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RESEARCH ARTICLE

Leaders' Dark Tetrad and their effectiveness in the eyes of followers: An analysis of the curvilinear relationships mediated by team members' knowledge-sharing behaviors

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Abstract

This study examined how leaders' Dark Tetrad traits - narcissism, Machiavellianism, psychopathy, and sadism - relate to perceived leadership effectiveness, and whether team members' knowledge-sharing behaviors mediate these associations. Curvilinear regression analyses conducted with a sample of 217 employees revealed that narcissism exhibited an inverted U-shaped relationship with leadership effectiveness. In contrast, Machiavellianism, psychopathy, and sadism were only negatively and linearly associated with leader effectiveness. Regarding knowledge-sharing, sadism demonstrated a significant curvilinear (U-shaped) relationship, while other traits yielded either weak or non-significant patterns. Knowledge-sharing itself followed an inverted U-shape curvilinear path in predicting leadership effectiveness. Knowledge-sharing behaviors did not mediate the relationship between Dark Tetrad traits and leadership effectiveness. These findings suggest that dark traits may display context-dependent adaptability, particularly at moderate levels, challenging traditional linear models in leadership research. They highlight the role of nonlinear dynamics in effective leadership. Limits and future directions are presented.

Keywords

Dark Tetrad, leader effectiveness, curvilinear relationship, knowledge-sharing behaviors

INTRODUCTION

Leadership effectiveness is critical in contemporary organizations operating within an increasingly volatile, uncertain, complex, and ambiguous (VUCA) environment (Mack & Khare, 2015). In such environments, effective leaders demonstrate adaptability, rapid decision-making, and the ability to maintain stability (Ruesga Rath et al., 2021). Leadership effectiveness is a multidimensional construct that pertains to the

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leader's ability to motivate, guide, and achieve successful outcomes (Chemers, 2008; Giessner & Van Knippenberg, 2007). According to this conceptualization, leadership effectiveness is assessed by how well the leader is perceived to steer the team toward its goals, inspire and motivate members, and the satisfaction members feel when working with the leader. Additionally, this approach incorporates perceptions of the leader's success in past tasks and expectations regarding their future performance, capturing both current effectiveness and potential for future success.

From a process-oriented and interactional perspective effectiveness is a dynamic interplay among multiple behavioral, relational, and contextual variables (Rost, 1993). It is not solely determined by internal competencies and the leader's psychological characteristics and dispositions (Javalagi et al., 2024; Judge et al., 2002; Silverthorne, 2001), but also by external contextual factors such as time limitations, availability of resources, subordinate engagement, and the overall quality of interpersonal dynamics within the team (Mesterova et al., 2015).

Specifically, a leader is effective to the extent that they can positively influence subordinates and organizational processes to achieve desirable results (Madanchian et al., 2017). Hence, leaders are not merely directive figures but also integral members of their teams, engaging with their followers in a shared social context (Tee, 2015). Leadership effectiveness is critical in shaping dynamics and performance within teams and organizations (Northouse, 2025).

A growing body of research has linked these behaviors to some surprising leader personality traits, such as those included into the Dark Tetrad (Ramos-Villagrasa et al., 2020). But the relationship between the Dark Tetrad personality traits and leadership effectiveness remains a subject of ongoing debate.

The Dark Tetrad extends the Dark Triad - comprising narcissism, Machiavellianism, and psychopathy - by incorporating sadism as a fourth dimension (Međedović & Petrović, 2015; Paulhus, 2014; Thibault & Kelloway, 2020). Each of these traits reflects socially aversive personality characteristics that are associated with manipulative, exploitative, and antagonistic behaviors.

Narcissism is characterized by grandiosity through tendencies toward self-perceived uniqueness, a desire for admiration, and charismatic self-presentation but its manifestation varies depending on individual personality structure and environmental influences (Fino et al., 2023). Subclinical narcissism is associated with functional, albeit manipulative, social behaviors (Paulhus & Williams, 2002). Narcissists possess high self-esteem, strategic social intelligence, and the ability to navigate social hierarchies with charm and deception (Dworkis & Young, 2023). Their narcissism is primarily instrumental, aimed at achieving power and control rather than compensating for deep-seated psychological distress (Jones & Figueredo, 2012).

Machiavellianism entails behaviors emphasizing strategic manipulation, deceit, and pragmatic goal pursuit (Brownell et al., 2023; Fino et al., 2023). High-Machiavellian individuals exhibit flexible social tactics, oscillating between cooperation and competition as needed (Czibor & Bereczkei, 2012). They engage in emotional manipulation, such as playing individuals against each other or feigning sincerity to achieve personal goals (Austin et al., 2007). Consequently, they often thrive in business and competitive environments where strategic decision-making is crucial (Kerekes, 2010).

Psychopathy, considered the "darkest" of the Dark Triad traits, entails impulsive actions, rule-breaking tendencies, and engagement in risky or antisocial behaviors (Fino et al., 2023). Those high on psychopathy are more likely to exhibit criminal activity, varying from small everyday crimes (such as opportunistic shoplifting; Lyons & Jonason, 2015) to having a chronically criminal lifestyle, leading to imprisonment and high levels of recidivism.

Sadism is characterized by the enjoyment derived from inflicting or witnessing others' suffering, both physical and emotional deriving pleasure from inflicting harm on others (Bonfá-Araujo et al., 2022; Buckels, 2012; Fino et al., 2023; Maheux-Caron et al., 2024). Everyday sadism is negatively correlated with agreeableness, honesty-

humility, and conscientiousness, reinforcing its distinctiveness from the other Dark Triad traits (Međedović & Petrović, (2015). Individuals high in everyday sadism were more likely to engage in aggressive behaviors, such as harming insects or inflicting discomfort on others, without external incentives (Buckels et al., 2013), strong engagement in violent video games (Greitemeyer, 2014) and online trolling behaviors, particularly when combined with psychopathy (Sest & March, 2017). van Geel et al. (2017) further identified sadism as a significant predictor of both traditional and cyberbullying, even when controlling the other Dark Tetrad traits.

While these traits are often linked to toxic behaviors and negative outcomes, at moderate levels they can also yield benefits under certain conditions and in specific contexts (Koehn et al., 2019; Vergauwe et al., 2021; Wille et al., 2024). When exhibited excessively or insufficiently, they can disrupt team dynamics, undermine followers' motivation, and reduce leaders' adaptability, ultimately limiting leadership effectiveness in complex contexts (Volmer et al., 2016). Considering these incongruent findings, a more nuanced approach, looking into specific mechanisms, could shed light on the dual effect Dark Tetrad traits seem to have on leadership effectiveness. Exploring how leaders' Dark Tetrad traits are linked to leadership effectiveness through behaviors exhibited by subordinates, such as knowledge-sharing behaviors, can be one such mechanism.

Knowledge-sharing behaviors are an important part of these dynamics and have a crucial role on performance in organizations (Yeboah, 2023). These behaviors are measurable and observable individual actions of exchanging information, expertise, and advice within a team context (Lee, 2018). These actions are reflected specifically through both "giving" and "asking" behaviors. "Giving" behaviors involve the active dissemination of knowledge, where individuals share their insights, strategies, lessons learned, and expertise with colleagues. This can be observed in actions such as offering advice, explaining procedures, or communicating new facts learned at work. These behaviors demonstrate an individual's willingness to contribute to the collective knowledge of the team by teaching, explaining, and providing guidance based on their professional experience and expertise. In contrast, "asking" behaviors highlight the receptive aspect of knowledge-sharing, where individuals seek information, insights, and guidance from their colleagues. This includes actions such as requesting advice, asking for explanations of procedures or strategies, and seeking insights from others based on their expertise or experience (Lee, 2018).

Knowledge-sharing behaviors significantly impact several key outcomes, such as team performance (Xiao et al., 2015) and innovation (Hu & Randel, 2014) and their effectiveness is influenced by multiple factors, including leadership. Leadership also plays a key role by modeling and incentivizing knowledge-sharing, either through formal rewards or by fostering a psychological climate conducive to information exchange (Jahani, 2011). Previous research reveals that leaders with moderate Dark Triad traits may encourage knowledge-exchange through strategic influence and control over information (Nassif, 2018). Yet their dysfunctional behaviors can also encourage knowledge-hiding and limitation of team access to information, ultimately harming long-term leadership effectiveness (Soral et al., 2022). Although existing literature has primarily focused on the influence of the Dark Triad (i.e., narcissism, Machiavellianism, psychopathy) on knowledge-hiding behaviors, limited attention was given to how knowledge-sharing behaviors might mediate the relationship between leadership traits and various outcomes. Furthermore, sadism, a central Dark Tetrad trait, is especially understudied, despite its potential to erode trust and reduce team members' willingness to share knowledge (Yin et al., 2023).

