# The Relationship Between Mindfulness, Triage Accuracy, and Patient Satisfaction in the Emergency Department: A Moderation-Mediation Model

**Authors:** Mor Saban, MA, MEM, MPH, Efrat Dagan, PhD, and Anat Drach-Zahavy, PhD, Haifa, Israel

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**Contribution to Emergency Nursing Practice**

- The current literature on the role of mindfulness in health care organizations indicates that mindfulness reduces stress and improves patients' well-being. Its effects on health care professionals' work performance and patient satisfaction are still unresolved.
- This article contributes an understanding of the positive association between nurses' trait mindfulness and accurate triage under high but not extreme workload environments, and stronger associations between accurate triage and patients' satisfaction when the ED teams were characterized with high, compared with low, collective mindfulness.
- The key implication for emergency nursing practice found in this article is the need for nursing leaders to cultivate mindfulness in the health care settings at the individual, departmental, and organizational levels.


## Abstract

**Introduction:** Individual and collective mindfulness attracts growing research attention, yet reports of their impact on health care professionals' work behaviors are scarce, especially in the emergency department. The aim of the current study was to explore whether the association between trait mindfulness and triage accuracy is moderated by the emergency workload environment, and whether this association promotes patient satisfaction subject to levels of collective mindfulness.

**Methods:** A prospective consecutive nested design was conducted. Data were collected from ED teams (nurses and physicians, N = 96) on individual characteristics and trait mindfulness. Data were also collected on triage accuracy, triage team characteristics, collective mindfulness, workload, and patient satisfaction (N = 960) at a specific patient–ED team encounter.

**Results:** Findings indicated that ED workload environment (b = 0.24, $P < 0.01$), trait mindfulness (b = 1.80, $P < 0.01$), and their interaction (b = −0.04, $P < 0.05$) were associated with triage accuracy. Triage accuracy (b = 1.81, $P < 0.001$), collective mindfulness (b = 1.29, $P < 0.001$), and their interaction (b = −0.32, $P < 0.001$) were associated with patient satisfaction. The moderated-mediation model was significant under high, but not under extreme, levels of ED workload environment and all levels of collective mindfulness.

**Discussion:** Trait and collective mindfulness are relevant to ED triage and patient satisfaction, but their effects are bounded by workload. The beneficial gain of nurses' trait mindfulness on triage accuracy and collective mindfulness on patient satisfaction is demonstrated only under high-workload environments but limited under extreme-workload environments.


**Key words:** Triage; Emergency department; Mindfulness; Patient satisfaction; Workload

Mor Saban is a PhD student in the Department of Nursing, The Faculty of Health and Welfare Sciences, University of Haifa, Haifa, Israel, and Rambam Health Care Campus, Haifa, Israel.

Efrat Dagan is an associate professor in the Department of Nursing, The Faculty of Health and Welfare Sciences, University of Haifa, Haifa, Israel.

Anat Drach-Zahavy is an associate professor and Head of the Department of Nursing, The Faculty of Health and Welfare Sciences, University of Haifa, Haifa, Israel.

For correspondence, write: Mor Saban, PhC, Rambam Health Care Campus & School of Nursing, Haifa University, Haifa 3498838, Israel; E-mail: morsab1608@gmail.com.

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## Introduction

Emergency triage is a rapid and focused assessment aimed at identifying patients who require immediate attention.[1,2] Inaccurate triage processes are estimated to occur in about

50% of patients requiring treatment in the emergency department.[3,4] This inaccurate triage may result in poor clinical outcomes, such as extended times for diagnosis and treatment, misuse and burnout of personal and hospital resources, reduced patient satisfaction, and even high ED mortality rates.[5,6] Patient satisfaction has been increasingly used as an outcome measure for overall health care performance and the quality of medical and nursing care.[7–9] However, only a few studies have examined the relationship between triage accuracy and patient satisfaction.[10–12] Previous research has typically attributed these impaired clinical outcomes to workload, patient crowding, and the dynamic and unpredictable environment characterizing ED settings.[13–15] Recent studies have suggested that nurses' impaired attention and lack of cognitive resources may explain triage inaccuracy.[16] In the high-workload environment of the emergency department, nurses might rely on habitual task performance and ritual assessment and treatment. Habitual and ritual routines may impair decision-making processes and limit full recognition of patients' current situations and needs, resulting in poor patient satisfaction.[17–21]

We propose that a mindfulness approach can improve triage accuracy in the emergency department and consequently also increase patient satisfaction. Mindfulness refers to the awareness of present events and experiences and is characterized by receptive attention to new and ongoing stimuli without reactivity, evaluation, judgment, or cognitive filters.[22–26] Mindfulness can be conceptualized at the individual, team, and organization levels.[27,28] Individual mindfulness has been extensively studied as a state of consciousness (state mindfulness) cultivated by meditation-like interventions.[29,30] More contemporary studies have identified interpersonal differences in the experience of mindful states, suggesting a dispositional tendency toward mindfulness (trait mindfulness).[25,31–33] In contrast, the term collective mindfulness refers to a team's capacity to develop a rich awareness of discriminatory details about internal and external processes and to regulate team behaviors accordingly.[34–39] Collective mindfulness was first described in Weick's 1993 analysis of the famous fire in Mann Gulch and was applied in different types of organizations.[38–40] Collective mindfulness can be identified through 5 team processes: (1) preoccupation with failure, (2) reluctance to simplify, (3) sensitivity to operations to prevent automated processes, (4) commitment to resilience, and (5) deference to expertise.[36,37]

Given the stressful and demanding nature of nursing in the ED setting, the exploration of the potential benefits of mindfulness for nurses and patients is warranted.[41,42]

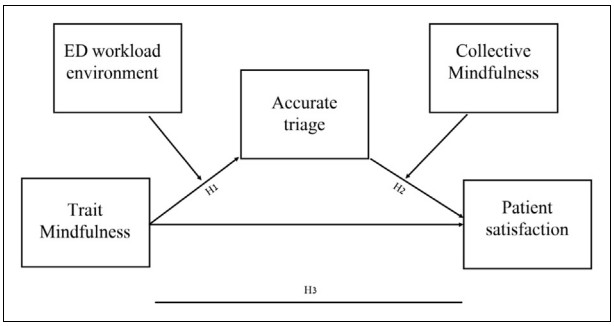


FIGURE 1

Triage accuracy and patient satisfaction model. H1, Hypothesis 1; H2, Hypothesis 2; H3, Hypothesis 3.

