ORIGINAL RESEARCH

Work Reward Moderates the Association Between Work Effect and Workplace Violence Among Medical Staff in China

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Purpose: Workplace violence (WPV) against healthcare workers is a significant public health issue in China and globally. Although the effort–reward imbalance theory claimed that work rewards may moderate the relationship between work effort and WPV, the quantitative evidence is limited. This study aimed to examine if work reward could moderate the associations between work effort and WPV against medical staff based on the effort–reward imbalance theory.
Methods: This is a cross-sectional study, which was conducted in 12 hospitals in Shandong, China. Data collected from 3426 medical staff were analyzed in this study. Work effort was evaluated by working hours and night shift work times per month (NSWM), and work reward was evaluated by monthly income and perceived social status. WPV, occupational characteristics, physical disease, and social-demographic variables were also evaluated in this study.
Results: There were 1788 (52.2%) medical staff, who reported the experience of workplace violence. Working hours, NSWM, and perceived social status were associated with WPV (all $p<0.001$). Monthly income could moderate the associations between monthly income and WPV or verbal violence ($p<0.05$), and perceived social status could moderate the associations between NSWM and WPV ($p<0.001$).
Conclusion: Monthly income could moderate the associations between monthly income and WPV (verbal violence), and perceived social status could moderate the associations between NSWM and WPV, which could be explained by the effort–reward imbalance model. These findings also can be translated into practices to control WPV against medical staff.
Keywords: workplace violence, working hours, shift work times, income, perceived social status, medical staff

Background

The World Health organization (WHO) defined workplace violence (WPV) as "incidents where staff is abused, threatened or assaulted in circumstances related to their work".[1] In recent decades, several studies have reported that about 60% of medical staff experienced WPV in China and other countries in the world,[2–4] and the prevalence appeared to be rising in China.[5,6] In addition, many studies had reported that WPV could contribute to the medical staff's negative psychological and physical health.[7–10] Because of these, we have enough reasons to believe that WPV against medical staff had been an important public health and social problem worldwide,[11,12] which should arouse our attention.

The reasons for the incidence of WPV against medical staff are complex, including patients' high expectation, limited health resources, media misdirection, medical staff's service attitude and communication skill, and so on.[13,14] Among these reasons, several intervention programs, which aimed to improve medical staff's service attitude and communication skill, had been identified to be effective to control WPV, such as communication skills intervention,[15] worksite walkthrough intervention,[16] and computer-based training intervention.[17] These studies further imply that improving medical staff's service attitude and communication skill should be an effective way to control WPV.

However, when we consider the reasons why the medical staff do not have a nice service attitude and communication skills, the effort–reward imbalance theory may explain it. The effort–reward imbalance theory claims that an imbalance between high efforts and low rewards leads to sustained strain reactions.[18] As we know, medical staff are characterized by heavy workload,[19,20] which means they have substantial work effort. However, there is little evidence which supports that work reward could reduce the incidence of sustained strain reactions, such as WPV.

According to the effort–reward imbalance theory, work rewards may weaken or replace the effect of work effort on the associations between work effort and WPV. However, to our knowledge, there is no study which explores the associations among work effort, work rewards, and WPV. To fill the gaps, a cross-sectional study was conducted to explore if work rewards could weaken or replace the effect of work effort on the associations between work effort and WPV.

In this study, night shift work times per month (NSWM) and working hours were chosen to evaluate work effort, which were based on the perspective of Labor Value Theory and Role Theory.[21,22] Marx's Labor Value Theory claims that working time is an important measure of labor value. The longer the working hours of medical staff, the greater the amount of labor they invest, and the higher the value they may create. The Role Theory also claims that medical staff are entrusted with the responsibility of saving lives and promoting health in their professional roles. The increase in working hours and the number of night shifts is a concrete manifestation of their fulfillment of this role responsibility, reflecting their efforts to meet role expectations. Actually, substantial work effort had been identified to be associated with WPV against medical staff, such as long working hours, night shift work, and so on.[23–25]

On the other side, monthly income and perceived social status were chosen to evaluate work reward, which were based on the perspective of Maslow's Hierarchy of Needs and Social Identity Theory.[26,27] Meeting economic needs corresponds to physiological needs and safety needs. According to the Maslow's Hierarchy of Needs, the income brought by work is used to meet basic physiological needs such as food, clothing, housing, and transportation, and to provide economic security to deal with possible risks and meet safety needs. According to the Social Identity Theory, the establishment of identity and self-esteem through work is in line with the viewpoint that individuals obtain identity and self-esteem through their belonging groups or roles. A job with a high social status and respect can enable individuals to obtain more social identity and self-esteem.

