

Article

The Role of Air Traffic Controllers' Mindfulness in Enhancing Air Traffic Safety: JDR Theory in the Saudi Arabian Aviation Context

Bader Alaydi ^{1,*} , Siew-Imm Ng ²  and Xin-Jean Lim ²¹ College of Business Administration, Prince Sultan University, Riyadh 11586, Saudi Arabia² School of Business & Economics, Universiti Putra Malaysia, Serdang 43400, Malaysia; imm_ns@upm.edu.my (S.-I.N.); limxinjean@upm.edu.my (X.-J.L.)

* Correspondence: balaydi@psu.edu.sa

Abstract

Background: Air traffic control is a stressful job and vital to aviation safety. Although technological developments have been introduced to enhance and facilitate the tasks of air traffic control officers (ATCOs), ATCOs still experience high levels of job stress. This study explores the influence of mindfulness and social work support (SWS) on the job performance and job stress of ATCOs in Saudi Arabia. **Methods:** Grounded in Job Demands–Resources (JDR) theory, this study used a cross-sectional design to survey 324 ATCOs, with a 72% response rate. Mindfulness and SWS were treated as individual and situation-specific resources that influence stress and performance outcomes. **Results:** The results indicated that mindfulness could reduce workplace stress and improve performance. Moreover, SWS was also critical in reducing the adverse impacts of stress on job performance, reflecting the buffering effect posited by JDR theory. **Conclusions:** This study demonstrates that JDR theory is applicable to the context of ATC since it validates the importance of mindfulness and SWS as critical resources in minimizing stress levels and improving performance. The findings have implications for the viability of mindfulness-based training interventions and peer-support programs in supporting the health of ATCOs and their ability to deal with highly stressful situations.



Academic Editor: Booi Kam

Received: 7 June 2025

Revised: 7 August 2025

Accepted: 12 August 2025

Published: 15 August 2025

Citation: Alaydi, B.; Ng, S.-I.; Lim, X.-J. The Role of Air Traffic Controllers' Mindfulness in Enhancing Air Traffic Safety: JDR Theory in the Saudi Arabian Aviation Context. *Logistics* **2025**, *9*, 117. <https://doi.org/10.3390/logistics9030117>

Copyright: © 2025 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Keywords: air traffic safety; mindfulness; job stress; job performance; social work support; JDR theory

1. Introduction

In the aviation industry, air traffic control (ATC) is the most vital service affecting air traffic, not only for human safety but also for the economic outcomes of airlines and airports. In fact, air traffic controllers' (ATCOs') performance is a significant factor in preventing collisions between flying aircraft, as well as during landing. ATC is characterized as a high-stress occupation [1] due to the risk to human lives and economic responsibility associated with performing this job [2]. Air traffic safety receives full attention from the International Civil Aviation Organization (ICAO), Airport Council International (ACI), Civil Air Navigation Services Organization (CANSO), and other major stakeholders in the aviation industry [3].

Although advanced technologies have been introduced in ATC to support flight safety and facilitate efficient air traffic flow [1,4], technological solutions alone have not fully alleviated job-related stress among air traffic controllers (ATCOs). To address this issue,

there is a growing recognition of the need to incorporate personal resources, particularly mindfulness and social work support (SWS), which have shown promising positive effects on stress management and performance outcomes [5]. Mindfulness, conceptualized as a self-care and attentional control strategy [6], enables individuals to remain focused amid high-pressure environments and serves as a powerful personal resource for managing job demands. Similarly, SWS functions as a critical psychosocial resource; support from supervisors and colleagues, often rooted in strong interpersonal relationships, can buffer the impact of job-related stress and mitigate its detrimental effects on job performance [7].

Given the critical nature of ATCOs' responsibilities and the psychological strain they routinely face, it is vital to examine how both individual-level (e.g., mindfulness) and environmental-level (e.g., SWS) resources influence their job performance [8]. Despite the urgency and relevance of this inquiry, empirical research in this area, particularly in the Saudi Arabian context, remains scarce [5].

This study contributes to both theoretical and practical domains. Theoretically, it advances the Job Demands–Resources (JDR) framework by integrating mindfulness as a personal resource and SWS as a contextual resource, thereby deepening our understanding of the mechanisms through which mindfulness affects job stress and then impacts performance in the ATC setting. Empirically, it provides valuable, context-specific insights into the under-researched aviation sector in Saudi Arabia. Practically, the findings offer actionable implications for designing ATCO training and welfare programs, emphasizing mindfulness-based interventions and peer-support structures as strategic tools to enhance well-being, reduce stress, and uphold aviation safety.

2. Literature Review

2.1. *Job Demands and Resources Theory*

The Job Demands–Resources (JDR) framework is a widely accepted model for analyzing how job characteristics affect employee outcomes, particularly performance and well-being [9]. According to this framework, job demands are aspects of a job that require sustained cognitive, emotional, or physical effort and are thus linked to psychological or physiological costs. In the high-stakes ATC environment, key job demands include shift work, unpredictable traffic volumes, and cognitive overload [10]. For instance, Ref. [10] showed that shift work, especially during night shifts, significantly contributed to fatigue among Indonesian ATCOs, as irregular schedules disrupted circadian rhythms and compounded the mental strain associated with continuous vigilance and real-time decision-making. These stressors are intensified when ATCOs manage heavy workloads under time constraints, increasing the risk of fatigue-related errors.

In contrast, job resources, as defined by Demerouti et al. [9], refer to physical, psychological, social, or organizational aspects that help achieve work goals, mitigate job demands, or promote development. In the ATC context, examples include structured training programs, relaxation therapy, and decision-support tools, all of which buffer the negative impact of job stress and enhance job performance. In [11], for example, relaxation therapy was demonstrated to improve psychological outcomes among Indonesian ATCOs, who otherwise showed signs of stress-related physiological activation (e.g., increased heart rate or muscle tension) due to workload surges. As another example, conformal automation tools have been introduced to help novice controllers develop effective strategies for managing traffic scenarios and resolving potential conflicts. These tools expose trainees to previously employed resolution strategies for similar conflict situations, thereby enhancing their situational awareness and decision-making skills. As a result, extended on-the-job training hours can be significantly reduced [12].

In addition to job resources, the JDR model has evolved to incorporate personal resources—individual psychological traits such as self-efficacy, resilience, or optimism—and contextual or social resources, including peer support and workplace climate. These resources operate similarly to job resources by enhancing engagement, reducing burnout, and moderating the effects of excessive demands [13]. In this study, we position mindfulness as a personal resource and social work support (SWS) as a contextual/social resource, both of which operate within the JDR framework to mitigate the negative effects of ATC job demands. Mindfulness refers to a state of nonjudgmental awareness and acceptance of present-moment experiences. In high-demand environments such as ATC, mindfulness enhances situational awareness, emotional regulation, and focus, traits essential for performance under pressure. Mindful ATCOs are more likely to remain calm during abnormal events (e.g., system failures or increased traffic density), avoid cognitive overload, and recover quickly from stress. These traits directly counteract the health-impairment process in the JDR model, reducing the strain typically caused by prolonged job demands. Prior research on similarly demanding professions has linked mindfulness to reduced anxiety, improved memory and concentration, and stronger self-regulation. In the ATC context, mindfulness may help controllers avoid common pitfalls such as mental fatigue, distraction, or panic, especially during night shifts or emergency scenarios. While some studies report diminishing returns at extremely high mindfulness levels, e.g., Ref. [14], appropriately implemented mindfulness interventions, such as brief daily meditations or guided focus exercises, can provide the optimal benefit without emotional overload.

Social work support (SWS), as a contextual resource, refers to the support system embedded in social relationships within the workplace [15]. In the JDR model, this functions as a contextual buffer that protects employees from the strain of job demands. Specifically, SWS provides both instrumental support (e.g., technical advice or direct task assistance) and emotional support (e.g., empathy, encouragement, or shared coping strategies), which alleviate stress during high-pressure situations. In practice, SWS might involve colleagues stepping in to help during sector overload, mentoring junior controllers, or offering moral support during extended shifts. These interactions strengthen team cohesion and confidence, contributing to lower stress and higher performance. For example, if an ATCO is overwhelmed by simultaneous coordination tasks, having a teammate provide real-time assistance or reassurance could immediately reduce task-related strain and improve subsequent performance. Over time, this culture of support fosters psychological safety, enabling ATCOs to manage demands more effectively and with greater confidence.

In line with JDR theory's motivational process, mindfulness and SWS not only reduce strain but also promote positive outcomes, such as improved job performance. By conceptualizing mindfulness as a personal resource and SWS as a contextual/social resource, this study contributes to a more nuanced application of the JDR model within aviation safety research. Both resources directly address the health-impairment and buffering processes of the JDR framework [13], offering actionable insights for reducing job stress and improving performance among air traffic controllers. This extension is particularly novel in the Saudi Arabian ATC context, where such applications remain underexplored.

2.2. ATC Job Performance

Air traffic control (ATC) appears to be a significant element determining aviation safety. ATC as a job is defined as the act of performing tasks required to execute organizational strategies and objectives [16]. Within the ATC context, the most important behavior is safety behavior [17].

Ref [18] asserts that ATC performance is best measured through task- and context-related performance. Task-based performance is defined as “the effectiveness with which

job incumbents perform activities that contribute to the organization's technical core either directly by implementing a part of its technological process, or indirectly by providing it with required materials or services" [16]. Monitoring and controlling flights are valid examples of ATC task performance [16]. In contrast, contextual performance covers functions capable of "contributing to organizational effectiveness in ways that shape the organizational, social, and psychological context that serves as a catalyst for task activities and processes" [16]. Support directed towards a colleague by resolving flight conflicts and coordinating flight information with other units are examples of ATC contextual performance [18].

According to [19], job performance is influenced by various variables, which can be job demands or personal resources. As shown in the literature, the level of job stress significantly affects job performance in various ways [20–24]. In some cases, the effect of stress on job performance has been characterized by an inverted U-shaped relationship, where job-related stress has both positive and negative effects on performance. This suggests that moderate stress can enhance performance by acting as a motivator, but once it exceeds a certain threshold, it becomes overwhelming and starts to hinder performance [23]. Thus, identifying personal resources that could manage stress or reduce its effects on performance is critical.

