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**A Multigroup Analysis of the Effect of Cognitive Appraisal on Nurses' Psychological Distress**

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The study was conducted in accordance with the internal guidelines of the Research Centre of Psychology, from the University of Minho, being in conformity with both the national and European regulations, regarding research with human participants and the management of personal data. The study was exempt from institutional review board approval.

The authors have no conflicts of interest to report.

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## Abstract

**Background:** Cognitive appraisal constitutes an important mechanism in the process of human adaptation to work environment and occupational stress. In this domain, nursing professionals are one of the occupational groups most affected by job stress, suffering high levels of psychological distress.

**Objectives:** The aim of this study was to analyze the moderator effect of shift work and the type of job contract on the relationship between work cognitive appraisal and nurses' psychological distress, and to explore the interaction effect of the two moderator variables on that relationship.

**Methods:** A sample comprised of 2,310 Portuguese registered nurses completed a sociodemographic and professional questionnaire: the Primary and Secondary Cognitive Appraisal Scale, and the General Health Questionnaire-12. Data were analyzed through structural equation modeling and multigroup analyses considering the following groups: (a) "shift" versus "nonshift work"; (b) "precarious job contract" versus "nonprecarious job contract"; and (c) "shift and precarious" versus "shift and nonprecarious" versus "nonshift and precarious" versus "nonshift and nonprecarious."

**Results:** Data confirmed the invariance for the measurement model, but the structural model presented a significantly worse adjustment for all grouping variables, showing the moderator effect of shift work and job contract and of their interaction. Differences tests in structural path coefficients revealed that shift work moderated the relationship between challenge perception and psychological distress—which was stronger for shift work nurses—and that a higher threat perception was related to greater psychological distress, especially in nurses with a precarious job contract. Among the four categories of interaction between job contract and shift work, cognitive appraisal became central in predicting nurses' mental health, explaining more variance in the group that did shift work and had a nonprecarious job contract.

**Discussion:** The study results highlight the need to develop occupational health intervention programs to promote nurses' mental health, focusing on reducing work perception as a threat and on making nurses' jobs more challenging and controllable.

**Keywords:** cognitive appraisal, distress, job contract, multigroup, nurses, shifts

## **A Multigroup Analysis of the Effect of Cognitive Appraisal on Nurses' Psychological Distress**

Psychological health related to occupational stress in health professionals has been an attractive scientific research topic for the last few years, such that job stress has been considered a public health problem (McIntyre et al., 2007; Wells, 2011). In this domain, registered nurses (RNs), constitute one of the occupational groups most exposed to high levels of stress as consequence of a wide range of risk factors associated with work environment (Circenis & Millere, 2012; Elovainio, Kuusio, Aalto, Sinervo, & Heponiemi, 2010). In fact, there is substantial evidence that occupational stress in nursing professionals is associated with several negative health outcomes; namely, psychological distress, anxiety, depression, burnout, low job satisfaction, absenteeism, psychiatric and physical morbidity, and medical errors, health risk behaviors, among others (Pisanti, van der Doef, Maes, Lazzari, & Bertini, 2011; Roberts & Grubb, 2014). Exposure to occupational stress can have a severe effect on nurses' mental well-being and, consequently, on organizational health and on the quality of healthcare provided (Kirwan, Matthews, & Scott, 2013; Ulrich, Lavandero, Woods, & Early, 2014). These findings from other studies highlight the importance of nurses' psychological health due to their vulnerability to occupational stress effects.

Research results are consistent in emphasizing the experience of psychological distress as one of the most relevant health outcomes due to its clinical significance and effect on individuals' general health/illness, functioning and safety (Pisanti et al., 2011; Turner, Hershcovis, Reich, & Totterdell, 2014). In psychiatric nosology, psychological distress has been described as a nonspecific mental health problem that deserves clinical concern (Drapeau, Marchand, & Beaulieu-Prévost, 2012). This emotional disturbance — normally conceptualized “as a negative state of mental health of anxiety and depressive symptoms” (Turner et al., 2014, p. 716) — can significantly influence individuals' social functioning and day-to-day living (Wheaton, 2007).

Regarding occupational health research in nurses, psychological distress related to work stress has been of major concern representing a relevant health outcome (Pisanti et al., 2011). However, studies have been mainly focused on assessing work environment conditions (Circenis & Millere, 2012) or psychosocial work predictors (Rahman, Abdul-Mumin, & Naing, 2017), and considering different occupational stress models, such as the Job Demand-Control-Support Model (Baba, Tourigny, Wang, Lituchy, & Monserrat, 2013), but giving less attention to individuals' cognitive appraisal work. By focusing on nurses' psychological health, the

purpose of this study was to explore how cognitive appraisal affects nurses' mental health, and determine if cognitive appraisal changes with rotating shift work and job contract precariousness. To the best of our knowledge, there is almost no research testing the specific relations between cognitive appraisal and nurses' psychological health or analyzing the effect of shift work and the type of job contract.

Cognitive appraisal theory postulates that stress reactions are a product of a complex functional combination of intrinsic and extrinsic factors related to the individuals and their environments (Lazarus & Folkman, 1984). Therefore, from the individual point of view, when a stressful episode occurs, the individual evaluates, primarily, the importance of the situation to his or her well-being, and only events that are considered relevant can have the potential to cause stress or strain or a positive personal growth experience (Gomes, 2014a). When a person evaluates a relevant situation as a threat and perceives reduced control and coping potential to deal with it, he or she is more likely to experience stress or strain. In contrast, when a person evaluates a relevant situation as a challenge and perceives high control and coping potential to deal with it, he or she is more likely to experience positive personal growth (Gomes, 2014b).

Shift work has been defined as an organization of the daily working hours in which different persons or teams work in succession to cover more than the usual eight hours a day (Jaradat, Nielsen, Kristensen, & Bast-Pettersen, 2017). Results of studies focused on shift work revealed that nurses working by shifts reported higher levels of psychological distress (Jaradat et al., 2017), but anxiety and depressive symptoms were significantly reduced over time after changing from night work to day work (Thun et al., 2014).