To explore if work rewards could weaken or replace the effect of work effort on the associations between work effort and WPV, we performed a cross-sectional study based on the effort–reward imbalance theory. If the hypotheses could be supported, they are helpful for us to further understand the associations between working hours, income level, and WPV. If the moderating effect of income can be confirmed, it also can give evidence to the effect of equal pay for equal work on quality and safety of health services.

Methods
Setting and Participants

This is a cross-sectional study conducted among medical staff in Chinese Shandong province. Shandong province is located in the east of China with the second largest population in all of the provinces of China, and the number of health workers in Shandong province ranked first in the Chinese provinces.[28] In this study, multiple stratified random cluster sampling methods were used to recruit medical staff in general hospitals through the following steps. Firstly, three cities were randomly selected from all 17 cities based on the Gross Domestic Product (GDP) per capita in 2018.[29] Secondly, one municipal hospital was randomly selected from each of the selected cities. In this step, three districts were also randomly selected from each of the selected cities. Thirdly, one county-level hospital (district-level hospital) was randomly selected from the selected districts. Thus, totally, 3 municipal hospitals and 9 county-level hospitals were selected in this study. In municipal hospitals, three inpatient areas from each department were randomly selected, and two inpatient areas from each department were randomly selected in county-level hospitals. Medical staff, including doctor, nursing, and medical technician staff, who worked on the interview date were recruited to participant in the survey. Finally, 3426 medical staff were interviewed and analyzed in this study.

Data Collection

The questionnaires were sent to medical staff individually, and they were asked to fill the questionnaires anonymously when they were free for the work. Two trained postgraduate students were stationed in the hospital to answer questions and collect the questionnaires on the interview date.

Measures

Workplace Violence (WPV), Verbal Violence, and Physical Violence

WPV was assessed by the question "have you ever experienced the following behavior conducted by your patients or their relations?" The answers were verbal violence, physical violence, both of verbal and physical violence, and none. This question was also used to evaluate WPV in several previous studies.[30] In this study, WPV was recoded into yes (1) and no (0), with the former including verbal violence, physical violence, or both of verbal and physical violence. Physical violence and verbal violence were also recoded into a classification of yes (1) and no (0). Participants who reported verbal violence and both of verbal and physical violence were analyzed as verbal violence experience. Similarly, physical violence experience contained the physical violence experience and both of verbal and physical violence experience. The participants without any WPV experience were analyzed as the control group.

Work Effort

In this study, work effort was evaluated by two variables, working hours and night shift work times per month (NSWM). Working hours were measured by the question "how many hours do you work per week on average?" The participants answered the number of hours per week which they worked. The numbers of the working hours per week were analyzed in this study. NSWM was measured by the question "how many times do you have night shift works per month on average?" The answers were the number of night shift works per month on average, which were analyzed in this study. These questions were also used in previous studies.[31]

Work Reward

Work reward were evaluated by two variables, monthly income and perceived social status. Monthly income was measured by the question about participants' monthly income, including salary, bonus, and all the other kinds of income. The answers can be chosen from ≤3000 RMB, 3001–5000 RMB, 5001–7000 RMB, 7001–9000 RMB, 9001–11000 RMB, 11001–13000 RMB, and ≥13001 RMB. As there were fewer participants who chose the last 3 answers, we recoded it in to ≤3000 RMB (L1), 3001–5000 RMB (L2), 5001–7000 RMB (L3), and ≥7001 RMB (L4). One dollar is approximately equal to 7 RMB. A similar evaluation method was also used in previous studies.[32,33] Perceived social status were assessed by the question "as a medical staff, how you evaluated your present social status?" The answers contained very high, high, middle, low, and very low. The answers were recoded into high (1), middle (2), and low (3). A similar evaluation method was also used in previous studies.[34]

Social-Demographic Variables

Gender was coded as male (0) and female (1). Age was calculated by the participants' date of birth. Marital status was evaluated by single, married, divorced, widowed, and others. Because of the small percentage of the last 3 answers, we recoded it into single (1), married (2), and others (3). Education was assessed by the academic degree which the participants' received. The answers were doctor, master, bachelor, junior college, secondary specialized school, high school, and middle school or below. As there was a small percentage of the last 4 answers, we recoded it into doctor (1), master (2), bachelor (3), and others (4).

