

Workplace Incivility and Turnover Intention Among Nurses: The Moderating Role of Adverse Childhood Experiences

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Abstract

Background

Workplace incivility is a well-documented contributor to nursing turnover; however, no study has examined whether adverse childhood experiences (ACEs) moderate this relationship. Two competing models—stress sensitization and stress inoculation—offer divergent predictions, yet empirical evidence in occupational contexts remains lacking. This study aimed to identify which dimension of workplace incivility most strongly contributes to turnover intention among nurses, and to examine the moderating effect of ACEs on this relationship.

Methods

A cross-sectional survey was conducted among 410 nurses from a tertiary general hospital in Shandong Province, China. XGBoost with 10-fold cross-validation was used to rank the predictive importance of incivility dimensions. Hierarchical regression analyses with robust standard errors were conducted across three models, and simple slope analyses were performed to probe significant interaction effects.

Results

XGBoost analysis identified supervisor incivility as the strongest predictor (gain = 0.223), followed by patient incivility (gain = 0.201). Hierarchical regression revealed that ACEs significantly moderated the association between workplace incivility and turnover intention ($\beta = -0.039$, $P < 0.001$). Simple slope analyses revealed that as ACEs levels increased, the effect of workplace incivility on turnover intention progressively decreased (-2SD: $b = 1.02$; -1SD: $b = 0.80$; 0SD: $b = 0.58$; +1SD: $b = 0.36$; +2SD: $b = 0.14$), indicating an attenuation pattern consistent with the stress inoculation model rather than the stress sensitization model.

Conclusion

Supervisor incivility exerts the greatest impact on nurses' turnover intention. ACEs moderate the incivility–turnover intention relationship in a manner consistent with stress inoculation, suggesting that childhood adversity may foster adaptive coping capacities that buffer subsequent occupational stress.

1. Introduction

Nursing turnover has become a critical global challenge confronting healthcare systems. The persistent shortage of nursing workforce not only compromises the quality of patient care and increases medical errors but also imposes substantial financial burdens on healthcare institutions through recruitment and training costs [1]. In China, the situation is particularly pressing, with nursing turnover rates remaining

high amid growing healthcare demands [2]. Turnover intention, defined as an individual's conscious and deliberate willingness to leave the organization, has been identified as the most immediate and reliable predictor of actual turnover behavior [3]. Therefore, understanding the determinants of turnover intention among nurses is of paramount importance for developing effective retention strategies.

Among the various factors contributing to nursing turnover, workplace incivility has emerged as a significant occupational stressor in healthcare settings[4]. Workplace incivility refers to low-intensity deviant behaviors with ambiguous intent to harm, enacted by perpetrators such as supervisors, colleagues, patients, or physicians[5]. Nurses are particularly vulnerable to workplace incivility due to the high-pressure nature of clinical environments and frequent interpersonal interactions with diverse stakeholders[6]. A growing body of evidence has demonstrated that exposure to workplace incivility is positively associated with turnover intention among nurses [7]. However, most previous studies have treated workplace incivility as a homogeneous construct[8], overlooking the possibility that incivility from different sources (e.g., supervisors vs. patients) may exert differential effects on turnover outcomes. Understanding which sources of incivility are most detrimental could inform more targeted interventions.

Adverse childhood experiences (ACEs)—including abuse, neglect, and household dysfunction occurring before age 18—have been recognized as a fundamental determinant of lifelong health and behavioral outcomes[9]. The cumulative burden of childhood adversity has been associated with increased vulnerability to psychological distress, maladaptive coping strategies, and interpersonal difficulties in adulthood [10]. In occupational contexts, individuals with higher ACEs exposure may perceive and respond to workplace stressors differently than those without such histories [11]. For instance, ACEs have been linked to heightened emotional reactivity, reduced resilience, and impaired social functioning, all of which may shape how individuals navigate stressful work environments [12]. However, the role of ACEs in shaping nurses' responses to workplace incivility remains largely unexplored.

Two competing theoretical models offer divergent predictions about how prior stress exposure influences subsequent stress responses. The stress sensitization model posits that early adversity sensitizes the neurobiological stress response system, rendering individuals more reactive to later stressors [13]. According to this perspective, individuals with higher ACEs would be expected to exhibit stronger negative reactions to workplace incivility, thereby amplifying its effect on outcomes such as turnover intention. In contrast, the stress inoculation model suggests that moderate exposure to early adversity may build psychological resilience, equipping individuals with adaptive coping mechanisms that buffer the impact of subsequent stressors [14]. Under this framework, higher ACEs exposure would attenuate rather than intensify the association between workplace incivility and turnover intention. To date, empirical evidence regarding which model better explains the interplay between childhood adversity and workplace stress remains scarce and inconsistent.

Despite the established links between workplace incivility and turnover intention, and the growing recognition of ACEs as a distal contributor to occupational outcomes, no known study has examined whether ACEs moderate the relationship between workplace incivility and turnover intention among

nurses[15]. Moreover, previous research has predominantly relied on traditional regression approaches that may not adequately account for the high intercorrelations among different sources of incivility, potentially obscuring the relative importance of specific incivility dimensions[16]. Addressing these gaps could yield important implications for nursing workforce management and trauma-informed organizational practices.

Accordingly, this study aimed to: (1) identify which dimension of workplace incivility most strongly contributes to turnover intention among nurses using XGBoost machine learning analysis; and (2) examine the moderating effect of ACEs on the relationship between workplace incivility and turnover intention. Given the competing theoretical predictions, we did not impose a directional hypothesis regarding the nature of the moderation. Instead, we explored whether the stress sensitization or stress inoculation model better accounts for the observed data.

2. Method

2.1 Study design and participants

This study adopted a cross-sectional study design based on data from nurses working in a tertiary general hospital in Shandong Province, China. A convenience sampling method was used for participant recruitment. The dataset was collected between March and October 2024 through an online questionnaire survey. Eligible participants were nurses who met the following criteria: (1) aged 18 years or older and (2) holding a valid nursing qualification certificate. Nurses who were on leave, participating in further education programs, or experiencing physical or psychological conditions that might affect their ability to complete the questionnaire were excluded.

Prior to data collection, the research team established communication with the nursing department of the participating hospital. Data collectors were recruited and provided with standardized training regarding research ethics, participant recruitment procedures, and questionnaire administration. After completing the training, data collectors distributed the online survey link to eligible nurses, who completed the questionnaire independently through an electronic platform.

Before accessing the questionnaire, participants were provided with information regarding the study objectives, procedures, potential benefits, and possible risks. Written informed consent was obtained electronically from all participants before participation. Participants were also informed that participation was voluntary and that they could withdraw from the study at any time without any consequences. To minimize duplicate responses, the online survey system was configured to allow only one submission from each IP address.

A total of 431 questionnaires were initially received. After excluding 11 responses that did not meet the eligibility criteria, 410 valid questionnaires were included in the final analysis, resulting in a valid response rate of 95.13%.

2.2 Demographic and Work-Related Information

Sociodemographic and occupational characteristics were collected using a self-developed questionnaire based on previous literature. These variables were selected because demographic and work-related factors have been reported to be associated with nurses' turnover intention and workplace incivility. Sociodemographic information included age, gender, marital status, education, and monthly income. Work-related characteristics comprised working years and number of night shifts per month.