## THEORETICAL BACKGROUND AND HYPOTHESES DEVELOPMENT

Despite the growing literature on trait and collective mindfulness and its impact on patient outcomes, such lines of study remain in their nascent stages, especially with respect to the emergency department.[43,44] Figure 1 delineates the present study's proposed theoretical model, suggesting that high levels of trait mindfulness positively affect patient satisfaction. However, this association is mediated by triage accuracy. The impact of trait mindfulness on triage accuracy is further moderated by the ED workload environment, and maintaining triage accuracy is expected to impact patient satisfaction through the moderating effect of collective mindfulness.

## TRIAGE ACCURACY: THE JOINT EFFECTS OF TRAIT MINDFULNESS AND THE ED WORKLOAD ENVIRONMENT

Triage requires nurses to engage with complex decision-making processes in an environment characterized by uncertainty, time pressure, and limited available information about the patient.[45,46] We propose that trait mindfulness is most useful in a highly dynamic ED environment, or high ED workload environment, characterized by the immediacy of present moment demands.[44,47] Research shows that individuals with high, as compared with low, trait mindfulness are better qualified to operate in the high ED workload environment.[19,21] Nurses with high, as compared with low, trait mindfulness tend to be highly sensitive to the environment, open to new information, reluctant to operate in habitual or ritual modes despite prior expertise and to possess nonjudgmental attitudes

toward self and others, focus on the present without undermining the goals of the future, and emphasize processes rather than outcomes.[26,44,48] Mindfulness may help nurses overcome automatic patterns of behaviors, habits, and reactions and thus make them better qualified to identify precise clinical priorities and provide appropriate care for patients.[19–21]

### PATIENT SATISFACTION: THE JOINT EFFECTS OF TRIAGE ACCURACY AND COLLECTIVE MINDFULNESS

Our assertion above is based on recent findings demonstrating that patient satisfaction is due not only to the health care provided but also sometimes dependent on patient–provider relationships, nurses' interpersonal skills, perceived staff attitudes, and provision of information.[49,50] We assumed these relational characteristics are more prevalent in teams with high collective mindfulness.

Accordingly, we anticipated that because patients sometimes lack the competence and professional knowledge required to evaluate triage accuracy, their satisfaction level is a product of both triage accuracy and the extent to which their needs are heard, well-attended, and treated by the health care teams.

Teams with high rather than low collective mindfulness have a collective awareness of details that "facilitate the construction, discovery, and correction of unexpected events capable of escalation."[51] Such teams aim to continuously update perspectives, assumptions, and classifications of events.[37,52] Therefore, collective mindfulness enhances the team's ability to detect and manage unexpected events and thus enhance safety and minimize errors.[37,53,54] Furthermore, high compared with low collective mindfulness refers to what actions teams undertake with their higher awareness of the present situation.[53] Under these circumstances, the interprofessional ED team might notice and be more attentive to patient needs, thus enhancing patient satisfaction. In addition, teams with high collective mindfulness have more accepting, open, and nonjudgmental attitudes, leading them to search for structural solutions to patient needs rather than automatic, simplified solutions.[34,55] Therefore, we suggest that the relationship between triage accuracy and patient satisfaction will be stronger in ED teams with high, rather than low, collective mindfulness.

### STUDY AIMS AND HYPOTHESES

The aim of the current study was to examine whether the association between trait mindfulness and triage accuracy is moderated by the ED workload environment, and whether this association promotes patient satisfaction, subject to levels of collective mindfulness (Figure 1).

#### *Specific hypotheses*

*Hypothesis 1: The association between trait mindfulness and triage accuracy will be moderated by the ED workload environment.*
*Hypothesis 2: The association between triage accuracy and patient satisfaction will be moderated by collective mindfulness.*
*Hypothesis 3: The joint effect of trait mindfulness and the ED workload environment promotes patient satisfaction through its relationship with accurate triage and therefore increases patient satisfaction only under ED teams with high levels of collective mindfulness.*

## Methods

### STUDY DESIGN AND SETTING

A prospective consecutive study was conducted in 2017 in a public tertiary emergency department at an academic teaching hospital. The emergency department consists of 1,000 beds and serves, on average, about 110,000 adult patients annually, covering over 2 million residents. The emergency department is considered one of the busiest in the country with an occupancy rate of 138% for most of the year.[56] The triage tool used in the emergency department is the Canadian Triage and Acuity Scale, ranging from high priority (P1) to low priority (P5), defined as P1, resuscitation is needed; P2, emergency treatment is needed; P3, urgent treatment is needed; P4, nonurgent treatment is needed; and P5, nonurgency visit needed. Patients categorized as P1 require immediate treatment, while patients categorized as P2–P5 are expected to receive medical assessment and treatment within 15, 30, 60, and 120 minutes, respectively.[57]

### ETHICAL CONSIDERATION

The study was approved by the institutional review boards of the hospital (#0305-16-RMB) and the university (197/16). All participants (nurses, physicians and patients) provided signed informed consent.

### PARTICIPANTS

The study sample consisted of health care providers and patients. Health care providers included all nurses (32 triage nurses and 16 staff nurses) and 31 physicians working in the emergency department 50% full time equivalent or

above during the study period. The unit of analysis was the ED team, including 1 triage nurse, 1 staff nurse who worked in tandem with the triage nurse on that shift, and 1 physician. Each triage nurse was examined in 3 different teams and in 3 different shifts. A triage nurse is an experienced registered nurse capable of demonstrating medical expertise in emergency settings. There are 3 threshold conditions to be a triage nurse: (1) at least 2 years of experience in the current emergency department; (2) an advanced course in emergency medicine (for 1.5 years involving 434 hours of theoretical and practical studies); and (3) a designated 6-month triage education course to prepare them for the complexities of their role. A staff nurse is a nurse who has a bachelor's degree in nursing. To sample as many team variations as possible in a variety of work situations, triage nurses and physicians were included 3 times in different teams and shifts, and staff nurses were included 6 times. Each team was different. A sample of 96 ED teams was recruited; 86% of triage nurses, 92% of staff nurses, and 63% of physicians agreed to participate in the study.

For each selected team, a consecutive sample of 10 patients, consisting of every third patient who attended the emergency department, were recruited (a total of 960 patients). Patients were included in the study if they were admitted in the walk-in clinic or the urgent medical care area of the emergency department, were Hebrew-speaking, were above 18 years old, and were able to sign an informed consent form and complete a self-report questionnaire. Patients with cognitive deficits, those admitted directly to the resuscitation bay, and women in active labor were excluded from the study.

