



## OPEN The role of resilience as a key player in mitigating job burnout's impact on workplace safety

Roozbeh Azimi<sup>1</sup>, Saleh Al Sulaie<sup>2</sup>, Saeid Yazdanirad<sup>3</sup>, Amir Hossein Khoshakhlagh<sup>4</sup>✉, Jee Woong Park<sup>5</sup> & Fatemeh Kazemian<sup>6</sup>

It is probable that resilience can play a significant role in mitigating the impact of job burnout on workplace safety outcomes. Identification of these relations and paths can be useful for reducing burnout effects and reinforcing safety behavior factors. This study seeks to explore the relationship between job burnout and unsafe behavior, with a specific focus on the mediating role of resilience. This cross-sectional study, conducted in 2023, involved 200 workers in the spinning and weaving industries in central Iran. The study used printed questionnaires distributed to study participants during their rest periods to collect data for further analysis. The questionnaires included demographic information, the Maslach burnout inventory, the Connor–Davidson Resilience Scale, and a set of safety behavior questionnaires. Subsequently, the study analyzed various dimensions of job burnout with respect to unsafety behavior by constructing a theoretical model using AMOS software. The results indicate that three burnout dimensions indirectly influence safety compliance through resilience ( $P < 0.001$ ). Specifically, depersonalization and personal accomplishment directly and indirectly affect safety participation through resilience and safety compliance ( $P < 0.001$ ). Resilience had the highest direct and total effect coefficients on safety compliance (0.692 and 0.692), while emotional exhaustion exhibited the highest indirect coefficients (–0.505). Regarding safety participation, the highest direct coefficient was associated with personal accomplishment (0.406), and the greatest indirect and total coefficients with depersonalization (–0.370 and –0.588). By recognizing the differential impacts of various burnout dimensions, tailored interventions can be developed to address specific facets of burnout, thus optimizing safety initiatives. Moreover, the pivotal role of resilience unveils a promising avenue for mitigating the adverse effects of burnout on unsafe behaviors.

**Keywords** Job burnout, Unsafe behavior, Resilience, Safety participation, Safety compliance

Occupational accidents result in significant damages such as damage including property and capital loss, reduced productivity, production delays, decreased quality, and potential harm to human resources. Every year, 270 million occupational accidents occur in the world, where approximately 2,200,000 workers die, and more than 420 million work-related absences and illnesses occur, of which the share of developing countries is 3–4 times more than that of developed countries. Apart from these cases, it is also estimated from the financial point of view that occupational accidents in 2006 caused an amount equivalent to 1.25 trillion dollars, which is equivalent to 4% of the gross world production<sup>1,2</sup>.

Preventative measures are necessary to minimize as well as more effectively manage and control accidents due to their considerable impacts on our lives<sup>3,4</sup>. For this purpose, it is necessary to introduce the factors that cause accidents in the first step. Accidents stem from various factors such as human, machine, environment, and management systems, individually and collectively. In workplaces, human factors play a crucial role in accident management regardless of technological advancements deployed as safety management systems. Individual skills

<sup>1</sup>Department of Occupational Health, School of Health, Tehran University of Medical Sciences, Tehran, Iran. <sup>2</sup>Department of Mechanical and Industrial Engineering, College of Engineering and Computers in Al-Qunfudah, Umm Al-Qura University, 21955 Makkah, Saudi Arabia. <sup>3</sup>Social Determinants of Health Research Center, Shahrekord University of Medical Sciences, Shahrekord, Iran. <sup>4</sup>Department of Occupational Health, School of Health, Kashan University of Medical Sciences, Kashan, Iran. <sup>5</sup>Department of Civil and Environmental Engineering and Construction, University of Nevada Las Vegas, Las Vegas, USA. <sup>6</sup>Student Research Committee, Kashan University of Medical Sciences, Kashan, Iran. ✉email: ah.khoshakhlagh@gmail.com

and performance become increasingly vital in accident prevention and management<sup>3–5</sup>. Supporting the same, research also indicated that 80–90 percent of such accidents result from unsafe behaviors<sup>5,6</sup>.

Safety behaviors include two branches of safety compliance and safety participation, which are considered as components of safety performance. Taking care of safety includes all activities that people should do to maintain and improve their safety and personal health. These behaviors include following standard work instructions and using personal protective equipment and other similar things. Safety participation includes behaviors that do not directly play a role in ensuring the safety of people, but they help create conditions that improve the level of safety and health in the organization and facilitate the achievement of the goals and plans for the organization's safety and health. These behaviors include things such as participating in voluntary safety activities, helping colleagues in safety matters, and participating in safety meetings<sup>7–10</sup>. Recent research highlights the significant role of unsafe behaviors in occupational accidents compared to unsafe working conditions<sup>5,11</sup>.