2.3 Turnover Intention

Turnover intention was assessed using the Turnover Intention Scale, which was developed based on the characteristics of nursing workforce turnover in China and adapted from Simon's turnover intention scale[17, 18]. The scale contains seven items measuring nurses' intention to leave from three aspects: the hospital, the nursing profession, and the current clinical department. Each item is rated on a 5-point Likert scale, with higher total scores representing a greater likelihood of turnover intention.

2.4 Adverse childhood experiences

Childhood adversity was evaluated with the Adverse Childhood Experiences Scale-Revised (ACES-R), a 14-item self-report measure [19]. Respondents were asked to report whether they had been exposed to each listed adversity prior to turning 18 years old. The foundational ACEs framework encompasses five categories of maltreatment—physical abuse, psychological abuse, sexual assault, physical neglect, and emotional neglect—alongside five markers of household dysfunction, namely parental divorce or separation, maternal victimization, substance abuse, parental incarceration, and household mental illness [20]. Building upon this original version, the ACES-R incorporates four supplementary items capturing low socioeconomic status, peer victimization, peer social isolation, and exposure to community violence. A cumulative score was generated by summing all endorsed items, resulting in a possible range of 0 to 14, where elevated scores denote a higher burden of adverse childhood experiences. This instrument has undergone Chinese translation and psychometric validation, demonstrating acceptable reliability (Guttman split-half = 0.75; test–retest = 0.70) [21].

2.5 Workplace incivility

Workplace incivility was assessed employing the scale originally developed by Guidroz [22], which has since been translated and culturally adapted for use in Chinese populations [23]. This 43-item instrument is structured around five subscales: nurse incivility (10 items), patient incivility (10 items), supervisor incivility (7 items), physician incivility (7 items), and general incivility (9 items). Responses are recorded on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), producing total scores between 43 and 215, with higher values signifying more frequent experiences of workplace incivility. The original version exhibited strong internal consistency (overall Cronbach's α = 0.972; subscale α s ranging from 0.885 to 0.962).

2.6 Statistical analysis

Multiple imputation was employed to address missing data, producing five imputed datasets through chained equations using the mice package in R [24]. To determine which dimension of workplace incivility exerted the strongest influence on turnover intention, extreme gradient boosting (XGBoost) was applied [25]. This approach was selected because the incivility dimensions exhibited high intercorrelations (Table 2), which could introduce bias into variable importance estimates when relying exclusively on regression coefficients [26]. Machine learning techniques such as XGBoost offer improved sensitivity and generalizability, and perform well with high-dimensional or heterogeneous data, even when sample sizes are modest[27]. The dataset was randomly partitioned into a training set (70%) and a validation set (30%), with model performance evaluated through 10-fold cross-validation [28]. Variable importance was estimated using gain values to reduce the risk of overfitting [29].

Table 2
The Relationship Among Workplace incivility, ACEs, and Turnover Intention

1.Workplace incivility	1	2	3	4	5	6	7	8
	1	0.742**	0.593**	0.724**	0.697**	0.731**	0.127**	0.501**
2.Nurse incivility	0.742**	1	0.521**	0.701**	0.606**	0.720**	0.092	0.474**
3.Patient incivility	0.593**	0.521**	1	0.603**	0.645**	0.596**	0.069	0.565**
4.Supervisor incivility	0.724**	0.701**	0.603**	1	0.793**	0.829**	0.105*	0.602**
5.Physician incivility	0.697**	0.606**	0.645**	0.793**	1	0.766**	0.080	0.571**
6.General incivility	0.731**	0.720**	0.596**	0.829**	0.766**	1	0.124*	0.611**
7.ACEs	0.127**	0.092	0.069	0.105*	0.080	0.124*	1	0.153**
8.Turnover intention	0.501**	0.474**	0.565**	0.602**	0.571**	0.611**	0.153**	1
*:P < 0.05, **:P < 0.001								

Hierarchical regression analyses with robust standard errors were conducted across three models. In Model 1, the effects of ACEs and workplace incivility on turnover intention were examined. Model 2 built upon Model 1 by incorporating an interaction term between ACEs and workplace incivility. Model 3 extended Model 2 through the inclusion of covariates. To further probe the interaction effect, simple slope analysis was performed, and slope plots were generated using an open-source interaction visualization tool based on ordinary least squares regression [30]. All statistical tests were two-tailed with significance set at $\alpha = 0.05$. Analyses were performed in R version 4.4.1.

3. Result

3.1 Characteristics of Participants

A total of 410 nurses were included in this study. The demographic characteristics of the participants are presented in Table 1. Among the participants, 213 (51.95%) were aged 30–40 years, 142 (34.63%) were younger than 30 years, and 55 (13.41%) were aged ≥ 40 years. The majority of participants were female ($n = 340$, 82.93%), while 70 (17.07%) were male. Regarding marital status, 296 participants (72.20%) were married or living with a partner, and 114 (27.80%) were single. In terms of educational attainment, most participants had a junior college education ($n = 372$, 90.73%), followed by technical secondary school education ($n = 21$, 5.12%) and bachelor's degree or above ($n = 17$, 4.15%). Regarding monthly income, 298 participants (72.68%) reported an income of > 6000 yuan, 81 (19.76%) reported 4000–6000 yuan, and 31 (7.56%) reported < 4000 yuan. For working years, half of the participants had more than 10 years of work experience ($n = 206$, 50.24%), whereas 102 (24.88%) had worked for < 5 years and 102 (24.88%) had worked for 5–10 years. Regarding monthly night shifts, 194 participants (47.32%) reported 1–4 night shifts per month, 163 (39.76%) reported no night shifts, 44 (10.73%) reported 5–9 night shifts, and 9 (2.20%) reported more than 10 night shifts per month.

Table 1
Characteristics of Participants (N = 410)

Variables	Mean $\pm$ SD or N (%)
Age (years)	
< 30	142 (34.63%)
30–40	213 (51.95%)
$\geq$ 40	55 (13.41%)
Gender	
Female	340 (82.93%)
Male	70 (17.07%)
Marital status	
Married/ Cohabitation	296 (72.2%)
Singlehood	114 (27.8%)
Education	
Technical secondary school	21 (5.12%)
Junior college	372 (90.73%)
Bachelor degree or above	17 (4.15%)
Monthly income(yuan)	
< 4000	31 (7.56%)
4000 ~ 6000	81 (19.76%)
> 6000	298 (72.68%)
Working years	
< 5	102 (24.88%)
5–10	102 (24.88%)
> 10	206 (50.24%)
Number of night shifts per month	
0	163 (39.76%)
1–4	194 (47.32%)
5–9	44 (10.73%)
> 10	9 (2.2%)

Variables	Mean $\pm$ SD or N (%)
Adverse Childhood Experiences (ACEs)	0.36 $\pm$ 1.13
Workplace incivility	95.30 $\pm$ 34.84
Nurse incivility	23.22 $\pm$ 7.45
Patient incivility	24.94 $\pm$ 10.31
Supervisor incivility	13.94 $\pm$ 7.17
Physician incivility	15.31 $\pm$ 7.80
General incivility	17.22 $\pm$ 8.73
Turnover intention	14.84 $\pm$ 7.42

The mean score of ACEs was 0.36 ± 1.13 . The mean score of workplace incivility was 95.30 ± 34.84 , including nurse incivility (23.22 ± 7.45), patient incivility (24.94 ± 10.31), supervisor incivility (13.94 ± 7.17), physician incivility (15.31 ± 7.80), and general incivility (17.22 ± 8.73). The mean score of turnover intention was 14.84 ± 7.42 .