Occupational Characteristics

Types of medical staff contained doctor (1), nursing (2), and medical technician (3). Professional title was evaluated by senior (1), vice-senior (2), intermediate (3), and junior and others (4).

Physical Disease

Physical disease was evaluated by the question "if you have been diagnosed with any physical disease?" The answer was yes (1) and no (0).

Statistical Analysis

In this study, IBM SPSS Statistics 24.0 (Web Edition) was used to conduct the data analyses. T-tests were performed to analyze the factors associated with WPV for continuous variables, and one-way ANOVA was used to compare the differences on categorical variables across groups. Logistic regression was conducted to further examine the factors associated with WPV, physical violence, and verbal violence. The moderating role of work effort on the association between work rewards and WPV was also analyzed in the logistic regression. All of the tests were two-tailed and a p-value of ≤ 0.05 was considered statistically significant.

Results

Totally, 3426 medical staff were interviewed in this study, and there were 1788 (52.2%) medical staff who reported the experience of workplace violence. Table 1 presents the results of description and single factor analyses conducted to analyze the factors associated with workplace violence. The results supported that workplace violence was associated with gender (χ^2=42.43, $p<0.001$), age (t=6.78, $p<0.001$), married status (χ^2=8.99, $p<0.05$), education (χ^2=47.70, $p<0.001$), types of medical staff (χ^2=53.62, $p<0.001$), professional title (χ^2=49.27, $p<0.001$), physical disease (χ^2=26.84, $p<0.001$), working hours/week (t=7.89, $p<0.001$), NSWM (t=3.59, $p<0.001$), monthly income (χ^2=48.16, $p<0.001$), and perceived social status (χ^2=229.60, $p<0.001$). The detailed results are presented in Table 1.

Description and single factor analyses were also conducted to analyze the factors associated with physical violence and verbal violence as presented in Table 2. In this study, 489 (489/3426, 14.3%) medical staff reported the physical violence experience, 1744 (1744/3426, 50.9%) medical staff reported the verbal violence experience, and 445 (445/3426, 13.0%) medical staff reported both verbal and physical violence experience. The results supported that physical violence was associated with gender (χ^2=103.80, $p<0.001$), age (t=8.00, $p<0.05$), married status (χ^2=7.17, $p<0.05$), education (χ^2=23.28, $p<0.001$), types of medical staff (χ^2=73.46, $p<0.001$), professional title (χ^2=60.92, $p<0.001$), physical disease (χ^2=30.95, $p<0.001$), working hours/week (t=8.79, $p<0.001$), NSWM (t=3.01, $p<0.01$), monthly income (χ^2=29.10, $p<0.001$), and perceived social status (χ^2=169.05, $p<0.001$). Factors associated with verbal violence were gender (χ^2=40.57, $p<0.001$), age (t=6.71, $p<0.001$), married status (χ^2=9.31, $p<0.01$), education (χ^2=46.10, $p<0.001$), types of medical staff (χ^2=50.87, $p<0.001$), professional title (χ^2=46.50, $p<0.001$), physical disease (χ^2=25.73, $p<0.001$), hospital level (χ^2=9.33, $p<0.01$), working hours/week (t=7.74, $p<0.001$), NSWM (t=3.29, $p<0.001$), monthly income (χ^2=51.79, $p<0.001$), and perceived social status (χ^2=241.08, $p<0.001$). The detailed results are presented in Table 2.

Table 1 Single Factor Analyses for the Association Between Social-Demographic and Occupational Characteristics, Working Hours, Monthly Income, and Workplace Violence

Variables	Workplace Violence (n=3426)			t/χ^2
	All, n (%)	**Yes, n (%)**	**No, n (%)**	
Observations	3426 (100.0)	1788 (52.2)	1638 (47.8)	–
Gender				42.43***
Male	919 (26.8)	564 (61.4)	355 (38.6)	
Female	2507 (73.2)	1224 (48.8)	1283 (51.2)	
Age, mean±SD	35.14±8.42	36.07±8.22	34.13±8.53	6.78***
Married Status				8.99*
Single	577 (16.8)	271 (47.0)	306 (53.0)	
Married	2802 (81.8)	1496 (53.4)	1306 (46.6)	
Others	47 (1.4)	21 (44.7)	26 (55.3)	
Education				47.70***
Doctor	56 (1.6)	36 (64.3)	20 (35.7)	
Master	562 (16.4)	341 (60.7)	221 (39.3)	
Bachelor	2368 (69.1)	1237 (52.2)	1131 (47.8)	
Others	440 (12.8)	174 (39.5)	266 (60.5)	

(Continued)

Table 1 (Continued).