Identifying factors affecting safety behaviors can be helpful to prevent accidents. Among various factors, one of the important factors in the workplace is job burnout. Burnout refers to a syndrome characterized by fatigue and withdrawal. This has psychological and physical symptoms such as decreased energy, chronic fatigue, susceptibility to illnesses, headaches, muscle pains, various physical complaints, sleep disorders, and emotional manifestations, which further include helplessness, anger, and negative attitudes towards oneself, job, life, and colleagues. These negative phenomena tend to decrease feelings of worthiness and successful performance and ultimately behaviors of withdrawing from work such as absenteeism and running away from work<sup>12,13</sup>. Three main dimensions of burnout include emotional exhaustion, depersonalization, and reduced personal accomplishment. In addition, it is estimated that 54% of the 555 million working days that are lost annually in the world are related to psychological factors including burnout in their main branch<sup>14</sup>. Job burnout may reduce the level of job safety<sup>15,16</sup>. Several studies revealed that different dimensions of burnout can affect safety behavior in workplaces. Consistent findings indicate that burnout impacts safety performance and behavior based on experiments with firefighters<sup>7</sup> and employees<sup>17</sup>. The results of a study performed by Yang et al. showed that burnout dimensions have significant effects on the relationships between safety compliance and safety participation with safety outcomes<sup>18</sup>. Baier et al. concluded that there is an association between the degree of burnout and patient safety for workers of emergency medical services<sup>19</sup>. However, the effect of each of the burnout dimensions on the two main branches of unsafe behavior, including safety compliance and safety participation is yet unclear. In other words, it has not been determined which burnout dimensions have the greatest effect on safety compliance or safety participation.

On the other hand, the effect of burnout dimensions on these factors of safety behaviors may be not direct and is mediated by another factor. It is predicted that resilience plays this role. The results of the previous studies showed that there are significant relationships between resilience with burnout dimensions and safety performance in workplaces. Resilience engineering attempts to enhance organizational capacity across all levels to create robust and adaptable processes for monitoring, adjusting risk models, and efficiently utilizing resources when confronted with unwanted/adverse conditions or events<sup>20</sup>. Meng et al. demonstrated a significant correlation between resilience, organizational commitment, and burnout<sup>21</sup>. The results of a study performed by Yusefi et al. indicated a significant inverse correlation between job burnout and resilience<sup>22</sup>. Guo et al. observed that there is a negative association between burnout and resilience among nurses<sup>23</sup>. Li et al. highlighted the positive influence of resilience on safety attitudes and behaviors among miners<sup>24</sup>. Ni et al. also observed that a resilient safety culture can effectively mitigate unsafe behavior among NGCWs through job crafting and perceived work meaningfulness<sup>25</sup>.

According to the theoretical framework in the present study, each of the burnout dimensions may directly or indirectly through resilience affect the safety compliance or safety participation factors. In other words, resilience may act as a mediator in mitigating the impact of job burnout on safe behavior. However, it is unclear whether resilience mediates the effect of burnout dimensions on safety compliance and safety participation. Also, the effect size of each path has not been determined. Identification of these relations and paths can be useful for reducing burnout effects and reinforcing safety behavior factors.

The mentioned relationships have not been thoroughly explored in previous studies. Unfortunately yet, the specific effects of different dimensions of burnout and their paths with the strongest influence remain unknown. In addressing these challenges, the current study aims to investigate the relationship between job burnout dimensions and unsafe behavior factors, with resilience serving as a mediator. This investigation employs path analysis techniques to extract these dynamics in the year 2024.

## Material and methods

Given the main research question on the relationships between job burnout dimensions and unsafe behavior factors associated with the mediator role of resilience, a methodology was designed. For this purpose, data was collected by questionnaires and then, a theoretical model was developed, and path analysis was performed to examine the roles and effects of the studied variables.

This cross-sectional study was conducted in 2023, involving 200 workers from the spinning and weaving industries located within the central region of Iran. Prior to conducting the study, ethical approval for the study was obtained from the research ethics committee of Kashan University of Medical Sciences (IR.KAUMS.MEDNT.REC.1402.155). Participating workers answered the survey questionnaire, which was analyzed by various analytical techniques.

## Participants

The 200 participants were selected from 30 spinning and weaving factories in Kashan, Iran through random sampling. The sample size was computed by Cochran's formula (Eq. 1). Inclusion criteria included an age range

between 18 and 60 years and a minimum career length of one year. Another important condition requires that the participating individuals must not have any psychiatric disorders. Conversely, exclusion criteria were established to exclude individuals unwilling to participate in the study, as well as those who submitted incomplete survey responses.

$$n = \frac{\frac{z^2 pq}{d^2}}{1 + \frac{1}{N} \left[ \frac{z^2 pq}{d^2} - 1 \right]} \quad (1)$$

where  $N$  is the population size,  $p$  is the estimated proportion of the population that has the attribute in question,  $q$  is  $1-p$ , and  $d$  is the margin of error. In this study, the values of  $N$ ,  $p$ ,  $q$ , and  $d$  were equal to 630, 1.96, 0.5, 0.5, and 0.05, respectively. The sample size was computed by 192 individuals.