3.2 Correlations Among Workplace Incivility, ACEs, and Turnover Intention and XGBoost Analysis

As presented in Table 2, workplace incivility and all of its dimensions were significantly positively correlated with turnover intention ($r = 0.501$, $r = 0.474$, $r = 0.565$, $r = 0.602$, $r = 0.571$, $r = 0.611$; all $P < 0.001$), indicating that higher levels of workplace incivility were associated with stronger intentions to leave the organization. In addition, ACEs were also significantly positively associated with turnover intention ($r = 0.153$, $P < 0.001$), indicating that greater exposure to adverse childhood experiences corresponded to higher turnover intention.

To further explore the relative contribution of different dimensions of workplace incivility to turnover intention, an XGBoost model was constructed (Fig. 1). The results demonstrated that supervisor incivility (gain = 0.223) had the highest contribution to turnover intention, followed by patient incivility (gain = 0.201), nurse incivility (gain = 0.169), physician incivility (gain = 0.162) and general incivility (gain = 0.114). These findings indicated that different sources of workplace incivility contributed unequally to turnover intention, with supervisor incivility and patient incivility showing the greatest predictive importance.

3.3 The Moderating Effect of ACEs on the Association Between Workplace Incivility and Turnover Intention

To examine whether ACEs moderated the association between workplace incivility and turnover intention, hierarchical regression analyses were conducted. Workplace incivility (including total

workplace incivility and its five dimensions), ACEs, and their interaction terms were sequentially entered into the regression models. As shown in Table 3, in Model 1, workplace incivility and ACEs were significantly associated with turnover intention. Specifically, workplace incivility ($\beta = 0.104$, $P < 0.001$) and ACEs ($\beta = 0.593$, $P = 0.036$) were positively associated with turnover intention. Similar significant associations were observed for all dimensions of workplace incivility, including nurse incivility, patient incivility, supervisor incivility, physician incivility, and general incivility.

Table 3
The interaction between ACEs and Workplace incivility on Turnover Intention

	Model1		Model2		Model3	
	β	<i>p</i> -value	β	<i>p</i> -value	β	<i>p</i> -value
Workplace incivility	0.104	<0.001	0.117	<0.001	0.118	<0.001
ACEs	0.593	0.036	5.061	<0.001	4.920	<0.001
Workplace incivility*ACEs			-0.039	<0.001	-0.039	<0.001
Nurse incivility	0.462	<0.001	0.514	<0.001	0.517	<0.001
ACEs	0.721	0.012	5.097	<0.001	5.195	<0.001
Nurse incivility *ACEs			-0.163	<0.001	-0.172	<0.001
Patient incivility	0.401	<0.001	0.422	<0.001	0.430	<0.001
ACEs	0.749	0.005	2.845	0.004	2.949	0.003
Patient incivility *ACEs			-0.075	0.026	-0.082	0.015
Supervisor incivility	0.612	<0.001	0.682	<0.001	0.681	<0.001
ACEs	0.595	0.022	3.740	<0.001	3.603	<0.001
Supervisor incivility *ACEs			-0.179	<0.001	-0.176	<0.001
Physician incivility	0.534	<0.001	0.596	<0.001	0.605	<0.001
ACEs	0.706	0.008	3.751	<0.001	3.798	<0.001
Physician incivility *ACEs			-0.167	<0.001	-0.170	<0.001
General incivility	0.511	<0.001	0.566	<0.001	0.562	<0.001
ACEs	0.511	0.048	3.978	<0.001	3.871	<0.001
General incivility *ACEs			-0.161	<0.001	-0.161	<0.001
Model3 included covariates (education, monthly income, marital status, gender, working years, age, number of night shifts per month).						

In Model 2, the interaction terms between workplace incivility and ACEs were introduced. The results demonstrated significant interaction effects between ACEs and workplace incivility on turnover intention ($\beta = -0.039, P < 0.001$). Significant moderating effects were also observed for all dimensions of workplace incivility, including nurse incivility ($\beta = -0.163, P < 0.001$), patient incivility ($\beta = -0.075, P = 0.026$), supervisor incivility ($\beta = -0.179, P < 0.001$), physician incivility ($\beta = -0.167, P < 0.001$), and general incivility ($\beta = -0.161, P < 0.001$). After adjusting for demographic covariates, the interaction effects remained statistically significant in Model 3.

To further interpret the significant interaction effects, simple slope analyses were conducted at different levels of ACEs (-2 SD, -1 SD, mean, $+1$ SD, and $+2$ SD). As illustrated in Fig. 2, the strength of the association between workplace incivility and turnover intention varied across different levels of ACEs. Specifically, as ACEs levels increased, the regression coefficient of workplace incivility on turnover intention gradually decreased (-2 SD: $b = 1.02$; -1 SD: $b = 0.80$; 0 SD: $b = 0.58$; $+1$ SD: $b = 0.36$; $+2$ SD: $b = 0.14$). These findings indicate that ACEs significantly moderated the relationship between workplace incivility and turnover intention. Overall, the observed moderation pattern suggests that higher levels of childhood adversity may attenuate, rather than intensify, the association between workplace incivility and turnover intention. This pattern is more consistent with the stress inoculation model than the stress sensitization model. Similar moderating patterns were observed for the different dimensions of workplace incivility, including nurse incivility, patient incivility, supervisor incivility, physician incivility, and general incivility (Figs. 3–7).

4. Discussion

This study investigated the relationships among workplace incivility, ACEs, and turnover intention among Chinese nurses, with three principal findings. First, workplace incivility and all of its dimensions were significantly and positively associated with turnover intention. Second, XGBoost analysis revealed that supervisor incivility exerted the strongest influence on turnover intention among all incivility dimensions. Third, and most notably, ACEs moderated the association between workplace incivility and turnover intention in a direction consistent with the stress inoculation model—higher levels of childhood adversity attenuated, rather than amplified, the impact of workplace incivility on turnover intention.

The positive association between workplace incivility and turnover intention observed in this study is consistent with a substantial body of prior research[7]. This finding can be interpreted through the lens of the job demands-resources model, wherein workplace incivility functions as a chronic interpersonal stressor that depletes nurses' emotional and psychological resources. When such resources are exhausted without adequate replenishment, employees may perceive the organizational environment as unsupportive or even hostile, thereby increasing their intention to leave[31]. Notably, all five dimensions of workplace incivility—including nurse, patient, supervisor, physician, and general incivility—demonstrated significant positive correlations with turnover intention, underscoring the pervasive impact of incivility regardless of its source. This finding suggests that interventions targeting turnover reduction should adopt a comprehensive approach rather than focusing solely on a single type of incivility[32, 33].