Variables	Workplace Violence (n=3426)			t/χ^2
	All, n (%)	Yes, n (%)	No, n (%)	
Types of medical staff				53.62***
Doctor	1268 (37.0)	764 (60.3)	504 (39.7)	
Nursing	1695 (49.5)	794 (46.8)	904 (53.2)	
Medical technician	463 (13.5)	230 (49.7)	233 (50.3)	
Professional title				49.27***
Senior	109 (3.2)	72 (66.1)	37 (33.9)	
Vice-senior	303 (8.8)	173 (57.1)	130 (42.9)	
Intermediate	1170 (34.2)	680 (58.1)	490 (41.9)	
Junior and others	1844 (53.8)	863 (46.8)	981 (53.2)	
Physical disease				26.84***
Yes	457 (13.3)	290 (63.5)	167 (36.5)	
No	2969 (86.7)	1498 (50.5)	1471 (49.5)	
Working hours/week, mean±SD	47.25±9.27	48.90±10.13	46.36±8.53	7.89***
NSWM, mean±SD	4.12±3.55	4.33±3.50	3.89±3.59	3.59***
Monthly income				48.16***
L1	359 (10.5)	144 (40.1)	215 (59.9)	
L2	1256 (36.7)	609 (48.5)	647 (51.5)	
L3	1139 (33.2)	635 (55.8)	504 (44.2)	
L4	672 (19.6)	400 (59.5)	272 (40.5)	
Perceived social status				229.60***
High	902 (26.3)	328 (36.4)	574 (63.6)	
Middle	1934 (56.5)	1009 (52.2)	925 (47.8)	
Low	590 (17.2)	451 (76.4)	139 (23.6)	

Notes: ***: $p<0.001$; *: $p<0.05$. SD denotes to standard error. NSWM denotes to night shift work times per month; L1 denotes to ≤3000 RMB monthly income. L2 denotes to 3001–5000 RMB monthly income. L3 denotes to 5001–7000 RMB monthly income. L4 denotes to ≥7001 RMB monthly income.

Table 2 Single Factor Analyses for the Association Between Social-Demographic and Occupational Characteristics, Working Hours, Monthly Income, and Physical/Verbal Violence

Variables	Physical Violence†			t/χ^2	Verbal Violence‡			t/χ^2
	All, n (%)	Yes, n (%)	No, n (%)		All, n (%)	Yes, n (%)	No, n (%)	
Observations	2127 (100.0)	489 (23.0)	1638 (77.0)	–	3382 (100.0)	1744 (51.6)	1638 (48.4)	–
Gender				103.80***				40.57***
Male	575 (27.0)	220 (38.3)	355 (61.7)		902 (26.7)	547 (60.6)	355 (38.6)	
Female	1552 (73.0)	269 (17.3)	1283 (82.7)		2480 (73.3)	1197 (48.3)	1283 (51.2)	
Age, mean±SD	35.14±8.42	37.64±8.40	34.13±8.53	8.00***	35.14±8.42	36.07±8.24	34.13±8.53	6.71***
Married Status				7.17*				9.31**
Single	372 (17.5)	66 (17.7)	306 (82.3)		568 (16.8)	262 (46.1)	306 (53.9)	
Married	1722 (81.0)	416 (24.2)	1306 (75.8)		2767 (81.8)	1461 (52.8)	1306 (47.2)	
Others	33 (1.6)	7 (21.2)	26 (78.8)		47 (1.4)	21 (44.7)	26 (55.3)	
Education				23.28***				46.10***
Doctor	27 (1.3)	7 (25.9)	20 (74.1)		51 (1.5)	31 (60.8)	20 (39.2)	
Master	307 (14.4)	86 (28.0)	221 (72.0)		554 (16.4)	333 (60.1)	221 (39.9)	
Bachelor	1488 (70.0)	357 (24.0)	1131 (76.0)		2342 (69.2)	1211 (51.7)	1131 (48.3)	
Others	305 (14.3)	39 (12.8)	266 (87.2)		435 (12.9)	169 (38.9)	266 (61.1)	

(*Continued*)

Table 2 (Continued).