The selection process began with a comprehensive list of all workers in Kashan city, totaling 630 individuals. From this list, 400 workers were randomly chosen, and their medical records were thoroughly reviewed for further screening. Subsequently, 240 individuals meeting the inclusion criteria were invited to participate in the study. Ultimately, 200 workers completed the questionnaire, resulting in a participation rate of 83.3 percent.

### Data collection

Before commencing data collection, the study provided the participants with the objectives and procedures of the study alongside with research aims and steps. During the data collection, the participants were asked to complete printed questionnaires during their rest periods. All participants were literate, while literacy was not a necessary criterion, with available assistance upon request. The researchers were available to the participants to address any queries and offer assistance if required to ensure the accurate completion of the questionnaires. The questionnaires comprised sections for demographic information, the Maslach burnout inventory, the Connor–Davidson Resilience Scale, and the safe behavior questionnaire.

### Ethical approval

The study was performed in accordance with the Declaration of Helsinki, and the research was approved by the ethics committee of Kashan University of Medical Sciences (IR.KAUMS.MEDNT.REC.1402.155).

### Consent to participate

All participants had provided informed consent to participate in the current study.

### Tools

#### Demographical information questionnaire

The demographic information questionnaire included several inquiries regarding age, work experience, gender, and education level.

#### Maslach Burnout Inventory

The Maslach Burnout Inventory (MBI), developed by Maslach (1981), is a widely used tool for assessing burnout levels. It comprises 22 items designed to measure emotional exhaustion, depersonalization, and personal accomplishment in the context of professional activities. A 7-point Likert scale from 0 to 6 was used to rate each item<sup>26</sup>. This questionnaire was divided into three subscales: emotional exhaustion (9 questions), depersonalization (5 questions), and personal accomplishment (8 questions). The total score for each dimension is computed by the sum of scores for the respective questions. Higher scores on emotional exhaustion and depersonalization indicate greater burnout, whereas higher scores on personal accomplishment signify lower burnout levels.

Maslach et al. reported internal reliability coefficients for the Maslach Burnout Inventory, with values of 0.9 for emotional exhaustion, 0.79 for depersonalization, and 0.71 for personal accomplishment<sup>27</sup>. In Iran, the validity and reliability of this questionnaire were first confirmed by Filian (1371), and its reliability coefficient was estimated at 0.78 using Cronbach's alpha method. Also, Bahnia (1379) calculated the reliability coefficient of this questionnaire between 0.55 and 0.87, while Badri Gregory (1374) found it between 0.75 and 0.84 using Cronbach's alpha method. Therefore, these findings collectively support the questionnaire's validity in measuring occupational burnout levels<sup>28</sup>.

#### The Connor–Davidson resilience scale

The resilience questionnaire, developed by Connor and Davidson (2003), assesses the psychological trait of resilience. The questionnaire contains 25 items categorized into five dimensions: personal competence (8 questions), tolerance of negative affect and the strengthening effects of stress (5 questions), positive acceptance of change (7 questions), sense of control (3 questions), and spiritual influence (2 questions)<sup>29</sup>. Participants respond to each question on a five-point scale ranging from 0 (not true at all) to 4 (true nearly all the time). The total score for each dimension is obtained by summing the scores of the related questions, while the sum of scores across all dimensions provides the total resilience score. A higher total score indicates greater resilience.

For this scale, a reliability coefficient of 0.87 has been reported<sup>29,30</sup>. The reliability of this scale in Iran was assessed by Derakhshanrad et al. in which Cronbach's alpha coefficient was obtained as 0.89<sup>31</sup>.

### Safety behavior questionnaire

Mahdinia et al. have designed and validated a questionnaire to evaluate safety behavior in Iran. This questionnaire consists of 23 items divided into two dimensions: safety compliance (12 questions) and safety participation (11 questions). Respondents rate each item on a five-point scale ranging from 1 (never) to 5 (always). The total score for each dimension is calculated by summing the scores of the relevant questions, with higher scores indicating greater safety behavior.

Mahdinia et al. conducted validation studies on this questionnaire and reported a content validity ratio of 0.910 and a Cronbach's alpha coefficient of 0.902 for the questions, indicating good validity and reliability<sup>32</sup>.

### Theoretical model

Based on the results of the previous studies, the relationship between the studied variables was approximated, and they are used in the development of a theoretical model, as shown in Fig. 1.