A novel contribution of this study is the application of XGBoost machine learning to disentangle the relative contributions of different incivility dimensions. The results identified supervisor incivility as the most potent predictor of turnover intention, followed closely by patient incivility. The prominence of supervisor incivility may be attributed to the inherent power asymmetry in the supervisor–subordinate relationship[34]. Unlike incivility from peers or patients, mistreatment by supervisors directly affects nurses' career advancement, performance evaluation, and resource allocation, thereby posing a more fundamental threat to their professional security and organizational belonging[35]. Moreover, supervisors serve as the primary representatives of organizational authority; when they exhibit uncivil behaviors, employees may interpret this as institutional tolerance of mistreatment, leading to a deeper erosion of trust and commitment to the organization [36]. The substantial contribution of patient incivility is also noteworthy. In the Chinese healthcare context, where the nurse-to-patient ratio is often low and patient expectations are escalating, nurses frequently face verbal aggression and unreasonable demands from patients and their families [37]. This finding aligns with previous research highlighting patient-initiated incivility as a significant source of occupational distress among nurses [38]. Together, these results suggest that priority should be given to addressing incivility from supervisors and patients when designing retention interventions.

The most striking finding of this study is that ACEs moderated the relationship between workplace incivility and turnover intention in a direction consistent with the stress inoculation model. Simple slope analyses demonstrated that as ACEs levels increased, the regression coefficient of workplace incivility on turnover intention progressively decreased. In other words, nurses with greater exposure to childhood adversity exhibited a weakened—rather than strengthened—link between workplace incivility and their intention to leave. Several potential mechanisms may account for this counterintuitive pattern. First, from a stress inoculation perspective, individuals who have encountered and navigated adversity during formative years may develop a broader repertoire of coping strategies and greater psychological flexibility. When confronted with workplace incivility later in life, these individuals may appraise such stressors as less threatening, drawing upon previously acquired coping resources to manage emotional distress without necessarily escalating to turnover consideration[39, 40]. Second, the phenomenon of desensitization may play a role, repeated exposure to adversity may recalibrate individuals' stress thresholds, rendering subsequent interpersonal stressors appear comparatively manageable [41]. Third, from a cognitive appraisal standpoint, nurses with higher ACEs may have developed different interpretive frameworks for workplace conflict—perhaps viewing incivility as an inevitable aspect of professional life rather than a personal violation warranting exit[42, 43].

This finding stands in contrast to the stress sensitization model, which would predict that childhood adversity heightens vulnerability to subsequent stressors and amplifies their negative consequences. It is worth noting that most prior research supporting the sensitization model has focused on clinical outcomes such as depression or anxiety [44, 45], whereas the present study examined a behavioral outcome—turnover intention. It is possible that the moderating effects of ACEs operate differently across outcome domains: while sensitization may dominate in psychopathological trajectories,

inoculation effects may be more salient in behavioral and occupational adaptation, particularly among individuals who have successfully entered and sustained professional careers despite early adversity.

These findings carry several practical implications for nursing workforce management. First, given that supervisor incivility emerged as the strongest predictor of turnover intention, hospital administrators should prioritize cultivating civil leadership cultures. This may involve implementing civility training programs specifically targeting nurse managers and supervisors, establishing clear codes of conduct for leadership behavior, and creating accountable reporting mechanisms for supervisory mistreatment[46]. Second, the significant contribution of patient incivility underscores the need for institutional-level protections against patient-perpetrated incivility, such as zero-tolerance policies, de-escalation training, and adequate staffing to reduce patient-to-nurse ratio pressures [47]. Third, the stress inoculation finding suggests that nurses with higher ACEs exposure may possess underrecognized resilience capacities. Rather than viewing childhood adversity solely as a risk factor, organizations could adopt a strengths-based, trauma-informed approach that acknowledges and leverages the adaptive coping skills that some nurses may have developed through early adversity[48]. However, this should not diminish the ethical imperative to prevent childhood adversity at the societal level.

5. Limitations

This study has several methodological strengths, including the use of XGBoost to address multicollinearity among incivility dimensions and the application of hierarchical regression with robust standard errors. Nevertheless, several limitations should be acknowledged. First, the cross-sectional design precludes causal inference; longitudinal studies are needed to confirm the temporal dynamics of the observed moderating effect. Second, all variables were assessed via self-report, which may introduce recall bias and social desirability effects—particularly concerning the retrospective assessment of ACEs. Third, the mean ACEs score in this sample was notably low, suggesting that the majority of participants reported minimal childhood adversity. This restricted range may limit the generalizability of the stress inoculation finding to populations with more severe or prevalent ACEs exposure. It is possible that the inoculation pattern observed here reflects the experience of individuals with relatively low-level adversity, whereas a sensitization effect might emerge among those with severe or chronic childhood trauma. Fourth, convenience sampling from a single tertiary hospital restricts the representativeness of the findings. Finally, other potential moderators—such as social support, personality traits, or organizational climate—were not examined and may interact with ACEs to shape turnover outcomes.

6. Conclusion

This study demonstrates that workplace incivility is significantly associated with turnover intention among Chinese nurses, with supervisor incivility exerting the strongest predictive influence. Crucially, ACEs moderate this relationship in a manner consistent with the stress inoculation model, such that higher childhood adversity attenuates the impact of workplace incivility on turnover intention. These findings challenge the assumption that early adversity uniformly amplifies vulnerability to occupational

stress and suggest that some nurses with ACEs exposure may have developed adaptive coping capacities. Future longitudinal research across diverse healthcare settings and ACEs severity levels is warranted to further elucidate the conditions under which stress inoculation versus sensitization effects prevail.

Declarations

Abbreviations

None

Ethics approval and consent to participate

This study obtained approval from the Ethics Committee of Shandong Provincial Hospital Affiliated to Shandong First Medical University. All human participant-related procedures conformed to the 1964 Helsinki Declaration and its subsequent amendments. All experimental methods complied with relevant regulations, and all subjects signed informed consent.

Consent for publication

Not Applicable.

Competing Interests

The authors declare none.

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Author Contribution

Xue Liang: methodology, formal analysis, investigation, writing – original draft. Hui Li: investigation, data curation, writing – review & editing. Jing Wang: investigation, data curation, writing – review & editing. Hongxiang Duan: investigation, data curation, writing – review & editing. Xiaoyang Zhou: conceptualization, methodology, supervision, project administration, writing – review & editing. Yadong Liu: conceptualization, supervision, project administration, writing – review & editing.

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Data Availability

The datasets supporting the findings of this study are not publicly available due to privacy protection requirements. The custom analysis code used in this work may be requested from the corresponding author on reasonable request.