Variables	Physical Violence†			t/χ^2	Verbal Violence‡			t/χ^2
	All, n (%)	Yes, n (%)	No, n (%)		All, n (%)	Yes, n (%)	No, n (%)	
Types of medical staff				73.46***				50.87***
Doctor	757 (35.6)	253 (33.4)	504 (66.6)		1244 (36.8)	740 (59.5)	504 (40.5)	
Nursing	1080 (50.8)	179 (16.6)	901 (83.4)		1677 (49.6)	776 (46.3)	904 (53.7)	
Medical technician	290 (13.6)	57 (19.7)	233 (80.3)		461 (13.6)	228 (49.5)	233 (50.5)	
Professional title				60.92***				46.50***
Senior	64 (3.0)	27 (42.2)	37 (57.8)		104 (3.1)	67 (64.4)	37 (35.6)	
Vice-senior	197 (9.3)	67 (34.0)	130 (66.0)		301 (8.9)	171 (56.8)	130 (43.2)	
Intermediate	683 (32.1)	193 (28.3)	490 (71.7)		1151 (34.0)	661 (57.4)	490 (42.6)	
Junior and others	1183 (55.6)	202 (17.1)	981 (82.9)		1826 (54.0)	845 (46.3)	981 (53.7)	
Physical disease				30.95***				25.73***
Yes	263 (12.4)	393 (21.1)	1471 (78.9)		448 (13.2)	281 (62.7)	167 (37.3)	
No	1864 (87.6)	96 (36.5)	167 (63.5)		2934 (86.8)	1463 (49.9)	1471 (50.1)	
Working hours/week, mean±SD	47.25±9.27	40.49±10.84	46.36±8.53	8.79***	47.25±9.27	48.87±10.15	46.36±8.53	7.74***
NSWM, Mean±SD	4.02±3.56	4.45±3.44	3.89±3.59	3.01**	4.12±3.55	4.33±3.50	3.89±3.29	3.29***
Monthly income				29.10***				51.79***
L1	261 (12.3)	46 (17.6)	215 (82.4)		350 (10.3)	135 (38.6)	215 (61.4)	
L2	792 (37.2)	145 (18.3)	647 (81.7)		1241 (36.7)	594 (47.9)	647 (52.1)	
L3	687 (32.3)	183 (26.6)	504 (73.4)		1125 (33.3)	621 (55.2)	504 (44.8)	
L4	387 (18.2)	115 (29.7)	272 (70.3)		666 (19.7)	394 (59.2)	272 (40.8)	
Perceived social status				169.05***				241.08***
High	665 (31.3)	91 (13.7)	574 (86.3)		884 (26.1)	310 (35.1)	574 (64.9)	
Middle	1174 (55.2)	249 (21.2)	925 (78.8)		1910 (56.5)	985 (51.6)	925 (48.4)	
Low	288 (13.5)	149 (51.7)	139 (48.3)		588 (17.4)	449 (76.4)	139 (23.6)	

Notes: †: Participants who only experienced verbal violence were excluded. ‡: Participants who only experienced physical violence were excluded. ***: $p<0.001$; **: $p<0.01$; *: $p<0.05$. SD denotes to standard error. NSWM denotes to night shift work times per month; L1 denotes to ≤3000 RMB monthly income. L2 denotes to 3001–5000 RMB monthly income. L3 denotes to 5001–7000 RMB monthly income. L4 denotes to ≥7001 RMB monthly income.

Logistical regressions were conducted to analyze the associations between work effort and workplace violence. The results supported that both working hours per week and NSWM were associated with WPV, whether monthly income and perceived social status were controlled. Perceived social status was also associated with WPV. Comparing with the highest monthly income group, the lowest monthly income group was associated with WPV. The detailed information is presented in Table 3.