Employment instability has risen since the early 1980s, when the proportion of individuals employed in flexible work gradually began to increase. However the recent economic crisis further reduced the possibility for individuals to have access to a permanent type of job contract (Moscone, Tosetti, & Vittadini, 2016). Precarious employment can be defined as employment relations that are characterized by high uncertainty, low income, and reduced social benefits (Benach et al., 2014), which have plagued the nursing profession over the last few years (Blake, 2011). Precarious employment has been related to mental health problems that need to be medically treated (Moscone et al., 2016).

Studies focusing on the effect of cognitive appraisal on psychological distress and considering the differences based on shift work and job contract are scarce. Therefore, the main aim of this study was to determine the moderator effect of shift work and the type of job contract on the relationship between cognitive appraisal and nurses' psychological distress, and analyze

the interaction effect of the two moderator variables on that relationship. To accomplish this purpose, we formulated three specific hypotheses:

H1. The relationship between cognitive appraisal and psychological *distress* is different between the two categories of shift and nonshift work.

H2. The relationship between cognitive appraisal and psychological *distress* is different between the two categories of precarious and nonprecarious types of job contracts.

H3. The relationship between cognitive appraisal and psychological *distress* is different among the four categories of interaction between the type of job contract and shift work.

## Method

### Study Design

To analyze the effect of shift work and job contract on the relationship between cognitive appraisal and nurses' psychological distress, we developed a nonexperimental, cross-sectional, and model testing correlational design.

### Participants

The sample included 2,310 RNs working for the Portuguese National Health Service. The nurses were mainly females ( $n = 1898$ , 82.2%) and single ( $n = 1087$ , 47.1%), with a mean age of 33.74 ( $SD = 9.41$ ) years (minimum–maximum = 21–66 years). In terms of the nurses' academic qualifications, in being an RN, 497 (21.5%) also had earned a postgraduate degree (e.g., a master or doctoral degree). In the total sample of nurses, the majority ( $n = 1320$ , 57.1%) worked in the hospital setting, while 370 (16%) worked in the primary healthcare system. Additionally, 69.6% ( $n = 1608$ ) had a permanent type of professional contract and 702 (30.4%) had a precarious contract. Further, 64.4% ( $n = 1487$ ) did shift work, rotating between day, evening, and night shifts, while 35.6% ( $n = 823$ ) did not work by shifts. Regarding nurses' leisure activities, 1,665 (72.1%) reported a hobby, of which 1,144 (49.5%) specified performing physical exercise regularly.

### Procedure

We conducted this study in accordance with the internal guidelines of the Research Centre of Psychology, from the authors' affiliated university, in conformity with both the national and European regulations regarding research with human participants and the management of personal data. The research started by contacting the Portuguese Professional Association of Nurses (PPAN) to present the main goals of the research and the procedures to

collect the data. We used an online questionnaire, a link for which we sent to participants through their professional internal email. Along with the information about the content and purpose of the research, we invited all RNs working in Portugal to participate in the study. In addition, the nurses were assured of the confidentiality of their responses, and their right to withdraw from the study at any time was reinforced. A total of 62,566 registered nurses were in the PPAN, and only 2,310 voluntarily took part in the study (the response rate was 3.7%), which is a significant level of nonresponse bias. Despite the nonresponse bias, among Portuguese studies with nurses, this investigation had one of the highest response rates and largest samples, and had a gender distribution similar to that of the population of Portuguese nurses (82% female, 18% male;  $p = .429$ ).

## Measures

**Sociodemographic and Professional Questionnaire.** This instrument was designed specifically for the study to assess nurses' personal variables (e.g., gender, age, marital status, level of education, hobby, and level of physical exercise) and professional characteristics (e.g., nature of the workplace, work shifts, and type of job contract).

**Primary and Secondary Cognitive Appraisal Scale (PSCAS).** The PSCAS, validated by Gomes and Teixeira (2016), was used to assess nurses' primary and secondary processes of cognitive appraisal concerning their work. Nurses' primary cognitive appraisal was measured through the following dimensions: (a) work importance (three items;  $\alpha = .91$ ) (e.g., "*My job . . . means nothing to me/means a lot to me*"); (b) threat perception (three items;  $\alpha = .79$ ) (e.g., "*My job . . . is not disturbing to me/is disturbing to me*"); and (c) challenge perception (three items;  $\alpha = .90$ ) (e.g., "*My job . . . is not exciting for me/ is exciting for me*"). The following dimensions measured secondary cognitive appraisal: (d) coping potential (three items;  $\alpha = .82$ ) (e.g., "*To what extent do you think you are prepared to handle the demands of your job?*"); and (e) control perception (three items;  $\alpha = .75$ ) (e.g., "*To what extent do you feel that what happens in your job depends on you?*"). The 15 items that comprise the PSCAS were assessed through a 7-point Likert scale, ranging from zero ("*Not at all important to me*") to six ("*important to me /well prepared*"). The total score for each dimension resulted from the pondered mean of the corresponding item values. As such, high scores on each dimension indicate greater perceived work importance, threat perception, challenge perception, coping potential, and control perception. In this study, the work importance dimension was used as a screening tool to select participants who evaluate work activity as personally relevant (score > 2) (Gomes & Teixeira, 2016). Concerning the PSCAS psychometric properties, construct validity,



confirmatory factor analysis indicated that the five-factor model had acceptable fit:  $\chi^2$  (80 *df*) = 555.785,  $p < .001$ ;  $\chi^2/df = 6.947$ ; RMSEA = .051, 90% CI [.047; .055],  $p$  (RMSEA  $\leq .05$ ) = .370; CFI = .974; GFI = .968; NFI = .970; TLI = .966.