Various personal resources lead to positive ATC performance outcomes, including the ATCO's personality, cognitive abilities [25], mindfulness [26], and SWS [27]. Within the safety domain, SWS mitigates the negative consequences of job insecurity for safety-relevant performance achievements [27]. In addition, supervisory support, an important component of SWS, has been reported to influence safety performance and lessen the adverse effects—such as safety obstacles and safety uncertainty—exerted by job demands on safety-related outcomes [28].

2.3. Job Stress

Job stress is considered a significant job demand that organizations strive to monitor due to its adverse effects on job performance [29]. ATC is associated with high job stress from various sources [30]. Consequently, ATCOs experiencing higher stress levels possess lower job satisfaction, ultimately impacting their intent to quit the ATC profession [31]. Stress may affect flight safety and well-being [20]. Within the human resource context, job stress can be eustress (good stress) or distress (bad stress), indicating that outcomes could be positive or negative depending on the prevalent situations and circumstances [32]. Along these lines, the literature reports five different findings regarding the crucial connection between job-related stress and performance. The primary view is that job-related stress negatively influences job performance [33].

The second view is that job-induced stress has positive effects on job-related performance [21]. This positive relationship is explained by the notion that job stress is seen as a challenge and a motivator. When an issue arises, it is seen as an opportunity to implement a corrective action aimed at improving job performance [34]. The third view involves the U-shaped relationship, which suggests that at high or low stress levels, job performance is high, but a moderate stress level leads to low performance [22]. The fourth perspective presents an inverted U-shaped relationship. This view asserts that job-related stress exerts both negative and positive influences on performance levels. This indicates that job-related stress functions as a motivator to perform better until it reaches a specific threshold, beyond which excessive levels of stress become discouraging, leading to decreased performance [23]. The fifth view pertains to the lack of a clear connection between job-related stress and job performance [24].

2.4. Mindfulness

Mindfulness is a person's ability to identify the challenges facing them in the present and focus on handling them effectively [35]. With the emergence of mindfulness, Business Harvard Review characterized it as a "must-have" within the workplace [36]. Mindfulness, which is a self-care strategy, impacts individuals personally or professionally at the workplace [37]. It is categorized into two dimensions: awareness and acceptance. Awareness is the process of regularly assessing the current experience and directing energy toward it instead of thinking about past or possible future situations. Acceptance refers to adopting a situation completely, showing the attitude of accepting something in its original form. Acceptance is described as "the way in which present-moment awareness is done: non-judgmentally, with an attitude of acceptance, openness, and even compassion toward one's experience" [38]. A previous review [39] concluded that mindfulness improves well-being and reduces stress. They described mindfulness as a form of self-regulation involving attention control, body awareness, emotion regulation, and a shift in self-perspective. One key outcome of emotion regulation is positive reappraisal, viewing stressful events as meaningful or manageable, which helps lower stress levels.

Studies examining the role of mindfulness in the workplace have consistently reported its positive impact on both job-related performance [40] and physical and psychological health [41–43]. In [40], it was found that mindfulness positively influences job performance, both directly and indirectly, through mechanisms such as creative process engagement and employee creativity. In terms of an individual's health, mindfulness has been associated with reduced stress and anxiety levels among nursing students [41], improved self-regulation leading to enhanced performance [44], and better memory and concentration, which in turn reduce irritability, tension, and exhaustion, as observed among ATCOs in Spain [42]. Within the aviation context, low levels of mindfulness have been linked to increased error rates, posing potential threats to air traffic safety [43].

Similarly, a study of US employees [45] revealed that mindfulness plays two roles at work. First, it can reduce the negative impact of a poor work environment on employees' psychological state. Second, mindfulness is strongly linked to lower work-related distress, suggesting it directly protects employee well-being. That is, mindfulness supports better adjustment at work and partly shields employees from the harmful effects of unsupportive environments because mindful individuals tend to feel less overwhelmed and are more likely to use active coping strategies.

In a study of Thai employees [46], practicing mindfulness meditation was found to help reduce burnout, improve coping skills, and boost job performance. Even when facing high job demands, employees who regularly practiced mindfulness reported less burnout than those who did not. These employees were more likely to use problem-solving strategies to cope with stress rather than react emotionally. A calm and focused mind helped them think positively about their ability to handle challenges, leading to greater job performance. Mindfulness training indeed plays an important role in managing stress effectively at work.

Although mindfulness is widely regarded as beneficial, concerns have been raised about its potential adverse effects on health and well-being. The author of [14] argued that mindfulness may exhibit an inverted U-shaped relationship with various outcomes, suggesting that while moderate levels of mindfulness are beneficial, its positive effects may diminish, reverse, or even disappear at higher levels. This assertion is supported by empirical findings. For example, Ref. [47] indicated that the negative impact of poor leadership on employee health and well-being was more pronounced among individuals with higher levels of mindfulness. Similarly, in [48], the authors reported that highly

mindful individuals who engage in surface acting tend to experience reduced self-control, which ultimately leads to lower performance outcomes.

In addition, it was reported in [49] that mindful attention, which is the core aspect of mindfulness, significantly increases depression, substance abuse, and anxiety. Moreover, the authors of [50] indicated that mindfulness has a strong negative relationship with stress in female nursing students but has no influence on the stress of male nursing students. In a related study [41], no significant relationship was found between mindfulness and depression among nursing students. Notably, there are conflicting findings on the impact of mindfulness within organizations, emphasizing the need to investigate its influence in the ATC context.

2.5. Social Work Support

SWS is “the degree to which a job provides opportunities for advice and assistance from others” [15]. It encompasses interactions among employees, colleagues, and supervisors. All behaviors within the workplace aimed at promoting employee training and learning are classified as support behaviors [51]. SWS can be seen as a personal contextual resource because employees differ in their ability to build and maintain positive relationships with other employees. Some employees are better at interacting with their colleagues or supervisors, while others lack this ability. SWS is provided by supervisors and colleagues, but employees with limited social interaction skills cannot fully benefit from this support [7].

SWS has been reported to have a considerable impact on organizations. However, the empirical research exploring the connection between SWS and employee behavior has produced conflicting evidence. Many researchers have concluded that it leads to positive outcomes in the organization. For instance, a direct connection between SWS and job performance has been reported [27], while an indirect connection through work engagement has also been found [52]. The authors of [53] argued that peers’ social support weakens the association between customer connections, job-related stress, and turnover intention, particularly weakening the relationship between job stress and turnover intention. Furthermore, the authors of [54] reported that it weakens the relationship between job complexity and the stress associated with it. Moreover, it diminishes the negative influence on both workload and performance [7] and strengthens the positive connection between psychological capital with workplace engagement [52]. Ref [55] indicated that social work support buffers the negative effects of stressful demands.

However, other scholars have claimed that SWS has a negative side, too. They have asserted that (1) SWS has a negative association with employees’ health and overall well-being [56]; (2) employees with elevated workload levels and lower SWS levels feel less stress compared with employees who experience elevated levels of SWS [57]; (3) employees who are responsible for performing the most complex tasks and have lower levels of SWS are more satisfied with their jobs as compared to those who have higher levels of SWS [58]; and (4) SWS is positively associated with counterproductive behaviors [59]. From the above, it is clear that the role played by social support in managing job stress is manifold [60]. It has been employed as a mediator, an explanatory variable [61], or an intermediary; however, whether it has a diminishing influence as a moderator remains inconclusive. Therefore, revisiting the buffering role of social support has become an essential task [53].

3. Hypothesis Development

According to [35], mindfulness corresponds to a person’s ability to completely focus on current issues as well as a strategy to efficiently respond to those issues. Considering the JDR framework, mindfulness is considered an individual resource that can serve as a

factor in managing job stress [13]. Authors have previously revealed that mindfulness is inversely correlated with emotional exhaustion [62], job-related stress [63], and burnout [64], meaning that mindfulness may dampen the consequences of health impairment and be an effective personal resource in preventing adverse psychological states [63]. Since air traffic control (ATC) is often conceived as a job involving high stress, and bearing in mind that mindfulness outcomes have been found to minimize negative consequences in the JDR model, the following hypothesis is proposed:

H1: *Mindfulness negatively influences job stress.*

Job and personal resources play a critical role in supporting job performance. When such resources are abundant, they can buffer or neutralize the adverse effects of job demands [13]. Personal resources, in particular, contribute to sustaining a positive relationship with one's work environment [65]. Among these resources, mindfulness has been consistently identified as a key enhancer of job performance [62]. A previous study [40] further established that mindfulness is positively linked to job performance directly as well as indirectly through creative process engagement and employee creativity. For ATCOs, maintaining present-moment awareness is essential for monitoring flight movements and executing timely, safety-critical decisions. Drawing on these empirical findings and grounded in the JDR framework, the following hypothesis is proposed:

H2: *Mindfulness positively influences ATC job performance.*

In [29], the author considered job stress as a harmful physical or emotional response generated by the discrepancy among individuals' capabilities, resources, requirements, and role expectations. Job stress is also seen as a double-edged sword that can be fruitful or counterproductive. It is fruitful when it motivates individuals to function better and counterproductive when outside factors exert pressure on individuals to function but fail to provide solid results [29]. Thus, passing the acceptable level of job stress is undesirable due to its adverse influence on job performance [66]. Considering these empirical studies and adhering to JDR theory, the following hypothesis is formulated:

H3: *Job stress negatively influences ATC job performance.*

Job stress has frequently been examined as a mediating variable in relationships between workplace constructs. For example, in [67], job stress was identified as a key mechanism linking low job satisfaction to increased turnover intention. Similarly, Ref. [54] showed that job stress mediates the effects of work burden and job complexity on job performance. The authors of [68] also reported that job stress significantly mediates the relationship between workload, working conditions, and employee performance. More broadly, job stress has been recognized as a proximal outcome influencing several critical organizational variables, including job performance, job satisfaction, and work commitment [69].

According to the JDR framework, the introduction of adequate personal resources can reduce job stress and exhaustion, thereby enhancing employee engagement and performance [13]. Likewise, the Cognitive Activation Theory of Stress suggests that positive cognitive practices, such as mindfulness, can mitigate stress and activate adaptive responses. Based on these theoretical perspectives and previous empirical findings, incorporating mindfulness into the workplace is expected to reduce job stress, which in turn may improve job performance. Accordingly, the following hypothesis is proposed:

H4: *The mindfulness–ATC job performance relationship is mediated by job stress.*

Social work support (SWS) is defined as a resource that helps people cope with their jobs through supportive relationships with others [70]. SWS is particularly effective in organizational settings characterized by limited resources or frequent policy and procedural changes. In the context of air traffic control, ATCOs often experience sudden surges in demand due to unforeseen operational changes. In such instances, support from colleagues, such as those on a break, can be instrumental in helping an ATCO manage flight conflicts or coordinate with other sectors, thereby alleviating individual workload and reducing stress levels [71].

