



Impact of authentic leadership on employee safety performance: Role of knowledge hoarding, support, and passion

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ABSTRACT

Purpose: This study examines the impact of Authentic Leadership (AL) on employee safety performance, focusing on Safety Compliance (SC) and Safety Participation (SP). It also investigates the indirect effects of Knowledge Hiding (KHo), Perceived Organizational Support (POS), and work passion on the relationship between AL and employee safety performance.

Methodology: A self-administered questionnaire was distributed to randomly selected employees working in Abu Dhabi's public sector organizations within hazardous industries in the UAE.

Findings: The results revealed that AL positively influences both SC and SP. Additionally, KHo and POS were identified as partial mediators in the relationships between AL and SC, and AL and SP. Harmonious Work Passion (HWP) positively moderated the AL–SC relationship, whereas Obsessive Work Passion (OWP) negatively moderated both the AL–SC and AL–SP relationships.

Implications: This research contributes to the relatively understudied literature on AL by exploring KHo, POS, and work passion as novel outcomes. To the best of our knowledge, it is the first study to examine the roles of KHo and POS in the link between AL and employee safety performance. The findings offer valuable insights for leaders in the UAE's hazardous industries on leveraging AL to enhance employee safety performance.

1. Introduction

Safety performance is defined as the level of safety compliance (SC) and safety participation (SP) (Neal et al., 2000) where the former means “following to safety procedures and carrying out work in a safe way” and the later means “helping co-workers, promoting the safety practices within the workplace, demonstrating initiative and putting effort into improving safety in the field” (Danışman et al., 2015). However, SC belongs to the employees (Fernandez-Muniz et al., 2017), while SP consists of behaviours helping to improve a safety-conducive environment (Hu et al., 2016) Fig. 1.

Authentic leadership (AL) is an important concept in the literature on leadership and organization behavior (Fusco et al., 2015). Authentic leaders, defined by their self-awareness, openness in relationships, strong internal moral values, and fair evaluation of information, act as

ethical exemplars within organizations (Camuffo et al., 2017). Grounded in social cognitive theory (SCT) (Bandura, 1997), this study proposes that AL impacts safety performance. SCT explains that people learn by observing others—especially role models like leaders—through a process called observational learning (Bandura, 1997). When employees witness authentic leaders consistently exhibiting honesty, accountability, and sincere care for others' welfare, they tend to adopt and reflect these values in their own actions, including safety performance behaviors such as SC and SP. AL also have been shown to positively related to a wide range of many business factors, for example organizational climate, adherence to policies and communication (Makhathini and Van Dyk, 2018), safety behaviours (Anugerah et al., 2019), team and employee performance and productivity (Fusco et al., 2015) Fig. 2.

Although, there are many studies examining leadership forms and its

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impact on safety performance in general (e.g., Avolio et al., 2018; Fernández-Muñiz et al., 2017; Cavazotte et al., 2021; Malik et al., 2020). Besides, several research has recently examined variables that affect employee safety performance and work-related injuries (Bayram 2022, Liu et al., 2019, Reader et al., 2017, Sarkam et al., 2018). For example, Bayram (2022) indicated that safety exercise, safety inspiration, SC, and safety knowledge impact the advancement of employee safety skills, Liu et al. (2019) revealed that organizational support strengthens the positive effect of occupational calling on safety performance of railway companies in China. Nonetheless, there are few studies that are concerned with the effect of AL on employee safety performance (Cavazotte et al., 2021), particularly in the hazardous sector. Scholars appear to permit those positive forms of leadership such as AL can be a key gap to enhance safety motivation and performance (Cavazotte et al., 2021). Malik et al. (2020) suggests that the results of leadership-safety performance vary in accordance with different industrial fields. Moreover, most of the research about the impact of leadership on employee safety performance has been conducted in the Western context (Molnar et al., 2019) Fig. 3.

Cultural and religious influences on leadership styles in the Arab world make them different (Yaseen, 2010; Zaabi et al., 2016). There are still many aspects of Arab leaders that are unknown (Namaki, 2008). According to previous research, Randeree & Ninan (2011) studied the impact of people-oriented leadership styles on task performance in the context of UAE. The leadership style in Arab world is transactional leadership, as they focus on short term tasks rather than long term plan (Bealer & Bhanugopan, 2014). Transactional leadership in the Arab world is reflected in workers' growing belief that leaders have the right to evaluate and punish or reward performance (Yaseen, 2010). Moreover, the reaction of Arab leaders to the issues of work is a slow reaction, and they wait until the problem grows and becomes difficult to solve (Jabnoun & Rasasi, 2005; Yaseen, 2010). However, the UAE presently tends to progressively shift to transformational and authentic leadership styles (Al Mansoori 2018). Hence, an investigation into the effect of authentic leadership on work-related outcomes such as safety performance are significant.

On the other hand, the exposures to work-related safety issues in the developing like the UAE are high as many constructions, industrial, and

workers are attached to hazardous industry of the country (Barss et al., 2009). For example, Industrial Development Bureau (2020) has received 61 reports of serious occupational accidents within the industrial sector in Abu Dhabi. The oil, gas, and energy sector of the UAE, being a significant contributor to the country's gross domestic production, is also a highly exposed-hazardous industry with many safety issues (Brelsford, 2017). The construction industry of the UAE continues to record high rates of fatalities (Mosly, 2015; Sanni-Anibire et al., 2020). More severe situations are also recorded in developing countries. Work-related accidents and fatality rates in the Middle East, including UAE have been reported to be 18.6 per 100,000 workers (Sanni-Anibire et al., 2020). Previous research has shown that the level safety performance in developing countries is low (Sanni-Anibire et al., 2020). Hence, this is profoundly stressed as the significance of choosing the UAE hazardous sector to study the AL-safety performance relationship and its influencing factors as the context of this study.

Additionally, previous research investigating the possible mediators and moderators that apparently intervene in the connection between AL and employee safety performance are limited in the extant literature. Lyubovnikova et al. (2017) the mediating mechanism of team reflexivity fully mediates AL and team performance. Nonetheless, no study has investigated perceived organizational support (POS), knowledge hoarding (KHo), and work passion as mechanisms through which AL could lead to employee safety performance.

POS is defined as how employees perceive their employer's appreciation of their contributions and concern for their well-being (Eisenberger et al., 1986, p. 501). Drawing on SCT, we argue that AL fosters a work environment characterized by trust, fairness, and care (Novitasari et al., 2021; Rayiramkandath, 2021), which in turn strengthens POS (Aria et al., 2019; Eisenberger et al., 1986). According to SCT, such positive environmental signals can elevate employees' perceptions of support, thereby encouraging enhanced safety performance behaviors. Consequently, POS functions as a psychological mechanism that mediates the relationship between AL and safety-related behaviors, including SC and SP. However, this possible mediation role of POS on the relationship between AL and safety performance has not empirically been investigated.

