

ORIGINAL ARTICLE

Work-related stress and wellbeing among nurses: Testing a multi-dimensional model

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Abstract

Aim: Basing on the Demands-Resources and Individual-Effects (DRIVE) Model developed by Mark and Smith in 2008, the study aims to propose and test a multi-dimensional model that combines work characteristics, individual characteristics, and work-family interface dimensions as predictors of nurses' psychophysical health.

Methods: Self-report questionnaires assessing work characteristics (effort; rewards; job demands; job control; social support), individual characteristics (socio-demographic characteristics; coping strategies; Type A behavioral pattern; Type D personality), work-family interface dimensions (work-family interrole conflict; job and life satisfaction), and health outcomes (psychological disease; physical disease) were completed by 450 Italian nurses. Logistic regression analyses and Hayes' PROCESS tool were used to test the proposed model by exploring main, moderating and mediating hypotheses.

Results: Findings confirmed the proposed theoretical framework including work characteristics, individual characteristics, and work-family interface dimensions as significant predictors of nurses' psychophysical disease. Specific main, moderating and mediating effects were found, providing a wide set of multiple risks and protective factors.

Conclusions: The study allowed a broader understanding of nurses' work-related stress process, providing a comprehensive tool for the assessment of occupational health and for the definition of tailored policies and interventions in public healthcare organizations to promote nurses' wellbeing.

KEYWORDS

job stress, mental health, nurses, physical health, work-family balance/conflict

1 | INTRODUCTION

In recent years, a growing body of research has targeted occupational health conditions among healthcare workers (Brand et al., 2017; Vu-Eickmann, Li, Müller, Angerer, &

Loerbroks, 2018) due to the specificity of demands featuring their work in itself (e.g., continuously dealing with pain, suffering and death), but also due to the new demands from the healthcare systems, in terms of pressures to achieve higher and shared standard of care and to develop new skills although lacking resources (e.g., staff shortage, economic issues, differences between national healthcare systems) (Cole & Carlin, 2009; Glazer &

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Gyurak, 2008; Ohue, Moriyama, & Nakaya, 2011; Organization for Economic Co-operation and Development, 2011; Panagopoulou, Montgomery, & Tsiga, 2015).

Within this framework, nurses have been recognized as particularly at risk for work-related stress problems, reporting high levels of psychological and physical disease (McGrath, Reid, & Boore, 2003; McNeely, 2005; Rotenberg, Silva-Costa, & Griep, 2014), and, therefore, research has made several efforts to identify factors influencing their wellbeing (Velando-Soriano et al., 2020).

Above all, a large body of studies investigated occupational health among nursing professionals by following a transactional approach, and, in particular, by adopting the Effort-Reward Imbalance Model (ERI Model; Siegrist, 1996) and the Job Demands-Control-Support Model (JDCS Model; Karasek, 1979; Karasek & Theorell, 1990). These studies confirmed the important role played by the ERI Model dimensions, namely Effort and Rewards (Hämmig, Brauchli, & Bauer, 2012; Rotenberg et al., 2014; Schreuder, Roelen, Koopmans, Moen, & Groothoff, 2010; Schulz et al., 2009; Xie, Wang, & Chen, 2011) and by the JDCS Model dimensions, namely Job Demands, Job Control and Social Support (Jalilian, Shouroki, Azmoon, Rostamabadi, & Choobineh, 2019; Laschinger, Finegan, Shamian, & Almost, 2001; Lavoie-Tremblay et al., 2008; Pisanti, van der Doef, Maes, Lazzari, & Bertini, 2011) in significantly determining nurses' occupational health conditions.

However, more recently, research has increasingly adopted a multi-dimensional transactional perspective that, by investigating main and interaction effects (i.e., moderating and mediating effects) of a broader range of factors influencing workers' wellbeing, aims to achieve a more comprehensive and accurate understanding of real-life situations (Enns, Currie, & Wang, 2015; Jourdain & Chênevert, 2010; Wang, Liu, Zou, Hao, & Wu, 2017). Individuals, in fact, are simultaneously exposed to multiple risks and they can also possess different resources to deal with them.

A key model representative of this perspective can be traced in the Demands-Resources and Individual-Effects Model (DRIVE Model; Mark & Smith, 2008), that integrates the ERI Model (Siegrist, 1996) and the JDCS Model (Karasek & Theorell, 1990), simultaneously examining several work characteristics (in terms of work demands and work resources) as risk and protective factors determining workers' wellbeing. In addition, the DRIVE Model provides an original contribution by also addressing individual characteristics as pivotal factors potentially influencing the occupational stress process.

The DRIVE Model has been successfully applied to different professional groups (Capasso, Zurlo, & Smith, 2018; Galvin & Smith, 2016; Nelson & Smith, 2016), and its validity has also been confirmed among nurses from the

UK (Mark & Smith, 2012) and from Italy (Zurlo, Vallone, & Smith, 2018). These studies, indeed, provided evidence of the role of work characteristics (the JDCS and ERI Model dimensions) and individual characteristics (in the form of coping strategies) as predictors of anxiety and depression among nurses, also revealing the moderating role of specific Work Resources (i.e., Job Control and Social Support). In addition, both the UK and Italian studies confirmed the significant increase in the explained variance in nurses' anxiety and depression levels after simultaneously addressing the JDCS and ERI Model dimensions, and, to a greater extent, after accounting for the role of individual characteristics (i.e., coping strategies).

Nonetheless, one of the main premises of the DRIVE Model lays in the definition of risk and protective factors into flexible categories, providing the opportunity to further develop the framework by including other dimensions potentially able to contribute to nurses' wellbeing.

In this perspective, firstly, research suggested to also consider the relevant role of Socio-demographic Characteristics, such as gender, age, educational level, working seniority (Lavoie-Tremblay et al., 2008; Marinaccio et al., 2013; Van Stolk, Staetsky, Hassan, & Woo Kim, 2012) and of personality characteristics, such as Type A behavioral pattern and Type D personality (Capasso et al., 2018; De Fruyt & Denollet, 2002; Glazer, Stetz, & Izso, 2004; Ogińska-Bulik, 2006; Zurlo, Pes, & Capasso, 2016) as playing a central role in determining work-related stress processes. This induced including them in the proposed framework to predict occupational health among nursing professionals.

Secondly, research in the field increasingly sustained that not only the work domain, but also the family domain may have a significant impact on workers' health conditions (Beutell & Schnee, 2014; Eby, Casper, Lockwood, Bordeaux, & Brinley, 2005). Accordingly, a growing body of research investigated Work-Family Interface process (Eby et al., 2005; Greenhaus & Powell, 2006), exploring the potential negative (i.e., conflict) or positive (i.e., enrichment) impact of the experiences in work (or family) domain on the other, and vice versa. In this direction, several studies conducted among nurses highlighted, on the one side, the negative influence of perceived Work-Family Interrole Conflict (Berkman et al., 2015; Burke & Greenglass, 2001; Hämmig et al., 2012), and, on the one other side, the positive impact of job and life satisfaction on nurses' wellbeing (AlAzzam, AbuAlRub, & Nazzal, 2017; Burke, Koyuncu, & Fiksenbaum, 2011; Cohen & Liani, 2009; Khamisa, Oldenburg, Peltzer, & Ilic, 2015; Lu, Zhao, & While, 2019; Meng, Luo, Liu, Hu, & Yu, 2015; Zurlo, Vallone, & Smith, 2020).

Therefore, since the increasing interest in deepening the role of workers' individual characteristics in work-related

stress processes (Capasso et al., 2018; Van Stolk et al., 2012), and considering nurses' additional burden for the integration of work life with roles and responsibilities linked to the personal domain (Grzywacz, Frone, Brewer, & Kovner, 2006), this suggests meaningfulness in integrating socio-demographic and personality characteristics, as well as work-family interface dimensions within a proposed multi-dimensional model for occupational health among nurses.

1.1 | A suggested multi-dimensional model for occupational health among nursing professionals

On the basis of the original DRIVE Model and referring to research reported above, the present study aimed to propose and test a multi-dimensional model for occupational health among nursing professionals, which integrates work characteristics (i.e., the JDCS and ERI Models dimensions), individual characteristics (i.e., Socio-demographic characteristics; coping strategies; Type A behavioral pattern; Type D personality), and Work-Family Interface dimensions (i.e., work-family interrole conflict; job and life satisfaction) as predictors of nurses' psychological disease (i.e., Global Severity Index, GSI, from the Symptom Checklist-90-Revised) and physical disease (i.e., the presence of physical disorders over the last 12 month before the survey).

In particular, firstly, we aimed to verify the hypothesis that work characteristics (i.e., work demands and work resources), including all dimensions addressed by the JDCS Model and the ERI Model, have main and interaction effects on health outcomes reported by nurses (i.e., psychological disease, physical disease).

Secondly, we aimed to give additional emphasis to the role of individual characteristics in nurses' work-related stress process, not only by further testing the impact of personality characteristics in the form of coping strategies, but also by exploring the influence of socio-demographic characteristics (i.e., gender, age, living with partner, presence of children, educational level, working seniority, working hours, night shifts) and of other personality characteristics (i.e., Type A Behavioral Pattern and Type D personality) on nurses' psychophysical health conditions. In addition, we aimed to also test the potential moderating effects of individual characteristics in the associations between work characteristics and health outcomes.

Finally, we aimed to include and test the role of Work-Family Interface dimensions (i.e., Work-Family Interrole Conflict; Job and life satisfaction) in predicting nurses' health conditions, also verifying their potential moderating and mediating effects in the associations between work characteristics and health outcomes (Figure 1).