The present study approaches these gaps by exploring the inverted U-shaped curvilinear relationship between leaders' Dark Tetrad traits (i.e., narcissism, Machiavellianism, psychopathy, and sadism) and their leadership effectiveness from the perspective of their followers, mediated by

knowledge-sharing behaviors among team members.

It advances the understanding of dark personality traits in leadership by moving beyond the traditional Dark Triad framework to include sadism, a trait often overlooked despite its potential impact on organizational dynamics (Johnson et al., 2019). It provides a more comprehensive perspective on how dark traits function in leadership contexts and challenges the predominant linear perspective on the relationship between dark traits and various outcomes by proposing a curvilinear (inverted U-shaped) model in which moderate dark traits may enhance team and leadership outcomes, while extreme manifestations could undermine these outcomes (Brownell et al., 2023). Considering knowledge-sharing behaviors as a potential mechanism further contributes to leadership theories by nuancing the understanding of how dark personality traits shapes team knowledge dynamics, an area previously underexplored (Yin et al., 2023). Moreover, previous studies linking Dark Tetrad traits to leadership effectiveness have generally relied on self-reported data from leaders, which may have introduced bias and limited the reliability of conclusions drawn (Maples et al., 2014) Our research addresses this issue by looking into employee perspectives on leadership effectiveness.

Our findings are relevant for organizations operating in VUCA environments. Because leadership selection and development often rely on personality assessments, understanding how dark traits shape knowledge-sharing behaviors and leadership effectiveness enables organizations to refine their criteria and move beyond simplistic categorizations of these traits as inherently detrimental.

Hypotheses development

The relationship between Dark Tetrad traits and leadership effectiveness has been conceptualized through both linear and curvilinear models, reflecting the complex effects of these traits in organizational settings (Brownell et al., 2023).

A substantial body of research supports a linear correlation, indicating that higher levels of Dark Tetrad traits generally lead to lower leadership effectiveness. Leaders that are high in psychopathy or sadism tend to exhibit impulsivity, aggression, and a lack of empathy, which can erode trust, decrease team cohesion, and foster toxic work environments (Başar, 2020; Dierdorff & Fisher, 2021). Similarly, highly Machiavellian leaders, who prioritize manipulation and strategic deception, may struggle to build genuine relationships with their subordinates, ultimately undermining long-term organizational success (Kiazad et al., 2010; Shah et al., 2021). Excessive narcissism has also been associated with counterproductive leadership behaviors, such as grandiosity, exploitative decision-making, and an inability to accept criticism, which can lead to organizational instability (Braun, 2018). However, many of these studies have methodological limitations, including reliance on self-report measures, which can be influenced by social desirability bias (Malesza & Ostaszewski, 2015). However, leadership effectiveness is highly context-dependent, which challenges the assumption of a strictly linear relationship (Belchetz & Leithwood, 2007).

Conversely, other studies suggest that Dark Tetrad traits may contribute to leadership effectiveness in an inverted U-shaped curvilinear fashion (Allen, 2016). For example, moderate narcissism could enhance leader confidence, charisma, and strategic vision, fostering innovation and decisiveness (Vergauwe et al., 2018). Moderate Machiavellianism may enable leaders to navigate complex social dynamics, negotiate effectively, and maintain a competitive edge (Shah et al., 2021). Psychopathy, also when exhibited in moderation, has been linked to risk-taking and resilience, traits that can be advantageous in high-stakes decision-making environments (Landay et al., 2019). However, these benefits appear to diminish or become counterproductive and dysfunctional when these traits reach extreme levels, reinforcing the reversed curvilinear perspective. Sadism has been less frequently examined in both linear and curvilinear models of leadership effectiveness (Schreyer et al., 2021). So far, studies show a weaker or inconsistent relationship with leadership success compared to the other three traits (Agbim, 2024). While

sadistic leaders may engage in behaviors that undermine workplace morale and ethical standards (Thibault & Kelloway, 2020), empirical evidence supporting its impact through curvilinear patterns remains scarce (Rudden & Brandt, 2018).

In general, excessive manifestations of the Dark Tetrad traits tend to correlate with increased ethical violations, employee dissatisfaction, and organizational dysfunction (Tortoriello et al., 2019). Yet recent findings indicate that moderate expressions are associated with higher perceived leadership effectiveness, particularly in competitive or crisis-driven industries (Castagna & Hart, 2024). This paradoxical pattern underscores the importance of contextual and situational factors in determining whether these traits enhance or hinder leadership success and the need to further explore the non-linear relationship between them. Leadership theories serve as a starting point in deciphering such patterns in the Dark Triad traits.

For example, while a moderate level of narcissism can enhance leadership performance, excessive narcissism tends to undermine it. Moderate levels of narcissism are often associated with qualities such as self-confidence, strategic vision, and persuasiveness, which contribute positively to leadership effectiveness. In the Hogan Development Survey (HDS) charismatic cluster (Vergauwe et al., 2018) narcissistic traits correspond to Boldness, which fosters a leader's ability to inspire and influence others. However, as narcissism intensifies, it crosses a threshold where confidence turns into arrogance, risk-taking becomes reckless, and a leader's receptivity to feedback diminishes. This transition exemplifies the too-much-of-a-good-thing effect (TMGT; Pierce & Aguinis, 2013), which posits that traits beneficial in moderation become maladaptive when overexpressed. The versatile leadership model (Kaiser & Overfield, 2010) further clarifies this dynamic by differentiating between two leadership dimensions: forceful vs. enabling leadership and strategic vs. operational focus. A leader with moderate narcissism effectively balances these dimensions by asserting authority while remaining responsive to team dynamics. In contrast, highly narcissistic leaders become overly dominant, dismissive of dissent, and prone to exploitative behaviors, which ultimately erode trust and impair decision-making. As a result, narcissistic leaders may experience initial success but ultimately face declining effectiveness as their interpersonal deficits outweigh their strategic strengths.

A similar inverted U-shaped curvilinear relationship occurs between Machiavellianism and leadership effectiveness. According to socio-analytic theory (Hogan & Shelton, 1998), leaders high in social skills can successfully translate interpersonal aspirations into purposeful action, using political skills to navigate complex workplace dynamics (Munyon et al., 2015). At moderate levels, Machiavellian leaders demonstrate a keen understanding of organizational power structures, effective negotiation skills, and adaptive leadership behaviors, making them appear charismatic and competent. However, in line with the revised trait activation theory (Genau et al., 2021; Tett et al., 2013), the effectiveness of Machiavellianism is context-dependent, being most pronounced in environments that demand control, influence, and strategic decision-making (Smith & Webster, 2017). As Machiavellian tendencies intensify beyond an optimal point, their leadership effectiveness declines due to excessive manipulation, distrust, and unethical conduct (Kholin et al., 2019).

The inverted U-shaped pattern between psychopathy and leadership effectiveness can be understood through the trait activation framework (Tett et al., 2013) and the triarchic model of psychopathy (Patrick, 2018). As conceptualized in the triarchic model, psychopathy consists of boldness, disinhibition, and meanness (Patrick, 2018). Among these dimensions, boldness—characterized by social dominance, fearlessness, and confidence—has been linked to leadership emergence and effectiveness, particularly in high-pressure environments (Blickle et al., 2018). Leaders with moderate psychopathic traits may show higher risk tolerance, decisiveness, and resilience, boosting their perceived authority and strategic judgment. However, the **trait activation framework** suggests that certain

workplace cues can amplify the maladaptive tendencies of psychopathic leaders. Specifically, opportunities for power and financial gain activate predatory behaviors associated with meanness, leading to inconsiderate treatment of subordinates, reduced team morale, and deteriorating job performance (Blickle et al., 2018). While moderate psychopathy may be advantageous for leadership effectiveness, excessive psychopathy leads to destructive, unethical, and ultimately counterproductive leadership behaviors.

While the curvilinear relationship between sadism and leadership effectiveness has not been sufficiently explored, the functional theory of sadism (Russell, 2019) can shed some light on this pattern. It posits that the enjoyment of aggression may serve an evolutionary purpose, influencing social status and group dynamics in both constructive and destructive ways, particularly in hierarchical social structures where enforcement of norms and control over resources are necessary (Cheng et al., 2010). In leadership, sadistic tendencies may contribute to either dominance- or prestige-based strategies (Henrich & Gil-White, 2001).

