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Original article

# Investigation of Demand–Control–Support Model and Effort–Reward Imbalance Model as Predictor of Counterproductive Work Behaviors

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ABSTRACT

*Background:* Nowadays, counter-productive work behaviors (CWBs) have turned into a common and costly position for many organizations and especially health centers. Therefore, the study was carried out to examine and compare the demand–control–support (DCS) and effort–reward imbalance (ERI) models as predictors of CWBs.

*Methods:* The study was cross-sectional. The population was all nurses working in public hospitals in Hamadan, Iran of whom 320 were selected as the sample based on simple random sampling method. The instruments used were Job Content Questionnaire, Effort–Reward Imbalance Questionnaire, and Counterproductivity Work Behavior Questionnaire. Data were analyzed using correlation and regression analysis in SPSS18.

*Results:* The findings indicated that both ERI and DCS models could predict CWB ($p \leq 0.05$); however, the DCS model variables can explain the variance of CWB-I and CWB-O approximately 8% more than the ERI model variables and have more power in predicting these behaviors in the nursing community.

*Conclusion:* According to the results, job stress is a key factor in the incidence of CWBs among nurses. Considering the importance and impact of each component of ERI and DCS models in the occurrence of CWBs, corrective actions can be taken to reduce their incidence in nurses.



## 1. Introduction

Human capital is one of an organization's most important resources, playing a significant role in its effectiveness and success. Attention to human forces in such organizations in recent years has accounted for a large part of the time and capital of leading organizations. Sometimes the employees of the organization face distress such as a lack of optimal management, injustice, and job stress. Such distresses cause the human resources in the organization to perform actions and behaviors that prevent the organization from achieving its aims [1]. One of the most important of these behaviors is counterproductive work behavior (CWB) that has piqued the interest of researchers in recent years [2]. CWBs are defined as intentional behaviors that are intended to harm the organization, its employees, or both [3]. These behaviors include theft and related behaviors, destruction of property, misuse of information, misuse of time and resources, unsafe behaviors, disordered and poor attendance, poor quality of work, alcohol use, drug and substance abuse, verbal acts, and inappropriate physical actions [4].

The researchers classified CWBs into two types based on their intended audience: individuals and organizations. CWBs toward individuals (CWB-I) are defined as intentional and employee-induced behaviors that harm individuals in the organization (e.g., inappropriate verbal actions with co-workers). CWB toward the organization (CWB-O) is defined as employees' intentional behavior and desire to harm and damage the organization (e.g., poor attendance) [5].

CWB is one of the most significant costs for organizations [6]. According to reports, in the United States in 2016, $1.1 million was lost due to theft, and more than $6.3 billion was lost due to job fraud. According to reports, the annual cost of wasting time, which is a type of CWB, in the United States is $759 billion [7,8]. Aside from the economic costs, CWB has negative psychological consequences such as negative effects on mental and physical health, decreased employee morale, increased absenteeism and early retirement, decreased productivity, and loss of organizational reputation [9,10]. Unfortunately, in spite of the significant costs and harms of abnormal work behaviors, these behaviors remain

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remarkably prevalent. In the United States, 33–75% of the employees are engaged in different types of CWB [11]. Given the frequency of CWB incidence and significant costs for organizations and communities, these behaviors have been examined in many studies [12].

The causes of CWBs can be divided into two categories: personal factors (such as personality traits and intelligence) and situational factors (such as organizational justice and leadership) [13–16]. According to Balducci et al., quantitative workload influences the overall CWB index [17]. Smoktunowicz et al. identified job demand and control as the factors that affect CWB [6]. Chiaburu and Harrison discussed the role of social support in the development of CWBs [18]. Moreover, many studies state that job stress is a predictor of CWB [19,20]. Nursing has consistently had the highest level of job stress among all healthcare professions over the last decade [21]. Patients' emotional demands, long work hours, and interpersonal conflicts among nurses all put them under stress [22,23]. Hence, continuous and prolonged exposure to unavoidable and stressful workplace situations may result in CWB among them. CWB in nurses inevitably has negative consequences on patients' health, quality of healthcare, clinical performance, and decisions of other healthcare professionals. Nevertheless, CWB nursing studies are sparse. This is especially the case for studies from the perpetrator's point of view. However, there are specific characteristics of work that lead to CWB in nurses for example, work demands, injustice in salary, and lack of support [24–26].