## DATA COLLECTION

The study aims and procedure were discussed at an ED staff meeting of nurses and physicians. Data were collected in 2 steps. The first step included collecting participants' individual characteristics. All ED staff participants were asked to complete a sociodemographic and professional questionnaire, and the triage nurses also completed the individual Mindful Attention Awareness Scale (MAAS).[32] This procedure was conducted according to the standard personality research guidelines to limit priming biases.[27,55] The second step included data collection at the specific patient–ED team encounter. In this step, triage accuracy, ED triage team characteristics, collective mindfulness, the ED workload environment, and patient satisfaction measurements were collected. In each shift, all ED triage teams were asked to complete a collective mindfulness questionnaire for their specific working team.

Next, in each patient–triage nurse encounter, triage accuracy was assessed by 2 expert nurses, using the Triage Accuracy Assessment Scale (TAAS). Cohen kappa coefficient for inter-rater agreement between the 2 experts was high (0.88). Each triage nurse was assessed for the triage accuracy on 10 eligible patients. The data were collected by the first author and 1 research assistant.

Following completion of the patient–triage nurse encounter, all patients whose triage process was measured for accuracy were asked if they would like to participate in the study. After providing signed informed consent, they completed patient satisfaction questionnaires. Data on ED workload environment were collected from the ED database and referenced to each team and shift evaluation.

## MEASURES

*Trait mindfulness* was assessed with the 15-item MAAS questionnaire.[32] MAAS is a trait mindfulness questionnaire, applicable in the health care setting.[58,59] Items were rated on a 6-point Likert-type scale (1, almost always; 6, almost never). An example item is "I could be experiencing some emotion and not be conscious of it until sometime later." Cronbach alpha for the current sample was 0.86.

*Collective mindfulness* was assessed with the 9-item Likert-type Safety Organizing Scale (1, not at all; 5, to a very great extent).[35] The Safety Organizing Scale was developed to assess the behavioral processes of collective mindfulness enacted by front-life employees: preoccupation with failure, reluctance to simplify interpretations, sensitivity to operations, commitment to resilience, and deference to expertise. The scale has been used before to measure collective mindfulness mostly in health care settings.[35,55] An example item is "When errors happen, we discuss how we could have prevented them." Cronbach alpha for the current sample was 0.92.

*Triage accuracy* was assessed with the 7-item TAAS. Each item is rated on a binary scale (0, incorrect; 1, correct). The instrument was developed for the current study based on the 7 crucial elements of the triage process: 1, severity level for triage; 2, admission area (resuscitation bay, emergent care area, or urgent care area); 3, first consultant to examine the patient; 4 or 5, the use of resources including laboratory or imaging tests, respectively; and 6 or 7, missing or redundant triage questions, respectively.[60,61]

We evaluated the reliability and validity of the TAAS in 350 triage encounters performed at a large medical center during August–December 2016. Four steps were undertaken to validate the TAAS instrument. First, in order to assess *face validity*, 5 nurses specializing in emergency care

TABLE 1
**Descriptive statistics of the study sample**

| **Panel 1: Team characteristics** | **Triage nurse (N = 32)** | | **Staff nurse (N = 16)** | | **Physicians (N = 31)** | |
|---|---|---|---|---|---|---|
| Tenure (mean, SD) | 3.45 | 7.23 | 7.16 | 5.13 | 4.35 | 3.65 |
| Male (n, %) | 12, | 37.5% | 9 | 56.3% | 24 | 77.4% |
| Female (n, %) | 20 | 62.5% | 7 | 43.7% | 7 | 22.5% |
| Ethnicity (n, %) | | | | | | |
| Jewish | 13 | 40.6% | 6 | 37.5% | 8 | 25.8% |
| Arab | 15 | 46.9% | 9 | 56.3% | 20 | 64.5% |
| Other | 4 | 12.5% | 1 | 6.2% | 3 | 9.7% |
| Part time job (n, %) | | | | | | |
| 50% FTE | 5 | 15.6% | 9 | 56.3% | 3 | 6.6% |
| >50% FTE | 27 | 84.4% | 6 | 43.7% | 29 | 93.4% |

| **Panel 2: Patient characteristics** | **N = 960** | |
|---|---|---|
| Male (n, %) | 628 | 65.4% |
| Ethnicity (n, %) | | |
| Jewish | 497 | 51.8% |
| Arab | 359 | 37.4% |
| Other | 104 | 10.8% |
| Manner of arrival (n, %) | | |
| Emergency medical services | 318 | 33.1% |
| Independent | 642 | 66.9% |
| Functional status (n, % independent) | 541 | 56.3% |
| Charlson score index (n,%) | | |
| 0 | 316 | 32.9% |
| 1–2 | 403 | 41.9% |
| 3+ | 241 | 25.2% |
| ED workload environment (percentiles) | | |
| 25 | 29.87% | |
| 50 | 33.80% | |
| 75 | 35.47% | |
| Shift (n,%) | | |
| Morning | 374 | 38.9% |
| Evening | 352 | 36.7% |
| Night | 234 | 24.4% |
| Day (n, %) | | |
| Weekday (Sunday–Thursday) | 769 | 80.1% |
| Weekend | 191 | 19.9% |
| P classification (n, %) | | |
| 1 (Resuscitation) | 9 | 0.9% |
| 2 (Emergency) | 120 | 12.5% |
| 3 (Urgency) | 452 | 47.1% |

*continued*

TABLE 1
**Continued**

| **Panel 2: Patient characteristics** | **N = 960** | |
|---|---|---|
| 4 (Less urgency) | 261 | 27.2% |
| 5 (Nonurgency) | 118 | 12.3% |
| Hospitalization rate (n, %) | 241 | 25.1% |

FTE, full time equivalent; SD, standard deviation.

reviewed the instrument. To avoid bias, expert evaluation was performed by external nurses who were not familiar with the ED staff. Following the experts' comments, minor changes were made to the wording of some items. The nurses rated each of the 7 items on a scale from 0 (not agree at all) to 4 (totally agree). The mean score was very high (3.73, SD = 0.15). Second, *content validity* was evaluated and 3 nurses specializing in emergency care were asked to rate each item for its relevance and clarity using a Likert scale ranging from 1 (irrelevant/unclear) to 4 (very relevant/clear). The content validity index for all items was 88.7%, indicating that the scale's items had good operationalization of the underlying constructs.[62] Third, *construct validity* was tested, and it was found that the model fit was acceptable for a 1-dimensional model ($\chi^2[350] = 179.3$, RMSEA = 0.08, CFI = 0.91). Last, *internal validity* was tested using Cronbach alpha, which was calculated to assess internal consistency and was found to be good (0.78). Removing any of the items did not improve the reliability score.

*The ED workload environment* was defined using the customary formula of the Israeli Ministry of Health for dynamic ED environments.[63] The formula considers 3 variables: the number of patients admitted to the emergency department, the functional morbidity condition of the patients, and the shift type (morning/evening/night). The product of the formula is weighted as a continuous variable. Given the high occupancy rate of the studied emergency department, we scored this variable into categories of high workload between 75% and 100%, and extreme workload as higher than 100%. Notably, we have not observed an ED workload less than 75%.