Furthermore, KHo is fragmented and still in its early phases,

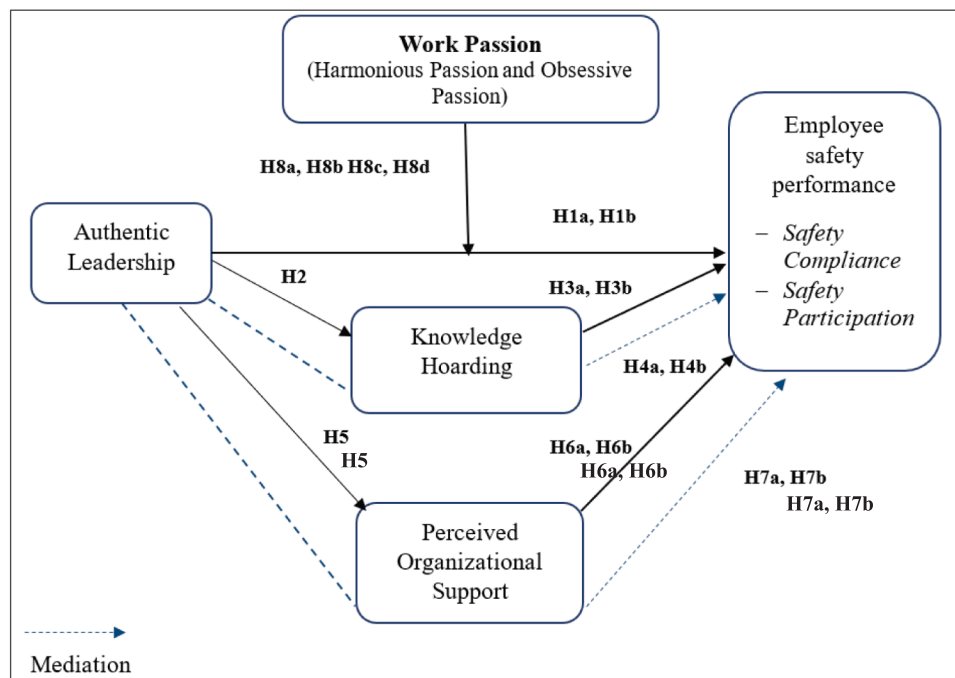


Fig. 1. Conceptual framework of the study.

providing more research directions (Oliveira et al., 2021). Knowledge hoarding is “an individual’s deliberate and strategic concealment of knowledge and information or the fact that they may possess relevant knowledge or information” (Evans et al., 2015: p. 02). While often viewed negatively, KHo can function as a protective strategy in high-risk settings, particularly under the influence of AL. It promotes ethical conduct and accountability, leading employees to carefully withhold critical safety-related information to avoid potential misuse and ensure it is accessed only by qualified individuals. Drawing on SCT, this behavior is shaped through observational learning and self-regulatory processes. Thus, when KHo is high in an AL context, it can mediate the AL–safety performance relationship by helping limit misinformation and support greater adherence to safety procedures and proactive safety involvement. However, there are few research testing the effect of leadership on KHo behavior (Elahi et al., 2024; Zada et al., 2022).

On the other hand, work passion is referred to the strong inclination toward work-related activities that individuals enjoy and invest time and energy in (Vallerand & Houlfort, 2003). Based on SCT, we contend that work passion acts as a moderator in the relationship between AL and safety performance, such that the positive influence of AL on safety performance is more noticeable when employees exhibit high levels of work passion. This supports SCT’s view that personal factors—like intrinsic motivation and emotional engagement—shape how individuals perceive and respond to environmental influences, including leadership behaviors. There are a few studies investigating the effect of different leadership styles on work passions, (Anser et al., 2021). Nonetheless, it has not been linked to safety performance resulting from AL though passion transferring from leaders to employees works differently for harmonious and obsessive work passions (Ho & Astakhova 2020).

Based on the above discussion, this study raises the following research question: Does AL influence safety performance, and if so, what roles do POS, KHo and work passion play in mediating or moderating the AL–safety performance relationship within the context of the hazardous

sector in the UAE?

Accordingly, the research objectives of this study are listed below.

1. Determine and explore the relationships between AL and employee safety performance.
2. Investigate the mediating roles of KHo and POS on the relationship between AL and employee safety performance.
3. Scrutinize the moderating role of work passion (harmonious and obsessive work passion) on the relationship between AL and employee safety performance.

The findings of this research will contribute to the on-going studies on AL by examining KHo, POS, and work passion as new outcomes. This study adds relationships that is explored little and evolved in an industrial setting of developing countries by integrating AL practices and employee safety performance through KHo, POS, work passion. Hence, this is among the first study that investigated the roles of KHo and POS in the relationship between AL and employee safety performance.

2. Literature review and hypothesis development

2.1. Social cognitive theory

This study espouses social cognitive theory (SCT) as the key theoretical framework. It suggests that learning emerges in a social experience with an active and reciprocal interaction of the individual, atmosphere, and behavior (Bandura 1986). It reflects different people obtain and conserve behaviors, simultaneously considering the social environment in which behaviors of an individual are performed (Shi & Teng, 2015). The theory further considers the experience of an individual exerts influence on reinforcements, anticipation, and assumptions, which builds the individual to become involved in a particular behavior (Thoijampa & Sarnkhaowkhom, 2019). People witness others

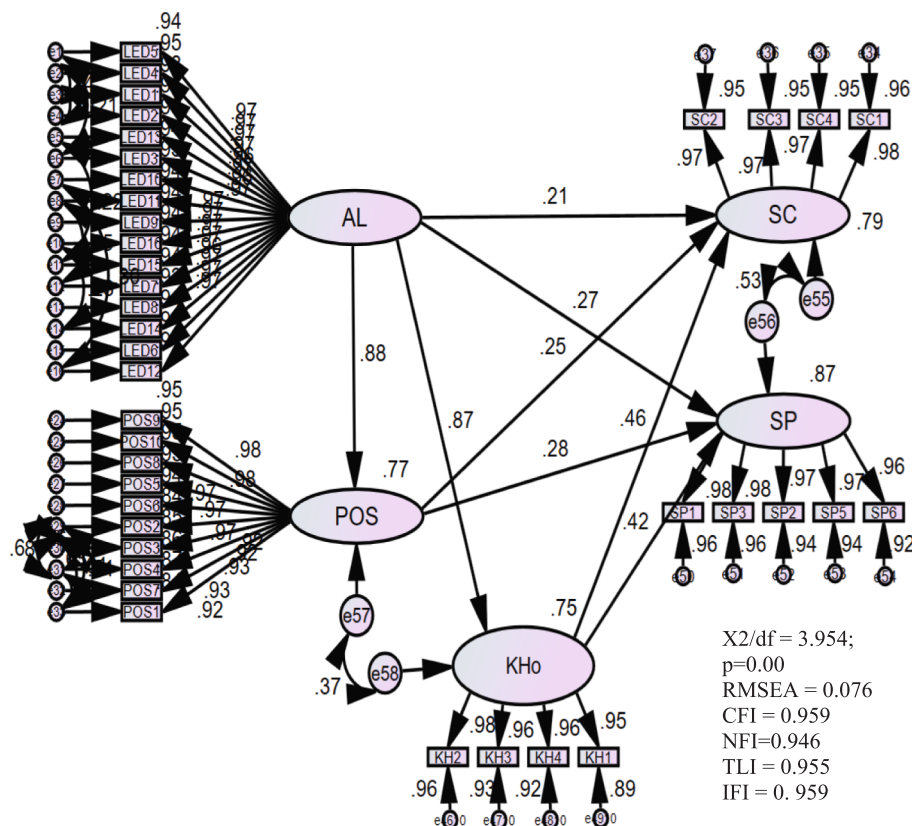


Fig. 2. Structural model analysis.