### Data analysis

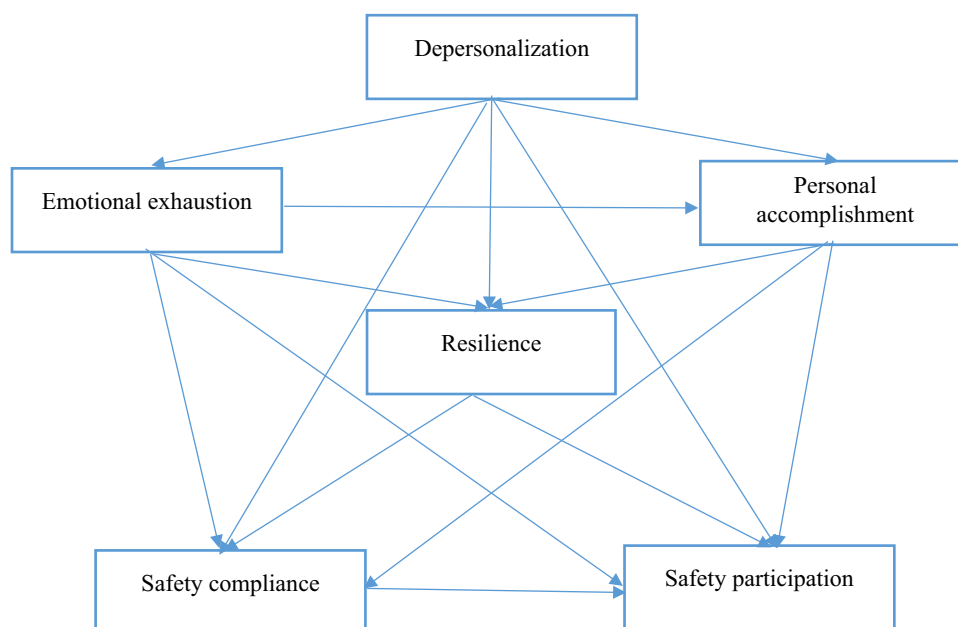
The research leveraged a verified statistical package for the social sciences (SPSS) software version 26 for data analysis. The normality of variables was examined based on skewness and kurtosis curves. As all parameters exhibited non-normal distributions, the correlation coefficients were computed using the Spearman test. The coefficients lower than 0.20, 0.20–0.39, 0.40–0.59, 0.60–0.79, and higher than 0.80 show very weak, weak, moderate, strong, and very strong correlations, respectively<sup>33</sup>. Following this statistical modeling, a theoretical model was constructed in AMOS software, and effect coefficients were then determined. To examine the hypothesized effects, the bootstrap method was used in this software. For this purpose, 5000-sample bootstrapping was used to yield 95% bias-corrected confidence intervals. Absolute, comparative, and normed fit indices were employed to evaluate the model fitness. The significance level was set at 0.05, indicating acceptable test results.

### Results

The data collected from 200 workers present the average and standard deviations of the participants' age and work experience as  $34.40 \pm 10.90$  years and  $9.74 \pm 5.41$  years, respectively. Table 1 presents additional demographic characteristics of the participants. The majority of participants fell within the age range of 30 to 40 years (50.5%), had work experience ranging from 5 to 10 years (35%), identified as male (94.5%), and held a diploma degree (48%).

Table 2 describes the descriptive information of the variables under study. The scores of safety compliance and safety participation exhibit a wide range, spanning from 1 to 60 and from 0 to 52, respectively. The Cronbach's alpha coefficients of the tools used for the measurement of burnout, resilience, and safety behavior were computed by 0.805, 0.963, and 0.878, respectively.

Table 3 describes the correlation matrix of the studied variables. The results reveal significant correlations between burnout dimensions and resilience, safety compliance, and safety participation variables ( $P < 0.01$ ). Among the burnout dimensions, depersonalization had the highest correlation with resilience ( $-0.592$ ). The correlation strengths between emotional exhaustion ( $-0.436$ ), depersonalization ( $-0.592$ ), and personal accomplishment (0.280) with resilience were moderate, moderate, and weak, respectively. Furthermore, the most significant



**Figure 1.** Theoretical model.

Variable		Frequency	Relative frequency (%)
Age (years)	Less than 30 years	70	35.0
	30–40 years	101	50.5
	30–40 years	17	8.5
	More than 50 years	12	6.0
Job experience (years)	Less than 5 years	47	23.5
	5–10 years	70	35.0
	10–15 years	60	30.0
	15–20 years	11	5.5
	More than 20 years	12	6.0
Gender	Male	189	94.5
	Female	11	5.5
Education level	Diploma	96	48.0
	Associate degree	92	46.0
	Bachelor degree	12	6.0
	Master degree	0	0.0