The most prevalent models of job stress in the workplace are the demand–control–social support (DCS) model and the reward–effort imbalance (ERI) model. DCS model calculates the dimensions of job stress using Job Content Questionnaire (JCQ) by combining job demand factors (workload, physical demands, time pressure, and work breaks), job control (freedom to decide how to work in their job), and social support (by supervisors and co-workers). In the DCS model, inappropriate work environment conditions such as high job demands, lack of job control, and lack of social support in the workplace increase job stress and, as a result, negative outcomes in individuals [27–29]. The ERI model, on the other hand, is based on social exchange theory and implicitly emphasizes organizational injustice (high cost and low profit in the job). According to this model, an imbalance between the effort expended at work and the rewards received (money, dignity, job opportunity, or job security) causes emotional distress, which increases the risk of negative health consequences. Furthermore, the model requires a lot of mental effort which is a sign of coping known as overcommitment, which worsens the experience of stress at work and eventually leads to negative consequences [30,31]. It is difficult to find a study that investigates the relationship between the components of these two models or compares them in the development of CWBs in nurses. Given this gap and the capabilities of the models stated, the purpose of the study was to examine the ERI model and the DCS model as predictors of CWBs and also to compare whether job pressure caused by high demand and limited control leads to higher CWB in nurses or the perception of an imbalance between effort and reward.

To achieve this aim, we considered the following hypotheses:

Hypothesis 1. The DCS model predicts CWB-I.

Hypothesis 2. The DCS model predicts CWB-O.

Hypothesis 3. The ERI model predicts CWB-I.

Hypothesis 4. The ERI model predicts CWB-O.

Hypothesis 5. The DCS model predicts CWBs better than the ERI model.

**Table 1**
Demographic characteristics of nurses (results of SPSS18 processing)

| Demographic information | *n* | % |
|---|---|---|
| Gender | | |
| Male | 35 | 4/11 |
| Female | 272 | 6/88 |
| Marital status | | |
| Single | 50 | 29/16 |
| Married | 257 | 71/83 |
| Education status | | |
| Associate degree | 23 | 49/7 |
| Bachelor degree | 224 | 97/72 |
| Master's degree and higher | 60 | 54/19 |
| Shift status | | |
| Morning | 48 | 64/15 |
| Evening | 11 | 58/3 |
| In circulation | 248 | 78/80 |
| Age M(SD) | 51/41 (94/9) | |
| Years of service M(SD) | 32/17 (36/10) | |

*Note*. $N = 307$.
M = mean; SD = standard deviation.

## 2. Materials and Methods

### 2.1. Participants

This cross-sectional study was conducted in 2021 in the Department of Ergonomics, School of Health, Hamadan University of Medical Sciences, Iran. The study population included 1,900 nurses from public hospitals in Hamadan, Iran. Having at least one year of work experience and being employed during the research were inclusion criteria. The Krejci Morgan table was used to determine the sample size. This table is provided by Krejci and Morgan, who estimated the sample size for different values of the community size using the following formula [32,33]:

$$s = X^2\, N\, P\,(1 - P)/d^2\,(N - 1) + X^2\, P\,(1 - P),$$

s = required sample size.
$X^2$ = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841).
$N$ = the population size.
$P$ = the population proportion (assumed to be *.50* since this would provide the maximum sample size).
$d$ = the degree of accuracy expressed as a proportion (*.05*)

However, there is no need for a formula to use this table since the table has all the provisions needed to arrive at the sample size. It is enough to find the population size in the respective column, then look at the corresponding column in the table and extract the sample size. In this study, for the statistical population of 1900 nurses, the sample size was estimated to be 320 using the Krejci and Morgan table. Then, these 320 nurses from all public hospitals in Hamadan were selected using the simple random sampling method and through the table of random numbers.

After going to the public hospitals of Hamadan city, the necessary arrangements were made with the hospital management and supervisors of different departments. Questionnaires were distributed among nurses who were selected as samples. Thirteen nurses were excluded from the study for failing to complete the questionnaire. Therefore, 307 nurses answered the questionnaires when they were present in the nursing offices. Finally, the questionnaires were collected and analyzed.

The research plan was approved by the Research Ethics Committee of Hamadan University of Medical Sciences (Code: IR.UMSHA.REC.1399.984). The collected data were anonymous and treated as confidential. Orientation sessions were held for participants and all participants signed, informed, and written consent.