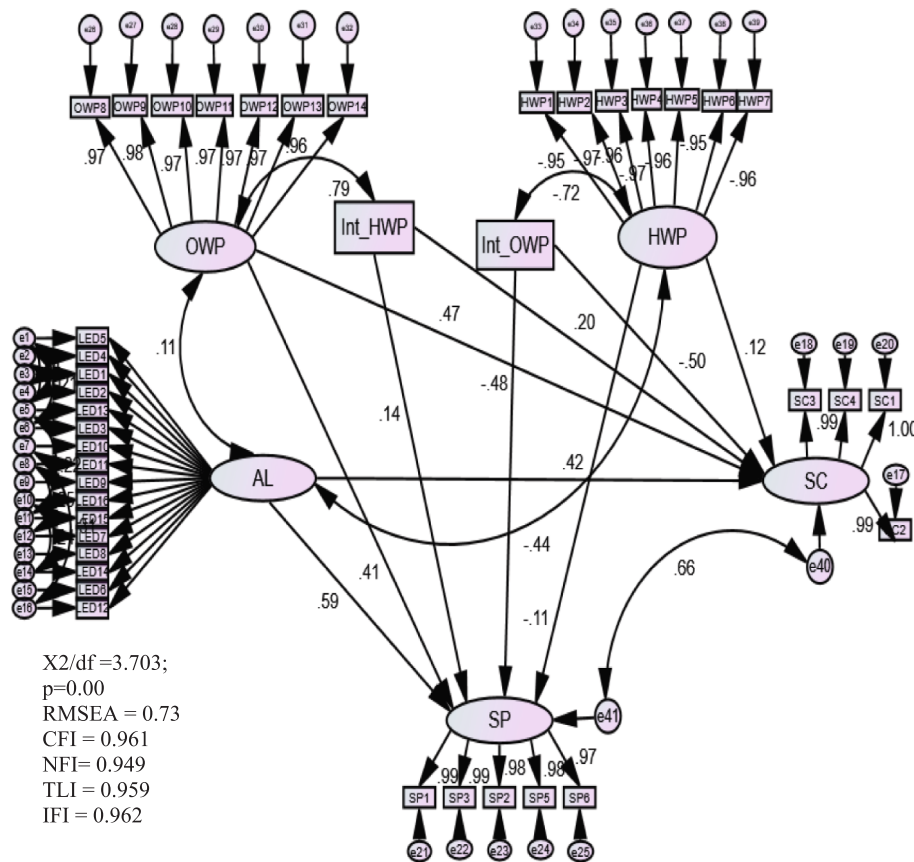


Fig. 3. Structural model with Moderation Variables.

and learn with the help of major factors such as their surroundings, behaviors, and person/cognition that put influence development in a “Triadic reciprocity” relationship (O’Kelley, 2019).

In the perspective of SCT, this study argues that AL encourages their followers to change their safety management related behaviors through self-discipline and reinforcement to start goal directed safety performance behavior which can be preserved over time. AL is a type of leadership style in which leaders practice honest and transparent behavior to build strong relationships with their followers (Novitasari et al., 2021). SCT posits that the important learning occurs before action is taken (Bandura 1986). Hence, it is contended that the past knowledge and experience of authentic leaders relating to safety of the working environment are valuable inputs for guiding and leading their followers to enhance their safety performance. Moreover, the adaptation of SCT theory in this study could also be justified as it has widely been used in occupational safety and health-related research (Shi & Teng, 2015).

2.2. Hypothesis development

2.2.1. Authentic leadership and employee safety performance

Authentic leaders show clarity, honesty, and credibility, and thus they are more likely to enhance employee awareness about the importance of complying and following safety behaviors (Camuffo et al., 2017), promoting employee safety performance. Studies indicates that employees tend to imitate their leaders’ behavior and thus becoming more likely to follow the safety regulations and partake in safety activities (Cavazotte et al., 2021; Gyekye and Salminen, 2005). SCT theory adapted by the current study also support the above as employees could learn through observing their leaders and others (Bandura 1986). Accordingly, this study contends that AL positively drive toward enhanced employee safety performance.

Based on SCT (Bandura, 1986), we contend that in the workplace, AL acts as a crucial environmental factor influencing employees’ thoughts and actions through mechanisms such as observational learning, self-regulation, and social modelling, thereby enhancing safety performance, which comprises both safety compliance (SC)—adhering to established rules—and safety participation (SP)—voluntarily engaging in behaviors that promote a positive safety culture. Leaders who demonstrate authenticity, marked by self-awareness, internalized moral values, relational transparency, and balanced judgment (Walumbwa et al., 2008), serve as important ethical role models. As SCT suggests, employees tend to observe and internalize such AL behaviors, especially when authentic leaders consistently act with honesty, accountability, and concern for their followers’ well-being. This modeling process motivates employees to align their actions with the safety behaviours and values embodied by their authentic leaders.

In addition, AL fosters a work environment of psychological safety and trust, which boosts employees’ self-efficacy, a central element in SCT (Bandura, 1997). When employees feel valued and supported, they are more likely to confidently engage in safe practices, comply with safety procedures (SC), and take proactive steps to improve workplace safety (SP). Through cues such as ethical conduct, transparent communication, and fairness, authentic leaders (Arias Rodriguez et al., 2024) help embed safety as a shared organizational priority, thereby shaping employee behavior through cognitive appraisal and social reinforcement (Bandura, 1997).

Although, there are many studies examining leadership style and its influence on safety performance in general (Avolio et al., 2018; Fernández-Muñoz et al., 2017; Cavazotte et al., 2021; Malik et al., 2020), there are limited studies that are concerned with the impact of AL on employee SC and SP (Cavazotte et al., 2021; Liu et al., 2021), particularly in the hazardous sectors. The hazardous sectors need to improve

leadership practices to improve employee safety performance and reduce work-related injuries and fatalities.

Fernández-Muñiz et al., (2017) revealed that safety leadership has a straight and effective impact on work stress and work risks on the organizations. Cavazotte et al. (2021) found employees' psychological capital and organizational citizenship mediate the effects of authentic leader attributes on frontline SP and SC in energy sector. A similar result was also revealed by Liu et al. (2021) concerning high-speed railway drivers and their supervisors in China.

In view of that, it is proposed the following two sub hypotheses.

H1a: AL positively impacts employee SC.

H1b: AL positively impacts employee SP.

2.2.2. Mediating role of knowledge hoarding

Knowledge hoarding (KHo) is "an individual's deliberate and strategic concealment of knowledge and information or the fact that they may hold relevant knowledge or information" (Evans et al., 2015: p. 02). Ethics and authenticity in relationships may favor knowledge creation and sharing (Besen et al., 2017), whereas it does not guarantee the absence of KHo. Literature confirms that KHo is not the opposite of knowledge sharing (de Garcia et al., 2022). There are a few research examining the effect of leadership style on KHo behavior (Elahi et al., 2024; Zada et al., 2022). For example, Elahi's et al. (2024) study revealed that exploitative in higher education institutions increases KHo. Zada et al. (2022) found that servant leadership is negatively associated with KHo and positively associated with psychological safety. Oliveira et al. (2021) revealed that KHo is fragmented and still in its early stages, requiring more research. They further stressed that future research addressing the backgrounds and consequents of knowledge hiding and KHo behaviors, and their moderators and mediators. Accordingly, in this study, KHo is examined as a mediator in the AL-safety performance relationship.

Although KHo is often viewed negatively, recent research (Evans et al., 2014) suggests it can serve strategic and protective functions that align with organizational goals—particularly in high-risk or safety-sensitive contexts. In such settings, KHo may reflect employees' deliberate efforts to safeguard sensitive and safety-related information and prevent its misuse. When under the influence of AL this selective control of knowledge can paradoxically enhance safety performance. According to SCT (Bandura, 1986), behaviors are shaped by self-regulation, environmental cues, and observational learning. AL, which embodies integrity and responsibility, may foster a culture where withholding specific safety-related knowledge is motivated by accountability rather than self-interest. Employees guided by such authentic leaders might restrict access to high-risk procedural knowledge, ensuring it is used only by qualified individuals. This behavior mirrors SCT's concept of selective modeling and judgment, where employees adopt behavioral norms—not just by imitating—but by applying context-sensitive discretion (Bandura 1986).

Furthermore, in an environment characterized by high KHo and AL, information becomes more deliberately curated and protected. This reduces informal and potentially dangerous information sharing, bolstering safety. AL's ethical clarity helps define what knowledge should be communicated versus controlled (Arias Rodriguez et al., 2024), supporting that critical safety knowledge is not misunderstood and diluted (e.g., protocol adherence and minimizing improvisation)—key elements of safety performance. KHo may become a constructive safety practice, supported by increased self-efficacy and observational learning (Bandura, 1997). Ultimately, KHo guided by AL enhances rather than impedes safety outcomes. AL reframes KHo as a responsible and strategic behavior, consistent with SCT's view of social environments and leadership as pivotal in shaping meaning and action.

Therefore, we argue that when KHo occurs at a high level—yet is shaped and guided by AL—it enhances rather than diminishes the connection between AL and safety performance. This is because AL redefines KHo from a self-interested behavior into a purposeful safety

strategy, aligning with SCT's view that social contexts and leadership influence how safety behaviors are interpreted and enacted.

Based on the above discussion, the following hypotheses are proposed.

H2: AL positively impacts KHo.