**Table 1.** Demographic characteristics of the participants.

Studied variable		Range	Mean	Std. Deviation
Burnout	Emotional exhaustion	0.00–52.00	24.64	11.74
	Depersonalization	0.00–23.00	10.10	6.14
	Personal accomplishment	0.00–33.00	17.07	8.86
Resilience	Personal competence	0.00–26.00	12.59	6.74
	Tolerance of negative effects and the strengthening effects of stress	0.00–17.00	7.11	4.45
	Positive acceptance of change	0.00–24.00	11.46	5.64
	Sense of control	0.00–11.00	5.14	2.46
	Spiritual influence	0.00–8.00	3.03	2.09
	Total	4.00–86.00	39.51	20.09
Safety	Safety compliance	1.00–60.00	32.48	14.83
	Safety participation	0.00–52.00	24.27	12.63

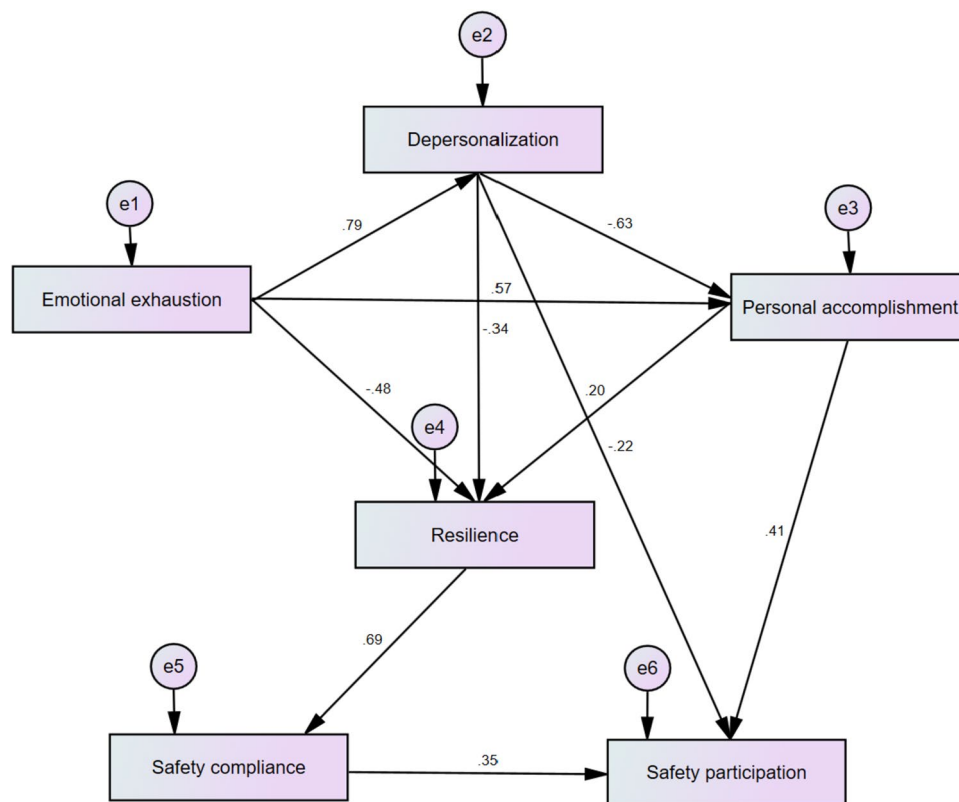
**Table 2.** The descriptive information of the studied variables.

Variable	1	2	3	4	5	6
1 Emotional exhaustion	–	–	–	–	–	–
2 Depersonalization	0.633**	–	–	–	–	–
3 Personal accomplishment	– 0.063	– 0.194**	–	–	–	–
4 Resilience	– 0.436**	– 0.592**	0.280**	–	–	–
5 Safety compliance	– 0.344**	– 0.439**	0.265**	0.669**	–	–
6 Safety participation	– 0.262**	– 0.398**	0.559**	0.473**	0.548**	–

**Table 3.** Correlation matrix of the studied variables. \*\*  $P < 0.01$ . \*  $P < 0.05$ .

correlation coefficients for safety compliance and safety participation were associated with resilience (0.699) and personal accomplishment (0.559), respectively. The correlation strength between emotional exhaustion (– 0.344), depersonalization (– 0.439), personal accomplishment (0.265), and resilience (0.669) with safety compliance obtained weak, moderate, weak, and strong, respectively. While, the correlation strength between emotional exhaustion (– 0.262), depersonalization (– 0.398), personal accomplishment (0.559), and resilience (0.473) with safety participation were weak, weak, moderate, and moderate, respectively.

In addition, the study examines the relationships among the variables through the model depicted in Fig. 2. Arrows denote the direction of the relationship between two variables, and the values on the arrows indicate their direct effect coefficients. Following the formulation of the theoretical model, insignificant relationships between variables were identified and excluded. The final model is presented in Fig. 2.