Demographic characteristics of the nurses were collected (see Table 1). Most of the subjects were females, married, and had a bachelor's degree and a rotating shift. The mean age and work experience of the subjects were, respectively, 41.51 and 17.32. Fig. 1 shows the conceptual framework in this study.

### 2.2. Measures

#### 2.2.1. Job Content Questionnaire

JCQ was developed by Karasek et al. in 1998 [29]. The long form contained 49 items, while the short form contained 22 items, divided into three subscales: decision latitude (nine items), psychological demands (five items), and social support (eight items). The questionnaire rates each item on a scale of 1 (strongly disagree) to 4 (strongly agree). Furthermore, Arajo and Karasek (2008) studied a sample of employees in Brazil to evaluate and confirm the tool's reliability and validity. Furthermore, they reported 0.65 (decision latitude), 0.66 (psychological demands), and 0.71 (reliability) for the subscales of this questionnaire (social support). In the same way, they used confirmatory factor analysis (CFA) to demonstrate its validity [34]. The validity of the JCQ was evaluated and confirmed using CFA in this study. Furthermore, using Cronbach's alpha, the reliability of the three subscales of decision-making latitude, job demand, and support in this study was calculated as 0.70, 0.66, and 0.75, respectively.

#### 2.2.2. Effort–Reward Imbalance Questionnaire

Siegrist et al. [31] created the English version of the Effort–Reward Imbalance Questionnaire, and Babamiri et al. [35] created the Persian version, which was used in the study to assess ERI and overcommitment. The questions in the questionnaire are graded on a four-point Likert scale (strongly disagree, disagree, agree, and strongly agree). The questionnaire had 22 questions, in which the first five items can be used to assess a person's efforts to perform job duties; 11 of them can be used to assess individuals' rewards, such as respect, approval, promotion, and job security; and the remaining six can be used to assess individuals' overcommitment. According to Babamiri et al. [35], the Cronbach's alpha reliability of the questionnaire for effort, reward, and overcommitment was 0.76, 0.79, and 0.75, respectively. CFA was also used to assess and confirm the validity of the Effort–Reward Imbalance Questionnaire.

**Table 2**
Mean and standard deviation of variables (results of SPSS18 processing)

| Variable | Mean | Standard deviation |
|---|---|---|
| Demand | 53.66 | 4.91 |
| Control | 66.52 | 7.91 |
| Social support | 22.11 | 5.31 |
| Effort | 19.91 | 4.19 |
| Reward | 31.41 | 3.82 |
| Overcommitment | 18.55 | 3.50 |
| CWB-I | 15.01 | 8.03 |
| CWB-O | 22.27 | 9.80 |

*Note*. $N = 307$.
CWB-I = counterproductive work behaviors toward individuals; CWB-O = counterproductive work behavior toward the organization.

#### 2.2.3. Counterproductivity Behavior Questionnaire

CWBs were measured using the Bennett and Robinson standard questionnaire [11]. The scale is two-dimensional and contains 19 questions: 12 questions are related to the organization-oriented CWB dimension, and 7 questions are related to the individual-oriented CWB dimension, with 7 options from 1 to 7 on the Likert scale (never, once a year, twice a year, several times a year, once a month, once a week, and once a day). Higher scores show a higher level of CWB. Cronbach's alpha for the present study was 0.91 and 0.93 for CWB-I and CWB-O, respectively.

### 2.3. Data analysis

Descriptive statistics were reported as a number (percentage) for categorical variables and a mean (standard deviation) for continuous variables across all participants. To investigate the relationship between variables, the Pearson correlation coefficient and multiple regression analysis were used. The results were presented with a confidence interval of 95%. SPSS18 [36] was used for all analyses. Before analyzing the data, the assumptions of linear regression analysis were examined: linearity, homoscedasticity, independence, normality, and no multicollinearity. Individual and CWB-I and CWB-O were dependent variables in the analyses, while DCS and ERI model variables were independent variables.

## 3. Results

The mean and standard deviation of the variables are listed in Table 2. The control variable on job had the highest mean of 66.52, followed by job demand at 53.66. In this study, the CWB-I had the lowest mean of 15.01.