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Figures

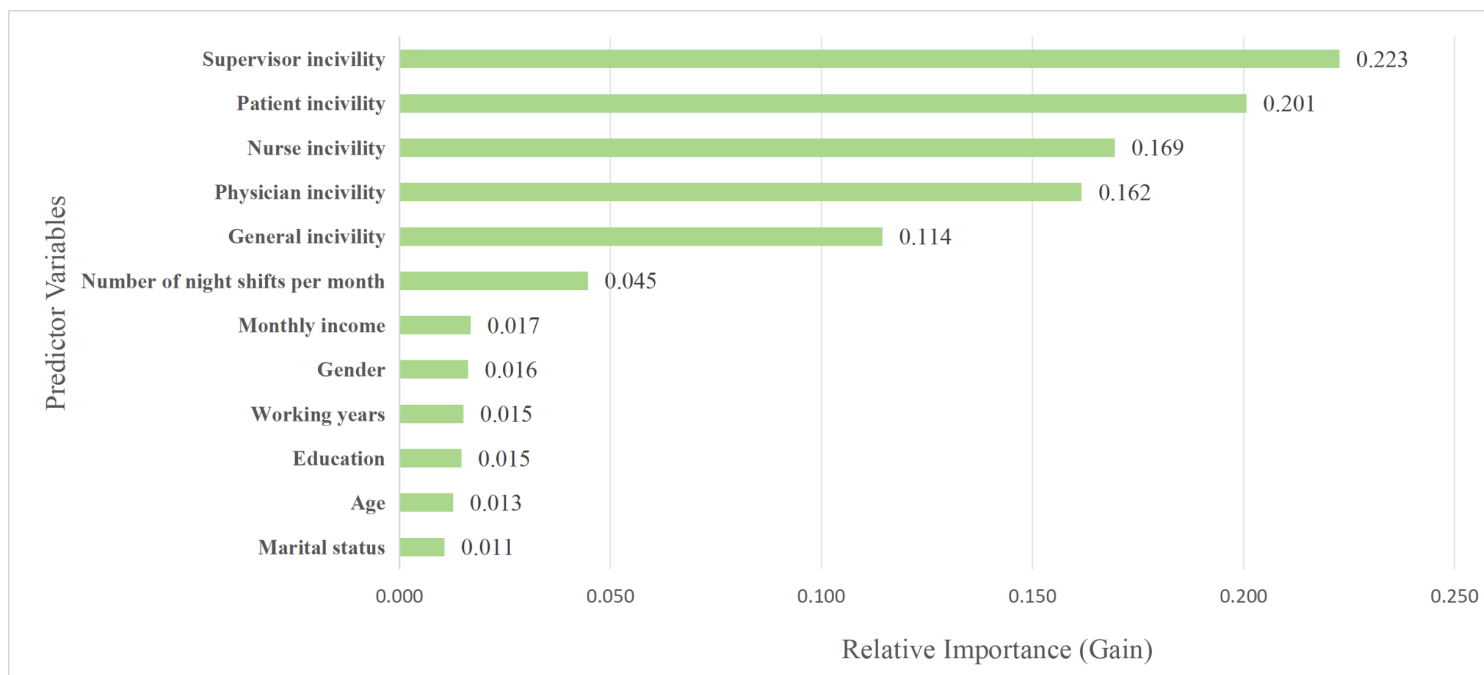


Figure 1

The ranking of the association strength between different dimensions of the nursing incivility scale and turnover intention.

X-axis indicates the contribution (gain) of each variable to turnover intention, Y-axis indicates the variables.

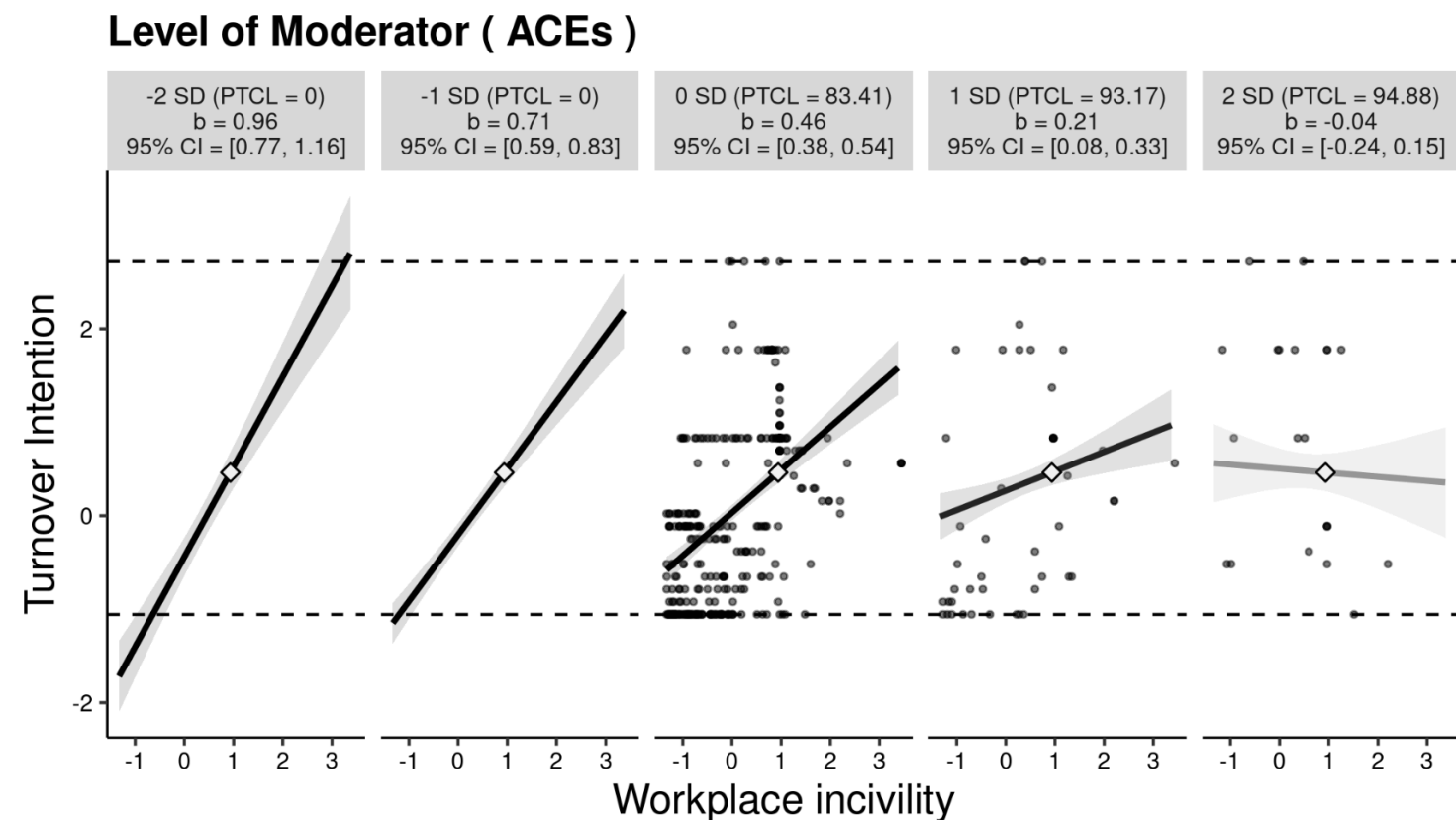


Figure 2

The interaction between ACEs and Workplace incivility on turnover intention.