SWS is widely recognized as one of the most effective strategies for promoting positive organizational outcomes, including job satisfaction, job performance, and employee motivation. It also plays a crucial mediating role between job demands and occupational stress [27,72]. Moreover, existing evidence suggests that SWS can buffer the negative effects of job insecurity on safety performance [27]. High levels of social support may enhance job performance by fostering a sense of psychological safety; individuals who feel supported by their colleagues are more likely to develop resilience in the face of stressors [54]. In the ATC environment, SWS can mitigate the detrimental effects of job stress on performance. For example, when faced with high-pressure tasks, the willingness of colleagues to collaborate and offer assistance can motivate ATCOs to manage similar challenges more effectively in the future, ultimately improving job performance. Considering the established benefits of SWS in previous empirical studies and in line with the Job Demands–Resources (JDR) framework, the following hypothesis is proposed:

H5: *The job stress–ATC job performance relationship is moderated by social work support, such that the negative relationship will be weaker at high levels of social work support.*

Grounded in the Job Demands–Resources (JDR) theoretical framework, this study proposes that mindfulness among air traffic controllers (ATCOs) serves as a valuable personal resource that positively influences job performance by reducing job-related stress. Additionally, job stress is expected to negatively impact job performance and function as a mediating variable in the relationship between mindfulness and performance. Furthermore, social work support (SWS) is posited to moderate the negative relationship between job stress and performance, potentially buffering its detrimental effects. The proposed research framework is illustrated in Figure 1.

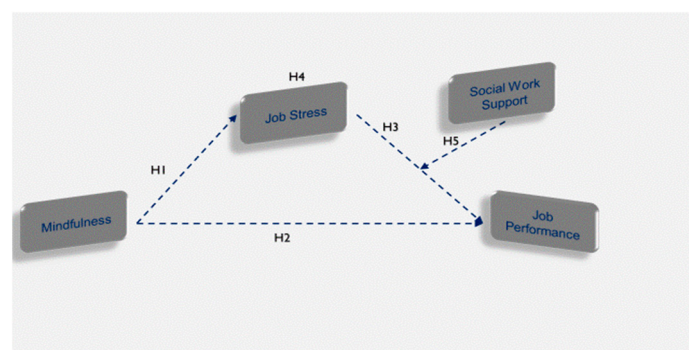


Figure 1. The research framework.

4. Research Methodology

4.1. Data Collection

To empirically evaluate the model, a cross-sectional survey design has been utilized, drawing on responses from ATCOs operating within the Kingdom of Saudi Arabia. Air traffic control (ATC) services in Saudi Arabia are managed by the Saudi Air Navigation Services Company (SANS), which operates 13 ATC units across various airports, each staffed with a different number of air traffic control officers (ATCOs). The total population comprises 594 ATCOs. SANS provided a comprehensive list of ATCOs for each unit, including detailed information for each officer. Considering the participants' scattered geographic distribution, a proportional stratified random sampling approach was followed in the current investigation. During the data collection period in 2021, a total of 324 completed questionnaires were collected from the target respondents. No missing responses were found. Furthermore, pilot testing was conducted with the participation of 30 ATCOs from the same target population to ensure the clarity, reliability, and validity of the questionnaire. Their feedback was reflected in minor wording modifications to improve the clarity of the items and reduce ambiguity in the questionnaire. Later, three email reminders were sent as follow-ups at 2-week intervals to increase the response rate. Ultimately, the final usable sample consisted of 324 completed questionnaires. Finally, the potential for non-response bias was assessed by using independent-samples t-tests and comparing early and late respondents in terms of key demographic and study variables. No significant differences were found, indicating that non-response bias is unlikely to be a major concern. Thus, all the responses were included for subsequent analysis. This translates to an overall response rate of 72%.

As can be seen in Table 1, the majority of the respondents were male (94.8%), aged 26 to 35 (60%), and married (70%) and possessed at least a diploma degree. Most of them have worked as ATCOs for 5–10 years. Jeddah and Riyadh were the units with the highest participant responses.

Table 1. Demographic profile.

Description		Frequency	Percent
Gender	Male	307	94.8
	Female	17	5.20
Age	25 years old and below	28	8.60
	26–30 years old	113	34.90
	31–35 years old	82	25.30
	36–40 years old	34	10.50
	41–45 years old	35	10.80
	46 years old and above	32	9.90
Marital Status	Single	88	27.20
	Married	228	70.40
	Divorced	8	2.50
Education	Diploma	155	47.80
	Bachelor's Degree	149	46.00
	Master's Degree or higher	20	6.20
Working Experience	Less than 5 years	99	30.60
	5–10 years	115	35.50
	11–15 years	29	9.00
	More than 15 years	81	25.00
Job Position	TwR	132	40.70
	APP	97	29.90
	ACC	95	29.30

Table 1. *Cont*

Description		Frequency	Percent
Unit	Jeddah	124	38.27
	Riyadh	80	24.70
	Dammam	32	9.90
	Madinah	10	3.09
	Abha	16	4.90
	Hail	9	2.80
	Alhasa	4	1.20
	Jazan	13	4.00
	Qasim	12	3.70
	Tabouk	7	2.20
	Taif	11	3.40
	Yanbu	6	1.90
	Najran	0	0
	Total	324	100.00

4.2. Measures

The job performance scale comprises two distinctive domains—task performance and contextual performance. Task performance was measured through a seven-item scale, which had a Cronbach’s alpha of 0.82, while contextual performance was measured with a 12-item scale, with a Cronbach’s alpha of 0.90 [73]. Job stress was measured using a four-item scale provided in [74] with a reasonable Cronbach’s alpha (0.87). We adapted the Philadelphia Mindfulness Scale described in [75] into a shorter version to increase efficiency and reduce respondent burden, particularly given their high-pressure ATC environment. Reliability for the shorter scale fell within acceptable thresholds (awareness $\alpha = 0.90$; acceptance $\alpha = 0.93$). All the items for acceptance were reverse items. A five-point scale was used to rate the items. The SWS scale is a six-item scale with Cronbach’s $\alpha = 0.82$ [15].

5. Findings

Given that the primary aim of this study was to examine both the direct and indirect effects of mindfulness on job stress and job performance, Partial Least Squares Structural Equation Modeling (PLS-SEM) was deemed an appropriate analytical technique. Using SmartPLS 3 software, the model assessment was conducted in two distinct phases: the measurement model and the structural model. The measurement model evaluated the reliability and validity of the constructs by examining the relationships between each construct and its associated indicators. In contrast, the structural model assessed the hypothesized relationships among the latent constructs, providing insights into the overall model’s explanatory power and predictive relevance.

Before performing measurement model assessments, reverse-worded items (AC1–5 and JS2, JS4) were coded in reverse to ensure that the direction of all measurement units remained the same [76]. During this procedure, the five-point Likert scale was reversed towards the opposite direction, keeping in mind that the lowest value indicated the highest degree of agreement. Afterward, Harman’s single-factor test was utilized to check the full form for the possible occurrence of common method variance (CMV) [77]. According to the results, the first factor explained 18.06% of the total variance, which is less than the critical value (50%), so CMV was deemed not to be a serious concern in this dataset [78].

5.1. Measurement Model Evaluation

Cronbach’s alpha (α) and composite reliability were computed to measure the reflective constructs’ reliability, complying with the guidelines presented by Hair and colleagues [79]. Table 2 presents the α values for all constructs; they range between 0.769 and 0.973, surpassing the suggested threshold of 0.70 [80]. Likewise, the composite reliability scores of all the constructs varied from 0.838 to 0.980, exceeding the minimum required

threshold value of 0.7; thus, they were deemed adequate [81]. Factor loadings and average variance extracted (AVE) were employed to assess the adequacy of convergent validity. All factor loadings reached the recommended value of 0.40 or above [82]. Meanwhile, all constructs showed adequate AVE figures, ranging from 0.512 to 0.925, which surpassed the threshold of 0.50.

Table 2. Results of measurement model.

	Mean	SD	Outer Loading	α Value	CR	AVE
Acceptance				0.844	0.89	0.618
AC1; I try to distract myself when I feel unpleasant emotions (R).	3.938	0.96	0.777			
AC2; I try to stay busy to keep thoughts or feelings from coming to mind (R).	3.966	1.022	0.807			
AC3; I tell myself that I shouldn't feel sad (R).	3.954	1.01	0.822			
AC4; If there is something I don't want to think about, I'll try many things to get it out of my mind (R).	4.108	0.989	0.827			
AC5; When I have a bad memory, I try to distract myself to make it go away (R).	3.991	0.935	0.69			
Awareness				0.769	0.838	0.512
AW1; I am aware of what thoughts are passing through my mind	3.787	0.681	0.618			
AW2; When someone asks how I am feeling, I can identify my emotions easily.	3.728	0.672	0.592			
AW3; I am aware of thoughts I'm having when my mood changes.	3.793	0.701	0.805			
AW4; Whenever my emotions change, I am conscious of them immediately.	3.756	0.801	0.815			
AW5; When talking with other people, I am aware of the emotions I am experiencing.	3.769	0.885	0.719			
Contextual Performance				0.930	0.94	0.568
CP1; I took on extra responsibilities.	4.056	0.833	0.727			
CP2; I started new tasks myself, when my old ones were finished.	4.025	0.835	0.735			
CP3; I took on challenging work tasks, when available.	4.185	0.88	0.832			
CP4; I worked at keeping my job knowledge up-to-date.	4.136	0.892	0.725			
CP5; I worked at keeping my job skills up-to-date.	4.201	0.839	0.786			
CP6; I came up with creative solutions to new problems.	4.222	0.805	0.767			
CP7; I kept looking for new challenges in my job.	4.299	0.835	0.823			
CP8; I did more than was expected of me.	4.012	0.824	0.744			
CP9; I actively participated in work meetings.	3.972	0.873	0.709			
CP10; I actively looked for ways to improve my performance at work.	4.216	0.822	0.767			
CP11; I grasped opportunities when they presented themselves.	4.262	0.833	0.806			
CP12; I knew how to solve difficult situations and setbacks quickly.	4.099	0.814	0.597			