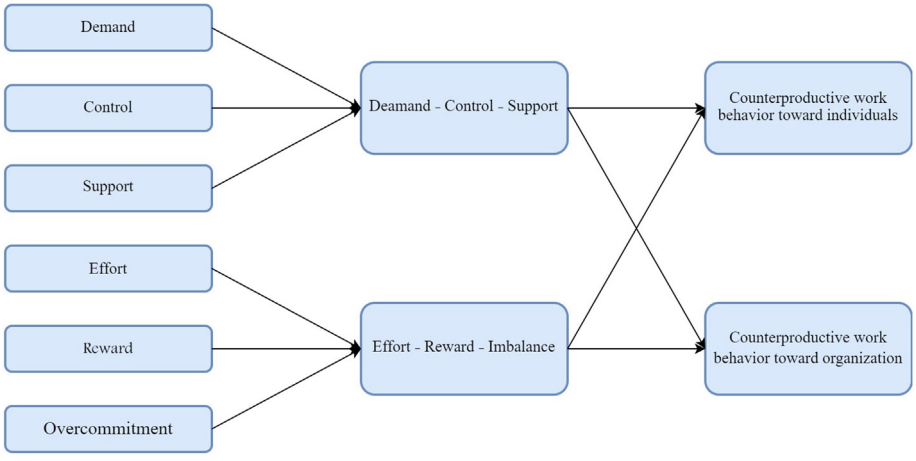


**Fig. 1.** Conceptual framework.

**Table 3**
Simple correlation coefficients by Pearson method (results of SPSS18 processing)

| Variable | Demand | Control | Social support | Effort | Reward | Overcommitment |
|---|---|---|---|---|---|---|
| CWB-I | | | | | | |
| R | 0.298 | 0.073 | −0.149 | 0.028 | −0.118 | 0.078 |
| P | 0.000 | 0.205 | 0.009 | 0.635 | 0.045 | 0.183 |
| CWB-O | | | | | | |
| r | 0.314 | 0.133 | −0.097 | 0.026 | −0.130 | 0.027 |
| p | 0.000 | 0.20 | 0.090 | 0.651 | 0.027 | 0.648 |

*Note.* $N = 307$. Significance levels at $p \leq 0.05$.
CWB-I, counterproductive work behaviors toward individuals; CWB-O, counterproductive work behavior toward the organization.

The simple Pearson correlation coefficient results show that CWB-I has a positive and significant relationship with demand and a negative and significant relationship with social support and reward (see Table 3). Furthermore, at the 0.05 level, there is a positive and significant relationship between CWB-O and demand and control, as well as a negative and significant relationship with reward.

Simultaneous regression analysis was used to determine the contribution of each of the variables of DCS models and ERI in predicting CWBs in nurses. The results of the regression analysis are shown in Table 4. The findings indicated that the prediction of CWBs (individual and organizational) has been confirmed by the predictive variables of DCS model ($p \leq 0.001$). Thus, there is sufficient evidence to support Hypotheses 1 and 2. According to Table 4, the ERI model is significant for CWB-I but not for CWB-O in nurses at the 0.05 level. Thus, there is evidence to support Hypothesis 3, but we did not find any evidence to support Hypothesis 4. Among the DCS model variables, demand and social support can predict CWB-I ($\beta = 0.318$), ($\beta = -0.169$ and organizational $\beta = 0.311$) and ($\beta = -0.127$). Among the predictor variables of ERI model, the overcommitment variable can predict CWB-I ($\beta = 0.145$) and reward variables predict CWB-I and CWB-O ($\beta = -0.179$ and $\beta = -0.171$) in nurses. Overall, DCS model variables can explain approximately 11% of the variance in CWB-I and CWB-O. In nurses, ERI model variables can explain 3% of CWB-I and 2.5% of CWB-O. As a result, Hypothesis 5 is supported.

## 4. Discussion

The purpose of the study was to examine and compare the DCS model and the ERI model as predictors of CWBs. The results showed that both models could predict and explain CWBs, but the DCS model had more predictability.