ACEs: Adverse childhood experiences, SD: standard deviation, PTCL: percentiles, CI: confidence intervals. Each point represents a different data point. The left side represents lower levels of adverse childhood experiences (-2 SD), while the right side represents higher levels of adverse childhood experiences (+2 SD). The grey (bold) slopes indicate a significant interaction between ACEs and workplace incivility on turnover intention.

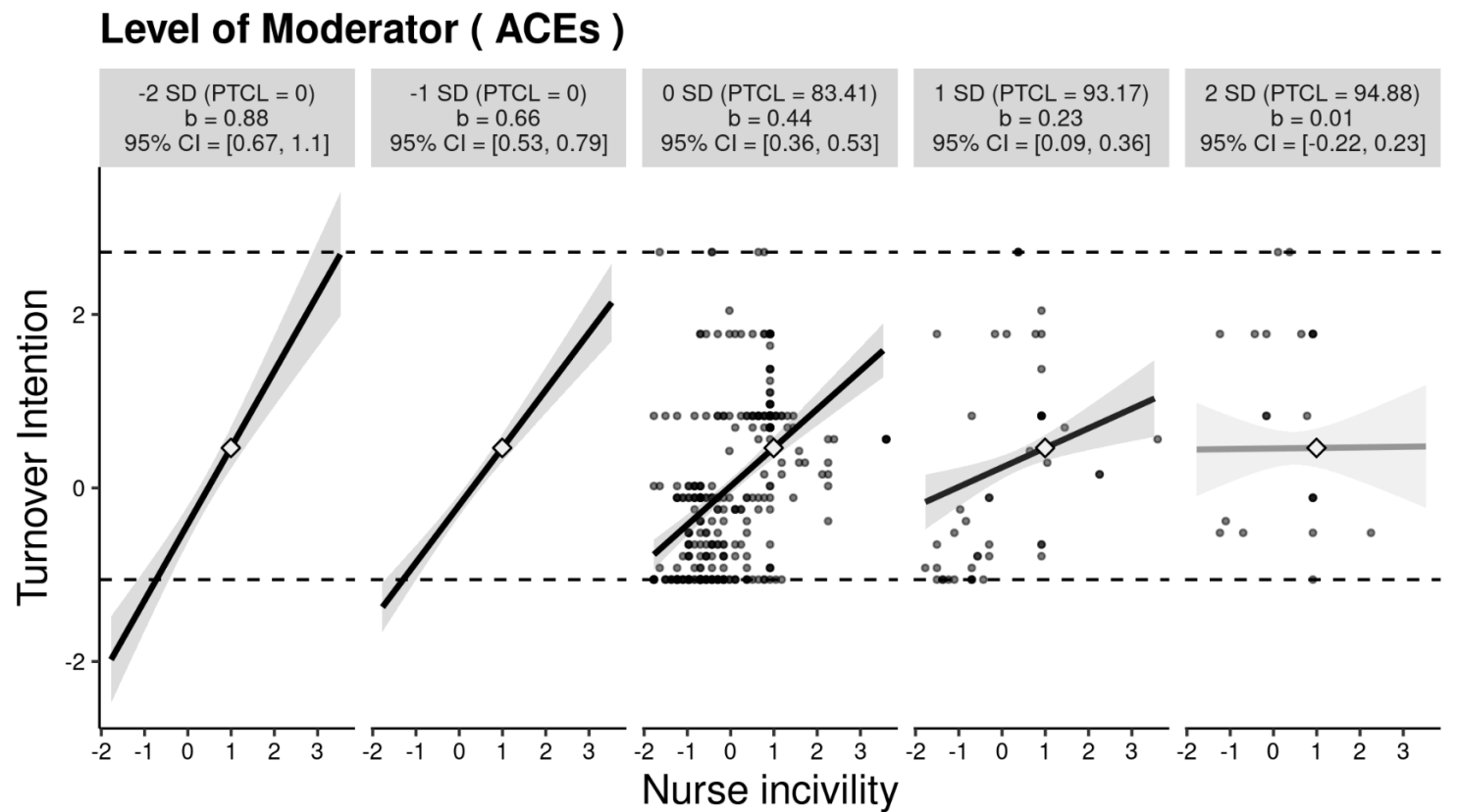


Figure 3

The interaction between ACEs and nurse incivility on the turnover intention.

ACEs: adverse childhood experiences, SD: standard deviation, PTCL: percentiles, CI: confidence intervals. Each point represents a different data point. The left side represents lower levels of adverse childhood experiences (-2 SD), while the right side represents higher levels of adverse childhood experiences (+2 SD). The grey (bold) slopes indicate a significant interaction between ACEs and nurse incivility on the turnover intention.

Level of Moderator (ACEs)