*Patient satisfaction* was assessed with the 12-item Caring subscale of the Consumer Emergency Care Satisfaction Scale (CECSS),[64,65] specifically developed to examine patient satisfaction in the emergency department. We chose only the Caring subscale of the CECSS. We chose to employ the shortest possible questionnaire to encourage patient participation in the study. Choosing the Caring subscale is justified, as a recent study found that only those giving a high Caring score (and not a high Teaching score) had higher odds of reporting good overall satisfaction (odds ratio [OR] 7.68, $P = 0.025$).[66] Items for the CECSS Caring subscale were scored on a 5-point Likert-type scale (1, completely disagree; 5, completely agree). An example item is "The nurse made sure that all my questions were answered." Cronbach alpha for the current sample was 0.89.

*Control variables:* The nurses' sociodemographic and professional data were collected, and gender and job tenure were included as control variables.

## DATA ANALYSIS

The unit of analysis was the team. That is, the hypotheses were posited at the team level, and the appropriateness of aggregating individual-level data to the team level was assessed empirically. Intraclass correlations (ICCs) assessing the reliability of team-level means were 0.82, 0.80, and 0.82 for collective mindfulness, triage accuracy, and patient satisfaction, respectively. For ICCs, a value of 0.70 or higher is generally acceptable.[67] Tests of $r_{wg(J)}$ indicated agreement of responses at the unit level, thus justifying the aggregation into team-level analysis.[68] Findings revealed that the indices for collective mindfulness were $r_{wg(J)} = 0.89$ (median = 0.87, range 0.79 – 0.90), for triage accuracy were $r_{wg(J)} = 0.81$ (median = 0.82, range 0.76 – 0.92), and for patient satisfaction were $r_{wg(J)} = 0.86$ (median = 0.84, range 0.82 – 0.91). We further calculated the ICC adjusted for the number of times each team member was represented in the team. The triage nurse, the staff nurse and the physician were represented 3 times, 6 times, and 3 times, respectively. The value of the adjusted ICC was 0.74. These indices exceeded the recommended value of 0.70, providing justification for the aggregation.[69]

The hypotheses were tested with SPSS (version 23, IBM, Stanford, CA). Mediation, moderation, and moderated-mediation analyses were performed using Hayes's model 21.[70] The model is based on ordinary least squares, with error terms calculated by bootstrapping for models based entirely on observed variables. The indirect effects and 95% bias-corrected confidence intervals were estimated using 5,000 bootstrap samples.[71]

TABLE 2
**Means, standard deviations, and intercorrelation matrix for the study's variables, aggregated to 96 ED teams**

| Variable | M | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|---|
| 1. Gender | - | - | 1.00 | | | | | | |
| 2. Tenure | 7.85 | 6.54 | .03 | 1.00 | | | | | |
| 3. Trait mindfulness | 3.58 | 0.55 | −.08 | −.17 | 1.00 | | | | . |
| 4. ED workload environment | 35.64 | 11.75 | −.10 | −.06 | .08 | 1.00 | | | |
| 5. Triage accuracy | 4.19 | 0.84 | −.11 | −.04 | .22** | .11* | 1.00 | | |
| 6. Collective mindfulness | 4.28 | 0.64 | −.17 | −.00 | .20** | .09 | .36** | 1.00 | |
| 7. Patient satisfaction | 3.48 | 0.31 | −.16 | −.14 | .54* | .09 | .65** | .61*** | 1.00 |

M, mean; SD, standard deviation.
*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$

## Results

Table 1 describes the sample characteristics. Most nurses were female (56.25%) and were not Jewish (60.41%). Physicians were mostly male (77.42%) and Arab (64.52%). The mean tenure in years for triage nurses was 7.16 (SD = 5.13 years). Physicians had a shorter mean tenure (M = 4.35, SD = 3.65 years). Most patients were Jewish (51.77%) and arrived independently (66.87%) during the morning and evening shifts (38.96% and 36.70%, respectively). The hospitalization rate was 25.10%. Most patients were classified as urgent (P3) or less urgent (P4) (47.08% and 27.19%, respectively) on a 5-level scale.

### HYPOTHESES TESTING

Table 2 presents the means, standard deviations, and intercorrelation matrix for all study model variables. Positive correlations were found between trait mindfulness and triage accuracy (ranged from 0 to 7) (r = 0.22, $P < 0.01$), collective mindfulness (r = 0.20, $P < 0.01$), and patient satisfaction (r = 0.54, $P = 0.03$). We also found a positive correlation between triage accuracy and collective mindfulness (r = 0.36, $P < 0.01$) and patient satisfaction (r = 0.65, $P < 0.01$). Finally, we found a positive correlation between collective mindfulness and patient satisfaction (r = 0.61, $P < 0.001$). The ED workload environment was found to correlate only with triage accuracy (r = 0.11, $P = 0.03$). No associations were found between the control variables (gender and tenure) and all other studied variables.

Table 3 presents the results of the regression analyses. To test Hypothesis 1, we analyzed the effect of the control variables (gender and tenure of the triage nurses), the independent variables (trait mindfulness and ED workload environment), and their interaction on triage accuracy scores (see Table 3, "triage accuracy" column).

The ED workload environment (b = 0.24, $p < 0.01$), trait mindfulness (b = 1.80, $P < 0.01$), and their interaction (b = −0.04, $P < 0.05$) were significantly correlated with triage accuracy, thus confirming Hypothesis 1 (Figure 2).

Figure 3 plots the effect of the triage nurses' trait mindfulness, ED workload environment, and their interaction on triage accuracy. We followed the recommendations of Dawson with values of ±1 SD serving as low- and high-trait mindfulness, respectively.[71] As shown in Figure 3, the positive association between trait mindfulness and triage accuracy was found only under a high ED workload environment but not under an extreme ED workload environment. Notably, the highest triage accuracy in our sample was obtained for high-trait-mindfulness nurses under a high ED workload environment.

To test Hypothesis 2, we analyzed the effect of triage accuracy, collective mindfulness, and their interaction on patient satisfaction levels above and beyond trait mindfulness, the ED workload environment, and their interaction (Table 3, "patient satisfaction" column). Triage accuracy (b = 1.81, $P < 0.001$), collective mindfulness (b = 1.29, $P < 0.001$), and their interaction (b = −0.32, $P < 0.001$) were significantly associated with patient satisfaction (Figure 4).