H3a: KHo positively impacts employee SC.

H3a: KHo positively impacts employee SP.

H4a: KHo mediates the relationship between authentic leadership and employee SC.

H4b: KHo mediates the relationship between authentic leadership and employee SP.

2.2.3. Mediating role of perceived organizational support

POS is referred to as employee perceptions concerning the extent to which their company "values their contributions and pay attention to their well-being" (Eisenberger et al., 1986, p. 501). Since the beginning of the 1980 s, researchers have become increasingly interested in POS and the effect of leadership on it (Asgari et al., 2020). Nevertheless, extensive research on POS, its influential factors such as different leadership styles, and its impact on performance indicators are still required (Eisenberger et al., 2020).

AL signals to employees that they are supported and valued by the organization, strengthening POS (Eisenberger et al., 1986). SCT suggests that such environmental signals, like supportive leadership, shape employee attitudes, which then influence safety performance. This implies that POS plays a mediating role in this process. When employees perceive high organizational support, it fosters positive attitudes toward the organization and its goals, including those related to safety performance (Eisenberger et al., 2020; Liu et al. 2019; Shoss et al., 2013).

When POS is strong, employees are more inclined to respond with behaviors that benefit the organization, including improved safety performance, such as SC and SP. Feeling psychologically safe, they are more willing adhere to safety protocols, to report risks, and exceed basic safety expectations—actions aligned with self-regulation and prosocial behavior as outlined in SCT (Neal & Griffin, 2006). Additionally, POS boosts employees' self-efficacy, a fundamental SCT concept, by strengthening their confidence in their ability to act safely and effectively at work (Bandura, 1997). Therefore, POS plays a central psychological role in translating the benefits of AL into robust safety behaviors. Hence, we argue that POS acts as a mediator between AL and safety performance, fostering a supportive climate, which promotes both SC and SP.

There are several studies that investigates the effect of leadership on POS, supporting the fact that leadership is an influential factor of POS (Asgari et al., 2020; Wang and Xu, 2019). Asgari et al. (2020) found a positive effect of leadership behaviors on employee POS and work satisfaction. Despite the paucity of research on the POS role in organizational performance. However, the studies investigating the relationship between AL and POS are limited in the extant literature (Aria et al. 2019; Arici, 2018). For instance, Aria et al. (2019) discovered that AL on intention to stay is mediated by POS in the perspective of teachers in high schools. In contrast, Arici (2018) revealed that AL moderates the negative influence of perceived supervisor support on turnover intention in hotel sector. However, these studies did not reflect the hazardous sector.

Liu et al. (2019), Reader et al. (2017), Tucker et al., (2008), which have been conducted in different industries, suggesting more future research. For example, Hu et al. (2016)) supported that POS impacts employees' safety and health compliance. In contrast, Addo & Dartey-Baah (2020) found POS mediated between the transformational leadership styles and safety behaviours in the power transmission subsector in Ghana. However, they found no mediation role of POS in the relationship between transactional leadership and safety behaviour.

Based on the preceding discussion, the following hypotheses are formulated.

H5: AL directly impacts POS.

H6a: POS positively impacts employee SC.

H6b: POS positively impacts employee SP.

H7a: POS mediates the relationship between AL and employee SC.

H7b: POS mediates the relationship between AL and employee SP.

2.2.4. Moderating role of work passion

Work passion is referred to a robust leaning toward job-related activities that employees enjoy and in which they devote time and efforts (Ho et al., 2018). HWP results from the independent internalization of an activity into one's uniqueness. OWP, on the other hand, refers to a measured internalization of an activity that creates an internal pressure to participate in such activity. HWP generally encourages healthy adjustment and thus positive work results while OWP "thwarts it by causing negative affect and rigid persistence" (Vallerand & and Houlfort, 2003: p. 756).

Although AL fosters an ethical and psychologically safe workplace, the extent to which its influence on safety performance behavior is significantly shaped by the employee's level of work passion. Employees with high work passion tend to be more intrinsically motivated and emotionally engaged (Vallerand et al., 2003). For example, employees with harmonious work passion—showing a high level of work passion (Forest et al., 2011)—tend to be receptive to ethical and empowering behaviors of AL. As a result, they are more attuned to the positive signals conveyed by authentic leaders and are more likely to align their actions—such as SC and SP—with the expectations set by AL. These employees also proactive and exhibit greater self-regulation, both of which are key mechanisms in SCT that enhance the impact of environmental influences on behavior (Bandura, 1997).

Conversely, employees with low work passion may be less responsive to AL. In situations involving OWP employees—reflecting low work passion characterized by lower levels of intrinsic motivation and emotional commitment of employees (Vallerand et al., 2003)—often struggle with self-regulation and are driven by external pressures, making them less likely to respond favorably to the safety-related messages conveyed by AL. Despite AL demonstrating transparency and ethical conduct, employees with OWP may resist or misread these signals because of their internal tensions or excessive attachment to work.

Thus, work passion functions as a moderator in the relationship between AL and enhanced safety performance. AL's positive impact on safety performance is amplified when employees exhibit HWP, while such relationship may weaken by OWP. This is consistent with SCT's assertion that personal factors, such as motivation and emotional engagement, shape how individuals interpret and act upon environmental stimuli, including leadership styles.

There are a limited studies investigating the effect of different leadership styles and work passions (Anser et al., 2021). For example, Ho & Astakhova, (2020) proposed found that passion transmission from leaders to employees works in different ways for harmonious and obsessive passion. Moreover, Anser et al. (2021) emphasized that the direct association between ethical leadership and knowledge hiding was depending on HWP. Conversely, a few previous studies demonstrated that work passion is positively related to employee safety performance (Ali et al., 2020; Xu et al., 2022). For instance, the study of Ali et al. (2020) established the effect of spiritual leadership style on SC and SP through the effect of HWP. In contrast, Xu et al. (2022) showed that the sense of calling had a positive direct effect on pilot safety behavior and that this relationship was somewhat mediated by HWP in airline industry.

In light of the above discussion, the following hypotheses are proposed.

H8a: HWP positively moderates the positive relationship between AL and employee SC, such that that the positive relationship will be stronger for higher than lower level of HWP.

H8b: HWP positively moderates the relationship between AL and employee SP, such that that the positive relationship will be stronger for higher than lower level of HWP.

H8c: OWP negatively moderates the relationship between AL and employee SC, such that that the positive relationship will be stronger for higher than lower level of OWP.

H8d: OWP negatively moderates the relationship between AL and employee SP, such that that the positive relationship will be stronger for higher than lower level of OWP.

3. Data and methodology

3.1. Research sample and data collection

The population of this research was all employees working in the public sector organizations of Abu Dhabi, the UAE, which are operating in the hazardous industry of the UAE. Abu Dhabi is considered as the largest city in the UAE, with the highest rate of industrial hazardous functions in the country with a 53.4 % waste in the hazardous waste category (Mordor Intelligence, 2021).

Data were collected by sending the questionnaires through email to randomly chosen employees working in Abu Dhabi's public sector companies operating in the most hazardous industries such as industrial and manufacturing, construction, and oil, gas, and nuclear energy sectors. We contacted all relevant public sector organizations operating in the hazardous sector of Abu Dhabi by emailing the letters to their HR heads to get their approval to participate in this study. Finally, consent was received from only 13 organizations. An online copy of the questionnaire was then made using Google Forms, and its link was shared to potential survey respondents through the organizations' HR department. The sample was randomly selected to participate in this study. As a result, 507 responses were collected.

3.2. Measures

A questionnaire was constructed to include all the variables of the study such as AL, employee safety performance, KHo, POS, and work passion. It was made available in both Arabic and English versions. The original questionnaire, initially developed in English, was translated into Arabic by a bilingual expert. Subsequently, a second independent translator retranslated the Arabic version back into English to ensure the accuracy. Initially, the questionnaire's cover page included information regarding the survey, such as research title, the aim of the study and its contributions. The confidentiality of the respondents was maintained by making the responses anonymous.