Accordingly, the following main, moderating and mediating effects hypotheses have been proposed and tested:

Hypothesis one (Main Effects): work characteristics (i.e., work demands and work resources), individual characteristics (i.e., socio-demographic characteristics and personality characteristics) and Work-Family Interface dimensions (i.e., Work-Family Interrole Conflict and job and life satisfaction) will have main effects on health outcomes (psychological disease, physical disease).

Hypothesis two (Moderating Effects): work resources will significantly moderate the associations between work demands and health outcomes (*Hypothesis 2a*); Individual Characteristics (*Hypothesis 2b*) and Work-Family Interface dimensions (*Hypothesis 2c*) will significantly interact with work characteristics (i.e., work demands and work resources) moderating their effects on health outcomes.

Hypothesis three (Mediating Effects): The association between work characteristics and health outcomes will be significantly mediated by Work-Family Interface dimensions.

By proposing this approach, it was meant to be more representative of nurses' real lives, in which it is more likely that they are exposed to multiple factors (hazards and resources). Moreover, due to its flexible design, it was aimed to propose a useful approach to be easily adapted to the different healthcare contexts for an early and careful assessment of nurses' health risks, guiding the development of tailored interventions aiming at safeguarding healthcare professionals' wellbeing.

2 | METHODS

2.1 | Study design and participants

This cross-sectional multi-center study was conducted between May 2016 and June 2017 in five hospitals of the Italian Public Health Service. A combined convenient and stratified sampling method was used. After obtaining a complete list of the Italian public hospitals, hospitals located in southern Italy were conveniently selected, and chairpersons were contacted to obtain the consent for administering a questionnaire to the nursing staff. The selected hospitals accounted for variances both in organizations and services (i.e., general hospital; academic hospital; and high-specialized hospital) and in geographic areas (i.e., covering metropolitan and rural areas, as well as medium and small-sized cities). In total, 550 nurses were given all the information about the study by means of a standardized oral introduction, and they were asked to individually complete the survey (single session lasting about 15–20 min). Informed consent was included within

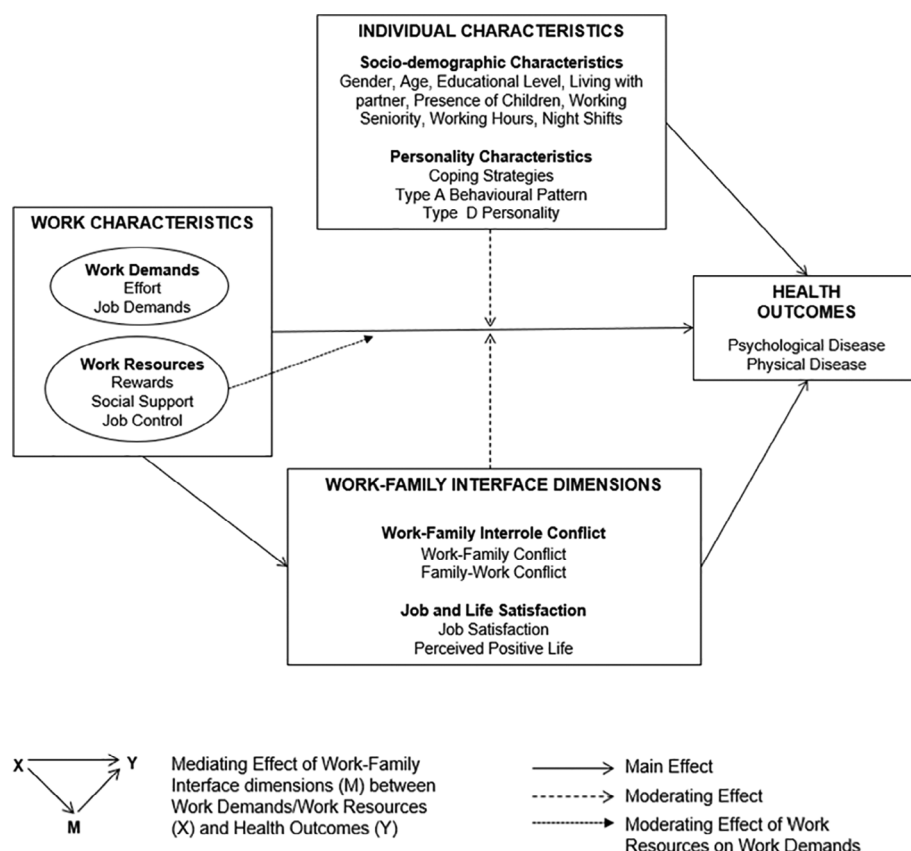


FIGURE 1 A proposed multi-dimensional model for occupational health among nurses: conceptual framework

the questionnaire. Overall, 450 nurses enrolled on a voluntarily basis (response rate = 81.8%).

2.2 | Ethical considerations

The study was approved by the Ethics Committee of Psychological Research of University of Naples Federico II (Registration number: 33/2019) and was conducted in accordance with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

2.3 | Instruments

A questionnaire including self-report measures was completed by participants. All the measurement tools were included within the Italian version of the DRIVE Questionnaire (Mark & Smith, 2012; Zurlo et al., 2018).

2.3.1 | Variables collected: Independent variables

Firstly, work characteristics were assessed by using the Effort-Reward Imbalance Test (ERI Test; Siegrist, 1996;

Zurlo, Pes, & Siegrist, 2010) and the Job Content Questionnaire (JCQ; Karasek et al., 1998).

The ERI Test (Siegrist, 1996; Zurlo et al., 2010) consists of 17 items on a 5-point Likert scale (ranging from 1 = “Disagree” to 5 = “Agree, and I am very distressed”) divided into three subscales: Effort (six items, $\alpha = .79$), Material Reward (seven items, $\alpha = .84$) and Esteem Reward (four items, $\alpha = .80$).

The JCQ (Karasek et al., 1998) consists of 27 items on a 4-point Likert scale (ranging from 0 = “Often” to 3 = “Never/almost never”) divided into four subscales: Job Demands (nine items, $\alpha = .68$), Social Support (four items, $\alpha = .80$), and Job Control, the latter comprising Skill Discretion (six items, $\alpha = .62$) and Decision Authority subscales (eight items, $\alpha = .64$).

Secondly, individual characteristics were assessed by collecting socio-demographic characteristics, information on adopted coping strategies, and on the presence of Type A Behavioral Pattern and Type D personality.

Socio-demographic characteristics were assessed by using single-item questions covering information on gender (male/female); age (in years); living with partner (no/yes); presence of children (no/yes); educational level (professional degree/bachelor degree); working seniority (in years); working hours (part time/full-time); night shifts (no/yes).

Coping strategies were assessed by using the Ways of Coping Checklist-Revised (WCCL-R; Vitaliano, Russo, Carr, Maiuro, & Becker, 1985), which consists of 42 items on a 4-point Likert scale (ranging from 0 = "Never" used to 3 = "Always" used) divided into five subscales: Problem-focused (15 items, $\alpha = .88$), Seek Advice (six items, $\alpha = .75$), Self-blame (three items, $\alpha = .78$), Wishful Thinking (eight items, $\alpha = .85$) and Escape/Avoidance (10 items, $\alpha = .74$).

Type A behavioral pattern was assessed by using the Bortner's Type A Behavioral Style Inventory (Bortner, 1969; Zurlo, Pes, & Capasso, 2013), which consists of 12 bipolar adjectival items measured on an 11-point Likert-type rating scale (e.g., ranging from 1 = "Often Late" to 11 = "Never late"). The total score (Type A behavioral pattern $\alpha = .77$) derived from the sum of three subscales: Time-conscious behavior (six items), emotional suppressive/Ambitious and competitive behavior (four items), and Efficient behavior (two items).

Type D personality was assessed by using the Type D Scale-14 (DS14; Denollet, 2005), which consists of a 5-point Likert scale (ranging from 0 = "Totally False" to 4 = "Totally True") divided into two subscales: Negative Affectivity (seven items; $\alpha = .88$) and Social Inhibition (seven items; $\alpha = .86$). The presence of Type D personality derived from the occurrence of both NA and SI.

Finally, Work-Family Interface dimensions were assessed by collecting information on perceived levels of work-family interrole conflict and of job and life satisfaction.

Work-family interrole conflict was assessed by using the Work-Family Conflict Scale (WFC; five items; $\alpha = .86$) and the Family-Work Conflict Scale (FWC; five items; $\alpha = .86$) (Colombo & Ghislieri, 2008; Netemeyer, Boles, & McMurrian, 1996). Each scale consists of five items on a 7-point Likert scale (ranging from 1 = "Strongly disagree" to 7 = "Strongly agree").

Job satisfaction was assessed by using the Job Satisfaction subscale from the Copenhagen Psychosocial Questionnaire (COPSOQ; Kristensen, Hannerz, Høgh, & Borg, 2005), which consists of four items on a 4-point Likert scale (ranging from 0 = "Highly unsatisfied" to 3 = "Very satisfied"), covering perceived satisfaction in the form of working conditions, perspectives and usage of abilities (Cronbach's $\alpha = .89$).

Perceived positive life was assessed by using a single item asking "In general, how do you find life?" (5-point Likert scale ranging from 0 = "Extremely stressful" to 4 = "Not at all"). Participants answering 4 = "not at all", 3 = "mildly stressful" and 2 "moderately stressful" were compared with those responding 1 = "very stressful" or 0 = "extremely stressful" (Smith, Johal, Wadsworth, Peters, & Davey Smith, 2000).

2.3.2 | Variables collected: Dependent variables

Health outcomes were assessed by obtaining information on perceived levels of psychological and physical disease.