Logistic regressions were further conducted to analyze the moderating effect of work reward on the association between work effort and workplace violence. The results found that monthly income could moderate the association between working hours/week and workplace violence (OR=0.989, $P<0.05$) or verbal violence (OR=0.991, $P<0.05$),

Table 3 Logistic Regression Analyses for Associations Between Work Effort and Workplace Violence [or (95% CI)]

Variables	Workplace Violence (n=3426)	Physical Violence (n=2127)	Verbal Violence (n=3382)
Working hours/week R^2	Model a 1.022 (1.014, 1.030)*** 0.063	Model b 1.030 (1.018, 1.041)*** 0.137	Model c 1.022 (1.013, 1.030)*** 0.062
NSWM R^2	Model d 1.058 (1.037, 1.080)*** 0.064	Model e 1.088 (1.054, 1.123)*** 0.138	Model f 1.058 (1.037, 1.081)*** 0.063

(Continued)

Table 3 (Continued).

Variables	Workplace Violence (n=3426)	Physical Violence (n=2127)	Verbal Violence (n=3382)
	Model g	Model h	Model i
Working hours/week	1.022 (1.014, 1.030)***	1.030 (1.018, 1.041)***	1.022 (1.014, 1.030)***
Monthly income (Ref.= L4)			
L1	0.646 (0.478, 0.874)**	0.993 (0.626, 1.576)	0.617 (0.454, 0.838)**
L2	0.844 (0.674, 1.058)	0.913 (0.645, 1.293)	0.823 (0.656, 1.033)
L3	0.945 (0.764, 1.167)	1.076 (0.784, 1.477)	0.927 (0.749, 1.147)
R^2	0.067	0.138	0.066
	Model j	Model k	Model l
Working hours/week	1.014 (1.005, 1.022)***	1.020 (1.008, 1.032)***	1.013 (1.005, 1.022)***
Perceived social status (Ref.= low)			
High	0.156 (0.122, 0.199)***	0.118 (0.082, 0.168)***	0.148 (0.116, 0.190)***
Middle	0.323 (0.260, 0.401)***	0.225 (0.167, 0.302)***	0.316 (0.254, 0.393)***
R^2	0.152	0.233	0.155
	Model m	Model n	Model o
NSWM	1.058 (1.036, 1.080)***	1.089 (1.055, 1.125)***	1.058 (1.036, 1.080)***
Monthly income (Ref.= L4)			
L1	0.648 (0.479, 0.877)**	0.939 (0.590, 1.492)	0.618 (0.455, 0.840)**
L2	0.823 (0.656, 1.031)	0.848 (0.598, 1.204)	0.802 (0.638, 1.007)
L3	0.914 (0.740, 1.130)	1.007 (0.732, 1.385)	0.897 (0.725, 1.109)
R^2	0.067	0.139	0.066
	Model p	Model q	Model r
NSWM	1.042 (1.019, 1.064)***	1.066 (1.031, 1.102)***	1.041 (1.019, 1.064)***
Perceived social status (Ref.= low)			
High	0.156 (0.122, 0.199)***	0.116 (0.082, 0.166)***	0.148 (0.116, 0.190)***
Middle	0.328 (0.264, 0.407)***	0.229 (0.170, 0.307)***	0.321 (0.259, 0.399)***
R^2	0.153	0.235	0.156

Notes: All the regressions were adjusted for gender, age, married status, education, type of medical staff, professional title, and physical disease. ***: $p<0.001$; **: $p<0.01$; CI denotes to confidence interval. NSWM denotes to night shift work times per month; L1 denotes to ≤3000 RMB monthly income. L2 denotes to 3001–5000 RMB monthly income. L3 denotes to 5001–7000 RMB monthly income. L4 denotes to ≥7001 RMB monthly income.

respectively. Perceived social status could moderate the association between NSWM and workplace violence (OR=0.947, $P<0.001$), physical violence (OR=0.923, $P<0.001$), or verbal violence (OR=0.949, $P<0.01$). The other moderating effect were not supported in this study, and the detailed results are presented in Table 4.

Discussion

There were several critical findings in this study. Firstly, more than half of the medical staff (52.2%) experienced WPV. Secondly, working hours, NSWM, and perceived social status were associated with WPV. Thirdly, monthly income moderated the associations between monthly income and WPV (verbal violence). Fourthly, perceived social status moderated the associations between NSWM and WPV.