**Figure 2.** Model designed for examination of the relations between the studied variables.

The results showed that the three dimensions of burnout could both directly and indirectly impact resilience ( $P < 0.001$ ). However, these dimensions could only indirectly influence safety compliance through resilience ( $P < 0.001$ ). Among burnout dimensions, depersonalization, and personal accomplishment were associated with direct effects as well as indirect effects on safety participation ( $P < 0.001$ ). Conversely, emotional exhaustion and resilience could solely influence safety participation indirectly ( $P < 0.001$ ). Safety compliance had a significant, direct effect on safety participation ( $P < 0.001$ ).

Table 4 presents the effect coefficients of the study variables. Additionally, Table 5 displays the direct, indirect, and total effects of these variables in a simple analysis. Based on the results, the studied variables could affect resilience, safety compliance, and safety participation through 7, 8, and 14 paths, respectively.

Regarding resilience, the highest direct, indirect, and total coefficients were associated with emotional exhaustion ( $-0.477$ ,  $-0.583$ , and  $-1.060$ ). For safety compliance, resilience exhibited the highest direct effect coefficient ( $0.692$ ), whereas depersonalization showed the greatest indirect and total coefficients ( $-0.734$  each). Concerning safety participation, the highest direct coefficient was linked to personal accomplishment ( $0.406$ ), while the greatest indirect and total coefficients were assigned to depersonalization ( $-0.388$  and  $-0.605$ ).

Table 6 also reports the direct, indirect, and total effects of the study variables in 5000 bootstrap sampling. In this analysis, for resilience, the greatest direct, indirect, and total coefficients were associated with emotional exhaustion ( $-0.477$ ,  $0.252$ , and  $0.729$ ). Regarding safety compliance, resilience showed the greatest direct and total effect coefficients ( $0.692$  each), whereas emotional exhaustion exhibited the highest indirect coefficients ( $-0.505$ ). For safety participation, the greatest direct coefficient was related to personal accomplishment ( $0.406$ ), while the highest indirect and total coefficients were linked to depersonalization ( $-0.370$  and  $-0.588$ ).

Table 7 represents the goodness-of-fit indices of the model. The results confirm that the model fitness was good.

## Discussion

This study was conducted to examine the roles and pathways of job burnout and resilience. Particularly, their relationship with safety performance / unsafe behavior was investigated. In total, the results showed that emotional exhaustion had the highest effect on resilience and safety compliance among burnout dimensions. While the greatest effect on safety participation was linked to depersonalization and personal accomplishment among these dimensions. Also, the findings indicated that resilience could significantly mediate the effect of three dimensions of burnout on safety compliance and the effect of two dimensions of emotional exhaustion and depersonalization on safety participation.

For a better understanding of these relationships, it is required to describe the dimensions of burnout. Emotional exhaustion refers to feelings of being drained and depleted by the psychological demands of work.

Variable	Coefficient
Depersonalization → emotional exhaustion	0.787
Depersonalization → personal accomplishment	- 0.633
Emotional exhaustion → personal accomplishment	- 0.570
Emotional exhaustion → resilience	- 0.477
Depersonalization → resilience	- 0.339
Personal accomplishment → resilience	0.205
Resilience → safety compliance	0.692
Depersonalization → safety participation	- 0.217
Personal accomplishment → safety participation	0.406
Safety compliance → safety participation	0.349
Emotional exhaustion → personal accomplishment → resilience	- 0.114
Emotional exhaustion → depersonalization → resilience	- 0.379
Depersonalization → personal accomplishment → resilience	- 0.126
Emotional exhaustion → depersonalization → personal accomplishment → resilience	- 0.090
Emotional exhaustion → resilience → safety compliance	- 0.331
Emotional exhaustion → personal accomplishment → resilience → safety compliance	- 0.079
Emotional exhaustion → depersonalization → resilience → safety compliance	- 0.262
Depersonalization → personal accomplishment → resilience → safety compliance	- 0.087
Emotional exhaustion → depersonalization → personal accomplishment → resilience → safety compliance	- 0.062
Depersonalization → resilience → safety compliance	- 0.235
Personal accomplishment → resilience → safety compliance	0.138
Resilience → safety compliance → safety participation	0.242
Emotional exhaustion → resilience → safety compliance → safety participation	- 0.116
Emotional exhaustion → personal accomplishment → resilience → safety compliance → safety participation	- 0.028
Emotional exhaustion → personal accomplishment → safety participation	- 0.092
Emotional exhaustion → depersonalization → resilience → safety compliance → safety participation	- 0.030
Depersonalization → personal accomplishment → resilience → safety compliance → safety participation	- 0.082
Depersonalization → resilience → safety compliance → safety participation	0.048
Emotional exhaustion → depersonalization → personal accomplishment → resilience → safety compliance → safety participation	- 0.022
Emotional exhaustion → depersonalization → personal accomplishment → safety participation	- 0.085
Depersonalization → personal accomplishment → safety participation	- 0.258
Personal accomplishment → resilience → safety compliance → safety participation	0.048