Survey participants rated their responses by using a seven-point Likert-type type scale (1 = strongly disagree, 5 = strongly agree). The questionnaire was divided into six sections, each representing the study's variable. Section A included type general questions.

Section B included 16 questions relating to AL derived from Neider & Schriesheim (2011) A sample item is "My leader solicits feedback for improving his/her interactions with others".

Section C provided 10 questions concerning employee safety performance, extracted from DeArmond et al. (2011), which was reflected by SC (4 items) (a sample item is "I use appropriate personal protective gear as indicated by the site health and safety guide") and SP (6 items) (a sample item is "I support others to make sure they perform their tasks safely").

Section D included 10 questions from Neves & Eisenberger (2014) concerning POS. A sample is "My organization values my contribution to its well-being".

KHo encompassed 4 questions from Connelly et al. (2012) presented in section E. A sample item is "I tend to accumulate and store information". These four-item measure were considered adequate based on their strong psychometric properties (e.g., Cronbach's Alpha value of 0.98), clear theoretical grounding, and direct relevance to the study's objectives. Additionally, to ensure brevity and minimize respondent fatigue—particularly in a high-risk, time-sensitive work setting—a concise, well-validated measure was deemed most appropriate.

Finally, section F consisted of 14 questions from Vallerand et al. (2003) relating to work passion, reflecting HWP (7 items) (a sample item is “This activity allows me to live a variety of experiences”) and OWP (7 items) (a sample item is “I cannot live without it”).

3.3. Common method bias assessment

Given that the data were obtained from a single source through self-reported questionnaires, the possibility of common method bias (CMB) was evaluated using Harman’s single-factor test (Podsakoff et al., 2003). An unrotated exploratory factor analysis was performed on all measurement items. The analysis revealed that the first factor explained only 43.65 % of the total variance, which is well below the 50 % threshold (Podsakoff et al., 2003), suggesting that common method bias is unlikely to pose a significant issue in this study.

4. Results

4.1. Exploratory factor analysis

The Exploratory factor analysis (EFA) was performed to produce the factor structure of the gathered data as to the constructs of the study, such as AL, SC, SP, POS, KHo, HWP, and OWP. With 54 questionnaire items, a 7-factor solution was produced by using maximum likelihood extraction way with Promax with kaiser normalization rotation. One item (SP4), extracted to SP factor, was removed as its loadings (0.35) was below 0.40 (Nunnally & Bernstein, 1994), which was considered as weak. Additionally, this item had a small difference in cross-loadings (less than 0.20) was lack discriminant validity and thus considered for removal.

The factor structure provided by EFA analysis is shown in Table 1.

Table 1
The Exploratory Factor Analysis.

Construct	Item	Factors	AL	OWP	POS	SC	HWP	KHo	SP
Authentic Leadership (AL)	LED1	0.930							
	LED2	0.921							
	LED3	0.910							
	LED4	0.936							
	LED5	0.944							
	LED6	0.871							
	LED7	0.893							
	LED8	0.879							
	LED9	0.900							
	LED10	0.907							
	LED11	0.905							
	LED12	0.831							
	LED13	0.913							
	LED14	0.872							
	LED15	0.894							
	LED16	0.896							
Obsessive Work Passion (OWP)	OWP8			0.903					
	OWP9			0.922					
	OWP10			0.949					
	OWP11			0.946					
	OWP12			0.960					
	OWP13			0.936					
	OWP14			0.946					
Perceived Organizational Support (POS)	POS1				0.554				
	POS2				0.642				
	POS3				0.622				
	POS4				0.609				
	POS6				0.825				
	POS8				0.864				
	POS9				0.897				
	POS10				0.889				
	POS5				0.858				
	POS7				0.591				
Safety Compliance (SC)	SC1					0.885			
	SC2					0.790			
	SC3					0.810			
	SC4					0.834			
Harmonious Work Passion (HWP)	HWP1						0.781		
	HWP2						0.783		
	HWP3						0.824		
	HWP4						0.797		
	HWP5						0.793		
	HWP6						0.799		
	HWP7						0.773		
Knowledge Hoarding (KHo)	KH1							0.520	
	KH2							0.721	
	KH3							0.697	
	KH4							0.586	
Safety Participation (SP)	SP1								0.616
	SP2								0.503
	SP3								0.538
	SP5								0.457
	SP6								0.446

N = 507.

4.2. Confirmatory factor analysis

4.2.1. Reliability

The value of the Cronbach's alpha exceeding 0.7 is assessed as statistically reliable (Hair et al., 2006). As shown in Table 2, the Cronbach's alpha data for all 8 constructs were above 0.7, indicating statistical reliability.

4.2.2. Convergent validity

Composite reliability (CR) and average variance extracted (AVE) were used to assess convergent validity (Brown, 2014). The results from the measurement model (Table 2) indicated that both AVE and CR values were above the thresholds of 0.5 and 0.7, respectively, confirming statistical significance (Byrne, 2016). Consequently, the study's measures demonstrated convergent validity.

4.2.3. Discriminant validity

The criterion of Fornell and Lacker (1981) was used to test the discriminant validity and maximum shared squared variance (MSV). The outcomes confirmed that the values of each construct supported discriminant validity shown in (Table 2), showing that the square root of AVE for each of the seven constructs exceeded the squared correlation values involving the construct. In addition, Table 2 also demonstrated that the AVE of each construct was greater than the MSV, ensuring that discriminant validity was achieved (Almén et al., 2018).

4.3. Structural model analysis and Hypothesis testing

4.3.1. Model fit analysis

To test the hypotheses and structural models AMOS v.26 was employed. To confirm that model fit's the empirical data, various criteria for goodness-of-fit indices applied, such as the normed chi-squared test (χ^2/df), root mean square error of approximation (RMSEA), comparative fit index (CFI), The Normed fit index (NFI), Tucker–Lewis index (TLI), and incremental fit index (IFI) (Hayes, 2009). These model fit indices could achieve the acceptable values ($\chi^2/df = 3.954$; $p = 0.00$; RMSEA = 0.076; CFI = 0.959; NFI = 0.946; TLI = 0.955; IFI = 0.959), confirming the fitness of the studied model (Table 3).

4.3.2. Testing for direct effects

Table 4 shows that AL positively impacted SC ($\beta = 0.210$; $p < 0.05$), SP ($\beta = 0.272$; $p < 0.05$), and KHo ($\beta = 0.866$; $p < 0.05$), hence accepting H1a, H1b, and H2. In the same vein, the direct relationships between KHo and SC ($\beta = 0.464$; $p < 0.05$), and between KHo and SP ($\beta = 0.423$; $p < 0.05$) were positive, thus accepting H3a and H3b. Moreover, the association between AL and POS ($\beta = 0.876$; $p < 0.05$) was significant, accepting H5. Finally, POS showed direct an impact on both SC ($\beta = 0.254$; $p < 0.05$) and SP ($\beta = 0.285$; $p < 0.05$), thus accepting H6a and H6b.

Table 2

Reliability, Convergent Validity, Discriminant Validity.

	Cronbach's Alpha (CA)	Composite Reliability (CR)	Average Variance Extracted (AVE)	Maximum shared Squared Variance (MSV)	KHo	AL	OWP	POS	SC	HWP	SP
(KHo)	0.980	0.980	0.925	0.810	0.962						
(AL)	0.996	0.996	0.939	0.790	0.866	0.969					
(OWP)	0.992	0.992	0.949	0.677	0.756	0.713	0.974				
(POS)	0.990	0.990	0.911	0.790	0.859	0.889	0.701	0.954			
(SC)	0.978	0.984	0.926	0.854	0.869	0.842	0.740	0.844	0.962		
(HWP)	0.992	0.992	0.945	0.799	0.894	0.847	0.823	0.847	0.816	0.972	
(SP)	0.988	0.988	0.944	0.854	0.900	0.887	0.750	0.888	0.924	0.877	0.972

Table 3

Model Fit Indices.