Leaders low in sadism may struggle with enforcing discipline, avoiding conflict, or making difficult but necessary decisions. Their reluctance to exercise authority or impose sanctions may result in a lack of control, leading to decreased group cohesion and reduced effectiveness in maintaining organizational goals. Such leaders may strategically use punishment, discipline, or assertive confrontation to maintain order, enforce fairness, and discourage deviant behavior within their teams. In contrast, moderate levels of sadism, particularly in its prosocial form, may enhance leadership effectiveness by enabling leaders to apply aggression in a controlled and purposeful manner (Henrich & Gil-White, 2001). However, as sadistic tendencies increase beyond a certain threshold, leadership effectiveness is likely to decline. Excessively everyday sadism may lead to coercive and fear-based leadership strategies. Leaders who derive excessive pleasure from aggression risk creating a toxic work environment characterized by intimidation, emotional abuse, and interpersonal hostility. This, in turn, may lead to reduced trust, lower team morale, and higher turnover rates among subordinates (Spain et al., 2014). As such, while moderate sadism may be advantageous in leadership roles that require assertiveness and norm enforcement, excessive sadism undermines social cohesion and long-term leadership sustainability. This aligns with research showing that dark traits can benefit leadership when moderate but become harmful when extreme (Grijalva et al., 2015; Judge et al., 2009). Thus, the sadism - leadership effectiveness relationship likely also follows a curvilinear trajectory. As such, we advance the following hypothesis:

Hypothesis 1: *The relationship between the Dark Tetrad personality traits (narcissism - H1a, Machiavellianism - H1b, psychopathy – H1c, and sadism – H1d) and leader effectiveness follows a curvilinear pattern of an inverted U-shape.*

This dual-edged impact of the Dark Tetrad traits is also highlighted for specific team dynamics, such as the knowledge-sharing processes. The often manipulative, exploitative, and self-serving tendencies displayed by leaders with Dark Tetrad traits can significantly hinder team members' willingness to share knowledge. However, at moderate levels, these traits may be strategically leveraged to facilitate knowledge-sharing.

Literature provides consistent evidence for a predominantly *negative linear relationship* between leaders' Dark Tetrad traits and knowledge-sharing behaviors in teams. These personality traits are linked to manipulative, exploitative, and antagonistic interpersonal styles, which tend to erode the psychological safety required for open communication within teams (O'Boyle et al., 2013). Leaders high in Machiavellianism are prone to strategically withhold or distort information to maintain power asymmetries, thereby obstructing the free flow of knowledge among subordinates (Huang et al., 2023). Psychopathic traits, characterized by impulsivity, lack of empathy, and interpersonal coldness, undermine trust and collaborative dynamics, discouraging

employees from engaging in reciprocal information exchange (Dargis et al., 2018). Although narcissistic leaders may initially appear charismatic and visionary, their tendency toward self-centeredness and status-seeking can shift the focus away from collective knowledge development toward personal validation (Liu et al., 2021; Nevicka et al., 2018; Tahir et al., 2023). Sadistic leadership can further deteriorate the team climate, instilling fear and punitive norms that directly inhibit knowledge-sharing behaviors (Torralba et al., 2020). In such contexts, team members are less likely to share ideas, offer feedback, or collaborate openly, perceiving such acts as potential sources of vulnerability or exploitation.

On the other hand, a few recent studies suggest that at moderate levels, these traits may facilitate knowledge-sharing, whereas at extreme levels, they become detrimental. Brownell et al. (2023) provides empirical support for a *curvilinear relationship* between founder Machiavellianism, psychopathy, and new venture performance, with knowledge-sharing serving as a key explanatory mechanism. Moderate Machiavellianism and psychopathy might enable strategic knowledge management, facilitating controlled information-exchange to optimize team performance. They found that, contrary to expectations, narcissism exhibited a positive linear relationship with performance, indicating that narcissistic founders may leverage their confidence and vision to sustain knowledge-sharing and organizational success. Yet, at excessive levels, these traits likely erode trust and psychological safety, leading to knowledge-hoarding and reduced collaboration (Bouncken et al., 2020).

Additionally, building on the self-regulation theory (Mithaug, 1993), knowledge-sharing is not merely inhibited or facilitated by the leaders' dark traits in a linear fashion, but this varies based on contextual factors and the intensity of these traits. Moreover, the curvilinear effect is influenced by contextual moderators such as duration of leader-follower interaction and situational pressures (Xia et al., 2019).

Considering the tenets of the charismatic leadership theory (Conger & Kanungo, 1998), low to moderate narcissism can enhance knowledge-sharing by fostering a compelling vision and confidence, motivating employees to engage in discussions and contribute ideas (Tahir et al., 2023; Wang et al., 2023). Likewise, moderate Machiavellianism may lead to strategic knowledge-dissemination, ensuring efficient information flow within teams. In situations of crisis or ambiguity, such leaders might display charismatic leadership, driving knowledge-sharing efforts to address urgent organizational challenges (Shah et al., 2021). However, as these traits intensify, the relationship reverses and, over time, the harmful traits typically dominate, reducing psychological safety and hindering knowledge-sharing (Shao et al., 2016; Yin et al., 2023). Highly narcissistic leaders may suppress team contributions, prioritizing their self-image over collective success (Xiao et al., 2018). Machiavellian leaders may manipulate knowledge-flow, creating an environment of distrust and secrecy where employees withhold information to protect themselves (Serenko & Choo, 2020). Psychopathy and sadism further deteriorate knowledge-sharing climates by fostering hostile, punitive environments that discourage open communication (Yin et al., 2023).

Considering these, it is plausible that leaders with Dark Tetrad traits exhibit a curvilinear effect on knowledge-sharing among followers. Thus, we advance that:

Hypothesis 2: *The relationship between the Dark Tetrad personality traits (narcissism – H2a, Machiavellianism – H2b, psychopathy – H2c, and sadism – H2d) and knowledge-sharing behaviors among team members follows a curvilinear pattern of an inverted U-shape*.

Knowledge-sharing is fundamental not only to team functioning and innovation but also to the perceived and actual effectiveness of leadership (Wang & Wang, 2012). This is, to a significant extent, shaped by the social and informational dynamics within the team, particularly the extent to which knowledge is openly communicated, distributed, and integrated.

Effective leaders are often those who succeed in cultivating a climate of trust, openness, and psychological safety—conditions that are prerequisites for knowledge-sharing behaviors (Edmondson, 1999). When team members feel secure and supported in contributing their knowledge, they are more likely to engage in collaborative problem-solving, provide constructive feedback, and coordinate efforts (Nelson, 2013). These behaviors, in turn, enhance the leader's capacity to access relevant information, align team actions with organizational goals, and respond adaptively to challenges. In this way, knowledge-sharing facilitates better decision-making and strategic foresight, thereby reinforcing perceptions of leadership competence and credibility (Kim et al., 2021). Moreover, knowledge-sharing behaviors contribute to the development of high-quality leader–member exchanges, characterized by mutual trust, respect, and reciprocity (Graen & Uhl-Bien, 1995). In teams where knowledge flows freely, leaders are more attuned to the needs, skills, and perspectives of their subordinates (MacGillivray, 2018). This relational attunement allows leaders to provide more targeted support, delegate effectively, and manage team dynamics constructively — core components of leadership effectiveness (Svensson & Wood, 2006).

Conversely, a lack of knowledge-sharing can impair leadership effectiveness by limiting access to critical insights, reducing situational awareness, and fostering fragmented team functioning (Burmeister et al., 2018). When team members do not engage in knowledge-sharing behaviors, leaders may struggle to coordinate collective efforts or to detect early warning signs of conflict, burnout, or inefficiency, thereby weakening their capacity to lead effectively (Choudhary & Mishra, 2021). In such contexts, leaders may be perceived as disconnected, authoritarian, or reactive rather than proactive (Zhao et al., 2019).

Hence, while evidence shows that moderate levels of knowledge-sharing are conducive to leadership effectiveness, excessive or unregulated information flow can become detrimental (Arnold et al., 2023) suggesting that the relationship between them may also follow a curvilinear pattern. According to cognitive load theory (Miller, 1956; Sweller, 1988), the human cognitive system (the working memory) has limited capacity to process and integrate large volumes of information simultaneously. **S**everal studies suggest that information initially enhances performance, but beyond a critical threshold, excessive information becomes detrimental (Eppler & Mengis, 2004; Klausegger et al., 2007). When the volume or complexity of information surpasses this threshold, *information overload* occurs - leading to difficulties in integration, prioritization, and strategic decision-making (Graf & Antoni, 2020). Knowledge-sharing behaviors that are initially functional can become counterproductive if they contribute to cognitive saturation.