**Table 4.** The effect coefficients of the study variables.

Variable	Resilience			Safety compliance			Safety participation		
	Direct	indirect	Total	Direct	indirect	Total	Direct	indirect	Total
Emotional exhaustion	- 0.477	- 0.583	- 1.060	-	- 0.734	- 0.734	-	- 0.373	- 0.373
Depersonalization	- 0.339	- 0.126	- 0.465	-	- 0.322	- 0.322	- 0.217	- 0.388	- 0.605
Personal accomplishment	0.205	-	0.205	-	0.138	0.138	0.406	0.048	0.454
Resilience	-	-	-	0.692	-	0.692	-	0.242	0.242
Safety compliance	-	-	-	-	-	-	0.349	-	0.349
Safety participation	-	-	-	-	-	-	-	-	-

**Table 5.** The direct, indirect, and total effects of the study variables in a simple analysis.

Individuals experiencing emotional exhaustion often describe sensations of weariness, tiredness, fatigue, and weakening. These hinder their adaptation to the work environment due to a lack of emotional energy to cope with work tasks<sup>34</sup>. Depersonalization is characterized by a sense of detachment and disconnection from work, where individuals perceive themselves and others as mere objects. This detachment often leads to negative attitudes and behaviors through a lack of sensible perception and lack of care and concern toward work being performed and/or people working together. This can further exacerbate the situation by escalating to irritability, loss of idealism, and interpersonal avoidance usually towards service users, patients, and/or clients<sup>34</sup>. Reduced personal accomplishment is reflected in a negative professional self-evaluation regarding professional competence and effectiveness on the job. In this condition, where Individuals may doubt their capabilities, they often find decreased productivity, morale, and coping skills<sup>34</sup>.

Variable	Resilience			Safety compliance			Safety participation		
	Direct	indirect	Total	Direct	indirect	Total	Direct	indirect	Total
Emotional exhaustion	- 0.477**	- 0.252**	- 0.729**	-	- 0.505**	- 0.505**	-	- 0.318**	- 0.318**
Depersonalization	- 0.339**	- 0.130**	- 0.469**	-	- 0.324**	- 0.324**	- 0.217**	- 0.370**	- 0.588**
Personal accomplishment	0.205**	-	0.205**	-	0.142**	0.142**	0.406*	0.050**	0.456*
Resilience	-	-	-	0.692*	-	0.692*	-	0.242**	0.242**
Safety compliance	-	-	-	-	-	-	0.349**	-	0.349**
Safety participation	-	-	-	-	-	-	-	-	-

**Table 6.** The direct, indirect, and total effects of the study variables in 5000 bootstrap sampling. \*\*  $P < 0.001$ . \*  $P = 0.001$ .

Indices	Name	Fitness	Obtained value
Absolute fitness indices	Goodness-of-fit index (GFI)	> 0.9	0.994
	Adjusted goodness-of-fit index (AGFI)	> 0.9	0.976
Comparative fitness indices	Normed fit index (NFI)	> 0.9	0.995
	Comparative fit index (CFI)	> 0.9	0.998
	Incremental fit index (IFI)	0–1	0.998
Normed fit index	Root mean squared error of approximation (RMSEA)	< 0.1	0.010
	Normed Chi-square ( $X^2/df$ )	1–3	1.684

**Table 7.** The fit indices of the model.

According to these definitions, it seems that job burnout first begins with emotional exhaustion, followed by depersonalization and reduced personal accomplishment. The results of the present study also confirm this implication. Taris et al. suggest that high levels of emotional exhaustion are often associated with high levels of depersonalization and reduced personal accomplishment<sup>35</sup>. Similarly, Schaufeli et al.<sup>36</sup>, Seidler et al.<sup>37</sup>, and Bussing and Glaser<sup>38</sup>, after conducting empirical studies, produced findings that concur with the notion that emotional exhaustion is a core component of the burnout syndrome in workplaces, while depersonalization and reduced personal accomplishment are considered either an antecedent or a consequence of burnout. These past findings are plausible explanations for our findings. So emotional exhaustion compared to two other dimensions could be associated with a higher effect coefficient on safety compliance. While two dimensions of depersonalization and reduced personal accomplishment compared to emotional exhaustion had a greater effect coefficient on safety participation. Safety compliance is described by complying with the health and safety standards, safety procedures and safety system of work. While safety participation is a higher level of safety and it is defined as voluntary involvement in safety activities such as safety meetings, safety training or even helping coworkers<sup>39</sup>. Therefore, workers in the early stages of burnout may first experience emotional exhaustion, which is more likely to make mistakes because of decreasing mental and physical energy<sup>40</sup>. The results of a study performed by Leiter and Maslach showed that exhaustion could positively affect injury rates among administration service employees<sup>41</sup>. Goldenhar et al. concluded that psychological distress was positively associated with near-misses among construction workers<sup>42</sup>. However, even with high emotional exhaustion, the person may still intend to participate in safety. While in depersonalization and reduced personal accomplishment because of negative emotions and views, the individual has a weak willingness to participate in safety<sup>43</sup>.