The first finding in this study was about the prevalence of WPV among medical staff, and we found that 52.2% of medical staff experienced WPV. Comparing with other studies, this prevalence was a little lower than other studies. This prevalence of WPV was 54.8% among nurses in Turkey,[35] and 71.9% among medical staff at primary hospitals.[36] One of the explanations was about the different current situation of WPV among doctors, nurses, and medical technicians.[37] In this study, we interviewed medical technicians, who are in lower prevalence of WPV.[38] The other reason may be explained by the cultural differences in the perception of WPV in different countries. Harmonization is one of the characteristics in Chinese Confucian culture.[39] Shandong Province was also the headstream of Confucian culture, which

Table 4 Logistic Regression Analyses for the Moderating Effect of Monthly Income or Perceived Social Status on the Associations Between Work Effort and Workplace Violence [or (95% CI)]

Variables	Workplace Violence (n=3426)	Physical Violence (n=2127)	Verbal Violence (n=3382)
	Model 1	Model 2	Model 3
Working hours/week	1.052 (1.027, 1.077)***	1.050 (1.015, 1.086)**	1.048 (1.023, 1.074)***
Monthly income (Ref.= L4)			
L1	0.139 (0.040, 0.485)**	0.344 (0.057, 2.077)	0.160 (0.046, 0.561)**
L2	0.301 (0.130, 0.700)**	0.446 (0.131, 1.515)	0.332 (0.142, 0.777)*
L3	0.563 (0.355, 0.892)*	0.752 (0.387, 1.462)	0.587 (0.369, 0.934)*
Working hours/week × monthly income	0.989 (0.981, 0.998)*	0.993 (0.981, 1.005)	0.991 (0.982, 0.999)*
R^2	0.069	0.138	0.068
	Model 4	Model 5	Model 6
Working hours/week	1.009 (0.983, 1.035)	1.008 (0.971, 1.046)	1.005 (0.979, 1.032)
Perceived social status (Ref.= low)			
High	0.196 (0.057, 0.680)*	0.218 (0.037, 1.304)	0.218 (0.062, 0.765)*
Middle	0.363 (0.188, 0.700)**	0.307 (0.120, 0.785)*	0.385 (0.198, 0.746)**
Working hours/week × perceived social status			
	1.002 (0.990, 1.015)	1.006 (0.988, 1.025)	1.004 (0.991, 1.017)
R^2	0.152	0.233	0.155
	Model 7	Model 8	Model 9
NSWM	1.051 (0.990, 1.116)	1.123 (1.025, 1.229)*	1.047 (0.985, 1.113)
Monthly income (Ref.= L4)			
L1	0.668 (0.447, 0.999)*	0.810 (0.433, 1.515)	0.650 (0.433, 0.975)*
L2	0.839 (0.631, 1.115)	0.773 (0.498, 1.198)	0.828 (0.622, 1.103)
L3	0.921 (0.738, 1.150)	0.975 (0.700, 1.357)	0.907 (0.726, 1.134)
NSWM × monthly income	1.003 (0.980, 1.026)	0.988 (0.955, 1.022)	1.004 (0.981, 1.028)
R^2	0.067	0.139	0.066
	Model 10	Model 11	Model 12
NSWM	1.156 (1.083, 1.235)***	1.256 (1.136, 1.389)***	1.152 (1.078, 1.231)***
Perceived social status (Ref.= low)			
High	0.094 (0.064, 0.140)***	0.056 (0.032, 0.098)***	0.091 (0.062, 0.136)***
Middle	0.244 (0.184, 0.325)***	0.151 (0.103, 0.221)***	0.241 (0.182, 0.321)***
NSWM × perceived social status	0.947 (0.918, 0.978)***	0.923 (0.881, 0.967)***	0.949 (0.919, 0.980)**
R^2	0.157	0.242	0.160

Notes: All the regressions were adjusted for gender, age, married status, education, type of medical staff, professional title, and physical disease. ***: $p<0.001$; **: $p<0.01$; *: $p<0.05$. CI denotes to confidence interval. NSWM denotes to night shift work times per month; L1 denotes to ≤3000 RMB monthly income. L2 denotes to 3001–5000 RMB monthly income. L3 denotes to 5001–7000 RMB monthly income. L4 denotes to ≥7001 RMB monthly income.

was also influenced by this culture in depth. This kind of harmonization may also reduce the occurrence of WPV against medical staff.