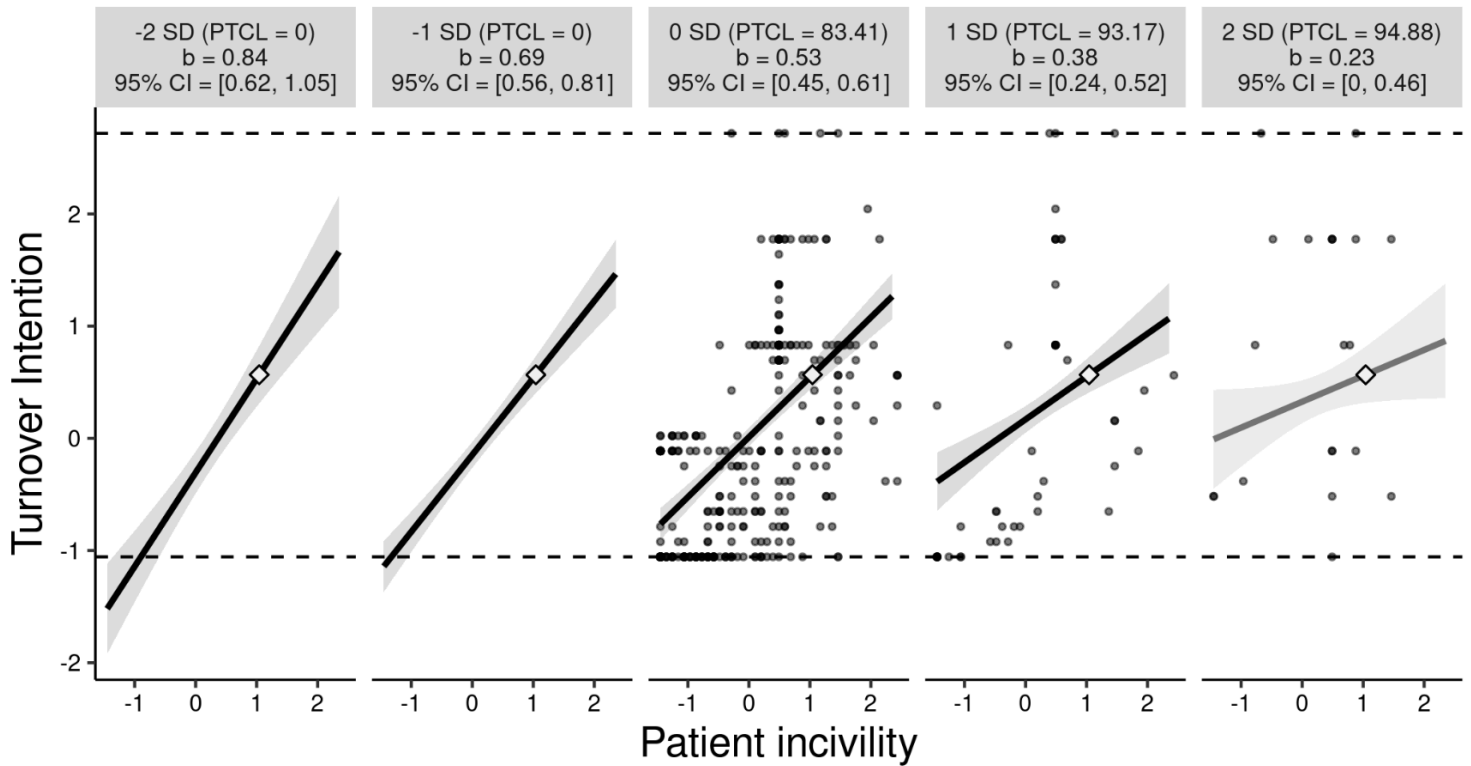


Figure 4

The interaction between ACEs and patient incivility on turnover intention.

ACEs: adverse childhood experiences, SD: standard deviation, PTCL: percentiles, CI: confidence intervals. Each point represents a different data point. The left side represents lower levels of adverse childhood experiences (-2 SD), while the right side represents higher levels of adverse childhood experiences (+2 SD). The grey (bold) slopes indicate a significant interaction between ACEs and patient incivility on turnover intention.

Level of Moderator (ACEs)

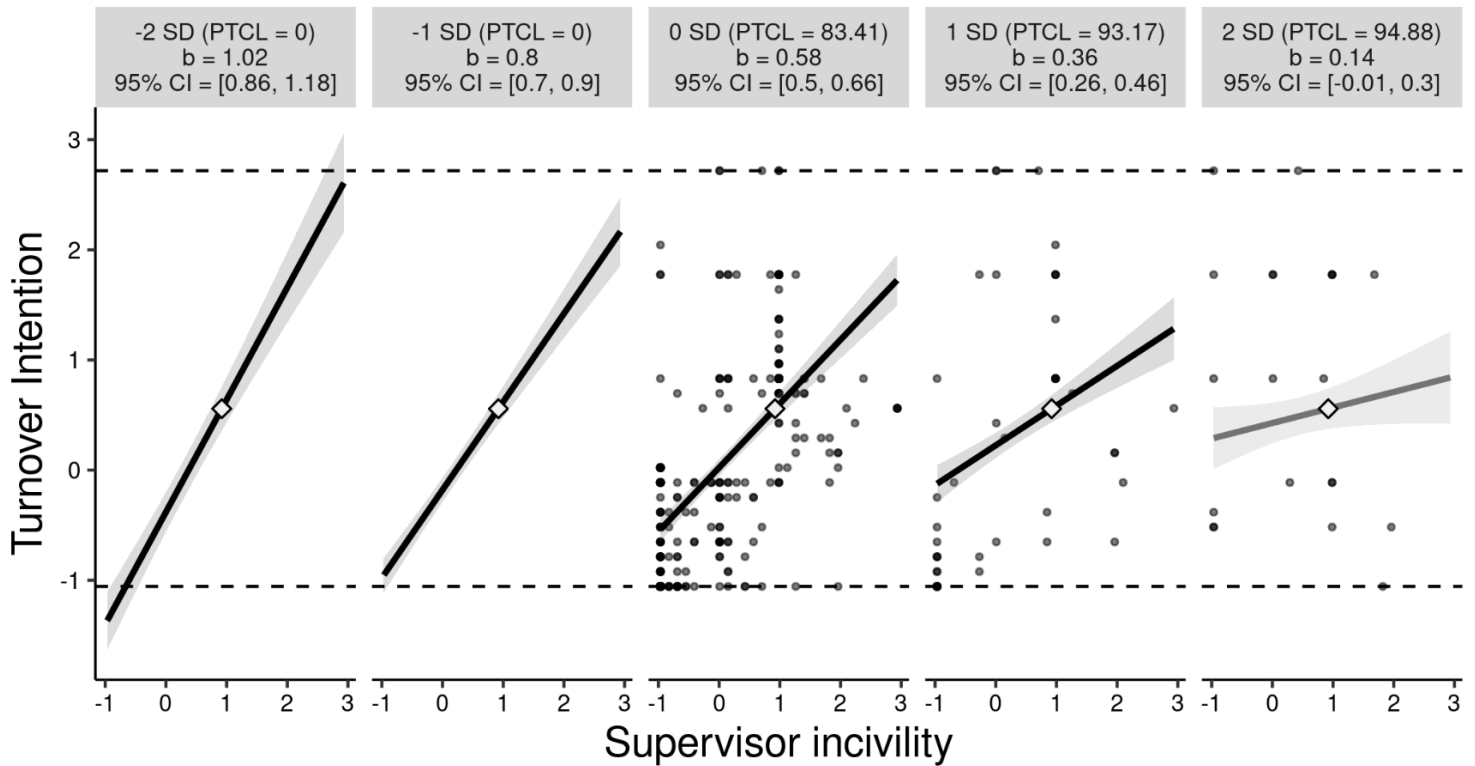


Figure 5

The interaction between ACEs and supervisor incivility on the turnover intention.

ACEs: adverse childhood experiences, SD: standard deviation, PTCL: percentiles, CI: confidence intervals. Each point represents a different data point. The left side represents lower levels of adverse childhood experiences (-2 SD), while the right side represents higher levels of adverse childhood experiences (+2 SD). The grey (bold) slopes indicate a significant interaction between ACEs and supervisor incivility on the turnover intention.

Level of Moderator (ACEs)