Model fit index	Threshold value	Actual value	Conclusion
Normed chi-squared test	≤ 5 (Timothy 2015)	3.954; $p = 0.00$	Acceptable
RMSEA	≤ 0.080 (Awang, 2012)	0.076	Acceptable
CFI	≥ 0.70 (Timothy, 2015)	0.959	Acceptable
NFI	> 0.90 (Byrne and Byrne, 2006)	0.946	Acceptable
TLI	> 0.90 (Byrne and Byrne, 2006)	0.955	Acceptable
IFI	> 0.90 (Byrne and Byrne, 2006)	0.959	Acceptable

4.3.3. Testing indirect/mediation effects

By using AMOS with the method of bootstrapping for 2,000 re-samples, it was revealed that both SC and SP were significantly impacted by AL via KHo ($\beta = 0.442$; $p < 0.05$ for SC; and $\beta = 0.391$; $p < 0.05$ for SP) and via POS ($\beta = 0.245$; $p < 0.05$ for SC; and $\beta = 0.266$; $p < 0.05$ for SP) (Table 5). Since, the relationships between AL and SC, and between AL and SP was significant, both KHo and POS were considered as partiality mediators. Thus, H4a, H4b, H7a, and H7b were accepted. While, both KHo and POS were important partial mediators linking AL and SC and SP, the mediation effects through KHo was stronger for both SC and SP than those through POS.

4.3.4. Testing for moderating effect

HWP positively and significantly impacted SC ($\beta = 0.119$; $p < 0.05$) (Table 6). The relationship between HWP and AL (Int_HWP) was significant and positive ($\beta = 0.204$; $p < 0.05$), confirming HWP have positive moderating on the AL-SC relationship. Thus, H8a was accepted. Fig. 4 clearly shows that with a low level of HWP, the strength of the AL-SC relationship decreases (blue color line), whereas a high level of HWP increases its strength (orange color line). However, HWP did not significantly affect SP ($\beta = -0.110$; $p = 0.278$), while the relation between HWP and AL (Int_HWP) given not significant ($\beta = 0.143$; $p = 0.370$), suggesting that HWP does not moderate the AL-SC relationship. Hence, H8b was rejected.

Concerning OWP, it positively and significantly impacted SC ($\beta = 0.466$; $p < 0.05$), while the interaction of OWP and AL (Int_OWP) had a significant negative impact on the AL-SC relationship ($\beta = -0.503$; $p < 0.05$). This implied a negative moderation role of OWP on the AL-SC relationship, accepting H8a. In the similar vein, OWP had a significant negative impact on SP ($\beta = 0.408$; $p < 0.05$), whilst the interaction of OWP and AL (Int_OWP) had a significant negative effect on the AL-SP association ($\beta = -0.475$; $p < 0.05$). This showed that OWP also negatively moderates such association, accepting H8d. Figs. 5 and 6 clearly illustrates OWP dampens the positive relationship between AL and SP, and between AL and SC, respectively. Hence, H8c and H8d were rejected.

The results of all hypothesis tests are summarized in Table 7.

Table 4

Path Coefficients of direct effects.

Hypothesis	Path			Estimate	Confidence Interval		t-statistic	P-value	Supported (Yes/No)
					Lower	Upper			
H1a	SC	<—	AL	0.210	0.094	0.34	3.68	0.004	Yes
H1b	SP	<—	AL	0.272	0.161	0.403	6.18	0.001	Yes
H2	KHo	<—	AL	0.866	0.826	0.897	32.07	0.001	Yes
H3a	SC	<—	KHo	0.464	0.344	0.601	9.10	0.001	Yes
H3b	SP	<—	KHo	0.423	0.323	0.537	10.85	0.001	Yes
H5	POS	<—	AL	0.876	0.834	0.908	35.04	0.001	Yes
H6a	SC	<—	POS	0.254	0.134	0.376	4.70	0.001	Yes
H6b	SP	<—	POS	0.285	0.186	0.421	6.95	0.001	Yes

Table 5

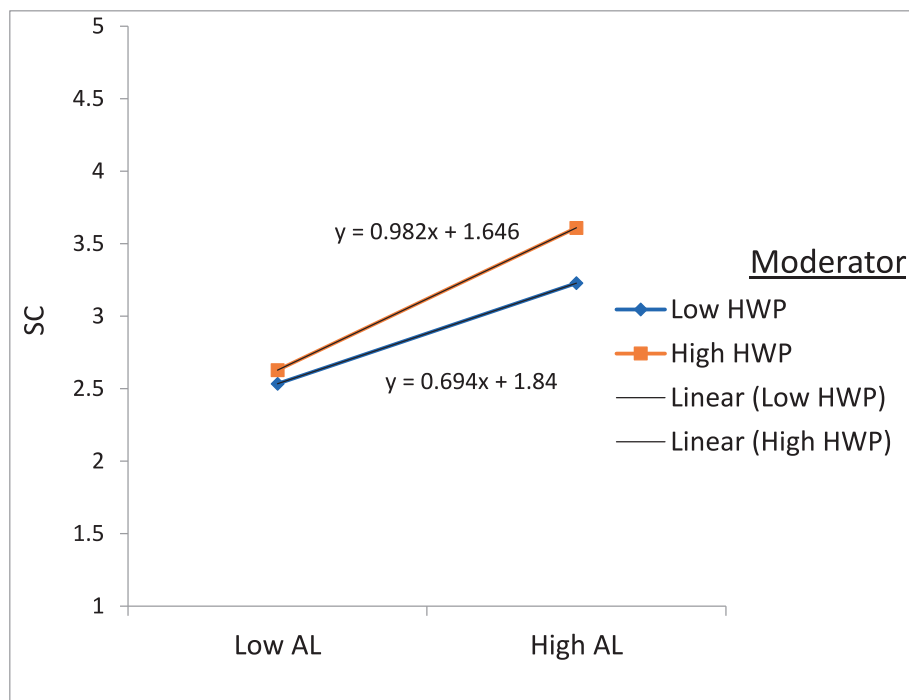
Path coefficients of indirect effect (mediation) of KHo and POS.

Hypothesis	Indirect Effect		Indirect effect	Confidence Interval		t-statistic	P- Values	Supported (Yes/No)
				Lower	Upper			
H4a	AL → KHo → SC (a1b1)		0.442	0.324	0.58	5.74	0.001	Yes (Partially mediated)
H4b	AL → KHo → SP (a1c1)		0.391	0.298	0.5	6.31	0.000	Yes (Partially mediated)
H7a	AL → POS → SC (a2b2)		0.245	0.133	0.362	3.5	0.001	Yes (Partially mediated)
H7b	AL → POS → SP (a2c2)		0.266	0.172	0.393	4.03	0.001	Yes (Partially mediated)

Table 6

Moderating effects of HWP and OWP.

Hypothesis	Parameter	Estimate	Confidence level		p- value	Supported (Yes/No)
			Lower	Upper		
H8a	SC <— Int_HWP	0.204	0.07	0.286	0.013	Yes (Positively moderated)
H8b	SP <— Int_HWP	0.143	−0.149	0.303	0.370	No (No moderation)
H8c	SC <— Int_OWP	−0.503	−0.555	−0.455	0.000	Yes (Negative moderation)
H8d	SP <— Int_OWP	−0.475	−0.554	−0.299	0.002	Yes (Negative moderation)