**General Health Questionnaire-12 (GHQ-12).** The GHQ-12 (Goldberg, 1992; McIntyre, McIntyre, & Redondo, 1999), is one of the most accepted and used self-report instruments to measure individuals' general psychological health, i.e., psychological distress, anxiety/depression, and social dysfunction. This tool allows appraisal of changes in affective and somatic symptoms in relation to the usual levels of health (e.g., “*Have you recently been feeling unhappy and depressed?*”). In the current study, we used the Portuguese version of the GHQ-12 (McIntyre et al., 1999), which is a 12-item instrument answered on a 4-point Likert scale, ranging from one (“*Better than usual*”) to four (“*Much less than usual*”). To quote the GHQ-12, we used the dichotomous scale (0-0-1-1) and the cutoff point 2/3 (at least three symptoms reported), which are the most frequently accepted and described in the literature (Chipimo & Fylkesnes, 2010). The final score of the scale was achieved by summing the 12 items values, ranging from 0-12. The higher the total score, the worse the mental health state (Baumann, Meyers, Le Bihan, & Houssemand, 2008), being a value equal or greater than three an indicator of distress levels that deserve significant clinical attention (Boothby et al., 2010). In this study, we considered both the total value of the scale, i.e., the global dimension of psychological distress (12 items;  $\alpha = .82$ ) and the two subscales of anxiety/depression (six items;  $\alpha = .82$ ) (e.g., “*Have you been feeling constantly under pressure?*”) and social dysfunction (six items;  $\alpha = .76$ ) (e.g., “*Have you been able to focus in what you do?*”). For this study, a second-order factor model was used, which revealed adequate fit indices:  $\chi^2(49 \text{ df}) = 205.313$ ,  $p < .001$ ;  $\chi^2/df = 4.190$ ; RMSEA = .037, 90% CI [.032; .043],  $p$  (RMSEA  $\leq .05$ )  $> .99$ ; CFI = .980; GFI = .985; NFI = .974; TLI = .973.

### Statistical Procedure

**Data Screening.** Data were analyzed through the IBM Statistical Package for the Social Sciences (version 24, SPSS, Inc., Chicago, IL). First, we conducted a missing value analysis to detect missing values patterns and estimates (imputes) missing values. We found that fewer than 5% of the data constituted missing values in a random pattern, which implied that the problems were less serious and almost any procedure for handling missing values would yield similar results (Tabachnick & Fidell, 2013). Second, we analyzed data from participants who attributed low importance to work activity with a total score less than or equal to 2 points on the PSCAS Likert scale concerning the work importance dimension (Gomes & Teixeira, 2016).

The procedure was based on the assumption of work relevance. Since relevance is central to understand emotional responses that emerge from the adaptation process to stress (Lazarus, 1991), emotions and efforts to cope with stressful situations only arise if the person evaluates work situations as significant and personally relevant (Gomes, 2014b). Therefore, the relationship between cognitive appraisal and nurses' psychological distress was only analyzed for participants who attributed some importance to work activity (i.e., reported more than 2 points on the PSCAS' Likert scale). According to this prerequisite, no participants were removed from the sample. Third, in order to detect univariate and multivariate outliers, we conducted a data distribution analysis, considering skewness, kurtosis, critical ratios ( $Z$ -score) and the squared Mahalanobis distance ( $MD^2: p1, p2 < .05$ ) (Marôco, 2010; Tabachnick & Fidell, 2013).

**Data Analyses.** We conducted descriptive and inferential statistics with the Statistical Package for Social Science (SPSS) and the analysis of moment structures (AMOS), (v. 24. SPSS Inc. Chicago, IL). To test the hypotheses, we used structural equation modeling (SEM). To assess the moderating effect of shift work and the type of job contract, on the relationship between nurses' work cognitive appraisal and psychological distress, we conducted invariance tests and multigroup analyses. To do so, we constituted the following groups of analyses: (a) "shift" versus "nonshift work"; (b) "precarious type of job contract" versus "nonprecarious type of job contract"; and (c) "shift and precarious" versus "shift and nonprecarious" versus "nonshift and precarious" versus "nonshift and nonprecarious." Afterward, by using maximum likelihood (ML) estimation methods, we adjusted the model individually to each group in order to eliminate the items that did not contribute to the adjustment quality and then tested for model estimation across groups (Byrne, 2010; Marôco, 2010).

Hypotheses were tested with a three-step process. First, we tested for the invariance of the measurement models of each group of variables (i.e., shift work and type of job contract) to impute any difference detected to the moderating effect. In this case, measurement models should be invariant for all groups of variables to accept the null hypothesis. For that, we tested the invariance by comparing the unconstrained model (i.e., all parameters free) with the one in which the measurement weights and structural covariances were constrained to be equal. Second, after confirming the invariance of the measurement models, we tested the moderating effect of shift work (H1), of the type of job contract (H2), and of their interaction (H3) on the relation between cognitive appraisal and psychological distress. In this case, we analyzed the invariance of the structural model across groups of moderators by comparing the model with unconstrained structural coefficients to the model with constrained structural coefficients.

Hypotheses of moderating effects were confirmed if the null hypothesis was rejected. Third, if null hypotheses were rejected in the previous step of data analysis, it was important to verify where the moderator exerted a significant effect on the relationship between cognitive appraisal and psychological distress. In this case, we assumed the moderating effect of shift work, of the type of job contract, and of their interaction, with the next important analysis being focused on which paths from the moderator variables were significantly different in the relation between cognitive appraisal and psychological distress. For that analysis, we tested for differences in the structural path coefficients by using the Z-score statistics. Null hypotheses were rejected for all cases in which structural path coefficients were significant.