Table 2. *Cont.*

	Mean	SD	Outer Loading	α Value	CR	AVE
Task Performance				0.909	0.928	0.648
TP1; I managed to plan my work so that it was done on time.	4.052	0.861	0.805			
TP2; My planning was optimal.	4.114	0.873	0.834			
TP3; I kept in mind the results that I had to achieve in my work.	4.049	0.866	0.798			
TP4; I was able to separate main issues from side issues at work.	3.954	0.917	0.834			
TP5; I knew how to set the right priorities.	4.025	0.926	0.822			
TP6; I was able to perform my work well with minimal time and effort.	3.559	1.232	0.83			
TP7; Collaboration with others was very productive.	4.262	0.833	0.705			
Social Work Support				0.843	0.954	0.568
SWS1; I have the opportunity to develop close friendships in my job.	3.944	0.877	0.576			
SWS2; I have the chance in my job to get to know other people.	3.599	1.127	0.837			
SWS3; I have the opportunity to meet with others in my work.	3.651	1.122	0.836			
SWS4; My supervisor is concerned about the welfare of the people that work for him/her.	3.997	0.97	0.824			
SWS5; People I work with take a personal interest in me.	4.222	0.716	0.722			
SWS6; People I work with are friendly.	4.287	0.725	0.692			
Job Stress				0.973	0.980	0.925
JS1; My job is extremely stressful.	2.38	1.419	0.931			
JS2; Very few stressful things happen to me at work (R).	2.269	1.396	0.986			
JS3; I feel a great deal of stress because of my job.	2.392	1.297	0.961			
JS4; I almost never feel stressed because of my work (R).	2.333	1.347	0.969			

R: reversed item.

5.2. Discriminant Validity Evaluation

The heterotrait–monotrait ratio of correlations (HTMT) was utilized as the criterion to assess the reflective constructs' discriminant validity. The results shown in Table 3 indicated an acceptable discriminant validity for the reflective constructs, as the values of HTMT were lower than the conservative threshold set at 0.85 [83]. Overall, these findings affirm that the constructs exhibited a clear empirical distinction from one another.

Table 3. Discriminant validity results with HTMT criterion.

	1	2	3	4	5	6
AC						
AW	0.248					
CP	0.255	0.261				
JS	0.095	0.109	0.427			
SWS	0.464	0.414	0.444	0.193		
TP	0.269	0.146	0.337	0.176	0.264	

Note: HTMT < 0.85.

5.3. Evaluation of Higher-Order Constructs

The present study incorporated two constructs in the form of reflective–formative higher-order constructs (HOCs), each encompassing multiple lower-order constructs (LOCs). Specifically, mindfulness comprised two lower-order constructs: (1) awareness

and (2) acceptance. Job performance is defined with two LOCs: task performance and contextual performance. Using a two-stage approach, both HOCs were assessed [84]. At the initial step, the whole set of LOCs was assessed by employing the previously mentioned standard reflective measurement method for the model. In the second phase, the whole set of HOCs was assessed by utilizing the standard steps provided for the model's formative measurement. The collinearity among the formative constructs was evaluated utilizing the variance inflation factor (VIF), as presented in Table 4. The VIF values for all lower-order constructs ranged between 1.056 and 1.106, remaining well below the rule-of-thumb limit of 3.0 [79], thereby demonstrating that no collinearity issues existed. Consequently, the outer weights and significance of each LOC were examined by employing the bootstrapping technique with 5000 re-samples. The results revealed that all LOCs associated with mindfulness (acceptance and awareness) and job performance (contextual performance and task performance) were statistically significant at the $p < 0.01$ level.

Table 4. Results for higher-order constructs.

HOC	LOC	Outer Weight	Std Error	Outer VIF	T-Statistics	p-Values
Mindfulness	Acceptance	0.655	0.058	1.056	13.708	0
	Awareness	0.620	0.08	1.056	5.733	0
Job Performance	Contextual Performance	0.908	0.036	1.106	22.662	0
	Task Performance	0.224	0.039	1.106	9.289	0

Note: HOC = higher-order construct; LOC = lower-order construct; VIF = variance inflation factor.

5.4. Descriptive Statistics

To gain insight into participants' responses to each construct examined in the current study, three key assessments were conducted: analysis of the mean, standard deviation, and normality. Table 5 shows that two dimensions were included to capture the effect of mindfulness: awareness (mean = 3.767; SD = 0.539) and acceptance (mean = 3.991; SD = 0.774). An average mean of 3.879 (above the neutral score of 3) suggests that respondents agreed that they reasonably practice mindfulness in their daily work. On the other hand, the respondents also indicated that their colleagues provided them with moderate and appropriate SWS (i.e., mean = 3.950; SD = 0.703). The mean job stress score was 2.677 (SD = 0.680), showing that respondents were indifferent (less than the neutral value of 3) about whether they were enduring a stressful experience in their workplace. Finally, the average mean score of job performance was 4.071 (above the neutral score of 3) when considering both task performance (mean = 4.002; SD = 0.752) and contextual performance (mean = 4.140; SD = 0.633) dimensions. It can be concluded that the respondents believed they performed their jobs well.

Table 5. Results of descriptive statistics.

Construct	Mean	Std. Deviation	Skewness	Kurtosis
(1) Mindfulness	3.879			
i. Awareness	3.767	0.539	−0.118	0.153
ii. Acceptance	3.991	0.774	−0.407	−0.723
(2) Job Stress	2.677	1.314	1.007	−0.321
(3) Social Work Support	3.950	0.703	−0.457	−0.250
(4) Job Performance	4.071			
i. Task Performance	4.002	0.752	−0.277	−1.098
ii. Contextual Performance	4.140	0.633	−0.361	−0.808

As presented in Table 5, the normality test results revealed that all constructs fell within the acceptable range of normality (i.e., -2 to $+2$) [85]. Skewness varied between -0.457 and 1.007 , while kurtosis ranged between -1.098 and 0.153 . Hence, the study concluded that the current dataset showed a normal distribution.

5.5. Evaluation of Structural Model

Direct relationships

Prior to relationship analysis, lateral collinearity was evaluated to confirm the absence of collinearity concerns among exogenous constructs. The results illustrated that the exogenous construct VIF value (i.e., mindfulness) on job stress (1.00) and job performance (1.280) and the VIF value of job stress on job performance (1.034) were lower than 3 (threshold limit), indicating that collinearity was not present in the studied dataset [79]. To determine the significance associated with the direct hypotheses, path coefficients were assessed. The bootstrapping technique was performed with 5000 re-samples. The findings show that mindfulness has a negative impact (H1: $\beta = -0.102$, $t = 2.017$, $p = 0.022$) on job stress and a positive impact (H2: $\beta = 0.146$, $t = 2.804$, $p = 0.003$) on job performance. In addition, the results show that job stress has a negative impact (H3: $\beta = -0.344$, $t = 7.331$, $p = 0.000$) on job performance. Thus, H1, H2, and H3 are supported.

The authors of [86] assert that there are three categories for the explanatory power of R^2 : substantial (above 0.67), moderate (0.33), and weak (0.19). About 24.2% ($R^2 = 0.242$) of the variance in job performance was explained by mindfulness and job stress, indicating that all the exogenous variables exhibited adequate explanatory power for the endogenous variables. The effect size (f^2) analysis was conducted following the guidelines in [61]: small (0.02), medium (0.15), and large (0.35) effect sizes for the exogenous constructs' influence on the endogenous construct. Mindfulness exhibited a trivial effect size at $f^2 = 0.010$ for the path with job stress as the endogenous construct. Furthermore, mindfulness exerted a trivial effect size (0.024), while job stress (0.164) exerted a medium effect size for the job performance path. Stone–Geisser's Q^2 [87,88] was used to evaluate predictive relevance. The blindfolding technique was employed. The results were greater than zero for job stress ($Q^2 = 0.009$) and job performance ($Q^2 = 0.167$), validating the predictive relevance of the framework.

Mediation Analysis

To examine the mediation path, the bootstrapping technique described by Preacher and Hayes [89] was used. The values in Table 6 show that the mediation path linking mindfulness with job performance via job stress is not significant (H4: $\beta = 0.035$, $t = 1.882$, $p = 0.060$).

Table 6. Results of structural model.

	Std Beta	Standard Error	t-Statistics	p-Values	VIF	F ²
Direct Relationship						
MINDF → JS	−0.344	0.047	7.401	0	1.0	0.010 (T)
MINDF → JP	0.146	0.052	2.799	0.003	1.28	0.024 (S)
JS → JP	−0.102	0.05	2.019	0.022	1.034	0.164 (M)
Mediation Relationship						
MINDF > JS > JP	00.35	0.019	1.882	0.060		
Moderation Relationship						
SWS × JS > JP	0.146	0.056	2.608	0.005		

Note: f^2 : T = Trivial; S = Small; M = Medium; JS = Job stress; JP = Job performance.

Moderation Analysis

A two-stage process was employed to evaluate the interaction terms [90]. First, the variation in R² values between the main and interaction models was tested. The results showed that the addition of SWS as a moderator increased the job performance R² value from 0.302 to 0.319 (an increase of 0.017) using the PLS Algorithm. Furthermore, to increase the accuracy level of estimation, the bootstrapping re-sampling approach with 5000 re-samples was implemented to verify the significance of the moderation path [91]. As Table 6 presents, the findings show a significant moderating effect of SWS on the job stress–job performance path (H5: $\beta = 0.146$, $t = 2.608$, $p = 0.005$). By employing the interaction plot (see Figure 2) presented by Dawson [92], it can be observed that an elevated level of SWS weakens the negative interconnection linking job stress with job performance, ultimately supporting H5.