Figure 5 plots the interaction between collective mindfulness and triage accuracy on patient satisfaction. We similarly followed the recommendations of Dawson with values of ±1 SD serving as low- and high-accuracy triage, respectively.[71] As seen in Figure 5, patients reported higher levels of satisfaction when triage accuracy and collective mindfulness were high, lending support to Hypothesis 2.

More specifically, for high collective mindfulness, patients' satisfaction is not significantly associated with triage accuracy. However, for low collective mindfulness, patients' satisfaction was positively associated with accurate triage, in

TABLE 3
**Mediation, moderation, and moderated-mediation analyses for triage accuracy and patient satisfaction**

| Variable | Triage accuracy | | | | | Patients' satisfaction | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | b | t | $R^2$ | $R^2$ changed (F change) | Overall $R^2$ | b | t | $R^2$ | $R^2$ changed (F change) | Overall $R^2$ |
| Step 1-control variables | | | | | 0.35** | | | | | |
| Gender | −0.10 | −0.60 | 0.06 | - | | 0.01 | 0.20 | 0.02 | - | 0.72** |
| Tenure | −0.00 | 0.06 | | | | −0.00 | −0.13 | | | |
| Step 2- independent variables | | | | | | | | | | |
| ED workload environment | 0.24 | 7.97** | 0.20 | 0.15 (4.9) * | | 0.97 | 0.2 | 0.23 | 0.21 (4.43)** | |
| Trait mindfulness | 1.80 | 12.84** | | | | 0.29 | 3.51** | | | |
| Step 3- interaction | | | | | | | | | | |
| ED workload environment × Trait mindfulness | −0.04 | −8.43* | 0.35 | 0.21 (6.76)** | | 0.14 | 3.72*** | 0.37 | 0.15 (3.43)* | |
| Step 4- mediator and independent variable | | | | | | | | | | |
| Triage accuracy (mediator) | | | | | | 1.81 | 4.10*** | 0.51 | 0.14 (2.34)* | |
| Collective mindfulness | | | | | | 1.29 | 3.38*** | | | |
| Step 5- triage accuracy × Collective mindfulness | | | | | | −0.32 | −3.11*** | 0.72 | 0.21 (7.35)** | |

*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$

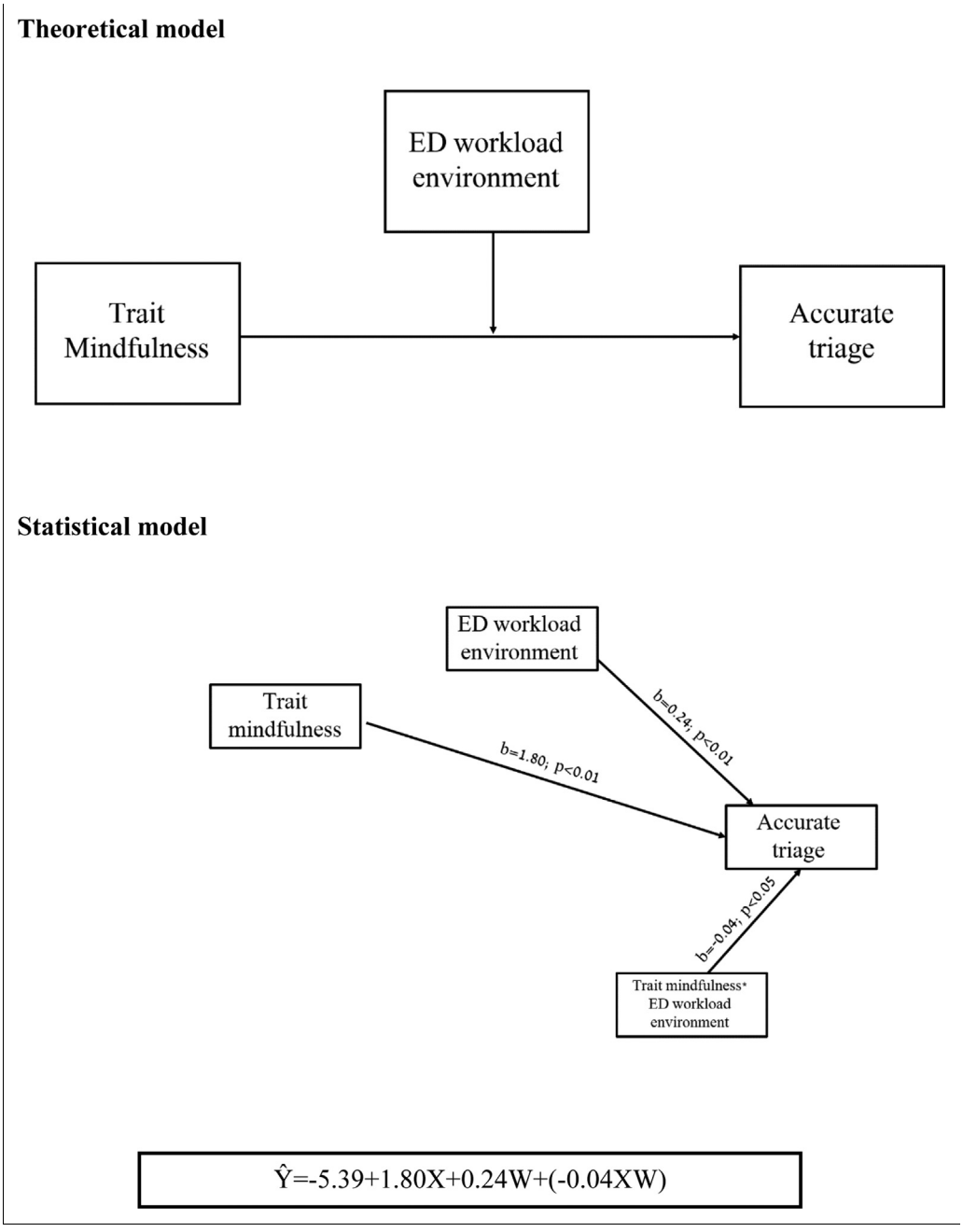


FIGURE 2

The association between trait mindfulness and triage accuracy was moderated by the ED workload environment. X, trait mindfulness; W, emergency department workload environment; Ŷ, accurate triage; XW, the interaction effect between trait mindfulness and ED workload environment on accurate triage.

contrast to the expected relationship in Hypothesis 2 (Figure 6).

Finally, to test the moderated-medication model (hypothesis 3), we followed Hayes's PROCESS analyses related to the moderating-mediating model 21.[70] Table 4 presents the effect of 2 levels of ED workload environment (high vs extreme) and 3 levels of collective mindfulness (low, medium, or high) on the association between trait mindfulness and patient satisfaction in the mediation of triage accuracy.