To estimate the model fit and understand how well the theoretical model reproduced the correlational structure of the observed variables in the study, we used the chi-square ( $\chi^2$ ) goodness-of-fit statistic (a test of the significance of the discrepancy function) and other descriptive indices. Specifically, we used an absolute index that assesses the model quality *per se*, the  $\chi^2/df$ , (Arbuckle, 1995–2008) and three relative indices that evaluate the quality of the model in analysis in comparison to the independence model and the saturated model, i.e., the normed fit index (NFI) (Bentler & Bonett, 1980), the comparative fit index (CFI) (Bentler, 1990, 2007) and the Tucker-Lewis index (TLI) (Bentler & Bonett, 1980; Tucker & Lewis, 1973). In addition, we used a measure of the population discrepancy, the root mean square error of approximation (RMSEA), as well as its 90% confidence interval and *p*-value for  $H_0$ : RMSEA  $\leq$  .05 (Steiger, 1990; Steiger, Shapiro, & Browne, 1985). The cutoff measures followed well-known criteria reported in the literature, assuming maximum likelihood estimation (Marôco, 2010). Values of RMSEA inferior to .08 indicate an acceptable fit and values lower than .05 indicate an excellent fit (Arbuckle, 1995–2008). Values of NFI in the range .80–.90 indicate a tolerable fit, and values higher than .90 indicate an excellent adjustment. In addition, CFI and TLI values greater than .90 constitute a good fit, while values higher than .95 constitute an excellent fit (Bentler, 1990; Bentler & Bonett, 1980). Moreover, we used the information theory-based indices centered on the chi-square statistics to compare the different models that adjust to the data, specifically, the expected cross-validation index (ECVI) (Benson & Bandalos, 1992), the Brown-Cudeck criterion (BCC), and the Akaike information criterion (AIC) (Arbuckle, 1995–2008). Both the BCC and AIC reflect the extent to which the observed and predicted covariance matrices differ from each other. There are no fit indices cutoff criteria for those information theory-based indices, but it has been established that small values of the AIC, compared to other competing models indicate a good-fitting parsimonious model and that better models will have smaller cross-validation indices (Tabachnick & Fidell, 2013). To

compare the fit of the nested models and reject the null hypothesis of measurement invariance, we used as criteria the significance of the chi-square difference statistic ( $p\Delta\chi^2 < .05$ ) and a  $\Delta$ CFI value greater than -.01 (Cheung & Rensvold, 2002). Research suggest that the  $\chi^2$  differences depend on the sample size being more vulnerable to Type I error, whereas CFI differences do not (Costa, Marôco, Pinto-Gouveia, & Galhardo, 2014). To reject the null hypothesis of structural invariance, we used as criterion the significance of the chi-square difference statistic ( $p\Delta\chi^2 < .05$ ) (Marôco, 2010). When testing for differences in the structural path coefficients and rejecting the null hypothesis, we used as a criterion the significance of the Z-score statistics ( $p < .05$ ). Finally, we considered the bootstrap procedure to obtain 95% CIs around parameter estimates, namely, bootstrapping with 1,000 samples, a 95% CI and bias-corrected CIs (Marôco, 2010).

## Results

### Descriptive Values for Cognitive Appraisal and Psychological Distress

Means, standard deviations and Spearman correlations between cognitive appraisal (PSCAS) and psychological distress (GHQ-12) were calculated for the total sample and for each group of moderating variables (Table 1). In all groups of nurses, threat perception correlated positively with psychological distress, anxiety/depression and social dysfunction, while challenge perception, coping potential, and control perception correlated negatively with psychological distress measures. Additionally, all groups of nurses presented clinical levels of psychological distress, with a GHQ-Total<sub>Mean</sub>  $\geq 3$ , considering a cutoff 2/3 out of 12 (Goldberg & Williams, 1988), ranging from 5.10 ( $SD = 2.86$ ) in the precarious type of job contract group and 5.42 ( $SD = 2.94$ ) in the nonprecarious type of job contract group. Anxiety/depression was the most prevalent dimension of psychological distress when compared to social dysfunction. Moreover, among all groups, threat perception was relatively low ( $M_{Threat\ Perception} \leq 2.16$ ;  $SD = 1.26$ ) and coping potential was moderately high ( $M_{Coping\ Potential} \geq 4.67$ ;  $SD = 0.82$ ).

### Cognitive Appraisal and Psychological Distress: Multigroup Model Estimation

To test the relationship between cognitive appraisal and nurses' psychological distress across groups, we conducted preliminary analyses to adjust the theoretical model (Figure 1) to the total sample of nurses and then individually to each of the three established multigroups in order to remove the items that did not contribute to the quality of the model fit (Marôco, 2010).

Table 1

Means, Standard Deviations and Correlations between Cognitive Appraisal (CAS) and Psychological Distress (GHQ-12) in the Total Sample ( $N = 2310$ ), in Shift ( $n = 1487$ ) and Nonshift ( $n = 823$ ) Groups, and in Precarious ( $n = 702$ ) and Nonprecarious ( $n = 1608$ ) Type of Job Contract Groups

Variables	Total Sample							Shift & Nonshift Groups							Precarious & Nonprecarious Job Contract Groups										
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	<i>M</i>	<i>SD</i>
1. Threat Perception <sub>(PSCAS)</sub>	1							1	-.342	-.375	-.339	.334	.396	.171	1.97	1.35	1	-.354	-.333	-.313	.330	.378	.179	2.17	1.32
2. Challenge Perception <sub>(PSCAS)</sub>	-.342	1						-.345	1	.243	.423	-.293	-.360	-.139	4.49	1.26	-.319	1	.239	.386	-.325	-.372	-.178	4.43	1.22
3. Coping Potential <sub>(PSCAS)</sub>	-.354	.215	1					-.328	.192	1	.451	-.234	-.309	-.093	4.97	0.78	-.416	.148	1	.392	-.256	-.312	-.123	4.92	0.77
4. Control Perception <sub>(PSCAS)</sub>	-.327	.372	.395	1				-.304	.336	.350	1	-.336	-.381	-.185	4.16	1.10	-.361	.343	.408	1	-.346	-.366	-.214	3.98	1.09
5. Psychological Distress <sub>(GHQ)</sub>	.355	-.322	-.251	-.340	1			.373	-.341	-.264	-.348	1	.781	.850	5.35	2.94	.419	-.331	-.273	-.329	1	.780	.851	5.42	2.94
6. Social Dysfunction <sub>(GHQ)</sub>	.389	-.362	-.306	-.360	.778	1		.390	-.364	-.309	-.352	.776	1	.335	1.21	1.64	.420	-.351	-.320	-.347	.772	1	.336	1.24	1.64
7. Anxiety/ Depression <sub>(GHQ)</sub>	.213	-.186	-.125	-.214	.859	.345	1	.242	-.215	-.146	-.235	.863	.351	1	4.15	1.94	.294	-.218	-.157	-.217	.875	.368	1	4.18	1.95
<i>M</i>	2.17	4.38	4.84	3.97	5.32	1.21	4.11	2.28	4.32	4.77	3.86	5.30	1.21	4.10	----		2.16	4.26	4.67	3.94	5.10	1.14	3.96	----	
<i>SD</i>	1.30	1.25	0.80	1.10	2.92	1.59	1.95	1.27	1.24	0.80	1.09	2.91	1.57	1.96	----		1.26	1.31	0.82	1.13	2.86	1.48	1.95	----	