**Fig. 4.** Moderator of HWP on AL-SC relationship.

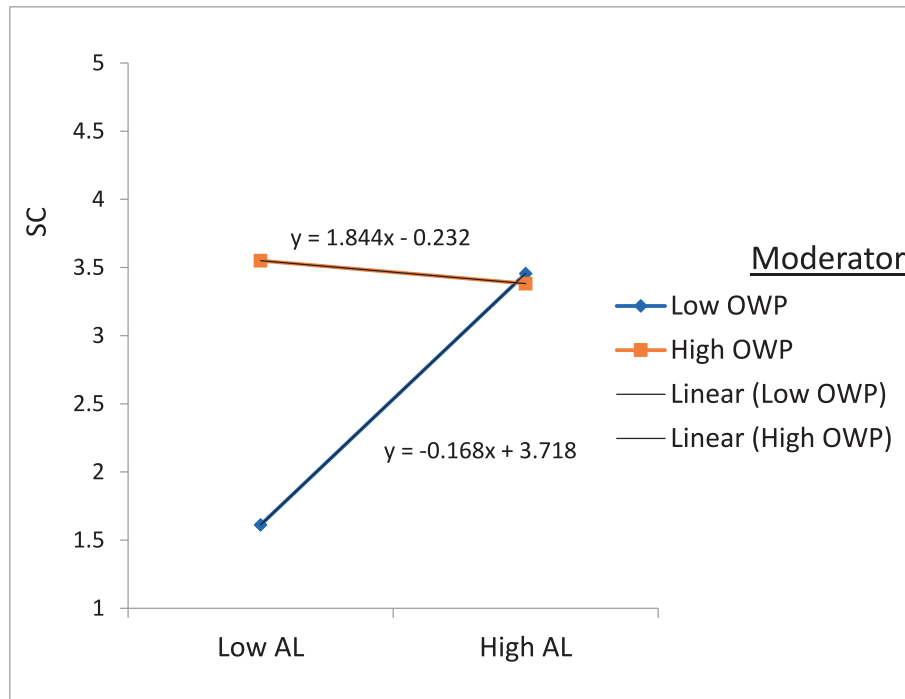


Fig. 5. Moderator of OWP on AL-SC relationship (Negative moderation).

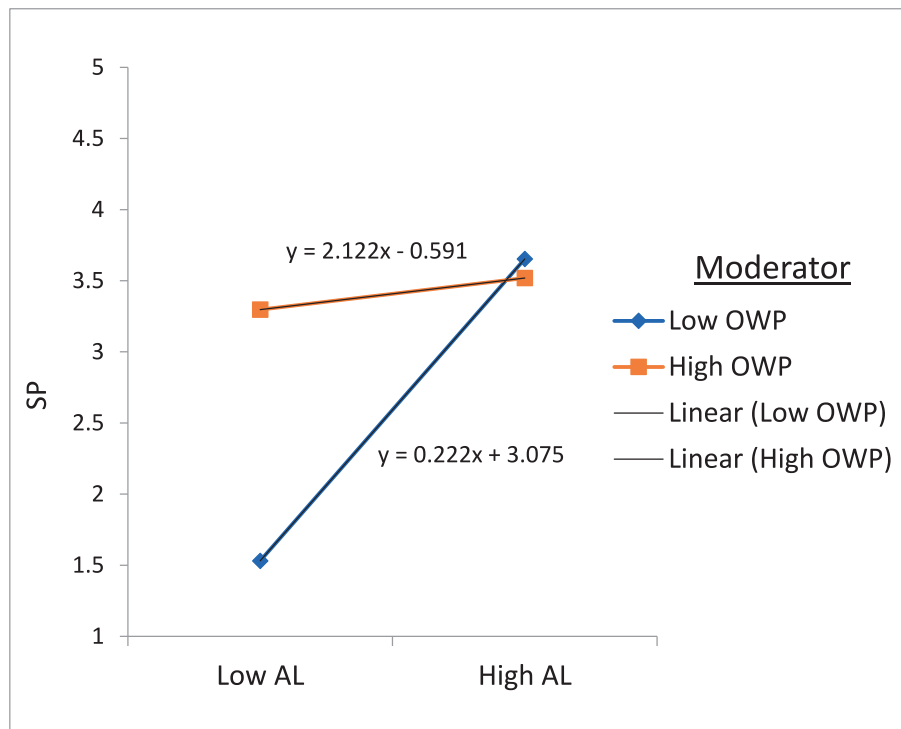


Fig. 6. Moderator of OWP on AL-SP relationship (Negative moderation).

5. Discussion

5.1. Authentic leadership and employee safety performance

H1a and H1b, which proposed that AL positively influences employee SC and SP, respectively, were supported. This finding is consistent with previous studies by Cavazotte et al. (2021) and Liu et al. (2021). However, the former was limited to the production, distribution,

and sales sectors of the fuel industry in Brazil, while the latter focused on high-speed rail network drivers and their line managers in China.

The observed AL-safety performance relationship suggests that employees in hazardous sectors tend to model their behavior after that of their leaders. As a result, they are more likely to comply with safety instructions and actively participate in safety initiatives (Cavazotte et al., 2021; Gyekye & Salminen, 2005). SCT theory also supports the above view as employees could learn through observing their leaders

Table 7
Summary of hypothesis testing.

Hypothesis Statement	Conclusion
H1a: AL positively impacts employee SC	Accepted
H1b: AL positively impacts employee SP	Accepted
H2: AL directly impacts KHO	Accepted
H3a: KHO directly affects employee SC	Accepted
H3b: KHO directly affects employee SP	Accepted
H4a: KHO mediates the relationship between AL and SC	Accepted
H4b: KHO mediates the relationship between AL and SP	Accepted
H5: AL directly impacts POS	Accepted
H6a: POS directly affect employee SC	Accepted
H6b: POS directly affect employee SP	Accepted
H7a: POS mediates the relationship between AL and SC	Accepted
H7b: POS mediates the relationship between AL and SP	Accepted
H8a: HWP positively moderates the relationship between AL and SC	Accepted
H8b: HWP positively moderates the relationship between AL and SP	Rejected
H8c: OWP positively moderates the relationship between AL and SC	Accepted
H8d: OWP positively moderates the relationship between AL and SP	Accepted

and others (Bandura 2008). This relationship also validates the improved self-efficacy, a central element in SCT (Bandura, 1997), as AL also nurtures a work environment of safety and trust.

In the UAE, where a high-power distance and a collectivist culture prevail, employees tend to perceive leaders as authoritative (Western PMSs in the UAE, 2022), significantly shaping organizational culture. When leaders demonstrate authenticity, they embody the culturally valued ideal of benevolent authority. This approach not only reinforces employee adherence to safety rules but also encourages voluntary participation in safety initiatives, reflecting the region's favoring of AL that is both directive and morally principled.

5.2. Mediating role of knowledge hoarding

H2, which proposed that Authentic Leadership (AL) positively impacts Knowledge Hiding (KHO), was supported. To the best of our knowledge, this is the first study to empirically demonstrate the link between AL and KHO in the hazardous sector. While ethics and authenticity in relationships may promote knowledge creation and accumulation (Besen et al., 2017), they do not necessarily eliminate KHO. Our argument is thus AL reframes KHO as a responsible, strategic act, aligning with SCT's emphasis on the role of social context and leadership in shaping behavior (Bandura, 1997). Therefore, this study suggests that AL can also contribute to KHO, alongside knowledge sharing.

H3a and H3b, which proposed that KHO positively influences Safety Communication (SC) and Safety Performance (SP), were also supported. This represents another novel finding, concluding that AL indirectly affects employee Safety Functioning Performance (safety performance). Few studies have directly examined the relationship between AL and employee safety performance. The positive effect of AL on safety performance may stem from the fact that the knowledge employees withhold is directly tied to their own safety. Employees are often held accountable for safety lapses or unsafe behavior, which may lead them to carefully manage what information they share. This finding suggests that KHO can play a strategic and protective role in organizations, especially in high-risk or safety-sensitive environments, where employees may intentionally withhold information to protect sensitive data and prevent misuse.

H4a and H4b, proposing the mediating role of KHO in the relationships between AL and SC, and AL and SP, were also supported, offering further insight. This partially aligns with Bayram (2022), who found that safety knowledge can indirectly improve employee safety productivity in terms of safety priorities, adherence to rules, and overall safety behavior. KHO, though high, is positively influenced by AL, which transforms it from a self-serving act into a deliberate safety strategy. This strengthens the link between AL and safety performance, aligning with

SCT's view that leadership and context shape how safety behaviors are understood and practiced. In light of the above, this study provides empirical support that AL influences KHO, which in turn affects both SC and SP in hazardous sectors in developing countries such as the UAE. In UAE organizations, where hierarchical structures and collectivist values dominate, knowledge is often kept within specific groups, particularly among local staff. AL may shape the social environment in a way that redefines KHO—from a culturally driven, self-protective act into an aligned safety-behavior that leverages respect for authority and collective loyalty.