### 4.1. CWB prediction by DCS model

The DCS model predicts both the CWB-I and CWB-O dimensions based on the results (Hypothesis 1 and 2). The demand component has a positive and significant relationship with both CWB dimensions, while social support has a negative and significant relationship. It is assumed in the DCS model that a combination of high job demand and low job control leads to physical and psychological strain. This is the worst case scenario for employees who have high job demand but little job control, as well as a lack of social support [37]. The findings revealed that the greater the job demands and demands for nurses in the workplace, as well as the less support they receive, the greater the pressure and stress they face. As a result, nurses commit to CWB-I and CWB-O in order to cope with these stresses and psychological pressures. Jalilian et al. examined job stress of the nurses based on the DCS model. They concluded that nurses' psychological and physical demands are high, but their social support and decision-making freedom are low. This demonstrates that the majority of the nurses studied are in an isometric position, which is the worst case scenario from a macroergonomic standpoint [38]. Chen et al. found that job demand was positively correlated with CWBs in a study of 439 coal workers, which is consistent with our findings [39]. Chiaburu and Harrison found that peer support is directly related to CWB-I and CWB-O in their meta-analysis, which is also consistent with our findings [18]. Smoktunowicz et al. used two theoretical frameworks (DCS model and resource conservation model) to examine the relationship between job demand, burnout, and the CWB in social support and job control among 625 police officers [6]. They concluded that high job demand is associated with high CWB indirectly and that burnout acts as a mediator. Work-related resources compensate for these indirect effects (social support and job control). In line with our findings, low levels of social support, low job control, and low job demand in the workplace were associated with higher levels of CWB. Useche et al. concluded in a study of 524 Colombian drivers that the DC model predicts bus rapid transport driver errors and violations (high-risk behaviors) and that positive and significant relationship demand and social support have a negative and significant relationship. It is in line with drivers' violations and is consistent with our results because the violations themselves are a form of counterproductive behavior [40].

**Table 4**
Non-standard and standard coefficients of regression model (results of SPSS-18 processing)

| | | Nonstandard coefficients | | Standard coefficients | t | Significance level | R | Squared R | Sig. of ANOVA |
|---|---|---|---|---|---|---|---|---|---|
| | | β | Standard error | β | | | | | |
| CWB-I | Constant | −5.591 | 5.191 | | −1.077 | 0.282 | 0.343 | 0.117 | $p \leq 0.001$ |
| | Demand | 0.522 | 0.100 | 0.318 | 5.230 | 0.000 | | | |
| | Control | −0.025 | 0.064 | −0.024 | −0.388 | 0.698 | | | |
| | Social support | −0.256 | 0.085 | −0.169 | −2.997 | 0.003 | | | |
| CWB-O | Constant | −8.381 | 6.363 | | −1.317 | 0.189 | 0.337 | 0.114 | $p \leq 0.001$ |
| | Demand | 0.624 | 0.122 | 0.311 | 5.100 | 0.000 | | | |
| | Control | 0.035 | 0.078 | 0.028 | 0.499 | 0.654 | | | |
| | Social support | −0.235 | 0.105 | −0.127 | −2.249 | 0.025 | | | |
| CWB-I | Constant | 21.535 | 4.246 | | 5.072 | 0.000 | 0.174 | 0.030 | 0.036 |
| | Effort | −0.034 | 0.131 | −0.018 | −0.262 | 0.794 | | | |
| | Reward | −0.377 | 0.137 | −0.179 | −2.748 | 0.006 | | | |
| | Overcommitment | 0.329 | 0.168 | 0.145 | 1.966 | 0.050 | | | |
| CWB-O | Constant | 31.141 | 5.274 | | 5.905 | 0.000 | 0.158 | 0.025 | 0.072 |
| | Effort | 0.046 | 0.163 | 0.019 | 0.280 | 0.779 | | | |
| | Reward | −0.445 | 0.175 | −0.171 | −2.612 | 0.009 | | | |
| | Overcommitment | 0.232 | 0.208 | 0.083 | 1.117 | 0.265 | | | |

*Note.* $N = 307$. Significance levels at $p \leq 0.05$.
CWB-I, counterproductive work behaviors toward individuals; CWB-O, counterproductive work behavior toward the organization.