*Note.* PSCAS = Primary and Secondary Cognitive Appraisal Scale, GHQ = General Health Questionnaire-12. Descriptive Statistic (*M*, *SD*) and Correlation matrix for Shift Group is below the diagonal and for Nonshift Group is above the diagonal. Descriptive Statistic (*M*, *SD*) and correlation matrix for Precarious Group is below the diagonal and for Nonprecarious Group is above the diagonal. All correlation coefficients were significant at  $p < .01$ .

The analysis of model estimation through SEM, comparing the independence and saturated models, showed that the theoretical model presented adequate fit indices in all four situations, i.e., for the total sample and for the three multigroups of comparison, and that all items contributed to the quality of the model fit (Table 2). As a result, the theoretical model became the multigroup model to estimate the moderating effect of shift work and the type of job contract and the effect of their interaction on the relationship between nurses' work cognitive appraisal and psychological distress (Figure 1).

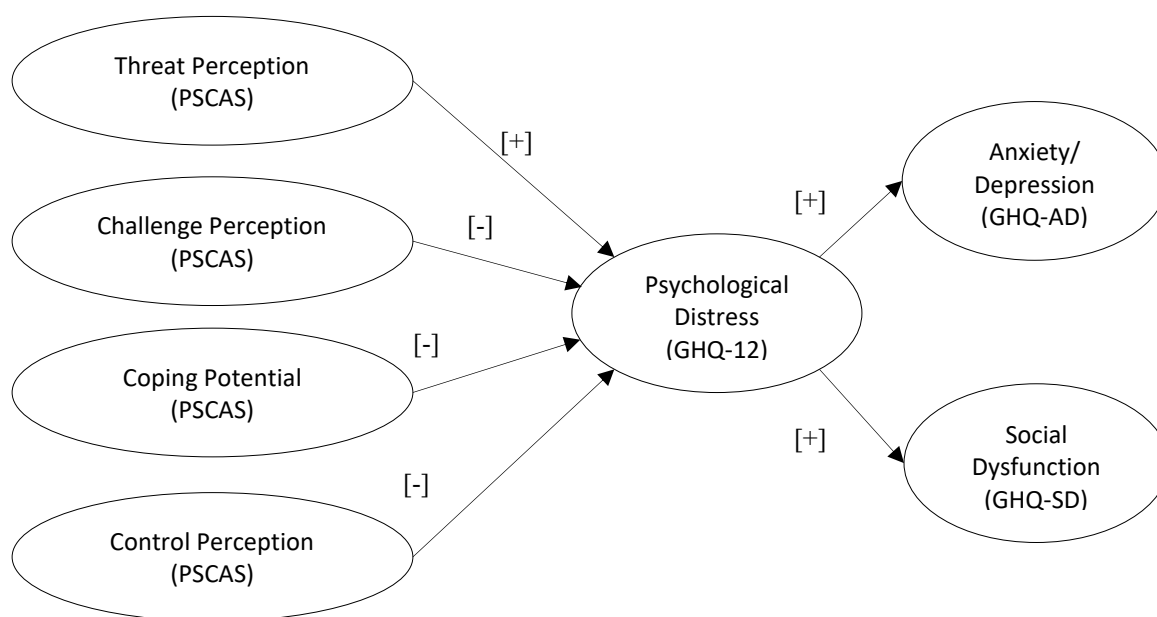


Figure 1. Theoretical and Multigroup Model of the relationship between Cognitive Appraisal and Psychological Distress.

### Testing Measurement Model Invariance

The first step of data analysis was testing the invariance of the measurement model across the three multigroups by comparing the unconstrained model (i.e., with all parameters free) to the model with measurement weights constrained (i.e., the measurement model per se). Model estimation analyses indicated that the measurement model presented adequate fit indices in all multigroups (Table 2). Moreover, considering the unconstrained model to be correct, the measurement model did not present a significant worse adjustment to groups compared to the unconstrained model, since  $p \Delta\chi^2 > .05$  and  $\Delta CFI < -.01$  (Cheung & Rensvold, 2002).

Table 2.

