu, 2013	Liao, Chen, & Hu, 2018	Tierney, 1992
Gu, Tang, & Jiang, 2015	Liao, Liu, & Loi, 2010	Tierney, Farmer, & Graen, 1999
Gu, Wang, Liu, Song, & He, 2018	Lin, Ma, Zhang, Li, & Jiang, 2018	Xu, Zhao, Li, & Lin, 2017
Hassanzadeh, 2014	Martinaityte & Sacramento, 2013	Volmer, Spurk, & Niessen, 2012
Huang, Krasikova, & Liu, 2016	Meng, Tan, & Li, 2017	Wang, 2016
Jaffer, 2013	Munoz-Doyague, & Nieto, 2012	Zaitouni & Ouakouak, 2018
Jiang & Yang, 2015	Naseer, Raja, Syed, Donia, & Darr, 2016	Zhang, Fan, & Zhang, 2015
Joo & Bennett, 2018	Pan, Sun, & Chow, 2012	Zhao, Kessel, & Kratzer, 2014
Joo, Yang, & McLean, 2014	Qu, Janssen, & Shi, 2017	
LMX - Innovation		
Atitumpong & Badir, 2017	Khalili, 2018	Scott, 1993
Basu & Green, 1995	Lee, 2008	Scott & Bruce, 1998 (2 studies)
Clegg, Unsworth, Epitropaki, & Parker, 2002	Liao & Chun, 2016	Song, Liu, Gu, & He, 2018

Denti, 2011	Park & Jo, 2018	Turunc, Celik, Tabak, & Kabak, 2010
Denti & Hemlin, 2015	Pundt, 2015	Wang, Fang, Qureshi, & Janssen, 2015
Janssen & van Yperen, 2004	Sanders, Moorkamp, Torka, Groeneveld, & Groeneveld, 2010	Wu, Liu, Kim, & Gao, 2018
Kim & Koo, 2017	Schermuly, Meyer, & Dämmer, 2013	Yuan, 2005

Benevolent Leadership - Creativity		
Dedahanov, Lee, Rhee, & Yoon, 2016	Wang & Cheng, 2010	Wang, Tang, Naumann, & Yang, 2019
Lin, Ma, Zhang, Li, & Jiang, 2018	Wang, Chiang, Tsai, Lin, & Cheng, 2013	Wu, 2018

Benevolent Leadership - Innovation		
Dedahanov, Bozorov, & Sung, 2019	Tian & Sanchez, 2017	Wu, 2018
Karakitapoğlu-Aygün, Gumusluoglu, & Scandura, 2019	Wang, Chang, & Wang, 2018	

Humble Leadership - Innovation		
Tuan, 2019	Wang, Zhang, & Jia, 2017	
Wang, Liu, & Zhu, 2018	Yuan, Zhang, & Tu, 2018	

Supportive Leadership - Creativity		
Cheung & Wong, 2011	Hwang, 2013	Škerlavaj Černe, & Dysvik, 2014
Choi, 2004	Jafri, 2018	Unsworth, Wall, & Carter, 2005
Darvishmotevali, 2019	Lim & Choi, 2009	Wang, Xue, & Su, 2010
George & Zhou, 2007	Ohly, Sonnentag, & Pluntke, 2006	Zaitouni & Ouakouak, 2018
Gu, He, & Liu, 2017	Oldham & Cumming, 1996	

Supportive Leadership - Innovation		
Chen, Li, & Leung, 2016 (2 studies)	Ohly, Sonnentag, & Pluntke, 2006	Yasir & Majid, 2018
Darvishmotevali, 2019	Škerlavaj Černe, & Dysvik, 2014	