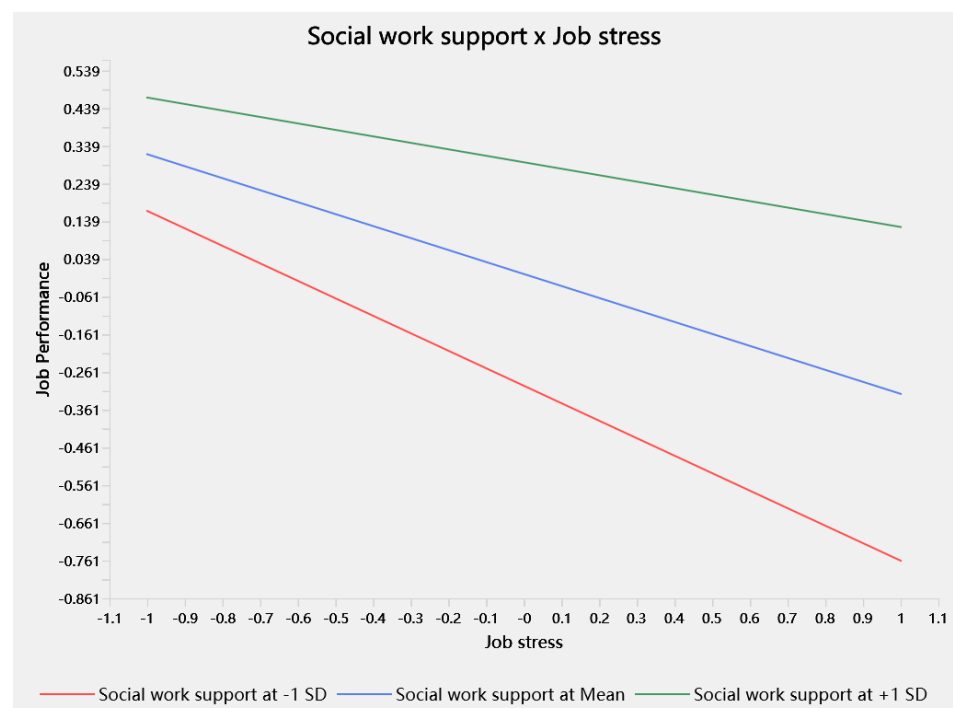


Figure 2. The moderation effect of SWS on the JS–JP path.

6. Discussion

We used the JDR framework to analyze the influences of mindfulness on job stress and job performance of air traffic control officers (ATCOs) in Saudi Arabia. The findings support the JDR framework, which posits that providing proper resources reduces health impairment. In a study among Australian nurses, mindfulness exhibited a negative influence on job stress [63]. A previous study in the education field [93] supported this negative relationship in a sample of female teachers, and it was reinforced in [94] for salespeople. Moreover, some studies have suggested that attending weeks of mindfulness-based training programs can reduce perceived and physiological stress among office workers in Sweden [95]. Goileant and colleagues [96] further claimed that there existed clear evidence confirming a reduction in job stress through a mindfulness training program. In the ATC context, a pilot study reported that mindfulness reduces exhaustion, tension, and irritability among ATCOs in Spain [42].

Although a few studies have claimed that mindfulness negatively impacts health (increased anxiety and depression) [49] and may have a dark side [14], this particular investigation confirms that mindfulness is negatively associated with job-related stress,

further emphasizing the need to incorporate mindfulness strategies into the profession of air traffic control (ATC) to reduce the stress levels experienced by air traffic control officers (ATCOs).

Moreover, the hypothesis positing a positive relationship between mindfulness and job performance is supported. This finding is consistent with the JDR framework, a theoretical groundwork proposing that personal resources lead to positive outcomes by improving motivation [9]. The results are on par with earlier empirical research, providing evidence for the positive association between mindfulness and job performance [40,62]. This designates mindfulness as a significant determinant of job performance in the ATC context. Harvard Business Review advised organizations to implement mindfulness, stating it is a “must-have” in the workplace due to its health benefits and positive outcomes within the work environment [36]. In this study, the level of air traffic controllers’ mindfulness was moderate to high (mean = 3.879) (above the neutral score of 3 on a 5-point Likert scale), including its dimensions of awareness (mean = 3.767) and acceptance (mean = 3.991). Awareness refers to a continual focus on one’s experience, with a consistent emphasis on the present instead of being preoccupied with past or possible future events.

The findings did not support the mediating role of job stress in the relationship between mindfulness and job performance. This result is unexpected, given that mindfulness was found to negatively influence job stress, and job stress, in turn, negatively influenced job performance. Moreover, this outcome contradicts the assumptions of both the Job Demands–Resources (JDR) model and the Cognitive Activation Theory of Stress. Although the theoretical rationale for proposing the mediation was sound, few studies have empirically examined the intermediary role of job stress in linking personal resources to performance outcomes, and several have reported non-significant results. For example, in [97], the authors investigated the mediating effect of job stress on the relationship between job satisfaction facets (e.g., pay, co-workers, and promotion) and turnover intention among project-level employees in Sri Lanka, but they found no significant mediation. Similarly, the JDR framework was applied in a study of nurses in Saudi Arabia [68], and job stress was found to serve as a mediator in only 16 out of 72 hypothesized relationships between job demands/resources and job performance.

The non-significant mediating effect observed in this study may be attributed to the moderate levels of job stress reported by the participants. The mean score for job stress fell below the neutral midpoint, contrasting with earlier research that characterized ATC job stress as high or extremely high [71]. This lower stress level is likely due to a substantial decline in workload, one of the primary stressors in air traffic control. According to [98], global flight volume dropped by 60% in 2020 compared to 2019. Data for this study were collected in August 2021, approximately 18 months after Saudi Arabia closed its borders, during a period when air traffic volume was still recovering. As a result, ATCOs may have perceived reduced job demands, contributing to lower reported stress levels. It is therefore plausible that under conditions of heightened job stress, a stronger mediating relationship may emerge.

Furthermore, the findings are consistent with assumptions made by theories and support that social work support (SWS) can reduce the harmful effects of job stress on performance. That is, the negative effect of stress on job performance is weaker for air traffic controllers who perceive more pronounced peer support, implying that work support can be considered a form of protection from the adverse impacts of job stress. Conversely, individuals who had low SWS scores exhibited a greater reduction in performance under stressful situations. These results confirm the JDR model’s notion that SWS, as a contextual resource, has a strong ability to counteract the adverse consequences of job demands [99].

The findings also support Social Capital Theory, which highlights the significance of social support in facilitating cooperation and group motivation among members of a team [100].

Additionally, these findings support the results of previous research in this field. For example, the authors of [54] demonstrate that social support lessens the effect of job complexity on job stress. In a similar context, Kim and Stoner [101] concluded that social support diminished the link connecting role stress with job-leaving intentions. SWS was also reported as an element reducing the adverse consequences of workload for performance [7]. Furthermore, Ref. [27] reported that SWS served as a buffer, decreasing the influence exerted by job insecurity on safety performance. Although some prior studies have suggested that SWS could have adverse effects, such as promoting dependency or gossip in the workplace [56–58,102], our findings position SWS as a protective and empowering mechanism in the ATC domain.

7. Conclusions

7.1. Theoretical and Managerial Implications

This study offers a meaningful theoretical contribution to both the air traffic control (ATC) literature and the Job Demands–Resources (JDR) framework in several important ways. First, it extends the application of JDR theory into the Saudi Arabian aviation sector, an underexplored, safety-critical context, where the stakes of job performance and stress management are exceptionally high. Second, this study advances the theoretical model by incorporating both personal and contextual resources (mindfulness and social work support) into the JDR framework. To our knowledge, this is the first empirical investigation to integrate and test mindfulness and SWS together within the JDR model in the aviation domain, thereby offering an important theoretical extension through the inclusion of these underexamined resource types.

Specifically, our findings provide empirical support for mindfulness as a personal resource that effectively reduces job stress and enhances job performance among air traffic controllers. This aligns with prior calls for research to move beyond conventional personal resources (e.g., psychological capital or coping strategies) and explore novel constructs within high-pressure professions. Furthermore, this study introduces SWS as a moderating contextual resource, responding directly to the call by [5] to investigate the moderating role of social support within the JDR framework, particularly in aviation-related professions. Our findings confirm that SWS can buffer the negative impact of job stress on job performance, reinforcing its value as a form of social capital in demanding work environments.

Lastly, this study contributes to the overall validation of the negative association between job stress and job performance in the ATC field, emphasizing the critical importance of proactive stress management strategies. While previous studies have examined various personal resources, such as psychological capital (e.g., self-efficacy, resilience, optimism, and hope) [103] and coping mechanisms [104], few have contextualized these within the aviation industry. Notably, the authors of [31] identified family support as a stress-buffering resource for ATCOs in Taiwan. However, our study is unique in situating workplace-based social support in the form of SWS within the JDR model and validating its moderating role. Collectively, these contributions broaden the theoretical landscape of the JDR model and offer practical implications for improving performance and well-being in safety-critical professions.

This empirical investigation provides meaningful insights into the air traffic control (ATC) industry, especially concerning practical strategies for managing job stress and enhancing performance to ensure safe and efficient flight operations. First, the significant influence of mindfulness on both job stress and job performance highlights its relevance and value within the ATC context. In this high-stakes environment, awareness refers to

the controller's ability to maintain full attention on flight movements, radar signals, and airspace conditions and avoid being distracted. Acceptance, on the other hand, involves a non-reactive mindset, remaining composed and mentally flexible during irregular or high-pressure scenarios, such as unexpected aircraft diversions, system alerts, or peak traffic periods. For example, an ATCO practicing mindfulness may respond to a sudden increase in inbound flights not with panic, but with steady decision-making, efficient task management, and clear communication. Such psychological readiness contributes to both individual performance and collective operational safety.

Given these findings, ATC organizations are strongly encouraged to implement structured mindfulness programs that target the development of two critical components: awareness and acceptance. These programs can be integrated into ongoing professional development through on-site workshops that incorporate techniques such as focused breathing, guided meditation, and real-time simulation exercises, helping air traffic controllers remain calm, attentive, and mentally agile under pressure. Additionally, ATC training academies should embed mindfulness modules into the curriculum for ATCO cadets, enabling them to build stress resilience and emotional regulation skills from the outset of their careers.

Importantly, any mindfulness initiative should be carefully tailored to align with Saudi Arabian organizational norms and workplace culture. For instance, programs could begin as pilot initiatives that are progressively scaled based on management approval and participant feedback. Moreover, delivery formats should reflect the hierarchical and safety-critical nature of ATC work, favoring practical, job-integrated sessions over abstract or overly individualistic approaches. When designed with cultural sensitivity and operational relevance, mindfulness training can become a powerful resource for sustaining performance and well-being in the demanding ATC environment.