In team contexts, this implies that moderate knowledge-sharing enhances the leader's awareness and decision quality, but excessive knowledge flow can overwhelm the leader, resulting in mental fatigue, indecision, and fragmentation of authority (McDowall, 2022). Leaders may find it increasingly difficult to distinguish relevant from irrelevant data, prioritize tasks and delegate efficiently, or maintain a coherent vision and situational awareness. This is especially noticeable in digital work environments, where the overuse of Information and Communication Technologies (Ragu-Nathan et al., 2008) can diminish a leader's cognitive and emotional bandwidth, ultimately constraining their capacity to guide, inspire, and regulate team dynamics (Estrada-Muñoz et al., 2022). We therefore hypothesize that:

Hypothesis 3: *The relationship between knowledge-sharing behaviors among team members and leader effectiveness follows a curvilinear pattern of inverted U-shape.*

Charismatic leadership theory (Conger & Kanungo, 1998) explains how leaders with moderate dark traits can positively influence knowledge-sharing and thereby enhance leadership effectiveness. Charismatic leaders engage followers through extraordinary behaviors, including articulating a compelling vision, taking personal risks, demonstrating empathy, and exhibiting unconventional

actions. Thus, leaders with moderate narcissism, Machiavellianism, psychopathy, and sadism may display charismatic behaviors that promote knowledge-sharing within teams. For example, moderate narcissism can inspire a grand vision that mobilizes the team (Schmid et al., 2021); moderate psychopathy encourages calculated risk-taking, fostering motivation (Prusik & Szulawski, 2019); moderate Machiavellianism supports strategic, empathy-simulating behavior to sustain collaboration (Gruda et al., 2023), and controlled sadism can drive creative problem-solving (Bhattacharjee & Tripathi, 2024). These leaders are thus perceived as exceptional, responding effectively to organizational demands and stimulating collaboration. Such charismatic behaviors could mediate the relationship between dark traits and perceived leadership effectiveness, ultimately improving team performance.

Furthermore, charismatic leadership shapes followers' engagement and interactions by fostering trust, motivation, and a shared vision, which creates a psychologically safe environment conducive to knowledge-sharing. Addressing emotional and symbolic needs, these leaders strengthen group cohesion and openness. However, when dark traits surpass moderate levels, charismatic behaviors lose efficacy and can harm knowledge-sharing. The organizational context, such as crises or VUCA environments, can also amplify or mitigate these effects. Hence our final hypothesis is that:

Hypothesis 4: *The curvilinear pattern of an inverted U-shape relationship between the Dark Tetrad personality traits (narcissism - H4a, Machiavellianism - H4b, psychopathy - H4c, and sadism - H4d) and leader effectiveness is mediated by team members' knowledge-sharing behaviors.*

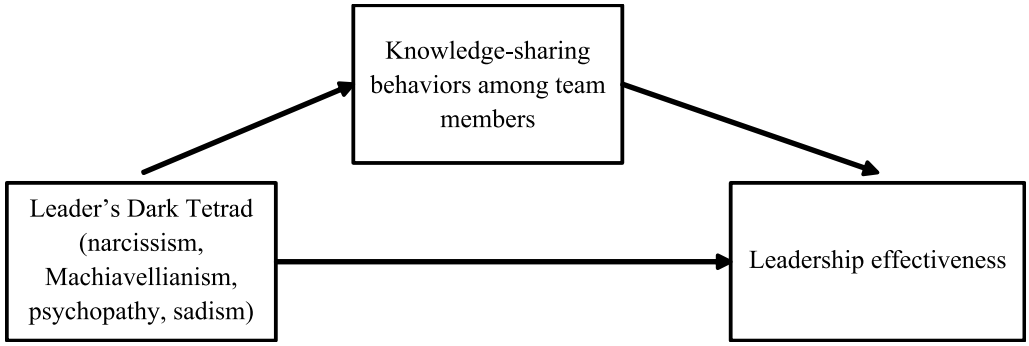

Figure 1. Research model with inverted U-shaped relationships.

METHOD

Participants

To ensure adequate power for detecting both direct and indirect effects (a minimum of .80), we utilized Fritz and MacKinnon's (2007) sample size estimation method, which is tailored for mediation models. Specifically, we selected a small-medium effect size of .234 based on relevant literature for a *path* (leader's dark personality traits to knowledge-sharing behaviors among team members) (Karim, 2022). The cited study investigated the relationship between dark traits and knowledge-hiding behaviors and although from a different context, this effect size can be reasonably applied, assuming the knowledge-sharing and knowledge-hiding behaviors are situated on a continuum (Connelly et al., 2011).

For the *b path* (knowledge-sharing behaviors among team members to leadership effectiveness), we applied a small-medium effect size of .219 based on Alkheyi et al. (2020). Other studies investigating the

relationship between knowledge-sharing behaviors and innovation reported similar effect sizes ranging from .125 to .291 (Aydin & Erkiliç, 2020).

We found that no specific effect size for the path between knowledge-sharing behaviors and leadership effectiveness is available. Although from a different context, this effect size can be reasonably applied, assuming the relationship is similar. We chose a τ' *value* of .14 for our sample size estimation based on the expectations for the direct effect of the predictor (dark triad traits) on the outcome (leadership effectiveness) in the presence of the mediator (knowledge-sharing behaviors). This value aligns with previous research, which suggests that the relationship between the dark triad traits and leadership effectiveness, when mediated by knowledge-sharing behaviors, is moderate but not overly large (Aydin & Erkiliç, 2020).

Considering these values, the required sample size is 224 participants.

The sample consisted of N = 217 employees nested in teams (70.6% females). Participants' ages ranged from 19 to 64 years (M = 39.03, SD = 12.23). In terms of education, 17% had graduated from high school, 16.1% graduated from a post-secondary school (non-tertiary), 45.9% held a bachelor's degree, 18.3% a master's degree, and the other 2.7% completed other studies as their last form of graduation (e.g. PhD, college, vocational school, or even high school program).

On average, participants had 10.61 years of experience in their current organization (SD = 10.72), including 9.22 years in their current role (SD = 10.03), 8.53 years within their current team (SD = 9.81), and 5.94 years under their current team leader (SD = 6.55). Teams had an average of 25 members.

Most of our sample (87.2%) worked full-time, across a variety of professional domains, including medical (56.6%), administrative (13%), tech (10%), commerce (7%), social (5%), finance (3%), HR (3%) and education (3%).

Instruments

Data was collected using a quantitative, non-experimental, cross-sectional correlational design.

To measure leaders' dark traits, we adapted the Romanian version of the Short Dark Triad (SD4) Scale (Jones & Paulhus, 2014; Fino et al., 2023) to assess followers' perceptions of their leader's dark traits, including Machiavellianism ("*My leader believes that it is unwise to share their secrets with others*"; α = .76) narcissism (*"From time to time, my leader enjoys standing out";* α = .88*)*, psychopathy (*"People say that my leader is out of control"; α* = .90), and sadism (*"My leader enjoys watching violent sports" (α* = .92*).* Participants used a 5-point Likert scale, ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree") to provide their answers.

We used the Perceived Leadership Effectiveness Scale (Knippenberg & van Knippenberg, 2005) to assess the effectiveness of leaders based on team members' perceptions. It captures various dimensions of leadership effectiveness, including task accomplishment, motivation, and overall satisfaction. An item example is *"This team leader is a good leader" (α = .96)*. Participants evaluated their leader's effectiveness on a 7-point Likert scale, ranging from 1 (*"Strongly Disagree"* or *"Not successful"*) to 7 (*"Strongly Agree"* or *"Very successful"*).

The Knowledge-Sharing Behavior Scale **(**Lee, 2018) assesses two dimensions of knowledge-sharing: knowledge-"giving" (*"I impart lessons that I have learned to colleagues"*) and knowledge-"asking" (*"I ask colleagues for their expertise"*), each captured through 16 items. The participants provided their answers on a 6-point Likert scale, from 1 (*"Never"*) to 6 (*"Always"*). We considered the global score of this scale (*α* = .97).

The following variables were controls: participants' age, gender, level of education, tenure in the organization, job tenure, tenure within their current team, and duration of collaboration with their current team leader, team size, employment type (full-time or part-time), and whether participants hold a leadership role (yes/no).

Procedure

Participants were recruited through online platforms using Google Forms. Upon agreeing to participate, they signed an electronic informed consent form detailing the study's purpose, duration, data anonymity and confidentiality, as well as their right to withdraw at any time without any negative repercussions. Subsequently, participants completed the survey.

To ensure data security, all responses were anonymized and stored on a secure online server accessible only to the research team. Responses were checked for completeness and used exclusively for research.

Data analysis

Descriptive analysis (mean, standard deviation, minimum and maximum) was followed by the hierarchical regression analysis to test the proposed inverted U-shape relationships. Following recommendations from the literature (Haans et al., 2016), all main predictors involved in the first three tested hypotheses were mean-centered prior to their inclusion in the regression analyses. Centering was performed by subtracting the sample mean from each individual global score to reduce multicollinearity between linear and higher-order terms and to facilitate interpretation of the regression coefficients. Next, a quadratic term was created based on the centered predictor (X^2). This quadratic term was calculated by squaring the centered predictor scores rather than raw scores, ensuring statistical validity and minimizing artifacts. Consequently, all curvilinear regression models included both the centered predictor and its corresponding centered quadratic term (Iacobucci et al., 2015).