Psychological disease was assessed by using the Global Severity Index (GSI; $\alpha = .97$) from the Symptom Checklist-90-Revised (SCL-90-R, 90 items; Derogatis, 1994; Prunas, Sarno, Preti, & Madeddu, 2010). GSI is the sum of all responses (90 items on a 5-point Likert scale ranging from 0 = "Not at all" to 4 = "Extremely") divided by 90. It indicates both the number of symptoms and the intensity of the psychological disease including anxiety, depression, somatization, interpersonal sensitivity, hostility, obsessive compulsive, phobic anxiety, psychoticism, and paranoid ideation. Clinical levels of psychological disease were calculated by using the cut-off scores for the GSI, that is, respectively, .97 for men and 1.24 for women.

Physical disease was assessed by using a single item asking "In the last 12 months have you suffered from any of the following health problems? Please tick Yes or No for each of the categories in the following list"; the list addresses cardiovascular, musculoskeletal, gastric, dermatological and respiratory disorders (Smith et al., 2000). The number of physical disorders reported was also recorded and physical disease was coded in the form of absence/presence by using the numbers of symptoms reported (median split).

2.4 | Data analysis

The Statistical Package for the Social Sciences (SPSS; Version 20) was used for all the analyses. Preliminary analyses have been conducted before the model testing. Firstly, descriptive statistics and Pearson's correlations were carried out. Secondly, a set of factor analyses (principal component analysis, PCA; method: Varimax, communalities $> .30$, parallel analyses, scree test, eigenvalue > 1) was carried out for work characteristics (one PCA of ERI and JCQ subscales) and for individual characteristics in the form of personality characteristics (one PCA of the five subscales of the WCCL-R subscales; one PCA of the three subscales of the Bortner's Type A Behavioral Style Inventory; and one PCA of the two subscales of the Type D Scale-14), so further testing the DRIVE Model framework and reducing the large number of explanatory variables in order to reach a middle ground between simplicity and complexity (Abdi & Williams, 2010; Capasso et al., 2018; Mark & Smith, 2008). Thirdly, variables have been dichotomized. In particular, with respect to work characteristics and individual characteristics, the factors extracted from the PCA were split at the median

into low and high levels, while, since the majority of the socio-demographic characteristics were already categorical variables, only age and working seniority variables were re-coded into low and high levels as follows: age (≤ 46 years / > 46 years) was dichotomized considering the mean value of the sample ($M = 46.21$), and working seniority (≤ 7 years / > 7 years) was dichotomized considering seven as the cut-off point, settled a priori in order to clearly distinguish the more experienced nurses from those newly enrolled. With respect to Work–Family Interface dimensions, Work–Family Conflict (≤ 17.57 / > 17.57 years) and Family–Work Conflict (≤ 11.02 / > 11.02) were dichotomized by using the mean scores values provided by the Italian validation study (Colombo & Ghislieri, 2008), while job and life satisfaction dimensions were split at the median into low and high levels. Finally, with respect to health outcomes, psychological disease (the GSI score) and physical disease (the number of physical disorders reported) were split at the median into low and high levels.

A set of logistic regression analyses was therefore run, testing the hypothesized main effects of work characteristics, individual characteristics, and Work–Family Interface dimensions on health outcomes (*Hypothesis one*). Afterward, a further set of logistic regression analyses was carried out to test the hypothesized moderating effects (*Hypothesis two*). Finally, the hypothesized mediating effects of Work–Family Interface dimensions in the associations between work characteristics and health outcomes (*Hypothesis three*) were tested by using Hayes' PROCESS tool for SPSS (Model 4; Hayes, 2013; Preacher & Hayes, 2008), that is an advanced regression-based approach. To verify the significance of the indirect effects, the Z Sobel test (Sobel, 1982) and bias-corrected bootstrapped test with 5,000 replications to ensure the 95% confidence interval were used (Hayes & Scharkow, 2013).

3 | RESULTS

3.1 | Characteristics of participants

Descriptive statistics and Pearson's correlations between all independent variables against health outcomes are reported in Table 1.

With respect to the characteristics of study participants, the final sample adequately represented both male and female nurses workforce (male = 206, 45.8%; female = 244, 54.2%). Furthermore, sampled nurses overall tended to be mostly older (age $M = 46.21$, $SD = 9.40$; range: 20–65 years; age > 46 years $n = 250$, 55.6%), lived with their partner ($n = 333$, 74%), and had at least one child ($n = 351$, 78%). Moreover, the majority possessed a

professional degree ($n = 341$, 75.8%), was highly experienced (working seniority $M = 19.27$, $SD = 8.94$; range: 0–39 years; working seniority > 19 years $n = 246$, 54.7%), worked full-time ($n = 423$, 94%) and performed night shifts ($n = 345$, 76.7%).

Furthermore, considering nurses' psychological and physical health conditions, 13.8% of sampled nurses ($n = 62$) reported clinical levels of psychological disease, while 49.3% ($n = 222$) referred the presence of physical disease over the last 12 months before the survey.

3.2 | Factor analysis

According to DRIVE Model framework, a preliminarily set of factor analyses were run for work characteristics and individual characteristics (personality characteristics). With respect to work characteristics, the PCA of ERI subscales (effort, esteem reward, material reward subscales) and JCQ subscales (job demands, skill discretion, decision authority, social support subscales) yielded two distinct components accounting for 40.47% of the common variance. The first component accounted for 25.71% of the explained variance and comprised the Esteem Reward and Material Reward subscales from ERI Test (factor loadings respectively .738 and .570) and the Social Support, Decision Authority, and Skill Discretion subscales from JCQ (factor loadings respectively .482, .393, and .325); therefore, it was labeled as “Work Resources”. The second component (14.76% of the explained variance) included Effort subscale from ERI Test and Job Demands subscale from JCQ (factor loadings respectively .714, and .405); therefore, it was labeled as “Work Demands”.

With respect to individual characteristics, two distinct components were extracted from the five coping strategies of the WCCL-R (Problem-focused, Seek Advice, Self-blame, Wishful Thinking and Escape/Avoidance subscales) accounting for 77.94% of the common variance. The first component accounted for 56.28% of the explained variance, and it combined Wishful Thinking, Escape/Avoidance, and Self-blame subscales (factor loadings respectively .849, .721, and .656); therefore, the factor was labeled as “Passive Coping”. The second component accounted for 21.66% of the explained variance, and it included Seek Advice and Problem-focused subscales (factor loadings respectively .821, and .762); thus, the factor was labeled as “active coping”. Finally, the two separated PCA of Bortner's Type A Behavioral Style Inventory and of Type D personality Scale showed two single components extracted. In particular, the factor labeled as “Type A Behavioural Pattern” accounted for 65.03% of the explained variance and it comprised the three subscales of emotional suppressive/ambitious-

TABLE 1 Characteristics of the study population ($N = 450$) and correlations with health outcomes

	Mean (SD)	Psychological disease	Physical disease
Work characteristics			
<i>Work demands</i>			
Effort	15.04 (4.93)	.293**	.151**
Job demands	14.54 (3.19)	.070	.003
<i>Work resources</i>			
Esteem reward	15.91 (3.83)	-.314**	-.102*
Material reward	26.92 (6.28)	-.215**	-.113*
Skill discretion	9.50 (1.91)	-.076	.034
Decision authority	11.46 (3.52)	-.229**	-.097*
Social support	7.28 (3.13)	-.185**	.035
Individual characteristics			
<i>Socio-demographic characteristics</i>			
Gender ^a	1.54 (0.49)	.136**	.190**
Age	46.21 (9.39)	-.072	-.065
Living with partner ^b	1.74 (0.44)	-.095*	-.021
Presence of children ^c	1.78 (0.42)	-.057	-.009
Educational level ^d	1.24 (0.43)	.012	.041
Working seniority	19.27 (8.94)	-.116*	-.034
Working hours ^e	1.94 (0.24)	-.011	.021
Night shifts ^f	1.77 (0.42)	-.046	-.104*
<i>Personality characteristics</i>			
Coping problem-focused	24.59 (8.17)	.051	.003
Coping seek advice	8.89 (3.77)	.152**	.068
Coping wishful thinking	9.44 (5.49)	.473**	.107*
Coping self-blame	3.46 (1.88)	.363**	.077
Coping escape/avoidance	9.28 (5.35)	.426**	.064
Type A behavioral pattern	88.17 (24.61)	-.026	.088
Type D personality ^g	1.29 (0.45)	.478**	.090
Work-family interface dimensions			
<i>Work-family interrole conflict</i>			
Work-family conflict	17.57 (7.83)	.177**	.189**
Family-work conflict	14.27 (7.45)	.119*	.108*
<i>Job and life satisfaction</i>			
Job satisfaction	6.93 (2.83)	-.186**	-.079
Perceived positive life	1.99 (0.98)	-.345**	-.169**

Note: The table shows means and standard deviations (SD) of work characteristics, individual characteristics, and Work-Family Interface dimensions, and their correlations with health outcomes (psychological disease and physical disease).

^aGender = women.

^bLiving with partner = Yes.

^cPresence of children = Yes.

^dEducational level = Bachelor degree.

^eWorking hours = Full-time.

^fNight shifts = Yes.

^gType D Personality = presence of both negative affectivity and social inhibition.

* $p < .05$.