This study further reinforces the critical role of social work support (SWS) as a valuable form of social capital that helps buffer the negative impact of job stress on performance. In the context of ATC, SWS refers to the network of interpersonal support built through collaborative relationships among air traffic controllers. To strengthen these support systems, ATC management is encouraged to foster a culture of mutual assistance and psychological safety through both formal and informal initiatives. Examples of such initiatives include organizing structured team-building exercises that simulate high-pressure coordination scenarios to build trust and cooperation, as well as hosting festive or cultural events that celebrate achievements, milestones, or national holidays to promote social bonding. Informal peer-support forums such as weekly "check-in" sessions, buddy systems for new recruits, or designated peer mentors can provide safe spaces for ATCOs to exchange coping strategies, share work experiences, and seek advice on operational or personal challenges.

In addition, ATC leadership should actively promote two key dimensions of support (instrumental and emotional). Instrumental support includes providing practical, task-oriented help such as real-time technical assistance, tips for managing flight conflicts, or advice during system failures. For example, during complex airspace coordination, an experienced colleague stepping in to help troubleshoot or communicate with adjacent sectors can not only solve the immediate issue but also strengthen team capacity. Emotional support can be provided by demonstrating empathy, encouragement, and reassurance, particularly during high-stress periods. For instance, a supervisor recognizing an ATCO's effort after a demanding shift or offering a quick debrief session can help normalize stress reactions and build psychological resilience.

To systematize SWS across the organization, ATC units may consider implementing peer-support programs, shift overlap periods, recognition platforms, and supervisor coaching. Peer-support programs can involve training selected ATCOs as peer support-

ers or “stress first-aiders” who can identify early signs of burnout and offer confidential, non-clinical support. A shift overlap period means having a brief window of overlap between shifts to facilitate face-to-face handovers and encourage informal peer interactions. Recognition platforms may be established to formally acknowledge ATCOs who demonstrate outstanding teamwork, provide instrumental support during critical operations, or offer meaningful emotional support to their peers. Supervisor coaching could be used to train frontline supervisors in supportive communication, conflict management, and stress-sensitive leadership. When these initiatives are consistently applied, they help cultivate a collaborative and resilient social support workforce, reducing stress, improving morale, and enhancing overall performance in the high-stakes ATC environment.

7.2. Limitations and Suggestions for Future Studies

Despite offering valuable contributions to the understanding of job stress and performance among air traffic controllers (ATCs), this study is subject to several limitations that warrant acknowledgment. First, the research is confined to the context of Saudi Arabia, which limits the generalizability of the findings to other national or regional settings. Future studies are encouraged to replicate the proposed model in other Middle Eastern countries (e.g., Egypt, Jordan, Bahrain, the UAE, Kuwait, Oman, and Qatar) to enhance the cross-cultural applicability and generalizability of the results.

Second, data collection occurred between August and September 2021, during a period when Saudi Arabia had restricted international travel and significantly reduced flight operations due to pandemic-related border closures. This prolonged period of low air traffic may have influenced ATCs’ perceptions of job stress and performance. Future studies should consider replicating the research during periods of normal air traffic volume to examine whether similar patterns hold under typical operational conditions.

Third, this study employed a cross-sectional design, which limits its ability to capture dynamic changes over time. Although the proposed relationships were supported in this context, future research should adopt a longitudinal approach to explore temporal variations and validate the hypothesized inverted U-shaped relationships between job stress and performance, as cautioned by [14].

Fourth, the study focused on only two personal resources. Scholars have highlighted the relevance of other positive psychological constructs, such as psychological capital and coping strategies, in buffering job demands. Future studies should explore these additional resources to better understand their role in the ATC environment. Fifth, the sample in this study is predominantly male (94.8%), which may limit the generalizability of the findings across gender groups. While this gender imbalance reflects the current demographic composition of the ATC workforce, future research is encouraged to incorporate more gender-diverse samples, where possible, to allow for broader applicability and deeper insight into potential gender-related differences.

Sixth, one of the limitations is the lack of Common Method Bias (CMB) assessment, which could be a potential concern due to the dependence on self-reported data gathered from one source. Even though common method variance (CMV) was tested using Harman’s single-factor test and procedural remedies, such as ensuring respondent anonymity and randomizing item order to mitigate bias, it is acknowledged that such tools may not fully eliminate CMB. It is recommended that future research include multi-source data or temporal separation to reduce potential method bias.

Finally, this study did not account for potential confounding variables, such as daily workload and shift schedules. Given the complex and high-stakes nature of ATC work, future research should explicitly measure and control for these factors to more accurately assess their influence on mindfulness, job stress, and performance outcomes.

Author Contributions: Conceptualization, B.A. and S.-I.N.; methodology, B.A.; software, B.A. and X.-J.L.; validation, B.A. and S.-I.N.; formal analysis, B.A. and X.-J.L.; investigation, S.-I.N.; resources, S.-I.N.; data curation, B.A.; writing—original draft preparation, B.A.; writing—review and editing, S.-I.N.; visualization, B.A.; supervision, S.-I.N.; project administration, S.-I.N.; funding acquisition, None. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Acknowledgments: The authors thanks Prince Sultan University for their support.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Ruskin, K.; Corvin, C.; Rice, S.; Richards, G.; Winter, S.; Clebone, A. Alarms, alerts, and warnings in air traffic control: An analysis of reports from the Aviation Safety Reporting System. *Transp. Res. Interdiscip. Perspect.* **2021**, *12*, 100502. [CrossRef]
2. Chen, M.L.; Lu, S.Y.; Mao, I.F. Subjective symptoms and physiological measures of fatigue in air traffic controllers. *Int. J. Ind. Ergon.* **2019**, *70*, 1–8. [CrossRef]
3. Chang, Y.H.; Yang, H.H.; Hsiao, Y.J. Human risk factors associated with pilots in runway excursions. *Accid. Anal. Prev.* **2016**, *94*, 227–237. [CrossRef]
4. Öge, E.; Çetin, M.; Top, S. The effects of paternalistic leadership on workplace loneliness, work family conflict and work engagement among air traffic controllers in Turkey. *J. Air Transp. Manag.* **2018**, *66*, 25–35. [CrossRef]
5. Alaydi, B.; Siew-Imm, N.G.; Mahomed, A.; Cheah, J.H. The Effects of Personal Resources in the Job Demands and Resources Model: A Systematic Literature Review. *Stud. Appl. Econ.* **2022**, *40*. Available online: <https://ojs.ual.es/ojs/index.php/eea/article/view/6624> (accessed on 20 March 2020). [CrossRef]
6. Clarkson, M.; Heads, G.; Hodgson, D.; Probst, H. Does the intervention of mindfulness reduce levels of burnout and compassion fatigue and increase resilience in pre-registration students? A pilot study. *Radiography* **2019**, *25*, 4–9. [CrossRef]
7. Yousoff, R.; Khan, A.; Rasheed, M.; Aamir, A. Effects of Social Support on Faculty Workload and Performance. *Rev. Eur. Stud.* **2014**, *6*, 95–103. [CrossRef]
8. Buruck, G.; Dörfel, D.; Kugler, J.; Brom, S.S. Enhancing well-being at work: The role of emotion regulation skills as personal resources. *J. Occup. Health Psychol.* **2016**, *21*, 480–493. [CrossRef]
9. Demerouti, E.; Nachreiner, F.; Bakker, A.B.; Schaufeli, W.B. The job demands-resources model of burnout. *J. Appl. Psychol.* **2001**, *86*, 499–512. [CrossRef]
10. Russeng, S.S.; Saleh, L.M.; Mallongi, A.; Hoy, C. The relationship among working period, work shift, and workload to work fatigue in air traffic controllers at Sultan Hasanuddin Airport. *Gac. Sanit.* **2021**, *35*, S404–S407. [CrossRef] [PubMed]
11. Saleh, L.M.; Russeng, S.S.; Tadjuddin, I.; Yanti, I.H.; Syafitri, N.M.; Yusbud, M.; Rahmadani, Y. The development of a work stress model for Air Traffic Controllers in Indonesia. *Kesmas J. Kesehat. Masy. Nas. (Natl. Public Health J.)* **2022**, *17*, 40–47. [CrossRef]
12. Guleria, Y.; Pham, D.T.; Alam, S.; Tran, P.N.; Durand, N. Towards conformal automation in air traffic control: Learning conflict resolution strategies through behavior cloning. *Adv. Eng. Inform.* **2024**, *59*, 102273. [CrossRef]
13. Schaufeli, W.B.; Taris, T.W. *A Critical Review of the Job Demands-Resources Model: Implications for Improving Work and Health*; Springer: Berlin/Heidelberg, Germany, 2014. [CrossRef]
14. Britton, W. Can Mindfulness Be Too Much of a Good Thing? The Value of a Middle Way. *Curr. Opin. Psychol.* **2019**, *28*, 159–165. [CrossRef]
15. Morgeson, F.P.; Humphrey, S.E. The Work Design Questionnaire (WDQ): Developing and validating a comprehensive measure for assessing job design and the nature of work. *J. Appl. Psychol.* **2006**, *91*, 1321–1339. [CrossRef] [PubMed]
16. Motowilo, S.J.; Borman, W.C.; Schmit, M.J. A theory of individual differences in task and contextual performance. *Hum. Perform.* **1997**, *10*, 71–83. [CrossRef]
17. Schopf, A.K.; Stouten, J.; Schaufeli, W.B. The role of leadership in air traffic safety employees' safety behavior. *Saf. Sci.* **2021**, *135*, 105118. [CrossRef]
18. Akca, M. The Impact of Working Conditions on Contextual Performance of Air Traffic Controllers. *Res. J. Politics Econ. Manag.* **2017**, *5*, 10–19.
19. Bakker, A.B.; Demerouti, E. Job Demands-Resources Theory. In *Work and Wellbeing*; Wiley: Hoboken, NJ, USA, 2014; Volume III, pp. 1–28. [CrossRef]
20. Loura, J.; Yadav, A.; Duhan, M. Job stress in air traffic controllers—A review. *Int. J. Mang. Soc. Sci. Res.* **2013**, *2*, 53–56.
21. Jamal, M. Job stress, job performance and organizational commitment in a multinational company: An empirical study in two countries. *Int. J. Bus. Soc. Sci.* **2011**, *2*, 20–29.