The steps involved in conducting the hierarchical regression analysis were: (1). control variables - including age, gender, level of education, tenure in the organization, job tenure, tenure within their current team, and duration of collaboration with their current team leader; (2). centered main predictor; (3). the squared term of the centered main predictor.

To test Hypothesis H4, we used the MEDCURVE macro (Hayes & Preacher, 2010) in IBM SPSS v.25. This macro allows us to explore and quantify indirect effects of knowledge-sharing in the proposed inverted U-shaped relationships between leader Dark Tetrad and leadership effectiveness.

RESULTS

Descriptive statistics

Results of the descriptive analysis are included in Table 1.

Table 1. *Descriptive statistics for main variables (N = 217)*

Variable	M	SD	Min	Max
Knowledge-sharing behaviors	4.43	.64	1.66	5.00
Machiavellianism	2.70	.81	1.00	5.00
Narcissism	2.88	.93	1.00	5.00
Psychopathy	1.82	.93	1.00	5.00
Sadism	1.52	.85	1.00	5.00
Leadership Effectiveness	5.35	1.34	1.00	7.00

When testing the inverted U-shaped relationship between narcissism and leader effectiveness (H1a), our results revealed that controls yield a non-significant model (R^2 = .044, p = .495). In the second step, the centered narcissism variable significantly explained the variance of leadership effectiveness (ΔR^2 = .054, p = .001). In the third step, the squared term of the centered narcissism variable further increased the explained variance (ΔR^2 = .088, p < .001). Both the linear term (β = 1.130, p < .001) and the quadratic term (β = -1.403, p < .001) were statistically significant and in the expected directions. This combination (a positive β for the linear term and a negative β for the squared term) clearly supports an inverted U-shaped curvilinear relationship: at moderate levels of narcissism, leader effectiveness is higher, but it decreases

at high and low levels. *These results support the hypothesized inverted U-shaped relationship between narcissism and leader effectiveness*.

The hypothesized inverted U-shaped relationship between Machiavellianism and leader effectiveness (H1b) was not supported by the data. In the first step, control variables yield a non-significant model (R^2 = .044, p = .495). In the second step, the centered Machiavellianism variable significantly explained variance (ΔR^2 = .086, p < .001). In the third step, the squared term of the centered Machiavellianism did not significantly explain additional variance (ΔR^2 = = .006, p =.231). The linear term was significant and negative (β = − .278, p < .001), whereas the quadratic term was non-significant (β = −.082, p = .231). *This pattern indicates the existence of a negative linear relationship between Machiavellianism and leader effectiveness.*

Our data reveal that the *relationship between psychopathy and leader effectiveness does not follow a curvilinear pattern of an inverted U-shape (H1c)*. The relationship between psychopathy and leader effectiveness appears to be linear and negative rather than curvilinear inverted U-shaped. In Step 1, controls generated a non-significant model (R^2 = .044, p = .495). In Step 2, the centered psychopathy variable increased the explained variance, ΔR^2 =.262, with the model explaining 30.6% of variance in leader effectiveness (R = .553, R^2 = .306, adjusted R^2 = .268, F (11,204) = 8.162, p < .001). The linear effect of psychopathy was significantly negative (β = −.529, p < .001). In Step 3, the squared term of centered psychopathy did not significantly improve the model (ΔR^2 = .003, F (1,203) = .874, p = .351). Neither the linear term (β = −.280, t = −1.026, p = .306), nor the quadratic term (β = −.253, t = −.935, p = .351) were statistically significant in this final model.

The inverted U-shaped relationship between sadism and leader effectiveness (H1d) was not empirically supported. In the first step, control variables did not significantly predict leader effectiveness (R^2 = .044, F(10, 205) = .94, p = .495). In the second step, the centered sadism variable explained additional variance (ΔR^2 = .129, ΔF(1, 204) = 31.72, p < .001). The linear term was statistically significant and negative (β = *-.368, t* = *-5.63, p* < .001), indicating that higher sadism was associated with lower perceived leader effectiveness. In the third step, the squared term of the centered sadism variable yielded a non-significant increase in explained variance (ΔR^2 = .006, ΔF(1, 203) = 1.46, p = .228) and was not statistically significant (β = -.372, t = -1.21, p = .228).

Figure 2 presents the regression slopes depicting the relationships between each of the Dark Tetrad traits and perceived leader effectiveness.

The curvilinear (inverted U-shaped) relationship between narcissism and knowledge-sharing behaviors was not empirically supported (H2a). In the first step, control variables explained 15.8% of the variance in knowledge-sharing behaviors (F(10, 205) = 3.85, p < .001). Age was a significant positive predictor (B = .015, p = .002). Adding the centered narcissism variable in the second step did not significantly improve the model (ΔR^2 = .000, p = .927). However, when including the quadratic term in the third step, the explained variance increased marginally to 17.3%, ΔR^2 = .015, p = .057, approaching significance. The coefficients for the quadratic term were negative (B = -.067, p = .057), consistent with an inverted U-shaped pattern, though this effect was marginally significant. The linear term was positive but also marginally significant (B = .390, p = .061).

Our data does not support a curvilinear pattern of inverted U-shape between Machiavellianism and knowledge-sharing behaviors among team members follows (H2b). After testing the first model in the hierarchical regression, the centered variable in Model 2 does not significantly improve the model fit (ΔR^2 = .001, F_{change}(1, 204) = .23, p = .63). Machiavellianism was not a significant linear predictor (B = -.025, SE = .052, β = -.03, p = .63). The quadratic term of Machiavellianism did not significantly improve model fit (ΔR^2 = .000, F_{change}(1, 203) = 0.03, p = .86), and was not statistically significant (B = -.007, SE = .041, β = -.01, p = .86).

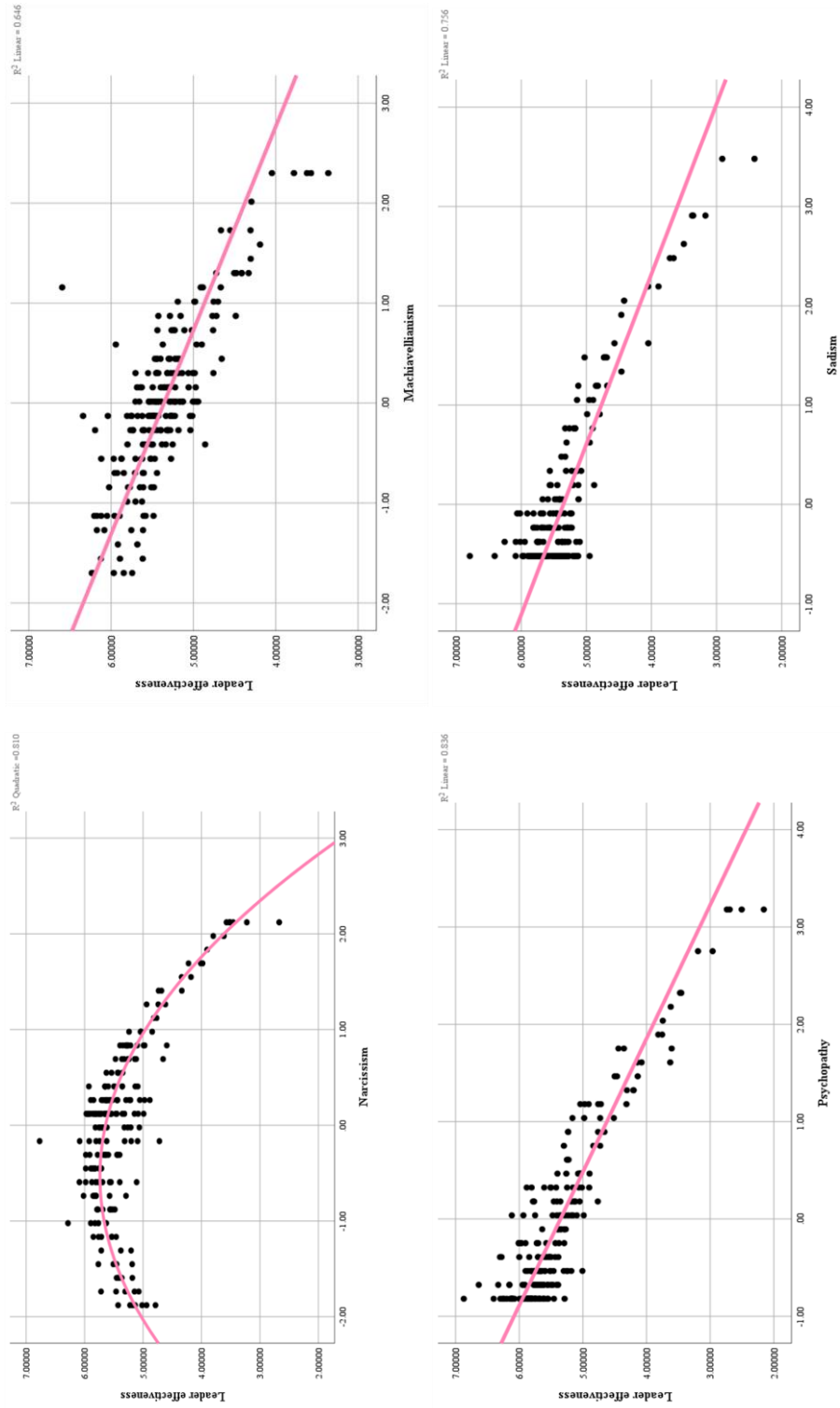

Figure 2. Quadratic and linear relationships between Dark Tetrad and perceived leader effectiveness.
Note. Centered values were used for dark personality traits.