** $p < .01$.

TABLE 2 Significant predictors of health outcomes: main effects ($N = 450$)

		Health outcomes ^d					
		Psychological disease			Physical disease		
		OR	95%	CI	OR	95%	CI
Work characteristics ^a	Work demands	2.15***	1.36	3.39	2.17**	1.39	3.40
	Work resources	.38***	.25	.56	1.00	.68	1.48
Individual characteristics ^b	Gender	1.80**	1.21	2.67	2.37***	1.58	3.54
	Age	1.16	.75	1.80	.90	.58	1.41
	Living with partner	.96	.54	1.72	.88	.48	1.59
	Presence of children	1.45	.76	2.77	1.24	.65	2.38
	Educational level	1.18	.73	1.90	1.10	.68	1.78
	Working seniority	.25**	.09	.70	.49	.18	1.34
	Working hours	1.60	.54	4.72	5.57***	1.67	18.55
	Night shifts	1.37	.83	2.28	.68	.41	1.13
	Active coping	1.00	.67	1.50	1.21	.84	1.76
	Passive coping	5.22***	3.49	7.81	1.34	.93	1.95
	Type A behavioral pattern	1.01	.66	1.55	1.34	.92	1.94
	Type D personality	8.89***	5.81	13.63	1.54*	1.06	2.24
Work–family interface dimensions ^c	Work–family conflict	2.52***	1.69	3.75	2.06***	1.39	3.06
	Family–work conflict	1.44	.93	2.25	1.22	.79	1.89
	Job satisfaction	.67*	.46	.97	.66*	.45	.97
	Perceived positive life	.57**	.38	.85	.46***	.30	.69

Note: The table shows the odds ratio (OR) and 95% confidence interval (CI) of associations between predictors (work characteristics, individual characteristics, and Work–Family Interface dimensions) and health outcomes (psychological disease and physical disease).

^aWork characteristics: high work demands and work resources.

^bIndividual characteristics: gender = women; age > 46 years; living with partner = yes; presence of children = yes; educational level = bachelor degree; working seniority > 7 years; working hours = full-time; night shifts = yes; high adoption of active and passive coping strategies; high levels of Type A behavioral pattern and Type D personality.

^cWork–family interface dimensions: high levels of work–family conflict, family–work conflict, job satisfaction, perceived positive life.

^dHealth outcomes: high levels of psychological and physical disease.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

competitive behavior, Time-conscious behavior, and Efficient behavior (factor loadings respectively .853, .842, .718), while the factor labeled as “Type D personality” accounted for 79.92% of the explained variance, and it comprised the two subscales of Negative Affectivity and Social Inhibition (factor loadings respectively .894 and .894).

3.3 | Main, moderating and mediating hypotheses

Hypothesis one (Main Effects): Findings from logistic regression analyses carried out to test main effects

hypotheses are reported in Table 2. In particular, with respect to work characteristics, high levels of work demands ($n = 226$, 50.2%) were associated with significantly higher risk for reporting health outcomes, while high levels of work resources ($n = 225$, 50%) were associated with significantly lower risk for reporting psychological disease. With respect to individual characteristics, gender (female; $n = 244$, 54.2%), working hours (full-time; $n = 423$, 94%), high adoption of passive coping ($n = 226$, 50.2%), and the presence of Type D personality ($N = 226$, 50.2%) emerged as significant risk factors, while working seniority (> 7 years; $n = 412$, 91.6%) emerged as a significant protective factor for health outcomes. No evidence supported the main effects on health

TABLE 3 Significant predictors of health outcomes: moderating effects

			Health outcomes ^d					
			Psychological disease			Physical disease		
			OR	95%	CI	OR	95%	CI
Work characteristics^a								
Work demands	×†	Work resources	.57**	.38	.86	1.41*	1.10	1.80
Work characteristics Individual characteristics^b								
Work demands	×	Gender	2.39***	1.63	3.52	2.69***	1.83	3.97
Work demands	×	Age	1.48*	1.01	2.16	1.13	.77	1.65
Work demands	×	Living with partner	1.45	.99	2.10	1.18	.82	1.72
Work demands	×	Presence of children	1.63***	1.31	2.03	1.51*	1.04	2.19
Work demands	×	Educational level	1.76*	1.09	2.84	1.64*	1.02	2.64
Work demands	×	Working seniority	1.95**	1.30	2.94	1.64*	1.09	2.46
Work demands	×	Working hours	2.25***	1.50	3.40	1.81**	1.21	2.72
Work demands	×	Night shifts	1.94***	1.33	2.84	1.19	.82	1.73
Work demands	×	Active coping	1.38	.94	2.04	1.86**	1.27	2.75
Work demands	×	Passive coping	5.52***	3.63	8.40	1.68**	1.15	2.46
Work demands	×	Type A behavioral pattern	1.66**	1.13	2.44	1.53*	1.04	2.24
Work demands	×	Type D personality	7.78***	5.06	11.99	1.77**	1.21	2.58
Work resources	×	Gender	.76	.50	1.54	1.42	.93	2.16
Work resources	×	Age	.55**	.37	.83	.92	.62	1.37
Work resources	×	Living with partner	.36***	.24	.54	.95	.65	1.38
Work resources	×	Presence of children	.37***	.25	.54	.89	.60	1.32
Work resources	×	Educational level	.43**	.23	.82	.76	.40	1.45
Work resources	×	Working seniority	.34***	.23	.51	.85	.58	1.25
Work resources	×	Working hours	.32***	.22	.47	1.06	.60	2.03
Work resources	×	Night shifts	.41***	.28	.61	.68	.36	1.26
Work resources	×	Active coping	.52***	.34	.79	.92	.61	1.39
Work resources	×	Passive coping	1.23	.77	1.96	.70	.44	1.12
Work resources	×	Type A behavioral pattern	.61*	.39	.94	.97	.62	1.50
Work resources	×	Type D personality	2.94***	1.71	5.06	1.10	.67	1.80
Work characteristics Work-family interface dimensions^c								
Work demands	×	Work-family conflict	2.87***	1.96	4.21	2.30***	1.58	3.35
Work demands	×	Family-work conflict	2.94***	2.00	4.32	1.84**	1.84	2.68
Work demands	×	Job satisfaction	1.14	.77	1.71	1.06	.71	1.58
Work demands	×	Perceived positive life	1.32	.91	1.92	.90	.62	1.31
Work resources	×	Work-family conflict	.65*	.43	.98	1.34	.80	2.23
Work resources	×	Family-work conflict	.63*	.42	.93	.87	.54	1.41
Work resources	×	Job satisfaction	.43***	.29	.65	.49**	.33	.75
Work resources	×	Perceived positive life	.37***	.25	.55	.56**	.38	.83

Note: The table shows the odds ratio (OR) and 95% confidence interval (CI) of the interaction effects of work demands with work resources on health outcomes (psychological disease and physical disease), and of work demands/work resources with individual characteristics and with Work-Family Interface dimensions on health outcomes. † Interaction terms are marked with the symbol × to define the products of the involved independent variables.

^aWork characteristics: high work demands and work resources.

^bIndividual characteristics: gender = women; age > 46 years; living with partner = yes; presence of children = yes; educational level = bachelor degree; working seniority >7 years; working hours = full-time; night shifts = yes; high adoption of active and passive coping strategies; high levels of Type A behavioral pattern and Type D personality.

^cWork-Family Interface dimensions: high levels of work-family conflict, family-work conflict, job satisfaction, perceived positive life.

^dHealth outcomes: high levels of psychological and physical disease.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

outcomes of the following individual characteristics: age (> 46 years $n = 250$, 55.6%), living with partner (yes $n = 333$, 74%), presence of children (yes $n = 351$, 78%), educational level (bachelor degree $n = 109$, 24.2%), night shift (yes $n = 345$, 76.7%), active coping (high adoption $n = 226$, 50.2%), and Type A behavioral pattern (presence $n = 217$, 48.2%). Finally, with respect to Work–Family Interface dimensions, high levels of work–family conflict ($n = 257$, 57.1%) emerged as significant risk factor, while high levels of job satisfaction ($n = 233$, 51.8%) and perceived positive life ($n = 307$, 68.2%) emerged as significant protective factors for health outcomes. No evidence supported the main effect of high levels of family–work conflict ($n = 324$, 72%) on health outcomes.

Hypothesis two (Moderating Effects): Findings from logistic regression analyses carried out to test moderating effects hypotheses are summarized in Table 3 (see also Table S1). Firstly, work resources significantly interacted with work demands buffering its negative effects on psychological disease. Nevertheless, the interaction between work demands and work resources was found still significantly associated with higher likelihood for reporting physical disease, despite it being nearly halved (*Hypothesis 2a*). Secondly, considering the interaction effects of work characteristics with individual characteristics on health outcomes, data revealed that gender (female), working hours (full-time), passive coping (high adoption), and Type D personality (presence) significantly interacted with work

demands increasing nurses' risk for reporting health outcomes.

In addition, the interactions between specific individual characteristics (i.e., working seniority >7 years; age > 46 years; presence of children; bachelor degree education; performing night shifts; adoption of active coping, and presence of Type A Behavioral Partner) and work demands were found significantly associated with high risk for reporting health outcomes. Conversely, the interactions between specific individual characteristics (i.e., working seniority >7 years; age > 46 years; living with partner; presence of children; bachelor degree educational level; performing night shifts; adoption of active coping, and presence of Type A Behavioral Partner) and work resources were found significantly associated low risk for reporting psychological health outcomes. Nevertheless, the interaction between Type D personality and work resources was found associated with significantly higher risk for reporting psychological disease. No evidence on the associations between work resources and, respectively, gender (female) and passive coping on health outcomes were found (*Hypothesis 2b*).

Finally, considering the interaction effects of work characteristics with Work–Family Interface dimensions on health outcomes, both work–family conflict and family–work conflict significantly interacted with work demands increasing nurses' risk for reporting psychological disease, while there was no evidence supporting the moderating role (i.e., buffering) of job satisfaction

TABLE 4 Results of mediation models with work–family interface dimensions mediating the relationship between work characteristics and health outcomes

Independent variable	Mediator	Dependent variable	Path A ^a	Path B ^b	Direct effect ^c	Indirect effect ^d	Sobel's Z ^e
Work demands	Work–family conflict ^f	Psychological disease	2.37**	.04**	.68***	.10*	2.25*
Work demands	Perceived positive life ^f	Psychological disease	−.45***	−.53***	.58**	.24***	3.46***
Work resources	Perceived positive life ^f	Psychological disease	.57***	−.47***	−.96***	−.27***	−3.55***
Work demands	Work–family conflict ^g	Physical disease	2.37**	.05***	.14	.11*	2.42*
Work demands	Perceived positive life ^g	Physical disease	−.45***	−.34***	.10	.15**	2.72**
Work resources	Perceived positive life ^g	Physical disease	.57***	−.35***	−.00	−.20**	−2.97**

Note: The table shows the path coefficients of the mediation models with Work–Family Interface dimensions mediating the relationship between work characteristics and health outcomes (psychological disease and physical disease). Only significant mediation models were displayed.