### 4.2. CWB prediction by ERI model

The findings indicated that the ERI model can forecast CWB-I (Hypothesis 3). According to these findings, there is a negative and significant relationship between the rewards obtained with CWB-I and CWB-O, as well as a positive and significant relationship between overcommitment and CWB-I. Indeed, the ERI model views work effort as an organized exchange process in which the individual is rewarded in proportion to his or her contribution to this social process [41]. They become involved in the CWB when nurses believe they are putting in a lot of effort but not getting the recognition they deserve. According to the findings of a systematic review conducted by Nguyen Van et al., the ERI rate of healthcare workers is high in many Asian and European countries [42]. In a study of 42 emergency ward nurses, Bardhan et al. discovered that overcommitment, even in the absence of an ERI, causes psychosocial stress among nurses [43]. Based on the results of Useche et al., there is a positive and significant relationship between drivers' violations and the rewards they receive, which is consistent with our findings [40]. Also in line with the current findings, a study conducted on 400 employees by Khattak et al. found that perceived injustice leads to counterproductive and deviant behavior [44]. Therefore, the lower the rewards for employees' efforts, the lower the balance of effort and reward. This increases employee perceptions of injustice, and as a result, employees become more involved in the CWB in their workplace to restore a sense of justice.

According to the results, the ERI model cannot predict CWB-O (lack of support for Hypothesis 4). The reason for this is that, according to Berry et al., the behaviors that demonstrate CWB toward individuals are more general and thus more than the behaviors that demonstrate CWB toward the organization [45]. Furthermore, the nurses who experience ERI may be included in this study to establish a link between individual effort and greater reward in the CWB focused on individuals. Costantini et al. discovered no relationships between the ERI model and the CWB in two waves of 80 employees of a manufacturing company, which is consistent with the current study in the individual aspect. They justified the lack of communication by claiming that employees may have a passive attitude toward the experienced imbalance rather than an active behavior by participating in a CWB-I to reestablish the relationship between reward and effort [46].

### 4.3. Comparison of DCS and ERI models in CWBs prediction

In the current study, the DCS model predicted CWBs better (by about 8%) than the ERI model (Hypothesis 5). The ERI and DCS models clearly overlap and differ: the DCS model demand dimension and the ERI model external effort dimension both refer primarily to time constraints and quantitative workloads. The ERI model's reward dimension seeks more macroeconomic opportunities and outcomes, but the dimensions of respect for this model conceptually and operationally overlap with the DCS model's social support dimension [47]. DCS model is limited to the situational aspects of the psychosocial work environment, whereas the ERI model considers both external (efforts and rewards) and internal (overcommitment) factors [48]. The differences between the two models appear to be the cause of the difference in the rate of predicting CWBs among nurses. Differences in the predictive power of different variables by ERI and DCS models can be seen in many studies. In one study, for instance, Rydstedt et al. discovered that the ERI model was a more powerful predictor of mental strain among workers and professionals than the DCS model (with a difference of 1% and 3%) [47,49]. In Harter et al.'s study, the ERI model predicted absenteeism among nurses better than the DCS model [48]. According to Reineholm et al., the DCS model was more capable of predicting employee health at work than the ERI model (approximately 2% and 1% difference for vitality and burnout) [50]. The study by Useche et al. also shows that, unlike the DC model, the ERI model was unable to predict violations [40].

### 4.4. Practical implications

Our study has important implications (according to the CWB predictor variables in the results) for managers of organizations, especially health centers:

- Correcting service compensation and reward systems by providing clear payment criteria, encouraging beneficial competition, and observing justice and stability in performance appraisal
- Teaching job management strategies and training coping skills to help improve nurses' ability to balance demand and available resources
- Interventions in job redesign to increase control over critical work processes and reduce workload
- Creation of social networks and more interaction of nurses with colleagues and hospital managers to increase social support

### 4.5. Limitations and future studies

The study had some limitations that point to future research avenues. The first limitation stems from the study's small sample size, which includes only one occupational group of public hospital employees, the majority of whom are women (88.6 percent), limiting study's generalizability To examine the effect of possible selection biases and generalize current findings, future studies with larger samples, more diverse populations, and composed of private sectors must be replicated.

The second limitation stems from the type of study that is cross-sectional design, which avoids causality. In order to gain stronger causal inferences, the findings must be replicated in longitudinal studies.

The third limitation is related to the measurement method, which is self-reporting despite the fact that self-reports and peer-to-peer reports in the CWB are significantly convergent [24]. However, each method has its own set of issues [51,52]. To achieve better results in future studies, it is critical to combine self-report methods with objective evaluations.

## 5. Conclusion

According to the study, job stress caused by high demand, low control, and a lack of adequate support causes CWBs more than the perception of an imbalance between effort and reward. Stress among nurses and their involvement in CWB types can be reduced by improving the components of reward, demand, and social support.

## Conflicts of interest

All authors have no conflicts of interest to declare.

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