22. AbuAlRub, R.F. The Relationship Between Job Stress, Job Performance and Social Support Among Hospital Nurses. Ph.D. Thesis, The University of Iowa, Iowa City, IA, USA, 2003.
23. McGrath, J.E. Stress and behavior in organizations. In *Handbook of Industrial and Organizational Psychology*; Dunnette, M.D., Ed.; Rand McNally: Chicago, IL, USA, 1976.
24. Hilton, M.F.; Scuffham, P.A.; Sheridan, J.; Cleary, C.M.; Vecchio, N.; Whiteford, H.A. The association between mental disorders and productivity in treated and untreated employees. *J. Occup. Environ. Med.* **2009**, *51*, 996–1003. [\[CrossRef\]](#)
25. Hedayati, S.; Sadeghi-Firoozabadi, V.; Bagheri, M.; Heidari, M.; Sze, N.N. Evaluating differences in cognitive functions and personality traits among air traffic controllers with and without error history. *Saf. Sci.* **2021**, *139*, 105208. [\[CrossRef\]](#)
26. Zhang, J.; Wu, C. The influence of dispositional mindfulness on safety behaviors: A dual process perspective. *Accid. Anal. Prev.* **2014**, *70*, 24–32. [\[CrossRef\]](#)
27. Guo, M.; Liu, S.; Chu, F.; Ye, L.; Zhang, Q. Supervisory and coworker support for safety: Buffers between job insecurity and safety performance of high-speed railway drivers in China. *Saf. Sci.* **2019**, *117*, 290–298. [\[CrossRef\]](#)
28. Sampson, J.M.; DeArmond, S.; Chen, P.Y. Role of safety stressors and social support on safety performance. *Saf. Sci.* **2014**, *64*, 137–145. [\[CrossRef\]](#)
29. Vijayan, M. Impact of Job Stress on Employees' Job Performance in Aavin, Coimbatore. *J. Organ. Hum. Behav.* **2018**, *6*, 21–29.
30. Fang, S.-C.; Chen, H.-L. Job stressors and job performance: Modeling of moderating mediation effects of stress mindset. *Pressacademia* **2019**, *6*, 35–45. [\[CrossRef\]](#)
31. Jou, R.-C.; Kuo, C.-W.; Tang, M.-L. A study of job stress and turnover tendency among air traffic controllers: The mediating effects of job satisfaction. *Transp. Res. Part E Logist. Transp. Rev.* **2013**, *57*, 95–104. [\[CrossRef\]](#)
32. Hargrove, B.; Hargrove, D.; Becker, W.S. Managing stress: Human resource management interventions for distress and eustress. *J. Hum. Resour. Sustain. Stud.* **2016**, *4*, 187–215.
33. Bowen, L.; Budden, S.; Smith, A. Factors underpinning unsafe driving: A systematic literature review of car drivers. *Transp. Res. Part Traffic Psychol. Behav.* **2020**, *72*, 184–210. [\[CrossRef\]](#)
34. Hatton, N.; Smith, D. Reflection in teacher education: Towards definition and implementation. *Teach. Teach. Educ.* **1995**, *11*, 33–49. [\[CrossRef\]](#)
35. Dwiديyanti, M.; Fahmi, A.Y.; Ningsih, H.E.W.; Wiguna, R.I.; Munif, B. *Seni Mindfulness Spiritual Islam [The Arts of Islamic Spiritual Mindfulness]*, 1st ed.; UNDIP Press: Semarang, Indonesia, 2019.
36. George, B. Developing Mindful Leaders for the C-Suite. Harvard Business Review. 2014. Available online: <https://hbr.org/2014/03/developing-mindful-leaders-for-the-c-suite/> (accessed on 20 March 2020).
37. Clarkson, L.; Blewett, V.; Rainbird, S.; Paterson, J.L.; Etherton, H. Young, vulnerable and uncertain: Young workers' perceptions of work health and safety. *Work* **2018**, *61*, 113–123. [\[CrossRef\]](#)
38. Cardaciotto, L.; Herbert, J.D.; Forman, E.M.; Moitra, E.; Farrow, V. The assessment of present-moment awareness and acceptance: The Philadelphia Mindfulness Scale. *Assessment* **2008**, *15*, 204–223. [\[CrossRef\]](#)
39. Hölzel, B.K.; Lazar, S.W.; Gard, T.; Schuman-Olivier, Z.; Vago, D.R.; Ott, U. How does mindfulness meditation work? Proposing mechanisms of action from a conceptual and neural perspective. *Perspect. Psychol. Sci.* **2011**, *6*, 537–559. [\[CrossRef\]](#)
40. Ngo, L.; Nguyen, N.; Lee, J.J.; Andonopoulos, V. Mindfulness and Job Performance: Does Creativity Matter? *Australas. Mark. J. AMJ* **2020**, *28*, 117–123. [\[CrossRef\]](#)
41. Kang, Y.S.; Choi, S.; Ryu, E. The effectiveness of a stress coping program based on mindfulness meditation on the stress, anxiety, and depression experienced by nursing students in Korea. *Nurse Educ. Today* **2009**, *29*, 538–543. [\[CrossRef\]](#)
42. Hermosilla, D.G.; de la Flor, A.R.; Asuero, A.M. Clear to Calm: A Pilot Study on The Effectiveness of a Mindfulness-Based Stress Reduction Program in ATM. *HindSight* **2020**, *30*, 1–3.
43. Qu, W.; Zhang, H.; Zhao, W.; Zhang, K.; Ge, Y. The effect of cognitive errors, mindfulness and personality traits on pedestrian behavior in a Chinese sample. *Transp. Res. Part F Traffic Psychol. Behav.* **2016**, *41*, 29–37. [\[CrossRef\]](#)
44. Moore, M.M.; Brown, P.M. The association of self-regulation, habit, and mindfulness with texting while driving. *Accid. Anal. Prev.* **2019**, *123*, 20–28. [\[CrossRef\]](#)
45. Schultz, P.P.; Ryan, R.M.; Niemiec, C.P.; Legate, N.; Williams, G.C. Mindfulness, work climate, and psychological need satisfaction in employee well-being. *Mindfulness* **2015**, *6*, 971–985. [\[CrossRef\]](#)
46. Charoensukmongkol, P. The contributions of mindfulness meditation on burnout, coping strategy, and job satisfaction: Evidence from Thailand. *J. Manag. Organ.* **2013**, *19*, 544–558. [\[CrossRef\]](#)
47. Walsh, M.; Arnold, K. The bright and dark sides of employee mindfulness: Leadership style and employee well-being. *Stress Health* **2020**, *36*, 287–298. [\[CrossRef\]](#)
48. Lyddy, C.J.; Good, D.J.; Bolino, M.C.; Thompson, P.S.; Stephens, J.P. The costs of mindfulness at work: The moderating role of mindfulness in surface acting, self-control depletion, and performance outcomes. *J. Appl. Psychol.* **2021**, *106*, 1921. [\[CrossRef\]](#)