^aPath A, effect of independent variable on mediator.

^bPath B, effect of mediator on dependent variable.

^cDirect effect, effect of independent variable on dependent variable controlling for the mediator.

^dIndirect effect, effect of independent variable on dependent variable through the mediator.

^eSobel's Z, Sobel test results for indirect effect.

^fPartial mediation.

^gFull mediation.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

and perceived positive life in the associations between work demands and health outcomes. Conversely, the interactions between all Work–Family Interface dimensions and work resources were associated with significantly lower risk for reporting health outcomes (*Hypothesis 2c*).

Hypothesis three (Mediating Effects): Hayes' PROCESS tool for SPSS, was used to investigate whether perceived Work–Family Interface dimensions mediate the associations between work demands/work resources and health outcomes. A summary of significant findings is reported in Table 4.

For psychological disease (Figure 2), data revealed that work–family conflict partially mediated the associations between work demands and psychological disease (Nagelkerke $R^2 = .08$, $p < .001$), as the confidence interval for its indirect effect does not contain zero (effect = .10, CI = .03 to .22), and Sobel test was significant ($Z = 2.25$, $p = .024$). Moreover, perceived positive life significantly partially mediated the associations of both work demands (Nagelkerke $R^2 = .12$, $p < .001$) and work resources (Nagelkerke $R^2 = .16$, $p < .001$) with psychological disease, as the confidence intervals for their indirect effects do not

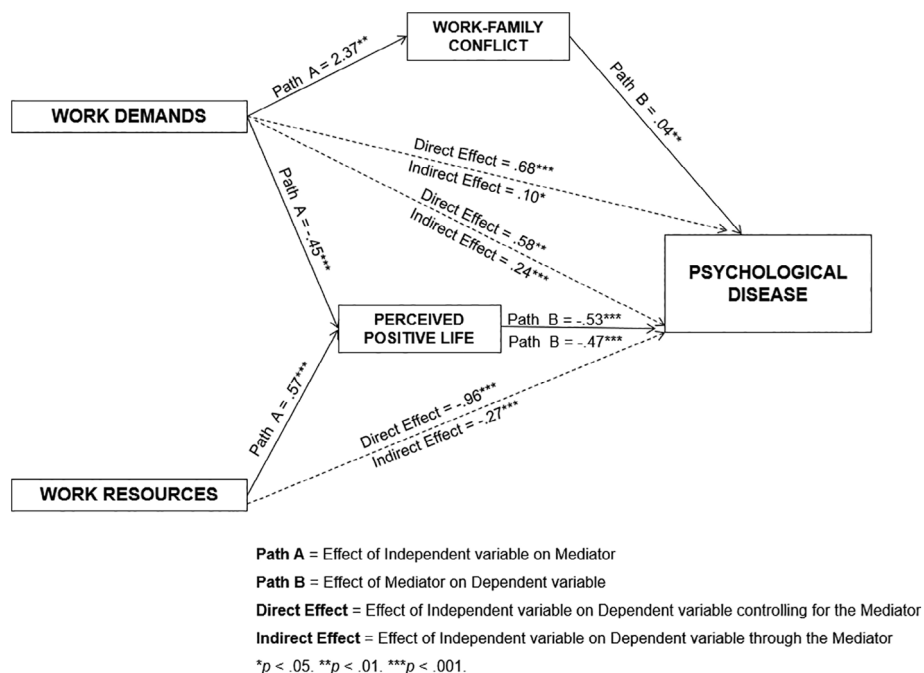


FIGURE 2 The mediating role of work–family conflict and perceived positive life in the associations between work characteristics and psychological disease

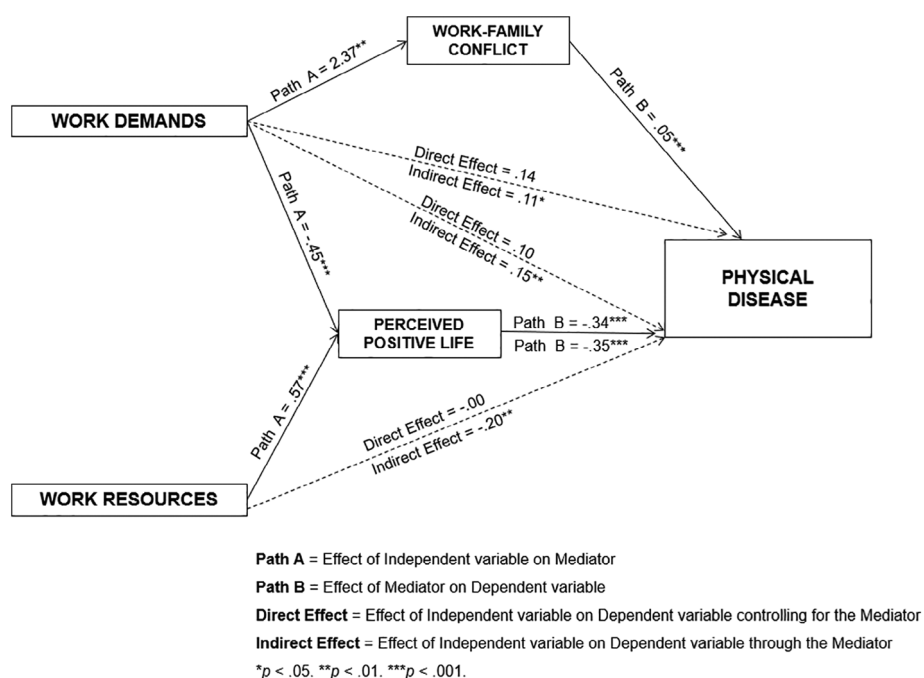


FIGURE 3 The mediating role of work–family conflict and perceived positive life in the associations between work characteristics and physical disease

contain zero, and Sobel tests were significant (respectively, for work demands: effect = .24; CI = .13 to .39; $Z = 3.46$, $p < .001$, and for work resources: effect = $-.27$; CI = $-.44$ to $-.14$; $Z = -3.55$, $p < .001$).

For physical disease (Figure 3), Work–Family Conflict fully mediated the associations between work demands and physical disease (Nagelkerke $R^2 = .05$, $p < .001$), as the confidence interval for its indirect effect does not contain zero (Effect = .11, CI = .04 to .24), and Sobel test was significant ($Z = 2.42$, $p = .015$). Moreover, perceived positive life significantly fully mediated the associations of both work demands (Nagelkerke $R^2 = .04$, $p = .001$) and work resources (Nagelkerke $R^2 = .04$, $p = .002$) with physical disease, as the confidence intervals for their indirect effects do not contain zero, and Sobel tests were significant (respectively, for work demands: effect = .15; CI = .06 to .28; $Z = 2.72$, $p = .006$, and for work resources: effect = $-.20$; CI = $-.35$ to $-.09$; $Z = -2.97$, $p = .003$). Neither job satisfaction nor Family–Work Conflict played a mediating role in the associations between work demands/work resources and health outcomes.

4 | DISCUSSION

Following the changes and new challenges facing healthcare systems worldwide (e.g., new therapeutic possibilities and populations' higher life expectancies), healthcare workers and mainly nurses, suffer from the growing demands to provide the best standards of care with inadequate resources (Farsi, Dehghan-Nayeri, Negarandeh, & Broomand, 2010; OECD, 2011). In Italy, for example, the healthcare system supplies peculiar provision of freely-accessible high-quality public services and it is rated as successfully achieving effective standards of care; notwithstanding, the health spending is still significantly lower than those of several European countries (OECD/European Observatory on Health Systems and Policies, 2019). This results in a high portion of the population requiring medical services which encounters a significant shortage of resources, particularly concerning nursing staff. Indeed, in Italy, the number of employed nurses is significantly lower than nearly all European countries (i.e., 5.8 nurses *per* 1,000 population rather than 8.5 in other European countries; OECD/European Observatory on Health Systems and Policies, 2019). This condition, therefore, may increase nurses' difficulties in work organization (Glazer & Gyurak, 2008), so exacerbating perceived pressures and overload, with a potential significantly high cost for their wellbeing.

Accordingly, responding to the widespread presence of work-related stress and psychophysical disease among

nursing professionals both worldwide (Han, Han, An, & Lim, 2015; McNeely, 2005; Mohammed, 2019) and in Italy (Zurlo et al., 2018), the present study proposed and tested a multi-dimensional model for an early and comprehensive assessment of nurses' occupational health.

Findings provided evidence supporting the proposed model, confirming not only the role of the original DRIVE Model dimensions (i.e., work characteristics and individual characteristics in the form of coping strategies) (Mark & Smith, 2012; Zurlo et al., 2018), but also the inclusion of further individual characteristics (i.e., socio-demographic characteristics, Type A Behavioral Pattern and Type D personality) and of Work–Family Interface dimensions (i.e., work–family interrole conflict, job satisfaction and life satisfaction). All the dimensions addressed within the model, indeed, revealed significant main, moderating and mediating effects on perceived levels of psychophysical health conditions among nurses.

With respect to main effects hypotheses, findings revealed the following risk factors: the work characteristic of work demands; the individual characteristics of gender (female), working hours (full-time), passive coping and Type D personality; and the Work–Family Interface dimension of work–family conflict. Furthermore, data also highlighted the following protective factors: the work characteristic of work resources; the individual characteristic of working seniority (> 7 years); and the Work–Family Interface dimensions of job satisfaction and perceived positive life.