As shown in Table 4, the moderated-mediation model was significant under a high ED workload environment and under low and high levels of collective mindfulness. The association between trait mindfulness and patient satisfaction was no longer significant under the joint circumstances of extreme levels of ED workload environment and all levels (low [95% CI = –0.09, −0.24], medium [95% CI = −0.12, −0.25], and high [95% CI = −0.14, −0.28]) of collective mindfulness.

## Discussion

This study tested a novel and integrative model for understanding the role of trait and collective mindfulness in triage accuracy and patient satisfaction in an ED workload environment. We have responded to recent calls in the literature to explore the role of mindfulness in improving work performance indicators,[22,25,34] specifically in the health care setting of ED triage.[72]

The study's model has several important aspects that contribute to the existing literature. First, the findings demonstrate that trait mindfulness is associated with improved accuracy of the triage process. Theoretically, higher-mindfulness nurses are characterized by broader attention to external cues and information in their surrounding environment and are more attuned to a relatively large number of stimuli. In the context of ED triage, this competence is crucial because the nurse has to consider a large amount of sociodemographic and medical information, which is being continually updated in a very heavy workload environment. Acquiring a rich body of information improves task performance and decreases the rate of errors that tend to occur when individuals miss critical environmental cues.[22,73,74] Accordingly, triage accuracy benefits from high-trait-mindfulness nurses. While the accuracy of the triage process is examined in the literature mainly with respect to adherence to structured protocols,[1,46,75] our findings make an additional contribution in emphasizing the professional importance of nurses' levels of mindfulness. However, this effect was found only under high ED workload environments, whereas in extreme conditions trait mindfulness no longer improved triage accuracy. An extreme ED workload environment represents a volume of patients in the ED treatment areas that force triage nurses to operate beyond their capacity.[76] Thus, extreme ED workload environments set limits on the effect of trait mindfulness on triage accuracy. This finding is contraindicated by Dane's[22] theoretical model, suggesting that mindfulness is most useful in heavy, but not extreme, workload environments. Possibly, the attentional demands characterizing the extreme ED workload environment exceed the attentional breadth capacity of even individual high-mindfulness nurses. This is contradictory to our hypothesized results, in which we anticipated that nurses working in extreme ED workload environments might be motivated by additional goals to secure triage accuracy to expedite the flow of patients.[77,78]

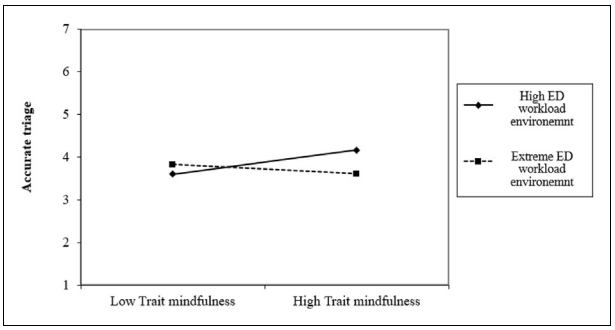


FIGURE 3

The interaction effects between trait mindfulness and ED workload environment on triage accuracy.

Second, the results showed a positive association between triage accuracy and patient satisfaction. The few studies examining this issue have demonstrated the critical role of the triage process in patient satisfaction.[79,80] The current study adds to this body of science by finding that ED patients' satisfaction levels are based on their evaluation of the triage care accuracy. Here we demonstrate that patient satisfaction may reflect not only the flow of the triage process, but also its quality in terms of accuracy. Triage accuracy may impact patients' satisfaction directly, or indirectly by reducing the waiting time in the emergency department.[80,81] This finding, however, is buffered by the triage teams' collective mindfulness. As our results show, triage accuracy is translated to patient satisfaction only under low levels of collective mindfulness. Under high levels of collective mindfulness, patient satisfaction is higher regardless of the levels of triage accuracy (Figure 3). This finding is in line with previous studies showing that patient satisfaction is a result of the joint effects of the patient–health care provider relationship and the quality of care.[50,82] However, under low levels of collective mindfulness, a positive correlation was found between triage accuracy and patient satisfaction in our models (Figure 5).

We anticipated that high, rather than low, collective mindfulness of the ED team enables team members to better notice and attend to patients' needs.[17] Therefore, patient satisfaction might be improved when patients perceive accumulating cues about both the accuracy of the triage process