## Models Fit Indices, Models Comparison and Summary of Invariance Tests across Multigroups regarding Shift Work and Type of Job Contract

Groups/Models	$\chi^2$	<i>df</i>	<i>p</i>	$\chi^2/df$	NFI	TLI	CFI	RMSEA(90%CI)	$p_{close}$	AIC	BCC	ECVI	MECVI
Multigroup Model for the Total Sample	1373.008	240	< .001	5.721	.938	.940	.948	.045 (.043-.048)	1	1493.008	1494.321	0.647	0.647
"Shift vs Nonshift work"													
Unconstrained Model	1674.473	480	< .001	3.488	.925	.937	.945	.033 (.031-.035)	1	2010.473	2018.645	0.871	0.875
Measurement Model	1699.015	498	< .001	3.412	.924	.939	.945	.032 (.031-.034)	1	1999.015	2006.312	0.866	0.869
Structural Model	1828.209	527	< .001	3.469	.918	.937	.940	.033 (.031-.034)	1	2070.209	2076.095	0.897	0.900
"Precarious vs Nonprecarious Job Contract"													
Unconstrained Model	1650.003	480	< .001	3.438	.926	.938	.946	.032 (.031-.034)	1	1986.003	1994.927	0.860	0.864
Measurement Model	1676.255	498	< .001	3.366	.925	.940	.946	.032 (.030-.034)	1	1976.255	1984.222	0.856	0.860
Structural Model	1843.539	527	< .001	3.498	.918	.937	.940	.033 (.031-.035)	1	2085.539	2091.966	0.904	0.906
"(Non)Shift x (Non) Precarious Job Contract"													
Unconstrained Model	2441.700	1080	< .001	2.261	.894	.936	.938	.023 (.022-.025)	1	2873.700	2905.209	1.246	1.260
Measurement Model	2462.546	1098	< .001	2.243	.893	.937	.938	.023 (.022-.024)	1	2858.546	2887.430	1.240	1.252
Structural Model	2761.383	1175	< .001	2.350	.880	.932	.927	.024 (.023-.025)	1	3003.383	3021.034	1.302	1.310
Groups/Models	$\Delta\chi^2$ <sup>(a)</sup>	$\Delta df$ <sup>(a)</sup>	<i>p</i> <sup>(a)</sup>	$\Delta CFI$ <sup>(a)</sup>	$\Delta\chi^2$ <sup>(b)</sup>	$\Delta df$ <sup>(b)</sup>	<i>p</i> <sup>(b)</sup>	$\Delta CFI$ <sup>(b)</sup>					
"Shift vs Nonshift work"													
Measurement Model	24.542	18	.138	< .001									
Structural Model	153.736	47	< .001	-.005	129.194	29	< .001	-.005					
"Precarious vs Nonprecarious Job Contract"													
Measurement Model	26.252	18	.094	< .001									
Structural Model	193.536	47	< .001	-.006	167.284	29	< .001	-.006					
"(Non)Shift x (Non) Precarious Job Contract"													
Measurement Model	20.846	18	.287	< .001									
Structural Model	319.683	95	< .001	-.011	298.836	77	< .001	-.011					

Note. <sup>(a)</sup> Assuming unconstrained model to be correct; <sup>(b)</sup> Assuming measurement model to be correct.

The results demonstrate the invariance of the measurement model of cognitive appraisal and psychological distress among the moderator variables (e.g., “shift vs. nonshift work,” “precarious vs. nonprecarious job contract,” and of the interaction among shift work and type of job contract). Considering these results, we proceeded in the data analysis by testing the structural models to test the hypotheses of this study.

### **Testing Structural Model Invariance**

In this second step of data analysis, we tested the invariance of the structural model across the three multigroups by considering the model with measurements weights constrained to be correct and by comparing the model with the unconstrained structural coefficients to the constrained model (i.e., with structural weights constrained). Model estimation analyses indicated significant differences in the quality of the adjustment of the two models in all multigroups of variables.

As shown in Table 2, the structural models with constrained coefficients presented a significant worse adjustment to groups compared to the model with free coefficients since  $\alpha = .05$ ,  $p\Delta\chi^2 < .05$  (Marôco, 2010). These results demonstrate that the causal model, concerning the effect of cognitive appraisal on psychological distress, is not invariant among groups regarding shift work, type of job contract, and of their interaction. Thus, the null hypothesis was rejected for all hypotheses, sustaining the differences in the structural models.

### **Testing Structural Path Coefficients Differences**

Considering the results of steps one and two according our expectations, we proceeded to step three of data analysis, verifying where the moderator (e.g., shift work, type of job contract, and their interaction) exerts a significant effect on the relationship between cognitive appraisal and psychological distress. Regression analyses indicated that all dimensions of work cognitive appraisal constituted significant predictors of psychological distress in all groups of nurses, except for “ *coping potential*.” This dimension did not become a significant predictor of nurses’ psychological distress in the “nonshift work” group or in the “precarious job contract” group (Figures 2 and 3).