It is important to note that these findings align with the results of the previous study. Baier et al. found that emotional exhaustion and depersonalization among burnout dimensions could predict safety-compromising behavior due to their possible correlations<sup>19</sup>. Salyers et al. also studied the relationship between burnout and safety in healthcare settings and revealed coefficients of - 0.24, - 0.20, and 0.10 between emotional exhaustion, depersonalization, and personal accomplishment with safety<sup>44</sup>. Vitale et al. investigated the association between burnout and safety performance among nurses and found that emotional Exhaustion (EE) is the most important dimension of burnout in this relationship<sup>45</sup>. However, the role of two dimensions of depersonalization and reduced personal accomplishment in safety participation and safety performance improvement should not be ignored. Shih et al. noted the importance of considering depersonalization and reduced personal accomplishment in understanding worker burnout, while work exhaustion is seemingly a critical aspect<sup>46</sup>. Karadag evaluated the relationship between burnout dimensions and occupational safety perception and observed that personal accomplishment and depersonalization compared to emotional exhaustion had a higher effect on safety perception<sup>47</sup>. The results of a study performed by Zarei et al. highlighted the strong correlation between personal accomplishment and safety climate dimensions, emphasizing its importance in fostering voluntary participation in safety measures<sup>43</sup>. The current research's studied variables and the identified relationships through our analysis and findings distinguish the research value of the work presented in this study from others where most researchers have

predominantly focused on individual dimensions only, such as emotional exhaustion<sup>48</sup> or depersonalization<sup>49</sup> without considering the combined effect with personal accomplishment.

As an interesting result, all three burnout dimensions indirectly impact safety compliance through resilience. Resilience acts as a strong mediator in the relationship between burnout dimensions with safety compliance and safety participation. This aligns with the findings of Park and EO, who demonstrated that resilience partially mediates the relationship between social capital and safety awareness<sup>50</sup>. Chen et al. examined these relationships in construction workers' perspective and showed that individual resilience is negatively correlated with interpersonal conflicts at work, which, in turn, reduces the frequency of physical safety outcomes. These results corroborate the findings of the present study<sup>51</sup>. In the present study, emotional exhaustion compared to two other dimensions had the greater effect coefficient on resilience. Considering the key role of emotional exhaustion in burnout, as mentioned above, these findings seem reasonable. The results show that with the progress of burnout in the two dimensions of depersonalization and success, the role of resilience in controlling the negative effects of these burnout dimensions on safety performance decreases. Deldar et al. also performed a systematic review and meta-analysis on the relationship between resiliency and burnout dimensions and observed that the associations between resiliency with emotional exhaustion, depersonalization, and personal accomplishment were  $-0.62$ ,  $-0.41$ , and  $0.25$ , respectively<sup>52</sup>. These results are consistent with the findings of the present study.

### Limitation

Due to the complexity and difficulty in extracting insights with additional parameters, the current study did not account for a possible influential factor, job stress, in the current model and analysis development. Therefore, it is suggested that future research should explore these relationships to provide a more comprehensive understanding of the factors impacting safety performance. Other limitations of this study also were the cross-sectional design and the use of self-report tools.

### Conclusion

The findings of this study enhance an understanding of how burnout dimensions intersect with safety compliance and participation. The results showed that resilience emerges as a pivotal factor in mediating the impact of burnout on safety outcomes. As an important finding, emotional exhaustion was identified as a primary contributor to resilience and safety compliance, whereas depersonalization and personal accomplishment exerted the greatest effect on safety participation.

The discovered insights hold substantial implications for policymakers tasked with enhancing safety outcomes in the workplace. By recognizing the differential impacts of various burnout dimensions, tailored interventions can be developed to address specific facets of burnout, thus optimizing safety initiatives. Moreover, the pivotal role of resilience unveils a promising avenue for mitigating the adverse effects of burnout on unsafe behaviors. Strengthening resilience among workers holds the potential to attenuate the detrimental impact of burnout, thereby fostering a safer work environment.

### Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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## Author contributions

R. A.: Supervision, Project administration, Conceptualization. A. H. Kh.: Writing—original draft, Supervision, Project administration, Conceptualization. S. A. S.: Writing—review & editing. S. Y.: Visualization, Methodology, Investigation, Formal analysis. J. W. P.: Writing—review & editing. F. K.: Data curation.

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## Competing interests

The authors declare no competing interests.

## Additional information

**Correspondence** and requests for materials should be addressed to A.H.K.

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