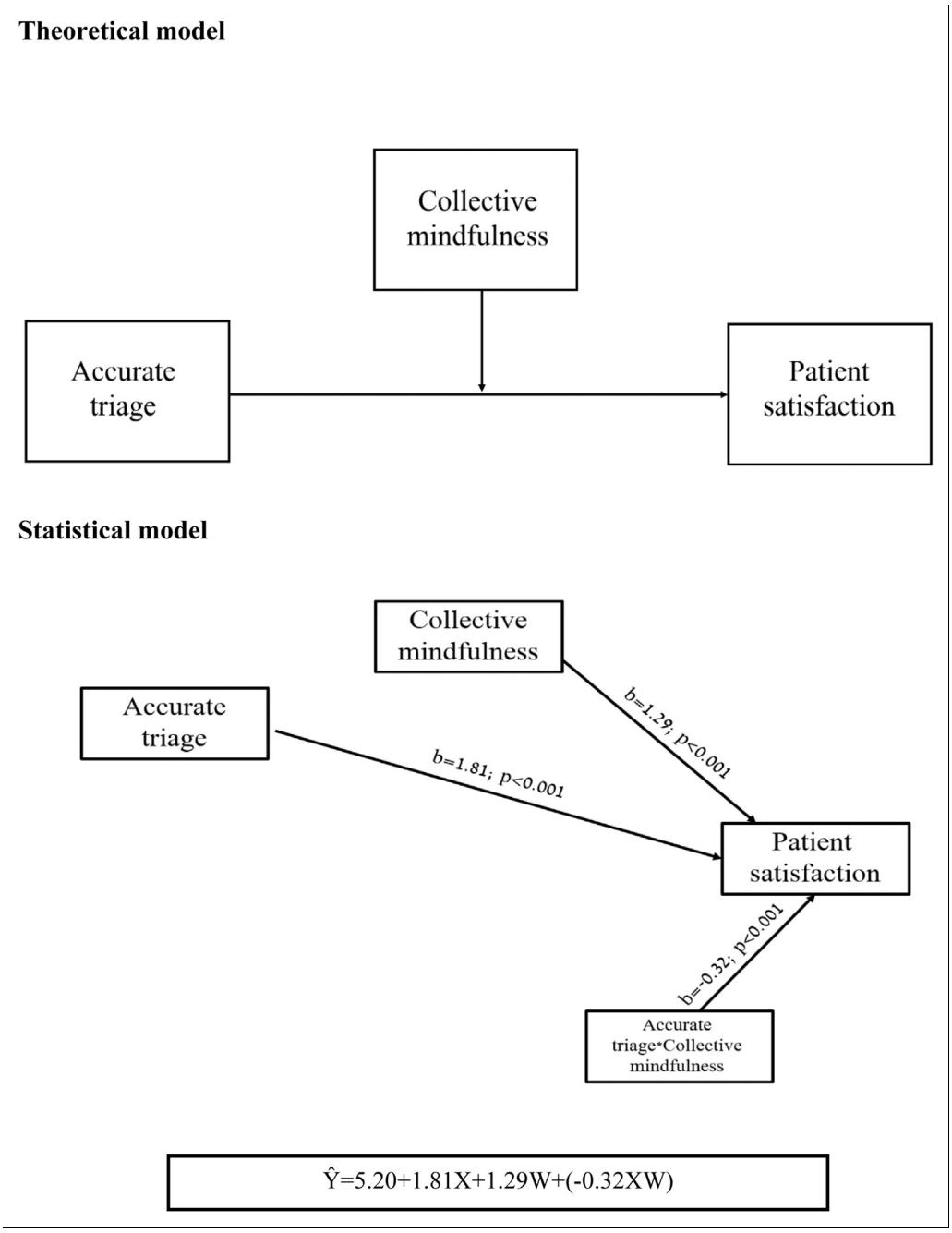


FIGURE 4

The joint effect of triage accuracy and collective mindfulness promotes patient satisfaction. X, accurate triage; W, collective mindfulness; Ŷ, patient satisfaction; XW, the interaction effect of accurate triage and collective mindfulness on patient satisfaction.

and the attentiveness of the ED team caring for them. Our data did not fully support this notion, as low collective mindfulness was also associated with increased patient satisfaction (Table 4 and Figure 5).

Third, the finding of the overall model showed that trait mindfulness promotes patient satisfaction through an accurate triage-mediating effect. This association exists only under high, but not extreme, ED workload

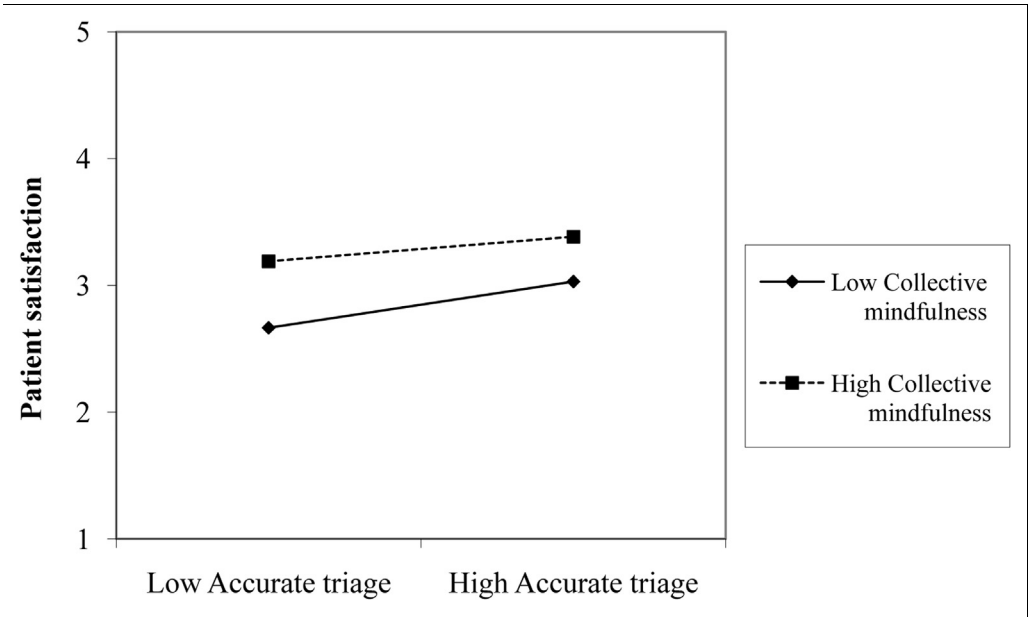


FIGURE 5
The interaction effects between triage accuracy and collective mindfulness on patient satisfaction.

environments, and under the 3 levels of collective mindfulness (low, medium, and high). These findings may indicate that under an extreme ED workload environment, even high levels of trait mindfulness, triage process accuracy, and collective mindfulness no longer have the ability to remedy demanding workload situations, and provide no buffer to promote patient satisfaction. These findings are in line with Rudolph and Repenning's[83] study that focused on resilience in organizations. The authors suggest that an over-accumulation of interruptions beyond a certain threshold could shift an organization from being resilient to being a fragile, self-escalating regime that amplifies failures.

The benefits of mindfulness may extend beyond the practitioner to his or her patients.[84-86] Our overall model results provide corroborating evidence to previous studies that indicate cognitive processes mediate the relationship between trait mindfulness and patient satisfaction.[83,84]

## Limitations

This study has several limitations. First, the study was conducted in 1 large, 1,000-bed academic tertiary hospital, serving over 2 million residents, which might limit the external generalizability of the findings. Using only 1 setting

TABLE 4
**The effect of ED workload environment levels and levels of collective mindfulness on patient satisfaction**

| ED workload environment | Collective mindfulness | Effect (β) | SE | 95% CI | |
|---|---|---|---|---|---|
| | | | | Low | High |
| High (16th): 27.39 | Low: 3.88 | 0.27** | 0.10 | 0.10 | 0.50 |
| | Medium: 4.33 | 0.33* | 0.08 | 0.18 | 0.52 |
| | High: 4.84 | 0.41*** | 0.09 | 0.22 | 0.58 |
| Extreme (84th): 38.47 | Low: 3.88 | 0.07 | 0.08 | −0.09 | 0.24 |
| | Medium: 4.33 | 0.09 | 0.09 | −0.12 | 0.25 |
| | High: 4.84 | 0.11 | 0.10 | −0.14 | 0.28 |

ED, emergency department; SE, standard error; CI, confidence interval.
*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$