With respect to moderating effects hypotheses, findings provided more complex information on nurses' work-related stress processes, allowing to better identify the group of nurses at significant psychophysical risk (Lorah & Wong, 2018). In particular, data revealed that although specific factors (i.e., age, living with partner, presence of children, educational level, night shifts, Type A behavioral pattern, active coping, and family–work conflict) were not direct determinants of nurses' disease, they significantly contributed to nurses' health conditions when they co-occurred with high demands and/or low resources conditions. These findings endorsed the multi-dimensional and transactional approach adopted, suggesting that also the groups of nurses who were not considered at high health risk themselves should, instead, deserve the development of interventions when they concurrently perceive their working environment as adverse (i.e., high work demands and/or low work resources). Furthermore, specific risk factors (i.e., female gender, working full-time, the adoption of passive coping, and perceived work–family conflict) were found able to significantly exacerbate the negative effects of work demands, so emphasizing the necessity to carefully identify nurses

simultaneously exposed to multiple hazards, and, consequently, who deserve the implementation of early interventions.

However, above all, Type D personality emerged as a specific and pivotal risk factor for nurses' psychophysical health, since it not only exacerbated the negative effects of work demands, but also it made ineffective the positive effects of work resources. These findings strongly confirmed the meaningfulness to also assess personality characteristics for a greater understanding of work-related stress processes (Duschek, Bair, Haux, Garrido, & Janka, 2020; Parkes, 1994; Tisu, Lupşa, Virgă, & Rusu, 2020), and clearly indicated the necessity to address, within counseling interventions, the significant role of Type D personality characteristics (i.e., negative affectivity and social inhibition; Mols & Denollet, 2010; Ogińska-Bulik, 2006) in influencing nurses' perceived wellbeing.

In contrast, considering protective factors, data primarily highlighted the key role of work resources, that emerged as the only factor able to significantly overcome the negative effects of perceived work demands. The other protective factors (i.e., working seniority >7 years, job satisfaction and perceived positive life) were found, instead, ineffective to counteract its negative impact. This induced us to consider that healthcare organizations may effectively promote nurses' wellbeing by supporting and enhancing work resources (i.e., esteem and material rewards, job control, social support) (Demerouti, Van den Heuvel, Xanthopoulou, Dubbelt, & Gordon, 2017). From this perspective, data also revealed that the positive effects of work resources were able to persist even in high risky conditions (i.e., being female and adopting passive coping strategies) and in heavy load working situations (working full-time), as well as among nurses who perceive high levels of work-family interrole conflict, so providing further evidence reinforcing the effective protective role of work resources.

Finally, with respect to the hypothesized mediating effects of work-family interface dimensions, findings revealed that work-family conflict and perceived positive life partially mediated the associations of work characteristics with psychological disease and fully mediated the associations of work characteristics with physical disease reported by nurses. These findings provided a better understanding of the underlying pathways of relationship between work characteristics and health outcomes through Work-Family Interface dimensions, and confirmed the intimate interplay between nurses' work and family lives.

Therefore, considering the practical implications of the study, overall findings highlighted the main necessity to early identify nurses who perceive high levels of work demands and low levels of work resources, due to their relevant occupational health risk. From this perspective,

findings endorsed the core of the proposed multi-dimensional and transactional model, that is represented by perceived work characteristics, strongly emphasizing the relevance of their assessment within healthcare work contexts. Accordingly, data clearly suggested the necessity to focus interventions aiming at reducing perceived work demands and at improving perceived work resources among nursing professionals. This can be targeted, for example, by supporting the development of a more personalized and flexible work arrangement and a more cooperative and supportive work environment, by fostering a clearer definition and recognition of nursing, as well as by providing a wider range of career prospects (Sawatzky & Enns, 2009; Semmer, 2003).

Nonetheless, findings supported the meaningfulness to sensibly assess also individual characteristics and Work-Family Interface dimensions in order to develop more tailored interventions. Indeed, the assessment of work characteristics alone may provide a limited framework of the multiple risks to which nurses are simultaneously exposed, as well as of the resources that can be activated, promoted and enhanced, so potentially resulting in less effective interventions. In this direction, data suggested to consider that female nurses, those adopting passive coping strategies, possessing Type D personality and perceiving high levels of work-family conflict should be offered with targeted interventions. This is even more noteworthy under the condition of simultaneously perceiving high levels of work demands and/or low levels of work resources. In the same direction, data also indicated that specific groups of nurses (i.e., elderly nurses; those living with a partner and having children; highly educated; night shifts workers; displaying Type A behavioral pattern; adopting active coping strategies; and perceiving high family-work conflict) should not be considered at high occupational health risk themselves, but they could still deserve focused interventions after a comprehensive assessment of all risk and protective factors addressed within the proposed model. Indeed, they could be exposed to further risk factors or, conversely, they could possess effective protective factors linked both to work and to personal domains.

In this perspective, since the moderating role of perceived Work-Family Interface dimensions, individual and organizational interventions should address the unique further risk and resources featuring the individuality of nurses. Organizations could, accordingly, put efforts into capitalizing on the possibility to support nurses' psychological health by providing counseling interventions targeted on exploring, facing and reappraising their perceived difficulties and pressures (as well as their positive feelings and overall appraisals) not only limited to their own work environment.

Similarly, interventions should aim at reducing nurses' physical disease, taking into account this may be the sign of the demands derived from the actual work and personal/family duties, so requiring the design and implementations of strategies to decrease the physical burden, support healthier lifestyles, and increase the occasions to recover. However, this may also represent the expression of nurses' psychological suffering.

Therefore, the identification of main, moderating and mediation processes of a complex set of factors underlying nurses' psychophysical health might foster the advancement in definition and refinement of more tailored and successful interventions for nurses without underestimating the individual beyond the worker.

4.1 | Study limitations and future research

Firstly, the study was carried out with a cross-sectional design. Therefore, despite this design being considered as useful to preliminarily test our proposed model (Spector, 2019), no inferences concerning the temporal associations between predictors and outcomes can be made and no cause–effect relationship can be suggested. Secondly, since the questionnaires were self-report measures, the risk of social desirability bias could be higher and common method variance could not be ruled. Nevertheless, although research demonstrated this limitation does not inevitably influence the validity of our findings (Fuller, Simmering, Atinc, Atinc, & Babin, 2016), future research could also include a wider range of sources of data. Thirdly, the model has been tested with a sample of Italian nurses, and further applications of this model in other countries are needed to evaluate its generalizability, as well as to allow gaining further information about factors influencing nurses' health conditions according to different healthcare systems worldwide. In the same direction, future research should deepen potential gender differences in factors influencing nurses' health conditions. In fact, while our study sample effectively represented also men, there is still a lack of studies investigating work-related stress process among male nurses (Gorgievski, Van der Heijden, & Bakker, 2018; Zurlo et al., 2020), and, therefore, future research could be developed to strengthen the understanding of factors influencing nurses' occupational health in both genders. Finally, the limited presence of protective factors for nurses' health conditions suggested that the proposed theoretical framework could be further developed in order to potentially identify other work characteristics (e.g., perceived team climate, specific work tasks and schedules, and organizational policies), individual

characteristics (e.g., attributional styles, emotional regulation strategies), and Work–Family Interface dimensions (e.g., perceived work–family assistance, social support from relatives and friends, time to recovery) able to reduce nurses' psychophysical risks as well as to significantly counteract the negative impact of perceived work demands.

5 | CONCLUSIONS

In conclusion, by enriching the DRIVE Model theoretical framework, the study proposed a comprehensive tool, including work characteristics, individual characteristics and Work–Family Interface dimensions, to be adopted in the public healthcare systems for a broad assessment of risks and protective factors influencing nurses' psychophysical health conditions. Findings could be used to enhance the development of tailored policies and interventions to promote nurses' wellbeing.

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CONFLICT OF INTERESTS


The authors declare they have no conflict of interest.

AUTHOR CONTRIBUTIONS

F.V. prepared the concept and design, collected data, performed the statistical analysis and drafted the manuscript; A.P.S. and M.C.Z. contributed to the concept, design, data analysis, and interpretation; F.V., A.P.S. and M.C.Z. critically reviewed the manuscript, and all authors read and approved the final manuscript.

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REFERENCES

- Abdi, H., & Williams, L. J. (2010). Principal component analysis. *Wiley Interdisciplinary Reviews: Computational Statistics*, 2, 433–459. <https://doi.org/10.1002/wics.101>
- AlAzzam, M., AbuAlRub, R. F., & Nazzal, A. H. (2017). The relationship between work–family conflict and job satisfaction among hospital nurses. *Nursing Forum*, 52, 278–288. <https://doi.org/10.1111/nuf.12199>
- Berkman, L. F., Liu, S. Y., Hammer, L., Moen, P., Klein, L. C., Kelly, E., ... Buxton, O. M. (2015). Work–family conflict, cardiometabolic risk, and sleep duration in nursing employees. *Journal of Occupational Health Psychology*, 20, 420–433. <https://doi.org/10.1037/a0039143>