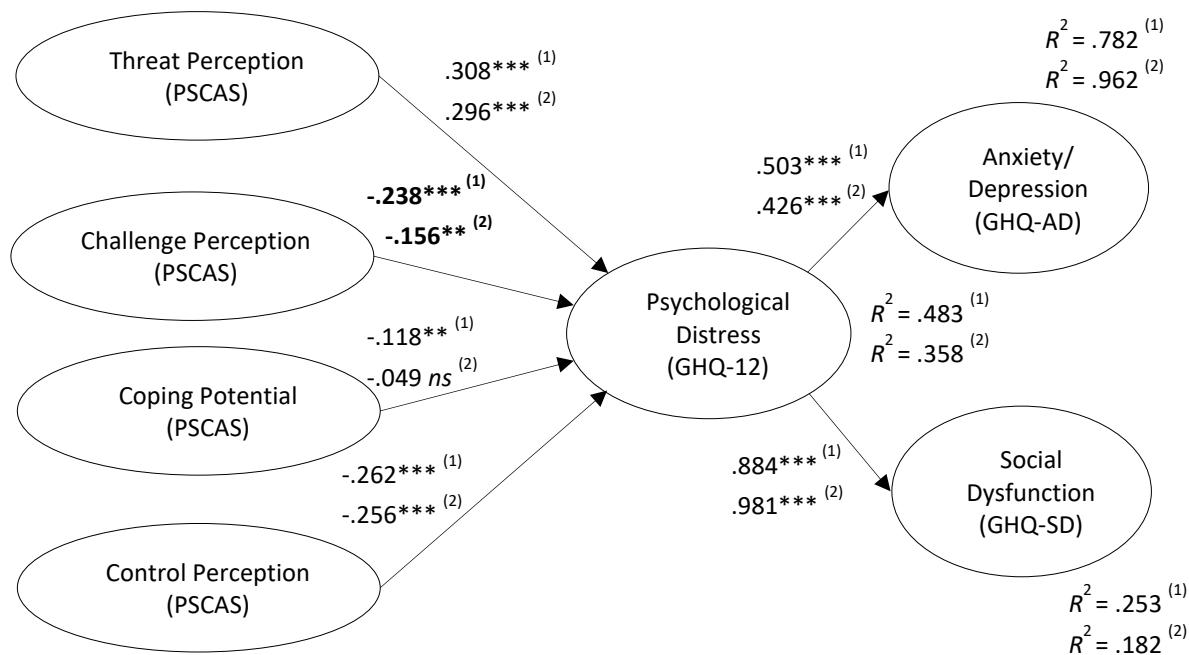


Figure 2. Structural Model for the Effect of Cognitive Appraisal on Nurses' Psychological Distress in Shift <sup>(1)</sup> vs Non-Shift work <sup>(2)</sup> Groups. Boldface represents statistically significant differences in the path coefficients. *ns* > .10. \**p* < .05. \*\**p* ≤ .01. \*\*\**p* ≤ .001.

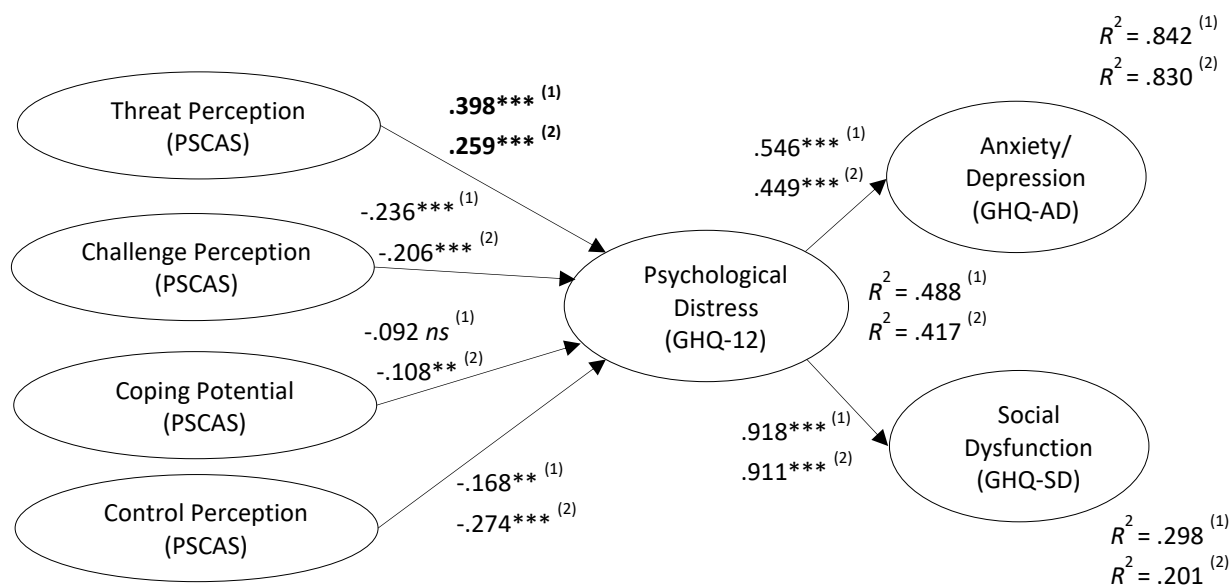


Figure 3. Structural Model for the Effect of Cognitive Appraisal on Nurses' Psychological Distress in Precarious <sup>(1)</sup> vs Non-Precarious <sup>(2)</sup> Job Contract Groups. Boldface represents statistically significant differences in the path coefficients. *ns* > .10. \**p* < .05. \*\**p* ≤ .01. \*\*\**p* ≤ .001.

The Z-test, hypothesizing the equality of structural coefficients across the multigroups revealed statistical and significant differences between “shift vs nonshift-work” nurses for the structural path “*challenge perception*” to “*psychological distress*” ( $B_{\text{Challenge Perception. Psychological Distress}}$ ) ( $Z = 2.045; p = .041$ ), with a stronger relationship for nurses who did shift work compared to the nonshift-work nurses. Additionally, we found statistical and significant differences between “precarious vs nonprecarious job contract” nurses, in the structural path “*threat perception*” to “*psychological distress*” ( $B_{\text{Threat Perception. Psychological Distress}}$ ) ( $Z = -2.373; p = .018$ ). This relationship was stronger for nurses with a precarious type of job contract than for those with a nonprecarious type of job contract.

For the four categories of interaction between the two moderator variables (“[Non] Shift x [Non] Precarious Job Contract”) we found no significant differences. Although, among the four groups in the analysis, cognitive appraisal explained more variance of psychological distress in the group of nurses that did shift work and had a nonprecarious type of job contract ( $R^2 = .459$ ).

### Discussion

Under the assumption that cognitive appraisal constitutes a central mechanism in the process of human adaptation to work and that job characteristics can also influence this adaptation to work conditions, we analyzed the moderator effect of shift work and the type of job contract and of their interaction on the relationship between work cognitive appraisal and nurses’ psychological distress. To do so, we formulated three hypotheses and proceeded with structural equation modeling and multigroup analyses.