Similar non-significant results were found on t*he inverted U-shape relationship between psychopathy and knowledge-sharing behaviors among team members follows (H2c).* After testing the first model in the hierarchical regression, we added the linear term for psychopathy in the second step. Psychopathy did not significantly explain knowledge-sharing ($\Delta R^2 = .007$, $F(1, 204) = 1.68$, $p = .196$). In the third step, the quadratic term did not significantly increase explained variance ($\Delta R^2 = .008$, $F(1, 203) = 1.99$, $p = .160$), and was not statistically significant (B = .056, $SE = .039$, $\beta = .42$, $t = 1.41$, $p = .160$). The linear term of psychopathy was also nonsignificant ($B = -.34$, $SE = .20$, $\beta = -.50$, $t = -1.66$, $p = .098$).

T*he relationship between sadism and knowledge-sharing behaviors among team members does not follow a curvilinear pattern of inverted U-shape (H2d).* The linear term of sadism led to a non-significant increase in explained variance ($\Delta R^2 = .013$, $F(1, 204) = 3.258$, $p = .073$). Including the quadratic sadism term significantly improved the model ($\Delta R^2 = .020$, $F(1, 203) = 5.103$, $p = .025$), with the full model explaining 19.2% of the variance, ($R^2 = .192$, $F(12, 203) = 4.012$, $p < .001$). In the final step, the linear sadism coefficient was significant and negative ($B = -.602$, $\beta = -.794$, $t = -2.594$, $p = .010$), while the quadratic sadism coefficient was significant and positive ($B = .106$, $\beta = .690$, $t = 2.259$, $p = .025$). This pattern supports a curvilinear relationship consistent with a U-shape between sadism and knowledge-sharing behaviors: knowledge-sharing behavior increases at low levels of sadism, decreases at moderate levels of sadism, and then increasing again at higher level of sadism, suggesting an unexpected complexity in how sadistic traits relate to team knowledge-sharing.

Figure 3 presents the regression slopes depicting the relationships between each of the Dark Tetrad traits and knowledge-sharing behaviors.

Results revealed that the *relationship between knowledge-sharing behaviors among team members and leader effectiveness follows an inverted U-shaped pattern (H3).* The model including only control variables was not significant ($F(10, 205) = .94$, $p = .495$), explaining 4.4% of the variance in leader effectiveness. Adding the centered predictor in Step 2 significantly improved the model ($\Delta R^2 = .05$, $F_{change}(1, 204) = 12.09$, $p = .001$). In Step 3, the squared knowledge-sharing term further improved model fit ($\Delta R^2 = .02$, $F_{change}(1, 203) = 5.20$, $p = .024$), resulting in a final model that explained 12.0% of the variance ($F(12, 203) = 2.31$, $p = .009$). The quadratic term was significant and negative ($B = -.361$, $SE = .158$, $\beta = -.217$, $p = .024$), while the linear term was not significant ($B = .187$, $SE = .212$, $\beta = .089$, $p = .378$).

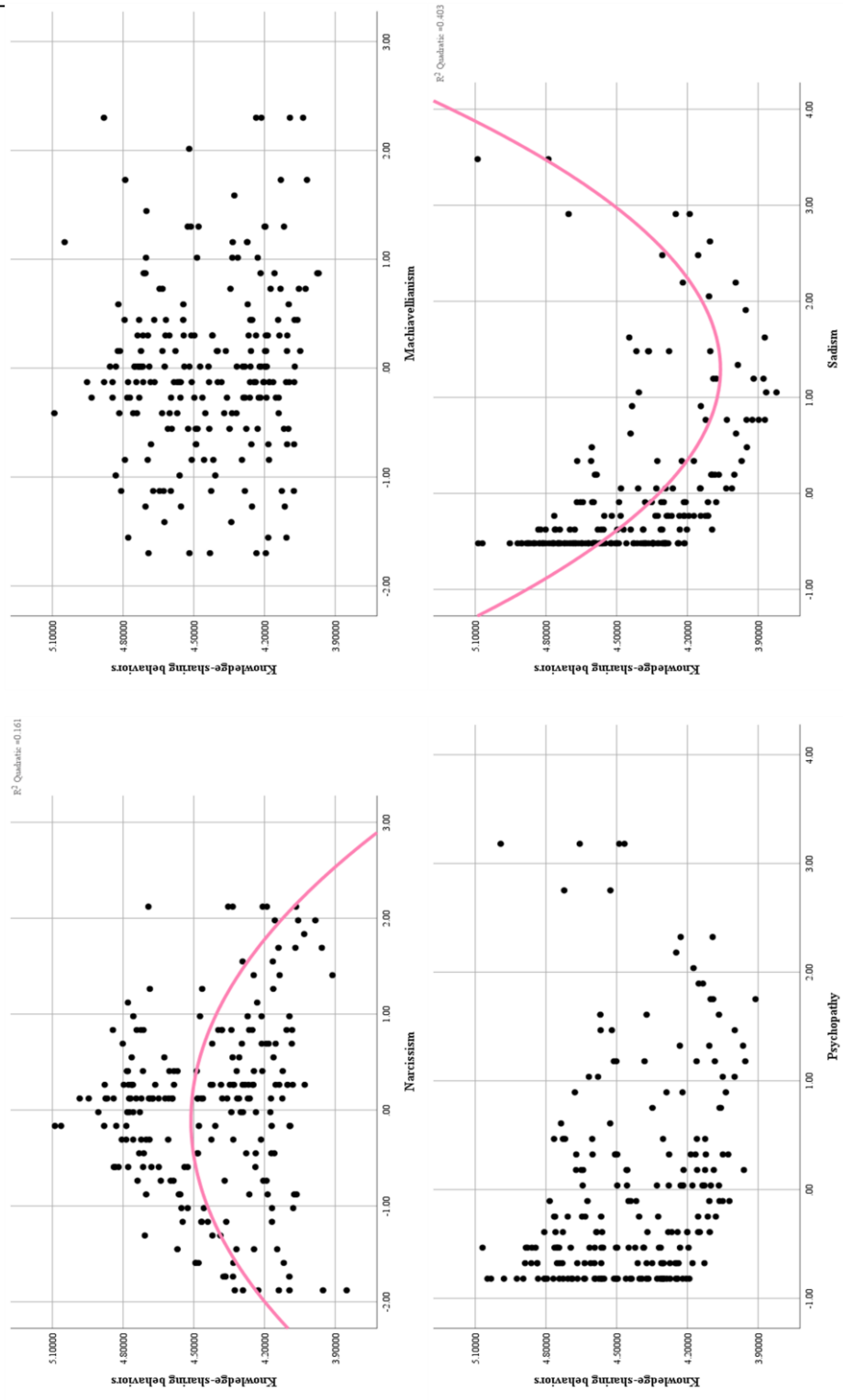

Figure 3. Quadratic relationship between Dark Tetrad and knowledge-sharing behaviors.
Note. Centered values were used for dark personality traits.

Figure 4 presents the regression slopes depicting the relationships between knowledge-sharing behaviors and leadership effectiveness.