- Beutell, N. J., & Schneer, J. A. (2014). Job and life attitudes of managers and professionals. *Journal of Psychological Issues in Organizational Culture*, 4, 18–32. <https://doi.org/10.1002/jpoc.21123>.
- Bortner, R. W. (1969). A short rating scale as a potential measure of pattern a behaviour. *Journal of Chronic Diseases*, 22, 87–91. [https://doi.org/10.1016/0021-9681\(69\)90061-7](https://doi.org/10.1016/0021-9681(69)90061-7).
- Brand, S. L., Coon, J. T., Fleming, L. E., Carroll, L., Bethel, A., & Wyatt, K. (2017). Whole-system approaches to improving the health and wellbeing of healthcare workers: A systematic review. *PLoS One*, 12, e0188418. <https://doi.org/10.1371/journal.pone.0188418>
- Burke, R. J., & Greenglass, E. R. (2001). Hospital restructuring, work-family conflict and psychological burnout among nursing staff. *Psychology & Health*, 16, 583–594. <https://doi.org/10.1080/08870440108405528>
- Burke, R. J., Koyuncu, M., & Fiksenbaum, L. (2011). Hospital culture, work satisfaction and psychological well-being. *Europe's Journal of Psychology*, 7, 624–639. <https://doi.org/10.5964/ejop.v6i1.172>
- Capasso, R., Zurlo, M. C., & Smith, A. P. (2018). Ethnicity, work-related stress and subjective reports of health by migrant workers: A multi-dimensional model. *Ethnicity & Health*, 23, 174–193. <https://doi.org/10.1080/13557858.2016.1258041>
- Cohen, A., & Liani, E. (2009). Work-family conflict among female employees in Israeli hospitals. *Personnel Review*, 38, 124–141. <https://doi.org/10.1108/00483480910931307>
- Cole, T. R., & Carlin, N. (2009). The suffering of physicians. *The Lancet*, 374, 1414–1415. [https://doi.org/10.1016/S0140-6736\(09\)61851-1](https://doi.org/10.1016/S0140-6736(09)61851-1)
- Colombo, L., & Ghislieri, C. (2008). The work-to-family conflict: Theories and measures. *Work*, 15, 35–55.
- De Fruyt, F., & Denollet, J. (2002). Type D personality: A five-factor model perspective. *Psychology & Health*, 17, 671–683. <https://doi.org/10.1080/08870440290025858>
- Demerouti, E., Van den Heuvel, M., Xanthopoulou, D., Dubbelt, L., & Gordon, H. J. (2017). Job resources as contributors to wellbeing. In C. L. Cooper & M. P. Leiter (Eds.), *The Routledge companion to wellbeing at work* (pp. 269–283). London and New York: Taylor & Francis Ltd.
- Denollet, J. (2005). DS14: Standard assessment of negative affectivity, social inhibition, and type D personality. *Psychosomatic Medicine*, 67, 89–97. <https://doi.org/10.1097/01.psy.0000149256.81953.49>
- Derogatis, L. R. (1994). In National Computer Systems Pearson (Ed.), *Symptom checklist 90-R: Administration, scoring, and procedures manual* (3rd ed.). Minneapolis, MN: NCS Pearson.
- Duschek, S., Bair, A., Haux, S., Garrido, A., & Janka, A. (2020). Stress in paramedics: Relationships with coping strategies and personality traits. *International Journal of Emergency Services*, 9, 203–213. <https://doi.org/10.1108/IJES-06-2019-0029>
- Eby, L. T., Casper, W. J., Lockwood, A., Bordeaux, C., & Brinley, A. (2005). Work and family research in IO/OB: Content analysis and review of the literature (1980 – 2002). *Journal of Vocational Behavior*, 66, 124–197. <https://doi.org/10.1016/j.jvb.2003.11.003>
- Enns, V., Currie, S., & Wang, J. (2015). Professional autonomy and work setting as contributing factors to depression and absenteeism in Canadian nurses. *Nursing Outlook*, 63, 269–277. <https://doi.org/10.1016/j.outlook.2014.12.014>
- Farsi, Z., Dehghan-Nayeri, N., Negarandeh, R., & Broomand, S. (2010). Nursing profession in Iran: An overview of opportunities and challenges. *Japan Journal of Nursing Science*, 7, 9–18. <https://doi.org/10.1111/j.1742-7924.2010.00137.x>
- Fuller, C. M., Simmering, M. J., Atinc, G., Atinc, Y., & Babin, B. J. (2016). Common methods variance detection in business research. *Journal of Business Research*, 69, 3192–3198. <https://doi.org/10.1016/j.jbusres.2015.12.008>
- Galvin, J., & Smith, A. P. (2016). Stress in U.K. mental health training: A multi-dimensional comparison study. *British Journal of Education, Society & Behavioural Science*, 9, 161–175. <https://doi.org/10.9734/BJESBS/2015/18519>
- Glazer, S., & Gyurak, A. (2008). Sources of occupational stress among nurses in five countries. *International Journal of Inter-cultural Relations*, 32, 49–66. <https://doi.org/10.1016/j.ijintrel.2007.10.003>
- Glazer, S., Stetz, T. A., & Izso, L. (2004). Effects of personality on subjective job stress: A cultural analysis. *Personality and Individual Differences*, 37, 645–658. <https://doi.org/10.1016/j.paid.2003.10.012>
- Gorgievski, M. J., Van der Heijden, B. I., & Bakker, A. B. (2018). Effort-reward imbalance and work-home interference: A two-wave study among European male nurses. *Work & Stress*, 33, 315–333. <https://doi.org/10.1080/02678373.2018.1503358>
- Greenhaus, J. H., & Powell, G. N. (2006). When work and family are allies: A theory of work-family enrichment. *Academy of Management Review*, 31, 72–92. <https://doi.org/10.5465/amr.2006.19379625>
- Grzywacz, J. G., Frone, M. R., Brewer, C. S., & Kovner, C. T. (2006). Quantifying work-family conflict among registered nurses. *Research in Nursing and Health*, 29, 414–426. <https://doi.org/10.1002/nur.20133>
- Hämmig, O., Brauchli, R., & Bauer, G. F. (2012). Effort-reward and work-life imbalance, general stress and burnout among employees of a large public hospital in Switzerland. *Swiss Medical Weekly*, 142, w13577. <https://doi.org/10.3929/ethz-b-000049815>
- Han, S. S., Han, J. W., An, Y. S., & Lim, S. H. (2015). Effects of role stress on nurses' turnover intentions: The mediating effects of organizational commitment and burnout. *Japan Journal of Nursing Science*, 12, 287–296. <https://doi.org/10.1111/jjns.12067>
- Hayes, A. F., & Scharkow, M. (2013). The relative trustworthiness of inferential tests of the indirect effect in statistical mediation analysis: Does method really matter? *Psychological Science*, 24, 1918–1927. <https://doi.org/10.1177/0956797613480187>
- Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York, NY: The Guilford Press.
- Jalilian, H., Shouroki, F. K., Azmoon, H., Rostamabadi, A., & Choobineh, A. (2019). Relationship between job stress and fatigue based on job demand-control-support model in hospital nurses. *International Journal of Preventive Medicine*, 10, 56. https://doi.org/10.4103/ijpvm.IJPVM_178_17
- Jourdain, G., & Chênevert, D. (2010). Job demands–resources, burnout and intention to leave the nursing profession: A questionnaire survey. *International Journal of Nursing Studies*, 47, 709–722. <https://doi.org/10.1016/j.ijnurstu.2009.11.007>
- Karasek, R. (1979). Job demands, job decision latitude, and mental strain: Implications for job redesign. *Administrative Science Quarterly*, 24, 285–308.