5.3. Mediating role of perceived organizational support (POS)

H5, which proposed a positive relationship between AL and POS, was supported. This finding aligns with previous research by Aria et al. (2019), who observed a similar AL–POS relationship among high school teachers and in the business process outsourcing sector. Furthermore, H6a and H6b, which posited positive relationships between POS and SC, as well as POS and SP, were also supported. These results are consistent with prior studies highlighting the influence of POS on safety citizenship behaviors (Reader et al., 2017), safety outcomes, and employee safety voice (Tucker et al., 2008). However, this study extends prior research by directly measuring employee Safety Functioning Performance (safety performance), specifically through SC and SP.

On the other hand, H7a and H7b, which proposed the mediating role of POS in the relationships between AL and SC, and AL and SP, respectively, were supported. While prior research has recognized the indirect effects of POS on safety-related outcomes (Addo & Dartey-Baah, 2020; Liu et al., 2019), these studies did not examine its role in the context of AL. Therefore, this study is among the first to empirically demonstrate the partial mediating effect of POS in the relationships between AL and both SC and SP.

These findings thus suggest that AL signals support and value to employees, enhancing their POS (Eisenberger et al., 1986). Grounded in SCT, such supportive work environmental cues influence employee attitudes, which in turn affect safety performance. High POS fosters positive attitudes toward the organization and its safety goals (Eisenberger et al., 2020), SC and SP. It also promotes psychological safety, self-regulation, and self-efficacy—key SCT elements—empowering employees to follow protocols, report hazards, and exceed safety expectations. Thus, POS serves as a psychological bridge linking AL to improved SC and SP acting as a key mediator in this relationship.

5.4. The moderating role of work passion

H8a, which proposed that HWP positively moderate the relationship between AL and SC, was supported. This indicates that the AL–SC relationship is stronger for individuals with higher levels of HWP. Employees with strong HWP tend to build meaningful interpersonal connections, which enhance their satisfaction, capability, and motivation to engage in both in-role and discretionary behaviors at work (Ali et al., 2020), thereby improving SC. These employees are proactive and self-regulating—core mechanisms in SCT that strengthen how environmental factors (Bandura, 1997) shape safety behavior (Bandura, 1997).

On the other hand, the study found a significant and negative moderating effect of OWP on the relationships between AL and both SC and SP, thereby supporting H8c and H8d. This suggests that OWP weakens the positive impact of AL on employee safety performance as it is associated with a controlled internalization of work activities. This form of internalization creates internal pressure, leading to negative outcomes and rigid persistence at work (Vallerand et al., 2003). Employees with OWP often face self-regulation challenges and are driven by external pressures, making them less receptive to safety messages from AL. In the UAE's high-power distance and hierarchical culture, these employees may superficially show compliance with safety but lack genuine commitment. Their rigidity may cause them to resist or

misinterpret AL's safety messages, often shifting focus to performance due to cultural or organizational pressures.

6. Conclusion

6.1. Theoretical implications

To our knowledge, this is the first study investigating KHO as a mediator between AL and safety performance relationship. Although knowledge sharing has been studied as a mediator, it has not been examined in the relationship between authentic leadership and employee safety performance. However, this study implied that a significant limited mediation role of KHO in the AL-SC and the AL-SP, providing a novel insight into the mechanism of AL in improving employee safety performance. Particularly, this study found that through the knowledge gathered and stored even through KHO practices, employees can improve their own safety behavior by adhering to safety policies and regulations (SC) and co-operating with other employees and helping them to cope with safety issues (SP) within organization even though they hide such knowledge unintentionally.

Furthermore, this is among the first study empirically supporting the partially mediating effect of POS in the relationship between AL and employee safety performance. Although, the indirect effect of POS on employee safety-related outcomes have been supported by a few studies (e.g., Addo and Dartey-Baah 2020; Liu et al., 2019) they were related to the transformational leadership styles or occupational calling etc.

Finally, this study also contributed to the current literature providing an empirical insight into how work passion, including HWP and OWP, can affect the strength and direction of the association between AL and employee safety performance, in terms of both SC and SP.

6.2. Practical implications

It becomes essential to incorporate AL development into leadership training initiatives across hazardous sectors in the UAE. These training programs should be designed to cultivate AL's four fundamental dimensions—self-awareness, relational transparency, internalized moral perspective, and balanced processing (Kelly 2023)—through industry-relevant simulations rooted in high-risk environments such as oil and gas or construction (e.g., ADNOC and EPC projects across the UAE). Such context-driven applications can help leaders develop ethical judgment and emotional intelligence while also fostering deeper trust with employees—a critical enabler of safety behavior in culturally hierarchical and high power-distance contexts like the UAE (Al Mazrouei & Pech, 2015; Western PMSs in the UAE, 2022).

Leaders also have a vital role in cultivating POS by creating an environment where employees feel safe to speak up about hazards or concerns without fear of retaliation. This is an approach consistently supported by safety culture literature in high-risk UAE sectors (Corporate OHS, 2022). Moreover, to nurture positive moderating role of HWP, organizations should adopt job enrichment strategies that empower employees with autonomy and problem-solving opportunities related to safety. Furthermore, formal recognition programs for safety actions and mentorship from passionate safety champions can reinforce HWP, especially within cultural settings that emphasize group cohesion and senior guidance (Vallerand et al., 2003).

In the demanding and performance-intensive environments typical of UAE industries, OWP may lead employees to neglect safety in favor of output. Organizations should therefore implement screening tools during performance evaluations to identify signs such as workaholism or disregard for safety rules safety neglect. To reduce such tendencies, work-life balance policies (e.g., mandatory rest breaks) should be enforced.

Finally, while embedding above practices into organizational safety management systems. (e.g., Health, Safety, and Environment performance evaluations), the UAE organizations should regularly monitor

indicators such as KHO, POS, HWP, and OWP through targeted surveys and safety audits, enabling data-driven safety interventions. Post-incident reviews should serve as structured learning opportunities, reinforcing AL behaviors and rebuilding safety performance in the aftermath of safety lapses (Ministry of Health & Prevention UAE, 2021).

Limitations and future directions studies

Like any research, this study has several limitations that offer opportunities for future investigation. First, while this study explored key mechanisms influencing employee safety performance (safety performance), other potentially important variables were not considered. For instance, since KHO was found to play a mediating role between AL and safety performance, it would be valuable for future research to examine how knowledge sharing might also mediate this relationship—an area that remains underexplored.

Second, the sample was limited to a public sector organization in Abu Dhabi operating in hazardous industries. This geographical and sectoral focus limits the generalizability of the findings to private organizations or public entities in other Emirates.

Third, the cross-sectional design of this study restricts the ability to infer causality. Future research should consider adopting a longitudinal approach to better understand how these relationships evolve over time.

Fourth, the current model did not account for demographic and organizational variables (e.g., age, tenure, department, organization type), which may significantly influence safety performance. Future studies are encouraged to include such variables to more precisely isolate the effects of authentic leadership and psychological mechanisms on safety outcomes.

Finally, many reliability coefficients were very high (>0.95), which may indicate item redundancy due to overlapping contents. Although reliability of all constructs remains strong, this could limit the constructs' breadth and affect content validity. Thus, future studies should refine these scales to reduce redundancy while maintaining theoretical depth.

CRediT authorship contribution statement

Muna Saeed Al Suwaidi: Writing – review & editing, Writing – original draft, Data curation, Conceptualization. **Fauzia Jabeen:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Formal analysis, Data curation, Conceptualization. **Moza Tahnoon Al Nahyan:** Methodology. **Sherine Farouk:** Methodology, Data curation. **Matloub Hussain:** Writing – review & editing, Validation, Supervision, Methodology.

Informed consent

Before conducting the study, the authors used an informed consent form comprising of research purpose, procedure, benefits and confidentiality was used to take the participants' consent to participate in the study.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data availability

Data will be made available on request.

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