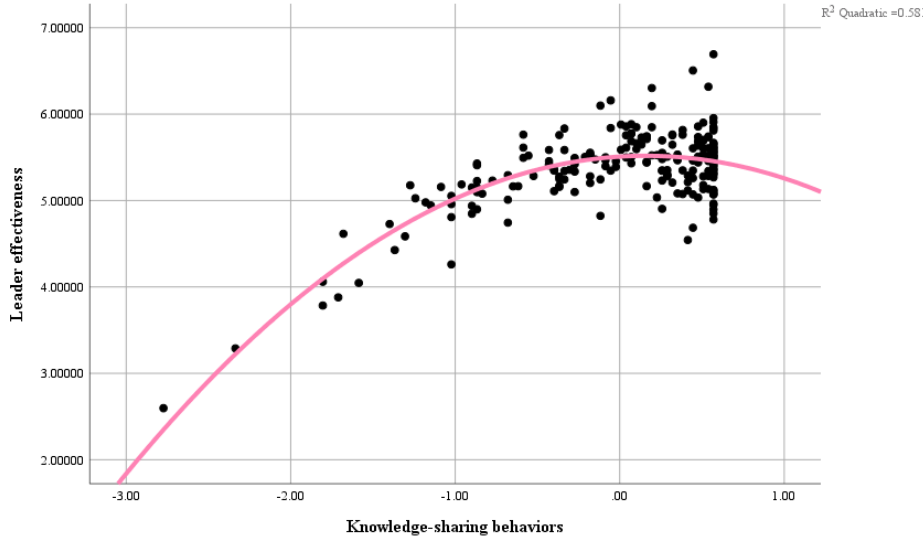

Figure 4. Quadratic relationship between knowledge-sharing behaviors and leader effectiveness. *Note.* Centered values were used for knowledge-sharing behaviors. R^2 (Quadratic) = .581.

We found that *knowledge-sharing behaviors were not a mediator in the inverted U-shaped relationship between narcissism and leader effectiveness (H4a)* although there was an inverted U-shaped relationship between narcissism and leader effectiveness (as indicated by significant positive linear (b = 1.23, p = .005) and negative quadratic effects of narcissism (b = –.28, p < .001) on leader effectiveness) and knowledge-sharing behaviors had a curvilinear effect on leader effectiveness (linear: b = 3.08, p = .012; quadratic: b = –.33, p = .031). Narcissism showed a marginally significant inverted U-shaped effect on knowledge-sharing (linear: b = .39, p = .061; quadratic: b = –.07, p = .057). However, the mediation analysis revealed that the indirect effect of narcissism on leader effectiveness via knowledge-sharing was not statistically significant at low (95% CI [–.03, .12]), mean (95% CI [–.03, .03]), or high (95% CI [–.12, .03]) levels of narcissism, as confidence intervals included zero. These findings suggest that while narcissism and knowledge-sharing each relate curvilinearly to leader effectiveness, knowledge-sharing does not significantly mediate this relationship.

Our data does not support Hypothesis H4b that the inverted U-shaped relationship between Machiavellianism and leader effectiveness is mediated by team members' knowledge-sharing behaviors. Results indicated that Machiavellianism (both linear and quadratic terms) did not significantly predict knowledge-sharing behaviors (b = .017, p = .943; b = –.007, p = .859, respectively). Knowledge-sharing behaviors exhibited a significant curvilinear relationship with leader effectiveness, with a positive linear term (b = 3.77, p = .002) and a negative quadratic term (b = –.41, p = .008), indicating an inverted U-shape. Bootstrapped indirect effects were not statistically significant at the mean or ±1 SD of Machiavellianism.

The hypothesized inverted U-shaped relationship between psychopathy and leader effectiveness mediated by knowledge-sharing behaviors was not empirically supported (H4c). Knowledge-sharing was not statistically significant predicted by either the linear (b = –.34, p = .098) or quadratic term of psychopathy (b = .06, p = .160). However, knowledge-sharing had a significant inverted U-shaped relationship with leader

effectiveness, with a positive linear effect ($b = 4.02$, $p < .001$) and a significant negative quadratic effect ($b = –.45$, p = .001). The direct effects of psychopathy on leader effectiveness were non-significant for both linear ($b = –.45$, $p = .241$) and quadratic terms ($b = –.06$, $p = .399$). The mediation analysis showed non-significant instantaneous indirect effects of psychopathy on leader effectiveness via knowledge-sharing across low, mean, and high levels of psychopathy, with all 95% bootstrap confidence intervals including zero. Thus, while knowledge sharing strongly predicts leader effectiveness in an inverted U-shaped pattern, knowledge-sharing does not significantly mediate the relationship between psychopathy and leader effectiveness.

Our data does not support the mediator role of knowledge-sharing behaviors in the inverted U-shaped relationship between sadism and leader effectiveness (H4d). The quadratic effect of sadism on the mediator, knowledge-sharing, was significant and positive ($b = .11$, $p = .025$), while the linear effect was significant and negative ($b = –.60$, $p = .010$), indicating a curvilinear relationship between sadism and knowledge-sharing in the form of U. In turn, knowledge-sharing showed a significant inverted U-shaped association with leader effectiveness, evidenced by a significant positive linear effect ($b = 3.68$, $p = .002$) and a significant negative quadratic effect ($b = -.41$, $p = .007$). The direct effects of sadism on leader effectiveness were not statistically significant for either the linear ($b = .06$, $p = .899$) or the quadratic terms ($b = –.13$, $p = .183$). Mediation analyses indicated that the instantaneous indirect effects of sadism on leader effectiveness through knowledge-sharing were not statistically significant at low, mean, or high levels of sadism.

DISCUSSIONS

This study examined the U-inverted shape relationships between leaders' dark personality traits - narcissism, Machiavellianism, psychopathy, and sadism - and leadership effectiveness. Additionally, it explored whether knowledge-sharing behaviors among team members mediate these relationships.

Our data provides partial support for the proposed inverted U-shaped relationships between Dark Tetrad traits and leader effectiveness.

Specifically, they indicate a curvilinear relationship between narcissism and leader effectiveness. This pattern aligns with previous research which suggests, on the one hand, that moderate narcissism levels, associated with increased self-confidence, vision, and assertiveness may enhance perceptions of leadership effectiveness (Schmid et al., 2021). On the other hand, excessive narcissism appears detrimental, potentially due to overconfidence, exploitation of others, and impaired decision-making (O'Reilly & Hall, 2020). This supports the "too much of a good thing" effect (TMGT; Pierce & Aguinis, 2013), wherein beneficial traits become counterproductive beyond a certain threshold.

In contrast, no significant quadratic effects were observed for Machiavellianism, psychopathy, or sadism. For Machiavellianism, the significant negative linear association suggests that higher levels of manipulation and strategic deception are consistently perceived by followers as harmful for leader effectiveness. These finding echoes prior evidence that Machiavellian leaders may erode trust and reduce team cohesion (Michel, 2024). Similarly, psychopathy had a significant negative linear effect, which is in line with past studies indicating that callousness and impulsivity undermine interpersonal functioning and leadership outcomes (Aprillia & Maharani, 2021). The lack of a curvilinear trend suggests that even low to moderate levels of psychopathy may not offer the adaptive advantages in high-stakes leadership contexts (Vergauwe et al., 2021). For sadism, our results indicated a negative linear trend consistent with research showing that leaders high in sadistic tendencies may engage in hostile behaviors that damage morale and performance (Buckels et al., 2013).

Taken together, these findings underscore the complexity of dark personality traits in

leadership roles. While moderate narcissism may facilitate leader emergence and perceived competence, the remaining traits of the Dark Tetrad appear to exert uniformly negative effects on perceived leader effectiveness, thereby challenging the notion that these traits may have adaptive or strategic value in leadership when present in moderation.

Our second hypothesis explored the inverted U-shaped relationships between the leaders' Dark Tetrad traits and knowledge-sharing behaviors among team members. The relationship between narcissism and knowledge-sharing was marginally curvilinear in the expected inverted U-shape. This suggests that individuals with moderate narcissism might be more motivated to share knowledge, potentially due to a desire for recognition and influence (Owens et al., 2015). However, a strong narcissistic self-enhancement and entitlement may suppress collaboration (Shukla & Upadhyay, 2025), which could inhibit knowledge-sharing. Although the quadratic effect approached significance, the findings imply a tentative trend that warrants further exploration in larger or more diverse samples.

Conversely, no significant linear or curvilinear relationships were observed between Machiavellianism or psychopathy and knowledge-sharing behaviors. These findings align with research indicating that highly Machiavellian individuals tend to hoard knowledge for strategic gain and self-protection (Sendjaya et al., 2016), while psychopathic traits, often linked to low empathy and manipulativeness, may diminish interpersonal trust and cooperative engagement (Shukla & Upadhyay, 2025) and, thus, effectively disrupt knowledge-sharing processes. The lack of curvilinearity suggests that even moderate levels of these traits may not lead to adaptive engagement in knowledge-sharing.