49. Sahdra, B.K.; Ciarrochi, J.; Parker, P.D.; Basarkod, G.; Bradshaw, E.L.; Baer, R. Are People Mindful in Different Ways? Disentangling the Quantity and Quality of Mindfulness in Latent Profiles and Exploring Their Links to Mental Health and Life Effectiveness. *Eur. J. Personal.* **2017**, *31*, 347–365. [\[CrossRef\]](#)
50. O'Driscoll, M.; Sahm, L.; Byrne, H.; Lambert, S.; Byrne, S. Impact of a mindfulness-based intervention on undergraduate pharmacy students' stress and distress: Quantitative results of a mixed-methods study. *Curr. Pharm. Teach. Learn.* **2019**, *11*, 876–887. [\[CrossRef\]](#) [\[PubMed\]](#)
51. Shanock, L.R.; Eisenberger, R. When Supervisors Feel Supported: Relationships with Subordinates' Perceived Supervisor Support, Perceived Organizational Support, and Performance. *J. Appl. Psychol.* **2006**, *91*, 689–695. [\[CrossRef\]](#) [\[PubMed\]](#)
52. Nasurdin, A.M.; Ling, T.C.; Khan, S.N. Linking social support, work engagement and job performance in nursing. *Int. J. Bus. Soc.* **2018**, *19*, 363–386.
53. Fong, L.H.N.; Chui, P.M.W.; Cheong, I.S.C.; Fong, D.K.C. Moderating effects of social support on job stress and turnover intentions turnover intentions. *J. Hosp. Mark. Manag.* **2018**, *27*, 795–810. [\[CrossRef\]](#)
54. Naqvi, R.; Mark, J.A.; Shabbir, B.; Smm, R.N. Impact of Workload and Job Complexity on Employee Job Performance with the Moderating Role of Social Support and Mediating Role of Job Stress: A Study of Travel agencies in Rawalpindi, Islamabad and AJK. *J. Account. Mark.* **2017**, *6*, 1–7. [\[CrossRef\]](#)
55. Jolly, P.M.; Kong, D.T.; Kim, K.Y. Social support at work: An integrative review. *J. Organ. Behav.* **2021**, *42*, 229–251. [\[CrossRef\]](#)
56. Hagihara, A.; Babazono, A.; Nobutomo, K.; Morimoto, K. Work versus non-work predictors of job satisfaction among Japanese white-collar workers. *J. Occup. Health* **1998**, *40*, 285–292. [\[CrossRef\]](#)
57. Yang, C.L.; Carayon, P. Effect of job demands and social support on worker stress: A study of VDT users. *Behav. Inf. Technol.* **1995**, *14*, 32–40. [\[CrossRef\]](#)
58. Ducharme, L.J.; Martin, J.K. Unrewarding work, coworker support, and job satisfaction: A test of the buffering hypothesis. *Work Occup.* **2000**, *27*, 223–243. [\[CrossRef\]](#)
59. Duffy, M.K.; Ganster, D.C.; Pagon, M. Social undermining in the workplace. *Acad. Manag. J.* **2002**, *45*, 331–351. [\[CrossRef\]](#)
60. Viswesvaran, C.; Sanchez, J.I.; Fisher, J. The Role of Social Support in the Process of Work Stress: A Meta-Analysis. *J. Vocat. Behav.* **1999**, *54*, 314–334. [\[CrossRef\]](#)
61. Cohen, S. Social Relationships and Health. *Am. Psychol.* **2004**, *59*, 676–684. [\[CrossRef\]](#) [\[PubMed\]](#)
62. Janssen, E.; Van Strydonck, I.; Decuyper, A.; Decramer, A.; Audenaert, M. How to foster nurses' well-being and performance in the face of work pressure? The role of mindfulness as personal resource. *J. Adv. Nurs.* **2020**, *76*, 3495–3505. [\[CrossRef\]](#)
63. Grover, S.L.; Teo, S.T.T.; Pick, D.; Roche, M. Mindfulness as a personal resource to reduce work stress in the job demands-resources model. *Stress Health* **2016**, *33*, 426–436. [\[CrossRef\]](#)
64. Guidetti, G.; Viotti, S.; Badagliacca, R.; Colombo, L.; Converso, D. Can mindfulness mitigate the energy-depleting process and increase job resources to prevent burnout? A study on the mindfulness trait in the school context. *PLoS ONE* **2019**, *14*, e0214935. [\[CrossRef\]](#)
65. Tisu, L.; Lupsa, D.; Virga, D.; Rusu, A. Personality characteristics, job performance and mental health the mediating role of work engagement. *Personal. Individ. Differ.* **2019**, *153*, 109644. [\[CrossRef\]](#)
66. Gharib, M.; Jamil, S.A.; Ahmad, M.; Ghouse, S. The impact of job stress on job performance a case study on academic staff at Dhofar University. *Int. J. Econ. Res.* **2016**, *13*, 21–33.
67. Chung, E.K.; Jung, Y.; Sohn, Y.W. A moderated mediation model of job stress, job satisfaction, and turnover intention for airport security screeners. *Saf. Sci.* **2017**, *98*, 89–97. [\[CrossRef\]](#)
68. Al-homayan, A.M.; Shamsudin, F.M.; Subramaniam, C.; Islam, R. Relationship among Job Demand-Resources, Job Stress, Organizational Support and Nurses' Job Performance. *Aust. J. Basic Appl. Sci.* **2013**, *7*, 294–308.
69. Arshad, M.Z.; Shahidan, A.N.; Ibrahim Siam, I.M.; Alshuaibi, A.S. Effect of Role Conflict and Work Overload on Job Stress: A Case of Banking Sector Employees. *Talent. Dev. Excell.* **2020**, *12*, 2686–2696.
70. Thompson, N.; Stradling, S.; Murphy, M.; O'Neill, P. Stress and organisational culture. *Br. J. Soc. Work.* **1996**, *26*, 647–667. [\[CrossRef\]](#)
71. Pant, R.; Taukari, A.; Sharma, K. Cognitive Workload of Air Traffic Controllers in Area Control Center of Mumbai Enroute Airspace. *J. Psychosoc. Res.* **2012**, *7*, 279–284.
72. Collins, S. Statutory social workers: Stress, job satisfaction, coping, social support and individual differences. *Br. J. Soc. Work* **2008**, *38*, 1173–1193. [\[CrossRef\]](#)
73. Koopmans, L.; Bernaards, C.M.; Hildebrandt, V.H.; Schaufeli, W.B.; de Vet Henrica, C.W.; van der Beek, A.J. Conceptual Frameworks of Individual Work Performance. *J. Occup. Environ. Med.* **2011**, *53*, 856–866. [\[CrossRef\]](#)
74. Motowidlo, S.J.; Packard, J.S.; Manning, M.R. Occupational Stress. Its Causes and Consequences for Job Performance. *J. Appl. Psychol.* **1986**, *71*, 618–629. [\[CrossRef\]](#)
75. Zeng, X.; Li, M.; Zhang, B.; Liu, X. Revision of the Philadelphia Mindfulness Scale for Measuring Awareness and Equanimity in Goenka's Vipassana Meditation with Chinese Buddhists. *J. Relig. Health* **2014**, *54*, 623–637. [\[CrossRef\]](#)

76. Pallant, J. *SPSS Survival Manual*; McGraw-Hill Education: London, UK, 2013.
77. Podsakoff, P.M.; MacKenzie, S.B.; Lee, J.Y.; Podsakoff, N.P. Common method biases in behavioural research: A critical review of the literature and recommended remedies. *J. Appl. Psychol.* **2003**, *88*, 879. [\[CrossRef\]](#)
78. Podsakoff, P.M.; Organ, D.W. Self-reports in organizational research: Problems and prospects. *J. Manag.* **1986**, *12*, 531–544. [\[CrossRef\]](#)
79. Hair, J.F.; Risher, J.J.; Sarstedt, M.; Ringle, C.M. When to Use and How to Report the Results of PLS-SEM. *Eur. Bus. Rev.* **2019**, *31*, 2–24. [\[CrossRef\]](#)
80. Nunnally, J.C.; Bernstein, I.H. *Psychometric Theory*, 3rd ed.; McGraw-Hill, Inc.: New York, NY, USA, 1994.
81. Jöreskog, K. Statistical Analysis of Sets of Congeneric Tests. *Psychometrika* **1971**, *36*, 109–133. [\[CrossRef\]](#)
82. Hulland, J. Use of partial least squares (PLS) in strategic management research: A review of four recent studies. *Strateg. Manag. J.* **1999**, *20*, 195–204. [\[CrossRef\]](#)
83. Gold, A.; Malhotra, A.; Segars, A. Knowledge Management: An Organizational Capabilities Perspective. *J. Manag. Inf. Syst.* **2001**, *18*, 185–214. [\[CrossRef\]](#)
84. Sarstedt, M.; Ringle, C.M.; Cheah, J.-H.; Ting, H.; Moisescu, O.I.; Radomir, L. Structural model robustness checks in PLS-SEM. *Tour. Econ.* **2019**, *26*, 531–554. [\[CrossRef\]](#)
85. George, D.; Mallery, P. *SPSS for Windows Step by Step: A Simple Guide and Reference, 11.0 Update*, 4th ed.; Allyn & Bacon: Boston, MA, USA, 2003.
86. Chin, W.W.; Newsted, P.R. Structural equation modeling analysis with small samples using partial least squares. *Stat. Strateg. Small Sample Res.* **1999**, *1*, 307–341.
87. Geisser, S. The predictive sample reuse method with applications. *J. Am. Stat. Assoc.* **1975**, *70*, 320–328. [\[CrossRef\]](#)
88. Stone, M. Cross-validatory choice and assessment of statistical predictions. *J. R. Stat. Soc. Ser. B Methodol.* **1974**, *36*, 111–147. [\[CrossRef\]](#)
89. Preacher, K.J.; Hayes, A.F. Asymptotic and Resampling Strategies for Assessing and Comparing Indirect Effects in Multiple Mediator Models. *Behav. Res. Methods* **2008**, *40*, 879–891. [\[CrossRef\]](#) [\[PubMed\]](#)
90. Chin, W.W.; Marcolin, B.L.; Newsted, P.R. A Partial Least Squares Latent Variable Modeling Approach for Measuring Interaction Effects: Results from a Monte Carlo Simulation Study and an Electronic-Mail Emotion / Adoption Study. *Inf. Syst. Res.* **2003**, *14*, 189–217. [\[CrossRef\]](#)
91. Streukens, S.; Leroi-Werelds, S. Bootstrapping and PLS-SEM: A step-by-step guide to get more out of your bootstrap results. *Eur. Manag. J.* **2016**, *34*, 618–632. [\[CrossRef\]](#)
92. Dawson, J. Moderation in Management Research: What, Why, When, and How. *J. Bus. Psychol.* **2014**, *29*, 1–19. [\[CrossRef\]](#)
93. Kim, E.A. The Effect of Teacher Mindfulness on Job Stress and Burnout. *Stress* **2018**, *26*, 208–214. [\[CrossRef\]](#)
94. Czuly, C.; Poujol, F. The effects of mindfulness on job stress, job satisfaction, and intention to leave the company of salespeople. In Proceedings of the 50th European Marketing Academy (93576), Madrid, Spain, 25–28 May 2021.
95. Andersson, M.; Engervall, M. The Relationship Between Mindfulness and Work-Related Stress. Bachelor's Thesis, Kristianstad University, Kristianstad, Sweden, 2017.
96. Goileant, C.; Gracia, F.; Tomás, I.; Subirats, M. Mindfulness at work and in organizations. *Psychol. Pap.* **2020**, *41*, 139–146. [\[CrossRef\]](#)
97. Dodanwala, T.; Santoso, D. The mediating role of job stress on the relationship between job satisfaction facets and turnover intention of the construction professionals. *Eng. Constr. Archit. Manag.* **2022**, *29*, 1777–1796. [\[CrossRef\]](#)
98. International Civil Aviation Organization. ICAO Reports. Available online: <https://www.icao.int/Newsroom/NewsDoc2021fix/COM.02.21.EN.pdf> (accessed on 15 January 2021).
99. Bakker, A.B.; Demerouti, E. Towards a model of work engagement. *Career Dev. Int.* **2008**, *13*, 209–223. [\[CrossRef\]](#)
100. Nahapiet, J.; Ghoshal, S. Social capital, intellectual capital, and the organizational advantage. *Acad. Manag. Rev.* **1998**, *23*, 242–266. [\[CrossRef\]](#)
101. Kim, H.; Stoner, M. Burnout and Turnover Intention Among Social Workers: Effects of Role Stress, Job Autonomy and Social Support. *Adm. Soc. Work* **2008**, *32*, 5–25. [\[CrossRef\]](#)
102. Hagihara, A.; Tarumi, K.; Miller, A.S.; Morimoto, K. Type A and type B behaviors, work stressors and social support at work. *Prev. Med.* **1997**, *26*, 486–494. [\[CrossRef\]](#)

103. Spence Laschinger, H.K.; Grau, A.L.; Finegan, J.; Wilk, P. Predictors of new graduate nurses' workplace well-being: Testing the job demands-resources model. *Health Care Manag. Rev.* **2012**, *37*, 175–186. [[CrossRef](#)] [[PubMed](#)]
104. Angelo, R.; Chambel, M. The role of proactive coping in the Job Demands–Resources Model: A cross-section study with firefighters. *Eur. J. Work. Organ. Psychol.* **2012**, *23*, 203–216. [[CrossRef](#)]

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.