Janssen, 2005	Sönmez & Yıldırım, 2019	

Ethical Leadership - Creativity

Chen & Hou, 2016	Feng, Zhang, Liu, Zhang, & Han, 2016	Mehmood, 2016
Chughtai, 2016	Gu, Tang, & Jiang, 2015	Sercan, 2016
Dedahanov, Lee, Rhee, & Yoon, 2016	Javed, Khan, Bashir, & Arjoon, 2017	Wang, Tang, Naumann, & Yang, 2019
Dedahanov, Lee, Rhee, & Yoon, 2016	Javed, Rawwas, Khandai,Shahid, & Tayyeb, 2018	Wu, 2018
Duan, Liu, & Che, 2018	Ma, Cheng, Ribbens, & Zhou, 2013	

Ethical Leadership - Innovation

Dedahanov, Bozorov, & Sung, 2019	Schuh, Zhang, & Tian, 2013	Zahra & Waheed, 2017
Dhar, 2016	Tu & Lu, 2013	
Javed, Bashir, Rawwas, & Arjoon, 2017	Wu, 2018	

Transformational Leadership – Destructive Leadership

Byrne, Dionisi, Barling, Akers et al. 2014	Johnson, Venus, Lanaj, Mao & Chang, 2012	Schmidt, 2008
Collins & Jackson, 2015 (2 studies)	Ogunfowora, 2009	Taylor, 2012
Courtwright, 2012		

Transformational Leadership – Entrepreneurial Leadership

Newman, Tse, Schwarz & Niesen, 2018	Cai, Lysova, Khapova, & Bossink, 2019	

Transformational Leadership – Humble Leadership

Hwang, 2017	Owens & Heckman, 2016	Oyer, 2015

Transformational Leadership – Supportive Leadership

Cheung & Wong, 2011	Guild, 2009	Liaw, Chi & Chuang, 2010
Lin, MacLennan, Hunt & Cox, 2015		

Contingent Reward – Empowering Leadership

Buengeler, Homan, & Voelpel, 2016	Khuong & Hoang, 2015	Nguyen, Kuntz, Naswall & Malinen, 2016
Ensley, Hmieleski & Pearce, 2006		
Contingent Reward – Authentic Leadership		
Chiaburu, Diaz & Pitts, 2011	Emuwa & Fields, 2017	Sanda & Arthur, 2017
Contingent Reward – Destructive Leadership		
Bardes, 2009 Ogunfowora, 2009	Taylor, 2012	Zhang, 2013
Contingent Reward – Servant Leadership		
Kool & van Dierendonck, 2012	Steinmann, Nubold & Maier, 2016	Washington, Sutton & Sauser, 2014
Contingent Reward – Authoritarian Leadership		
Ensley, Hmieleski & Pearce, 2006	Khuong & Hoang, 2015	
Contingent Reward – Supportive Leadership		
Malatesta, 1995	Tremblay & Gibson, 2016	Walumbwa, Wu, & Orwa, 2008
Authentic Leadership – Humble Leadership		
Bharanitharan, Chen, Bahmannia & Lowe, 2018	Hwang, 2017	Mao, Chiu, Owens, Brown, & Liao, 2019
Servant Leadership – Humble Leadership		
Hwang, 2017		
Ethical Leadership – Humble Leadership		
Owens, Yam, Bednar, Mao, & Hart, (2019).		
LMX – Supportive Leadership		
Bhal, Ansari, & Aafaqi, 2007	Hsu, Chen, Wang, & Lin, 2010	Schaffer & Riordan, 2013
Bryant, 2008	Lu & Sun, 2017	White, Campbell, & Kacmar, 2012
Gkorezis, 2015		
Benevolent Leadership – Supportive Leadership		
Chan, 2007 Chan, 2017	Lee, Jang, & Lee, 2018	Shu, Chiang, & Lu, 2018
Empowering Leadership – Entrepreneurial Leadership		
Newman, Tse, Schwarz & Niesen, 2018		
Destructive Leadership – Authoritarian Leadership		
Aryee, Chen, Sun, & Debrah, 2007 Bell, 2017	Dobbs, 2014	Schmidt, 2008

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