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Citation for final published version:

Vallone, Federica, Smith, Andrew Paul and Zurlo, Maria Clelia 2020. Work-related stress and wellbeing among nurses: testing a multi-dimensional model. *Kango Tenbo the Japanese Journal of Nursing Science*, e12360. 10.1111/jjns.12360

Publishers page: <http://doi.org/10.1111/jjns.12360>

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

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 Behavioural 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 the public healthcare organizations to promote nurses' wellbeing.

Key words: job stress; work family balance/conflict; mental health; physical health; nurses.

1 | INTRODUCTION

In recent years, a growing body of research 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 the lacking resources (e.g., staff shortage, economic issues, differences between the national healthcare systems) (Cole & Carlin, 2009; Glazer & Gyurak, 2008; Ohue, Moriyama, & Nakaya, 2011; Organization for Economic Co-operation and Development [OECD], 2011; Panagopoulou, Montgomery, & Tsiga, 2015).

Within this framework, nurses have been recognised 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 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 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, 2015; Nelson & Smith, 2016), and its validity has also been confirmed among nurses from 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 significantly 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 Behavioural Pattern and Type D Personality (Capasso et al., 2018; De Fruyt & Denollet, 2002; Glazer, Stetz, & Izso, 2004; Oginska-Bulik, 2006; Zurlo, Pes, & Capasso, 2016) as playing a central role in determining work-related stress process. This induced to include 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 (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 one 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 increasingly interest in deepening the role of workers' individual characteristics in work-related stress process (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 the meaningfulness to integrate 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 multidimensional 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 multidimensional 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 Behavioural 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 Behavioural 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-life, in which 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 risk, 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 standardised oral introduction, and they were asked to individually complete the survey (single session lasting about 15-20 minutes). Informed consent was included within the questionnaire. Overall, 450 nurses enrolled on a voluntarily basis (response rate = 81.8%).

2.2 | Ethical considerations

The study was approved by the Ethical 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, Vallone, & Smith, 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, Pes, & Siegrist, 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 Behavioural 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 Behavioural Pattern was assessed by using the Bortner's Type A Behavioural 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 Behavioural Pattern $\alpha = .77$) derived from the sum of three subscales: Time-conscious behaviour (six items), Emotional suppressive/Ambitious and competitive behaviour (four items), and Efficient behaviour (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 (NA; seven items; $\alpha = .88$) and Social Inhibition (SI; 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; 5 items; $\alpha = .86$) and the Family-Work Conflict Scale (FWC; 5 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, i.e., 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 Behavioural 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; Mark & Smith 2008; Capasso et al., 2018). 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 7 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 5000 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 displayed to be mostly elder (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 preliminary 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 labelled 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 labelled 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 labelled 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 labelled as “Active Coping”. Finally, the two separated PCA of Bortner’s Type A Behavioural Style Inventory and of Type D Personality Scale showed two single components extracted. In particular, the factor labelled as “Type A Behavioural Pattern” accounted for 65.03% of the explained variance and it comprised the three subscales of Emotional suppressive/ambitious-competitive behaviour, Time conscious behaviour, and Efficient behaviour (factor loadings respectively .853, .842, .718), while the factor labelled 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 significant protective factor for Health Outcomes. No evidence supported the main effects on Health 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 Behavioural 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. 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 was 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 Behavioural 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 Behavioural 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 psychophysical disease, while there were no evidence supporting the moderating role (i.e., buffering) of Job Satisfaction 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 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 which interested the 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 share of the population requiring medical services which, however, encounters a significant shortage of resources, particularly concerning the 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 the 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 Behavioural 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 process, 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 Behavioural 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 multidimensional 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 process (Duschek, Bair, Haux, Garrido, & Janka, 2020; Parkes, 1994; Tisu, Lupşa, Vîrgă, & Rusu, 2020), and clearly indicated the necessity to address, within counselling interventions, the significant role of Type D Personality Characteristics (i.e., Negative Affectivity and Social Inhibition; Mols & Denollet, 2010; Oginska-Bulik, 2006) in influencing nurses' perceived wellbeing.

On the contrary, considering protective factors, data primarily highlighted the key role of Work Resources, that emerged as the only factor able to significantly overwhelm 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 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 life.

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 multidimensional and transactional

model, that is represented by perceived Work Characteristics, inducing to strongly emphasize 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 Behavioural 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 the work and to the 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 in capitalizing 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 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 approaching the nurses without underestimating the individuals beyond the workers.

4.1 | Study limitations and future research

Firstly, the study was carried out with a cross-sectional design. Therefore, despite this design was 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, whilst 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 risk 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 risk 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.

ACKNOWLEDGMENTS

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

CONFLICT OF INTEREST

The authors declare that 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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