In the first hypothesis, we expected the relationship between cognitive appraisal and psychological *distress* to be different among the two categories of shift and nonshift work. Findings confirmed the hypothesis, showing the invariance of the measurement model and the variance of the structural model between the two categories of shift and nonshift work. Additionally, we found a significant effect of threat perception, challenge perception, control perception, and coping potential on nurses’ psychological distress. These effects were observed, as expected, for the shift-work group but not for the nonshift-work group. In fact, for nonshift-work nurses, work coping potential was not a significant predictor of mental health. Furthermore, we found that higher work challenge perception was related to a reduced psychological distress in nurses, particularly for nurses that worked by shifts compared to nonshift-work nurses. These results are in accordance with literature, which indicate that shift work constitutes an important source of occupational stress for nurses that work by shifts, who

experience high levels of psychological distress related to work (Jaradat et al., 2017), thus interfering with their work efficiency (Halder & Sahu, 2015). Our findings reinforce the idea that perceiving shift work as a challenge instead of a threat constitutes an important protector factor for shift-work nurses' mental health. Further, for nurses who worked by shifts compared to nonshift-work nurses, cognitive appraisal of work explained a greater amount of the variance found for psychological distress, suggesting that for nonshift-work nurses, other factors beyond work might better explain these nurses' mental health status. Therefore, work cognitive appraisal, particularly challenge perception, seems to be a crucial factor for shift work nurses' mental health.

In the second hypothesis, we expected the relationship between cognitive appraisal and psychological *distress* to be different among the two categories of precarious and nonprecarious type of job contract. The results confirmed the hypothesis, showing the invariance of the measurement model and the variance of the structural model between the two categories of precarious and nonprecarious type of job contract. Work cognitive appraisal, characterized by low threat perception, high challenge perception, high control perception and high coping potential, was related to a reduced psychological distress. These effects were observed, as expected, for the group of nurses with a nonprecarious type of job contract, but not for nurses with a precarious type of job contract. In fact, for nurses that had a precarious type of job contract, work coping potential was not a significant predictor of mental health status. In addition, we found that job contract became a significant moderator in the relationship between threat perception and psychological distress, with this relationship being stronger for nurses that had a precarious type of job contract. These results are in accordance with research, which highlights that a precarious job represents an important source of occupational stress for nurses, leading to the experience of high levels of psychological distress related to work (Gomes, Cruz, & Cabanelas, 2009; Rotenberg, Griep, Fischer, Fonseca, & Landsbergis, 2009). For that reason, our findings indicate that perceiving a precarious job as a threat instead of a challenge constitutes a risk factor for nurses' mental health, which might interfere with the quality of the healthcare provided, as shown in a literature review (Goodare, 2017). For nurses with a precarious job contract, compared to nonprecarious job contract nurses, cognitive appraisal of work, explained a superior amount of the variance found for psychological distress. Therefore, work cognitive appraisal, particularly threat perception, seems to be mainly important for the mental health of nurses with a precarious job contract.

In the third hypothesis, we expected the relationship between cognitive appraisal and psychological *distress* to be different among the four categories of interaction between type of

job contract and shift work. The results confirmed the hypothesis, showing the invariance of the measurement model and the variance of the structural model across the four categories of interaction between type of job contract and shift work (“shift and precarious” vs. “shift and nonprecarious” vs. “nonshift and precarious” vs. “nonshift and nonprecarious”). In all groups, cognitive appraisal dimensions showed to be significant predictors of nurses’ mental health. Specifically, work cognitive appraisal, characterized by low threat perception, high challenge perception, high control perception and high coping potential, was related to a reduced psychological distress. Nevertheless, we did not find any significant differences in the structural paths coefficients among the four categories of interaction between type of job contract and shift work. However, for nurses with shift work and nonprecarious job contract, compared to other groups of nurses, cognitive appraisal explained a greater amount of the variance found for psychological distress, indicating that these nurses might be at a higher risk of experiencing psychological distress related to work environment. Therefore, cognitive appraisal seems to be particularly important for the mental health of nurses that worked simultaneously by shifts and had a nonprecarious type of job contract.

These results are in accordance with recent economic transitions in Europe that increased the number of employees with precarious contracts, resulting in a sense of job insecurity (Kretsos & Livanos, 2016; Varela, Rajado, do Paço, Berhan, & Guedes, 2013). Unexpectedly, professionals with a nonprecarious type of contract who were also members of the institutional staff board saw their salary being drastically reduced, experiencing a great deal of difficulty in meeting their financial responsibilities with their number of working hours and work shifts being simultaneously increased (Varela et al., 2013). Therefore, facing a highly demanding job, nurses in those positions could maintain their job but were underpaid, overworked, and had less time to rest. This idea is highlighted in recent studies, showing that over the past few years, economic and technological changes led to work intensification, affecting employees' well-being (Paškvan, Kubicek, Prem, & Korunka, 2016), thus constituting the main reasons for job dissatisfaction and the intention to leave the nursing profession (de Oliveira, Griep, Portela, & Rotenberg, 2017; Goodare, 2017).

### **Limitations**

Regardless of the importance of the abovementioned findings, some limitations should be addressed. The study focuses on nurses registered in the PPAN, which is a limitation to external validity and generalizability of the findings. However, Portuguese nurses are very well regarded for their professional competency, and a vast number are continuously being requested

to work in several other countries (e.g., UK, Spain, Netherlands, U.S.). In the last few years, we have observed a high rate of emigration in the nursing profession, resulting in a considerable number of nurses working worldwide. Further, academic qualification of Portuguese nurses is not very different from their counterparts in other countries since Portuguese nursing courses are in accordance with the Bologna Plan. Therefore, we believe that this study is important for all nurses, independent of their nationality. Another limitation is that nearly 70% of the sample had a permanent professional contract, whereas 30% had a precarious one. However, we achieved in our sample the distribution found in the population for these variables. However, besides the low response rate, in comparison to the total number of nurses registered in the PPAN, we achieved a large sample size.

### **Conclusion**

The results of the present study emphasize the need to develop occupational health intervention programs to promote nurses' mental health, to address cognitive appraisal of the work environment, to reduce work perception as a threat, and to increase work challenge perception and control perception, mainly for nurses that do rotating shift work and nurses with a precarious type of job contract. Additionally, the study results highlight the importance of considering nurses who simultaneously have a nonprecarious job contract and do shift work, making their job more challenging and controllable by developing strategies to manage work intensification.

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