- Karasek, R., & Theorell, T. (1990). *Healthy work: Stress, productivity and the healthy work: Stress, productivity and the reconstruction of working life*. New York, NY: Basic Books.
- Karasek, R., Brisson, C., Kawakami, N., Houtman, I., Bongers, P., & Amick, B. (1998). The job content questionnaire (JCQ): An instrument for internationally comparative assessments of psychosocial job characteristics. *Journal of Occupational Health Psychology*, 3, 322–355. <https://doi.org/10.1037/1076-8998.3.4.322>
- Khamisa, N., Oldenburg, B., Peltzer, K., & Ilic, D. (2015). Work related stress, burnout, job satisfaction and general health of nurses. *International Journal of Environmental Research and Public Health*, 12, 652–666. <https://doi.org/10.3390/ijerph120100652>
- Kristensen, T. S., Hannerz, H., Høgh, A., & Borg, V. (2005). The Copenhagen psychosocial questionnaire—a tool for the assessment and improvement of the psychosocial work environment. *Scandinavian Journal of Work, Environment & Health*, 31, 438–449.
- Laschinger, H. K. S., Finegan, J., Shamian, J., & Almost, J. (2001). Testing Karasek's demands-control model in restructured healthcare settings: Effects of job strain on staff nurses' quality of work life. *The Journal of Nursing Administration*, 31, 233–243.
- Lavoie-Tremblay, M., Wright, D., Desforges, N., Gélinas, C., Marchionni, C., & Drevniok, U. (2008). Creating a healthy workplace for new-generation nurses. *Journal of Nursing Scholarship*, 40, 290–297. <https://doi.org/10.1111/j.1547-5069.2008.00240.x>
- Lorah, J. A., & Wong, Y. J. (2018). Contemporary applications of moderation analysis in counseling psychology. *Journal of Counseling Psychology*, 65, 629–640. <https://doi.org/10.1037/cou0000290>
- Lu, H., Zhao, Y., & While, A. (2019). Job satisfaction among hospital nurses: A literature review. *International Journal of Nursing Studies*, 94, 21–31. <https://doi.org/10.1016/j.ijnurstu.2019.01.011>
- Marinaccio, A., Ferrante, P., Corfiati, M., Di Tecco, C., Rondinone, B. M., Bonafede, M., ... Iavicoli, S. (2013). The relevance of socio-demographic and occupational variables for the assessment of work-related stress risk. *BMC Public Health*, 13, 1157. <https://doi.org/10.1186/1471-2458-13-1157>
- Mark, G., & Smith, A. P. (2008). Stress models: A review and suggested new direction. In J. Houdmont & S. Leka (Eds.), *Occupational Health Psychology* (pp. 111–144). Nottingham, UK: University Press.
- Mark, G., & Smith, A. P. (2012). Occupational stress, job characteristics, coping, and the mental health of nurses. *British Journal of Health Psychology*, 17, 505–521. <https://doi.org/10.1111/j.2044-8287.2011.02051.x>
- McGrath, A., Reid, N., & Boore, J. (2003). Occupational stress in nursing. *International Journal of Nursing Studies*, 40, 555–565. [https://doi.org/10.1016/s0020-7489\(03\)00058-0](https://doi.org/10.1016/s0020-7489(03)00058-0)
- McNeely, E. (2005). The consequences of job stress for nurses' health: Time for a check-up. *Nursing Outlook*, 53, 291–299. <https://doi.org/10.1016/j.outlook.2005.10.001>
- Meng, R., Luo, Y., Liu, B., Hu, Y., & Yu, C. (2015). The nurses' well-being index and factors influencing this index among nurses in Central China: A cross-sectional study. *PLoS One*, 10, e0144414. <https://doi.org/10.1371/journal.pone.0144414>
- Mohammed, A. I. (2019). Workplace stress among nurses. *International Journal of Innovative Research in Medical Science*, 4, 690–693. <https://doi.org/10.23958/ijirms/vol04-i12/802>
- Mols, F., & Denollet, J. (2010). Type D personality in the general population: A systematic review of health status, mechanisms of disease, and work-related problems. *Health and Quality of Life Outcomes*, 8, 9. <https://doi.org/10.1186/1477-7525-8-9>
- Nelson, K., & Smith, A. P. (2016). Occupational stress, coping and mental health in Jamaican police officers. *Occupational Medicine*, 66, 488–491. <https://doi.org/10.1093/occmed/kqw055>
- Netemeyer, R. G., Boles, J., & McMurrian, R. (1996). Development and validation of work-family conflict and family-work conflict scales. *Journal of Applied Psychology*, 81, 400–410. <https://doi.org/10.1037/0021-9010.81.4.400>
- Ogińska-Bulik, N. (2006). Occupational stress and its consequences in healthcare professionals: The role of type D personality. *International Journal of Occupational Medicine and Environmental Health*, 19, 113–122. <https://doi.org/10.2478/v10001-006-0016-7>
- Ohue, T., Moriyama, M., & Nakaya, T. (2011). Examination of a cognitive model of stress, burnout, and intention to resign for Japanese nurses. *Japan Journal of Nursing Science*, 8, 76–86. <https://doi.org/10.1111/j.1742-7924.2010.00161.x>
- Organization for Economic Co-operation and Development [OECD]. (2011). *Health at a glance 2011: OECD Indicators*. Paris, France: OECD Publishing.
- Organization for Economic Co-operation and Development [OECD]/European Observatory on Health Systems and Policies. (2019). *Italy: Country Health Profile 2019, State of Health in the EU. Paris/European observatory on health systems and policies*. Brussels, Belgium: OECD Publishing.
- Panagopoulou, E., Montgomery, A., & Tsiga, E. (2015). Bringing the well-being and patient safety research agenda together: Why healthy HPs equal safe patients. *Frontiers in Psychology*, 6, 211. <https://doi.org/10.3389/fpsyg.2015.00211>
- Pisanti, R., van der Doef, M., Maes, S., Lazzari, D., & Bertini, M. (2011). Job characteristics, organizational conditions, and distress/well-being among Italian and Dutch nurses: A cross-national comparison. *International Journal of Nursing Studies*, 48, 829–837. <https://doi.org/10.1016/j.ijnurstu.2010.12.006>
- Preacher, K. J., & Hayes, A. F. (2008). Contemporary approaches to assessing mediation in communication research. In A. F. Hayes, M. D. Slater, & L. B. Snyder (Eds.), *The sage sourcebook of advanced data analysis methods for communication research* (pp. 13–54). Los Angeles: Sage Publications, Inc.
- Prunas, A., Sarno, I., Preti, E., & Madeddu, F. (2010). *SCL-90-R. Symptom Checklist-90-R*. Firenze, Italy: Giunti.
- Rotenberg, L., Silva-Costa, A., & Griep, R. H. (2014). Mental health and poor recovery in female nursing workers: A contribution to the study of gender inequities. *Revista Panamericana de Salud Publica*, 35, 179–185.
- Sawatzky, J. A. V., & Enns, C. L. (2009). A mentoring needs assessment: Validating mentorship in nursing education. *Journal of Professional Nursing*, 25, 145–150. <https://doi.org/10.1016/j.profnurs.2009.01.003>
- Schreuder, J. A., Roelen, C. A., Koopmans, P. C., Moen, B. E., & Groothoff, J. W. (2010). Effort–reward imbalance is associated with the frequency of sickness absence among female hospital nurses: A cross-sectional study. *International Journal of Nursing Studies*, 47, 569–576. <https://doi.org/10.1016/j.ijnurstu.2009.10.002>

- Schulz, M., Damkröger, A., Heins, C., Wehlitz, L., Löhr, M., Driessen, M., ... Wingenfeld, K. (2009). Effort–reward imbalance and burnout among German nurses in medical compared with psychiatric hospital settings. *Journal of Psychiatric and Mental Health Nursing*, 16, 225–233. <https://doi.org/10.1111/j.1365-2850.2008.01355.x>
- Semmer, N. K. (2003). Job stress interventions and organization of work. In J. C. Quick & L. E. Tetrick (Eds.), *Handbook of occupational health psychology* (pp. 325–353). Washington, DC: American Psychological Association.
- Siegrist, J. (1996). Adverse health effects of high-effort/low-reward conditions. *Journal of Occupational Health Psychology*, 1, 27–41. <https://doi.org/10.1037/1076-8998.1.1.27>
- Smith, A. P., Johal, S., Wadsworth, E., Peters, T. & Davey Smith, G. (2000). *The scale and impact of occupational stress: The Bristol stress and health at work study* (Health and Safety Executive Research Report No. 265). London, England: HSE Books.
- Sobel, M. E. (1982). Asymptotic intervals for indirect effects in structural equations models. In S. Leinhardt (Ed.), *Sociological methodology* (pp. 290–312). San Francisco, CA: Jossey-Bass.
- Spector, P. E. (2019). Do not cross me: Optimizing the use of cross-sectional designs. *Journal of Business and Psychology*, 34, 125–137. <https://doi.org/10.1007/s10869-018-09613-8>
- Tisu, L., Lupşa, D., Virgă, D., & Rusu, A. (2020). Personality characteristics, job performance and mental health the mediating role of work engagement. *Personality and Individual Differences*, 153, 109644. <https://doi.org/10.1016/j.paid.2019.109644>
- Van Stolk, C. V., Staetsky, L., Hassan, E., & Woo Kim, C. (2012). *Management of psychosocial risks at work: An analysis of the findings of the European survey of enterprises on new and emerging risks (ESENER)*. European Risk Observatory Report. European Agency for Safety and Health at Work. Luxembourg City, Luxembourg: EU-OSHA.
- Velando-Soriano, A., Ortega-Campos, E., Gómez-Urquiza, J. L., Ramírez-Baena, L., De La Fuente, E. I., & Cañadas-De La Fuente, G. A. (2020). Impact of social support in preventing burnout syndrome in nurses: A systematic review. *Japan Journal of Nursing Science*, 17(1), e12269. <https://doi.org/10.1111/jjns.12269>
- Vitaliano, P. P., Russo, J., Carr, J. E., Maiuro, R. D., & Becker, J. (1985). The ways of coping checklist psychometric properties. *Multivariate Behavioral Research*, 20, 3–26. https://doi.org/10.1207/s15327906mbr2001_1
- Vu-Eickmann, P., Li, J., Müller, A., Angerer, P., & Loerbroks, A. (2018). Associations of psychosocial working conditions with health outcomes, quality of care and intentions to leave the profession: Results from a cross-sectional study among physician assistants in Germany. *International Archives of Occupational and Environmental Health*, 91, 643–654. <https://doi.org/10.1007/s00420-018-1309-4>
- Wang, X., Liu, L., Zou, F., Hao, J., & Wu, H. (2017). Associations of occupational stressors, perceived organizational support, and psychological capital with work engagement among Chinese female nurses. *BioMed Research International*, 2017, 1–11. <https://doi.org/10.1155/2017/5284628>
- Xie, Z., Wang, A., & Chen, B. (2011). Nurse burnout and its association with occupational stress in a cross-sectional study in Shanghai. *Journal of Advanced Nursing*, 67, 1537–1546. <https://doi.org/10.1111/j.1365-2648.2010.05576.x>
- Zurlo, M. C., Pes, D., & Capasso, R. (2013). Teacher stress questionnaire: Validity and reliability study in Italy. *Psychological Reports*, 113, 490–517. <https://doi.org/10.2466/03.16.pr0.113x23z9>
- Zurlo, M. C., Pes, D., & Capasso, R. (2016). Personality characteristics, job stressors, and job satisfaction: Main and interaction effects on psychological and physical health conditions of Italian schoolteachers. *Psychological Reports*, 119, 27–38. <https://doi.org/10.1177/0033294116656818>
- Zurlo, M. C., Vallone, F., & Smith, A. P. (2018). Effects of individual differences and job characteristics on the psychological health of Italian nurses. *Europe's Journal of Psychology*, 14, 159–175. <https://doi.org/10.5964/ejop.v14i1.1478>
- Zurlo, M. C., Vallone, F., & Smith, A. P. (2020). Work–family conflict and psychophysical health conditions of nurses: Gender differences and moderating variables. *Japan Journal of Nursing Science*, e12324, 1–12. <https://doi.org/10.1111/jjns.12324>
- Zurlo, M. C., Pes, D., & Siegrist, J. (2010). Validity and reliability of the effort–reward imbalance questionnaire in a sample of 673 Italian teachers. *International Archives of Occupational and Environmental Health*, 83, 665–674. <https://doi.org/10.1007/s00420-010-0512-8>

SUPPORTING INFORMATION

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