Unexpectedly, our data revealed a significant U-shaped (and not inverted as expected) relationship between sadism and knowledge-sharing (H2d). Specifically, individuals high and low in sadism were more likely to share knowledge, whereas those at moderate levels shared the least. This paradoxical result could reflect different sadistic motivations: while low-sadism individuals may share out of prosocial intent, those high in sadism may engage in strategic or even manipulative sharing as a form of control or subtle domination (Góis et al., 2019). This finding suggests that sadism's role in team dynamics may be more complex than previously assumed.

Our findings indicate that older participants were more willing to share knowledge. Consistent with prior research, greater professional experience, interpersonal skills, and a stronger sense of collective responsibility among older individuals may promote more collaborative knowledge-sharing behaviors (Crandall et al., 2022).

Our data revealed an inverted U-shaped curvilinear relationship between knowledge-sharing behaviors among team members and perceived leader effectiveness. Thus, moderate levels of team knowledge-sharing were associated with the highest perceptions of leader effectiveness, whereas both low and high levels were linked to lower ratings. This pattern is theoretically consistent with the Goldilocks and TMG principles (i.e., "too little" or "too much" can be suboptimal) and aligns with others suggesting that excessive knowledge-sharing can lead to information overload, decision paralysis, or even perceptions of inefficiency or micromanagement (Eppler & Mengis, 2004). Too little sharing may, in turn, hinder collaboration, alignment, and innovation, reflecting negatively on a leader's capacity to foster productive teamwork (Srivastava et al., 2006). The observed curvilinear effect underscores the importance of balance in team knowledge processes and suggests that leader effectiveness is highest when teams share knowledge purposefully and selectively rather than indiscriminately.

The mediation pathways were not statistically significant for any of the four traits (Hypothesis 4). One explanation for this may lie in the dual nature of Dark Tetrad traits, which often generate ambivalent or contradictory social effects that are difficult to transmit through a single group-level mechanism like knowledge-sharing. For instance, moderate levels of narcissism may boost interpersonal charm and confidence (Back et al., 2013), positively influencing both leader ratings and openness in the team, but

higher levels may generate relational toxicity, distrust, or dominance behaviors that suppress collaborative exchanges (Grijalva & Harms, 2014). This shift in valence across trait levels may create nonlinear direct effects on leader effectiveness that are not fully captured by the more stable, behaviorally grounded process of knowledge-sharing, which depends on team cohesion and psychological safety (Edmondson, 1999).

Moreover, knowledge-sharing behaviors are collective and emergent, while the Dark Tetrad traits are intrapsychic and often strategic or manipulative in expression (Jones & Paulhus, 2014). Particularly in the case of Machiavellianism and psychopathy, individuals may display goal-directed social behavior that appears cooperative on the surface but is ultimately self-serving (Amir & Malik, 2016; Deutchman & Sullivan, 2018), meaning their influence on leader effectiveness may bypass or distort the communal mechanism of knowledge-sharing. From a Social Exchange Theory perspective (Blau, 1964), knowledge-sharing relies on reciprocal trust and norm-based give-and-take. However, individuals high in Machiavellianism or psychopathy may violate these norms, thus weakening the credibility of knowledge-sharing as a consistent mediating pathway.

In the case of sadism, although its relationship with knowledge-sharing followed a significant U-shaped curve, this dynamic may be explained by atypical or paradoxical interpersonal strategies, such as using knowledge to exert control or inflict discomfort, which complicates its translation into collective performance appraisals. This reflects the instrumental use of social behaviors often observed in dark personality profiles, where overt actions (like sharing information) may not reflect genuine team-oriented intentions (Buckels et al., 2013).

This research contributes to the understanding of the Dark Tetrad traits by challenging linear assumptions frequently held in Industrial-Organizational psychology. By modeling curvilinear relationships, particularly inverted U-shapes, the findings suggest that traits traditionally labeled as maladaptive (e.g., narcissism, sadism) may exhibit context-dependent functional utility when expressed at moderate levels. This aligns with emerging perspectives in personality psychology (e.g., Judge et al., 2009; Spain et al., 2014), which propose that certain dark traits can have adaptive benefits under specific situational or dosage conditions. Additionally, the results underscore that not all dark traits operate uniformly in organizational settings, thus supporting the idea of trait specificity rather than trait generality in predicting workplace behaviors. Furthermore, the unsupported mediation role of knowledge-sharing in the relationship between Dark Tetrad traits and leader effectiveness indicates that interpersonal and communicative processes may not be the primary psychological mechanism explaining how these traits influence leadership perceptions. This challenges the existing mediation models rooted in social exchange and behavioral visibility theories and invites a shift toward exploring alternative mediators, such as emotional manipulation, impression management, or perceived authenticity.

Our findings caution organizations against oversimplified personality assessments in leader selection and development processes. While moderate narcissism might support confident and inspiring leaders, unchecked expressions can erode collaboration and long-term team functionality. As such, leadership development programs should aim to regulate - rather than eliminate - certain dark traits, focusing on self-awareness, adaptive use of assertiveness, and ethical boundaries. Moreover, the identification of an optimal level of knowledge-sharing indicates that more is not always better. Leaders should be trained not only to encourage open exchange but also to manage cognitive load, prioritize critical information, and avoid over-diffusion of responsibility within teams. The strong, consistent effect of age on knowledge-sharing also points to the value of age-diverse teams and mentoring structures, where more experienced members can facilitate knowledge-transfer and cultural continuity.

This study highlights the importance of testing both linear and nonlinear relationships in I-O psychology research. Many leadership and personality models assume linearity,

potentially overlooking meaningful patterns that emerge only when quadratic terms are modeled. The use of curvilinear regression and mediation techniques allowed for more precise estimation of complex dynamics and serves as a call for more nuanced statistical approaches in leadership and personality research.

Despite offering valuable insights, the present study has several limitations.

Our cross-sectional research design limits the ability to infer causal relationships. While the data analysis methods allowed exploration of curvilinear and indirect relationships, the temporal ordering of variables cannot be established. As such, it remains unclear whether dark personality traits influence knowledge-sharing behaviors and leader effectiveness, or whether team dynamics and leadership perceptions might also shape how such traits are perceived. Future studies should adopt research designs which are better at capturing causal relationships and their dynamics over time.

This study assessed leaders' Dark Tetrad traits using subordinates' perceptions rather than self-assessment. This approach is advantageous as it mitigates the biases commonly associated with self-reports from leaders, such as social desirability and lack of self-awareness (Rico-Bordera et al., 2025). Leaders high in dark traits may underreport or distort their responses due to impression management concerns. However, subordinates may not have accurate insight into the leader's internal motives, cognitive style, or emotional functioning - especially for traits like Machiavellianism or psychopathy, which can be intentionally concealed. As such, this perceptual mismatch between observable behavior and internal traits may compromise the validity of the trait assessment, making it difficult to determine whether the observed effects are due to actual leader characteristics or subordinate interpretations of behavior. Moreover, all variables were assessed using self-reports, which raises concerns about common method bias and social desirability effects. Participants may have responded in ways they perceived as socially acceptable, particularly regarding sensitive traits such as psychopathy or sadism. Future research should incorporate multi-source assessments, such as peer evaluations, supervisor ratings, and objective behavioral measures (e.g., frequency of shared documents, meeting participation). Mixed-methods approaches - such as combining quantitative ratings with qualitative interviews - may enhance the depth and credibility of perceived leader trait assessments. Additionally, future research could explore which specific behavioral cues subordinates use to infer traits such as those included in Dark Tetrad, potentially informing more targeted instruments.

The sampling strategy employed - snowball sampling across various organizations and industries - resulted in a heterogeneous sample. Although this enhances ecological validity of the study, it also introduces sampling bias and limits generalizability. Expanding the sample to include larger and more demographically balanced groups, including more male participants, underrepresented populations and varying hierarchical levels, would allow for greater generalizability and potential subgroup analyses.

CONCLUSIONS

This study examined how leaders' dark personality traits (narcissism, Machiavellianism, psychopathy, and sadism) relate to leadership effectiveness, and whether knowledge-sharing behaviors mediate these relationships.

Results showed that only narcissism followed a curvilinear (inverted U-shaped) pattern with leadership effectiveness, suggesting that moderate levels of narcissism may enhance, but low and excessive levels impair effectiveness. The other traits were linearly and negatively associated with leadership effectiveness. Regarding knowledge-sharing, sadism exhibited a U-shaped relationship, while narcissism showed a marginal trend; Machiavellianism and psychopathy showed no significant effects. Knowledge-sharing was positively associated with leader effectiveness in a curvilinear manner, with moderate levels predicting the highest outcomes. However, no significant mediation effects were found.

These findings offer a nuanced picture on Dark Tetrad, indicating that only certain dark

traits - particularly moderate narcissism - may enhance leadership effectiveness when expressed through socially adaptive behaviors.

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