The other finding in this study was that longer working hours and more NSWM were positively associated with WPV. This was easy to understand, which was also identified in previous studies.[40,41] Medical staff with long working hours and more NSWM may be at higher risk of job burnout and psychological problems[42–44], which were risk factors for WPV.[45,46] On the other side, more working hours also increases WPV, because more time at work may have more opportunities for WPV to happen. We also found that higher income level was positively associated with WPV. Findings about this association in previous studies were conflicting. A study in general practitioners supported that lower monthly income was associated with the experiencing of physical violence,[47,48] while another conducted among nurses found that monthly household income was positively associated with nurse–patient disputes.[49] In this study, we evaluated WPV in a lifespan. Medical staff who experienced WPV were also with older age and higher professional title, because of the

longer work ages. As we know, income also mainly depended on professional title, and was also associated with age in public hospitals, and these make that higher income was associated with the experiencing of WPV.

One of the main findings for this study was the moderating effect of income level on the association between working hours and WPV (verbal violence), based on the effort–reward imbalance model. The results supported that income level could moderate the association between working hours and WPV. As we know, medical staff with long working hours may experience more work burnout, which was a risk factor for WPV. However, the higher income level may reduce the associations between working hours and WPV. Because according to the effort–reward imbalance model, higher income level may be a kind of reward for their long work time, and may further help medical staff to have more energy to work. And it further reduces the risk of WPV.

This study also supported that monthly income could weaken the association between working hours per week and verbal violence, but could not weaken the association between working hours and physical violence. The different findings may be explained by the different influence of verbal violence and physical violence on medical staff. As we know, although the prevalence of physical violence was lower than verbal violence among medical staff,[50,51] medical staff who experienced physical violence might be at higher risk of psychological and physical health problems.[8,52,53] In this situation, higher income level may be not enough to weaken the association between working hours and physical violence.

The other main finding was that perceived social status could moderate the associations between NSWM and WPV. As we know, medical staff with more NSWM often disrupt the normal circadian rhythm, causing fatigue, sleep deprivation, and increased stress levels.[54,55] This can potentially lead to heightened irritability and reduced patience among workers. However, perceived social status could act as a buffer or an amplifier in this context. If medical staff perceive themselves to have a relatively high social status, they might have better coping mechanisms, more resources, or greater support systems to deal with the challenges of night shift work and its potential impact on their behavior and interactions in the workplace. This also could be explained by the effort–reward imbalance model,[18,56] which explains that an imbalance between high efforts and low rewards leads to sustained strain reactions.[57]

This study also supported that both income level and perceived social status were associated with WPV. For the association between income level and WPV, the findings supported that higher income level was positively associated with WPV. This can be explained by the working years. Longer working years were positively associated with higher income level, and the medical staff with longer working years had more opportunities to experience WPV. This study also supported that perceived higher social status was associated with less WPV experiences. This finding can be explained by the identified associations between perceived social status and work burnout,[58] and in future considering the associations between work burnout and WPV.[59] The associations between perceived social status and WPV can be assumed.

Although there were some significant findings in this study, several limitations should be considered when we interpret the results. Firstly, any causal relationships cannot be interfered on the associations between working hours, NSWM, perceived social status, and WPV, because of the cross-sectional design. Secondly, all the factors analyzed in this study were collected by medical staff's self-report, and this may also bring some bias for the findings in this study. Thirdly, the data analyzed in this study were collected from general hospitals in Chinese Shandong province, so we should be cautious when extending the findings into other regions. Fourthly, this study only compared the differences between WPV incidences or not; future studies can explore if the effort–reward imbalance model could explain the intensity of WPV.

Conclusion

This study supported that monthly income could moderate the associations between monthly income and WPV (verbal violence), and perceived social status could moderate the associations between NSWM and WPV, which could be explained by the effort–reward imbalance model. The findings also implied that some rewards for the heavy workload and efforts may be also helpful to control WPV, and the findings also supply evidence to control WPV in the institutional and medical staff's perspective. These findings also can be translated into practices to control WPV against medical staff.

Data Sharing Statement

Data are available from the corresponding author upon reasonable request.

Ethics Approval and Informed Consent

The institutional review board of Shandong University School of Public Health (ref.: 20181219) approved the study protocol before data collection. Informed consent was obtained from all of the participants. The study adhered to ethical principles outlined in the Declaration of Helsinki guidelines.

Funding

Disclosure

The authors declare that they have no competing interests.

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