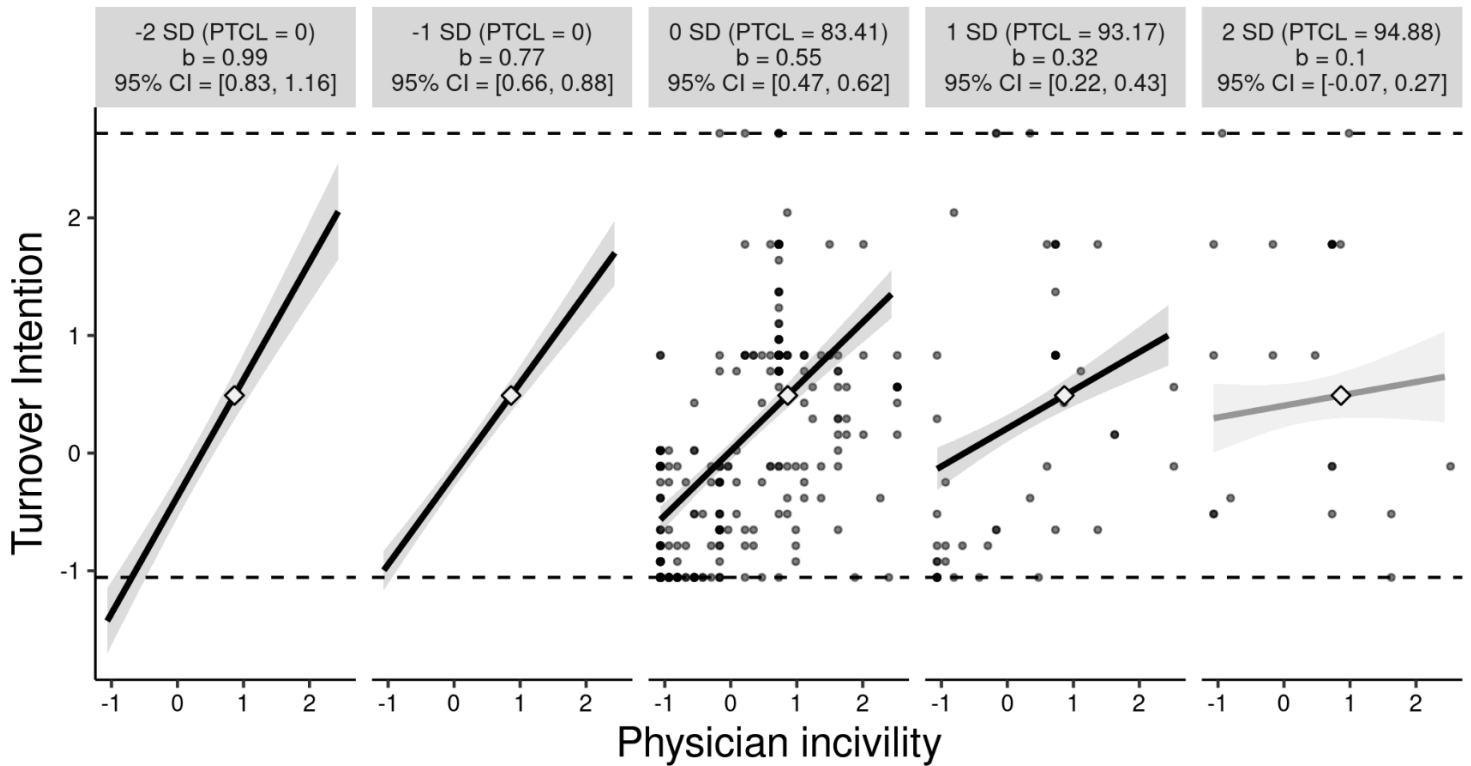


Figure 6

The interaction between ACEs and physician incivility on turnover intention.

ACEs: adverse childhood experiences, SD: standard deviation, PTCL: percentiles, CI: confidence intervals. Each point represents a different data point. The left side represents lower levels of adverse childhood experiences (-2 SD), while the right side represents higher levels of adverse childhood experiences (+2 SD). The grey (bold) slopes indicate a significant interaction between ACEs and physician incivility on turnover intention.

Level of Moderator (ACEs)

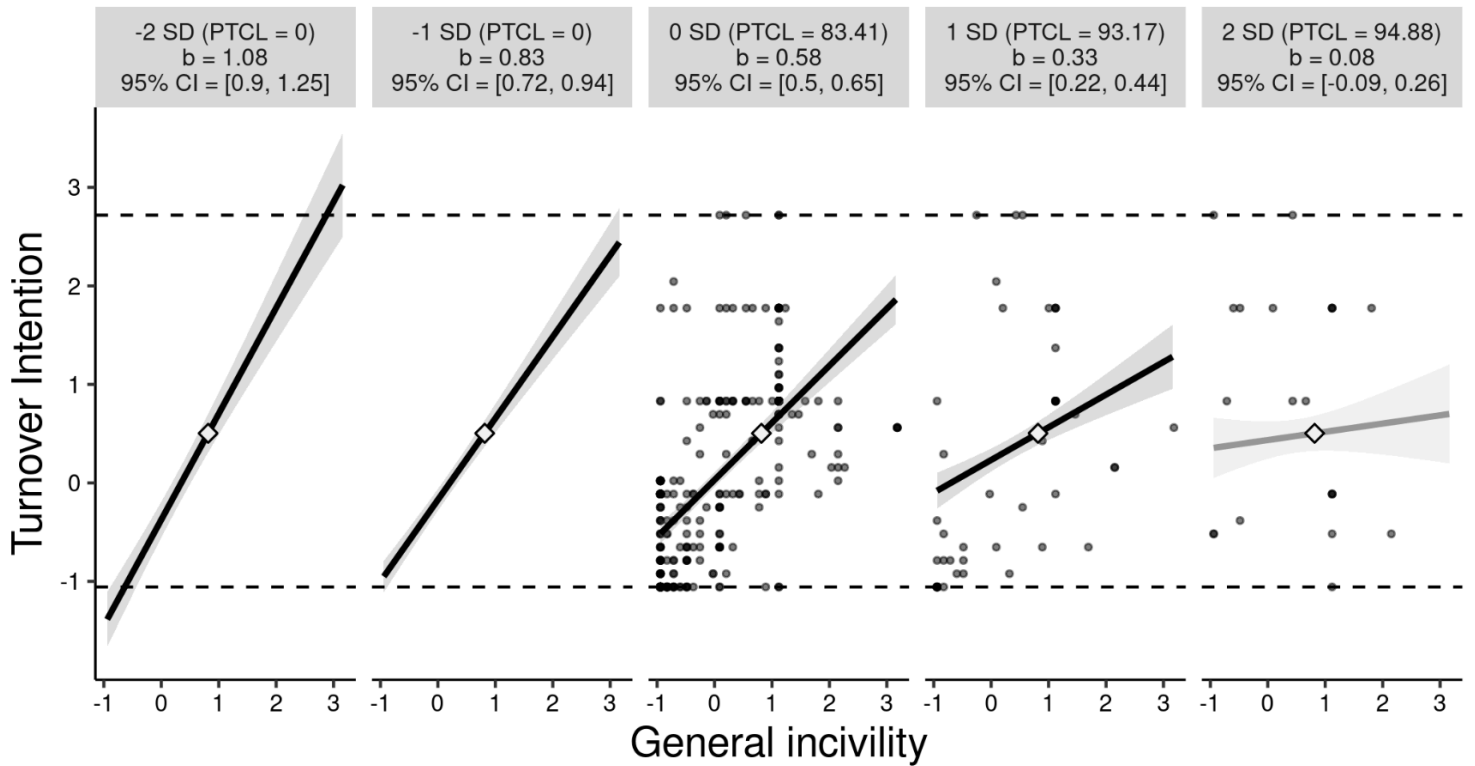


Figure 7

The interaction between ACEs and general incivility on turnover intention.

ACEs: adverse childhood experiences, SD: standard deviation, PTCL: percentiles, CI: confidence intervals. Each point represents a different data point. The left side represents lower levels of adverse childhood experiences (-2 SD), while the right side represents higher levels of adverse childhood experiences (+2 SD). The grey (bold) slopes indicate a significant interaction between ACEs and general incivility on turnover intention.