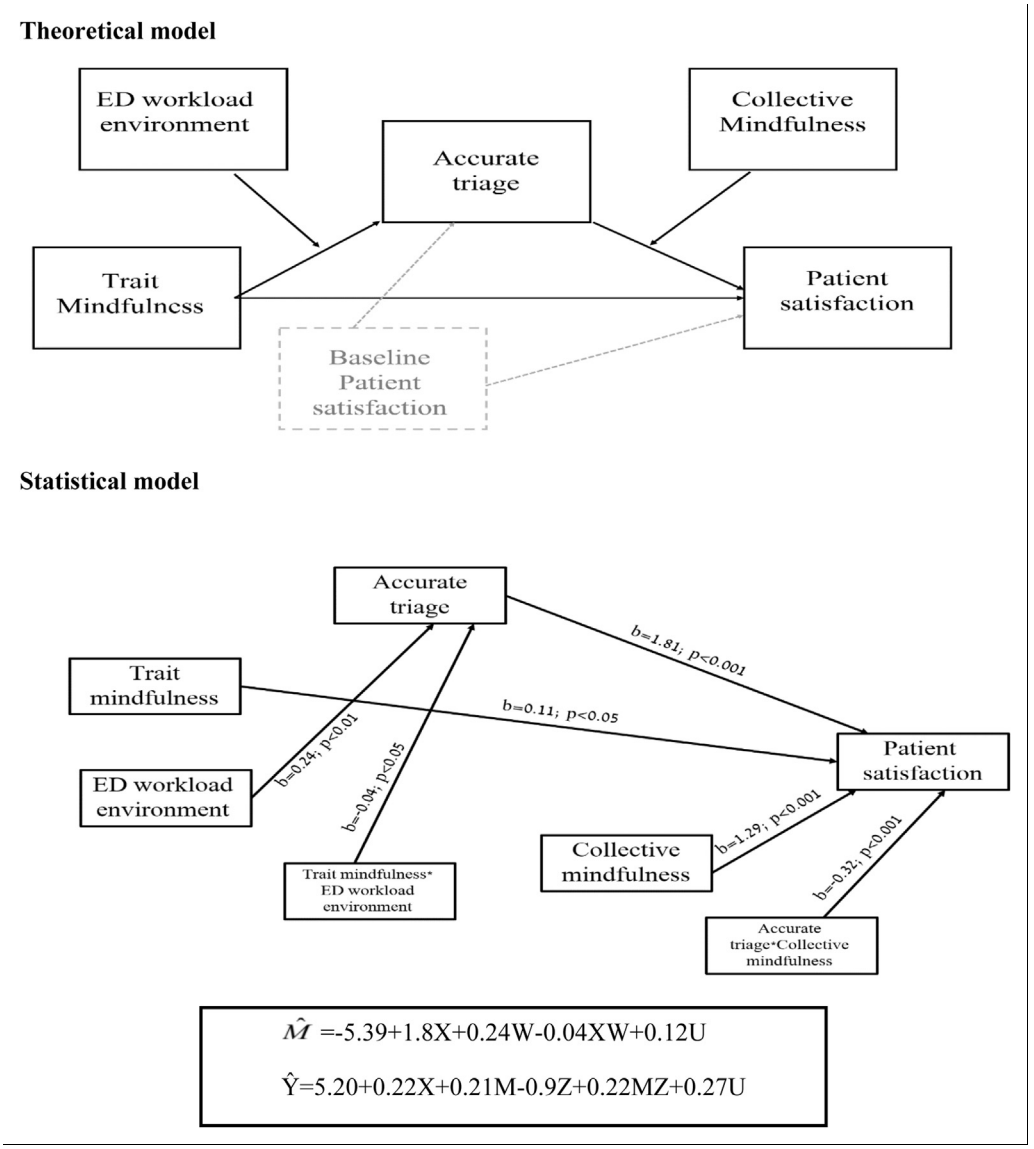


FIGURE 6

The joint effect of trait mindfulness and the ED workload environment promotes accurate triage and consequently patient satisfaction only under high levels of collective mindfulness ED teams. X, trait mindfulness; W, emergency department workload environment; XW, the effect of the interaction between trait mindfulness and emergency department on accurate triage; M, accurate triage; Z, collective mindfulness; U, baseline patient satisfaction; Y, patient satisfaction; MZ, the effect of accurate triage and collective mindfulness on patient satisfaction.

may have limited any potential environmental differences among emergency departments. Second, each triage nurse was assessed on 3 different occasions, each time with different team members (a different staff nurse and a different physician). This strategy could have violated the statistical assumptions of independence and biased the results by overrepresenting 1 triage nurse's individual mindfulness. The ICC was adjusted to account for the number of occasions that members participated in the teams to reduce the potential bias in our findings. Third, because of the highly dynamic environment of the emergency department, we could not assess our model under conditions of low workload. Fourth, data on mindfulness and patient satisfaction were gathered via self-report measures, which are inherently subjective. Nevertheless, because the phenomena investigated are by definition implicit, self-report measures appear adequate.[55,87] We collected data by several methods and from different sources to limit same-source bias.

DIRECTIONS FOR FUTURE RESEARCH

The lines of inquiry pursued here suggest several future research directions. First, building on the contingency framework developed here, health scholars could further explore the conditions under which mindfulness is beneficial versus costly from a task-performance standpoint. Second, the relationship between trait and collective mindfulness should be further explored. Sutcliffe and colleagues called for more multilevel mindfulness research that simultaneously examines individual and collective mindfulness.[24] Future research could further examine the effect of mindfulness in the emergency department on health outcomes, such as mortality. Third, in our study we focused on trait mindfulness as a personal characteristic. Hence, more research is necessary to determine when and how mindfulness states tend to arise and to better understand how factors including, but not limited to, personal predisposition and job experience may affect nurses' level of mindfulness in the health care setting. Fourth, because a high-mindfulness trait improved triage accuracy, future research could examine whether mindfulness training can also improve triage accuracy, especially for those nurses characterized as low-mindfulness individuals, as well as how long after training any improvements might persist. Last, no power analysis was conducted, and the teams' sample size may have been too small to detect relationships with smaller effect sizes.

## Implications for Emergency Nurses

This study has significant implications for health care professionals aiming to achieve better ED work processes, performance, and patient satisfaction. Given the importance of mindfulness, nursing managers should help cultivate it in health care settings. The impact of trait mindfulness in the emergency department could be improved via careful staff recruitment processes, staffing assignments, and/or mindfulness training.[25] Collective mindfulness is a matter of shaping work structures and values to improve health care providers' attentiveness to patients' needs. These goals may be emphasized through organizational policy, as well as in evaluation and compensation practices.

## Conclusions

The study contributes to a better understanding of the role of both individual and collective mindfulness in task performance within the ED triage process. Our findings support the positive effects of trait and collective mindfulness on patient satisfaction in ED triage, under high but not under extreme ED workload environments.

In addition, our study advances knowledge about the role of mindfulness in the emergency department and has the potential to change the way in which patient satisfaction is managed in the emergency department. Our findings support the need for managers, policymakers, and clinicians to incorporate mindfulness into health care organizations as a potential tool to educate and train health professional teams for better triage outcomes.

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## Author Disclosures

Conflicts of interest: none to report.

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