

## Deciphering Hardiness: Differential Relationships of Novelty Seeker, Rigid Control, and Hardy Profiles on Nurses' Burnout and their Effects

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### Abstract

**Background:** Nurses experience high levels of psychosocial stressors. Hardiness may help offset these and reduce burnout. Most research has used a variable-centered approach (e.g., regression, SEM) to address the additive and interactive effects of hardiness dimensions on stressors and strains.

**Objective:** To confirm the existence of different hardiness profiles in nurses using a person-centered approach and to assess their differential relationships between stressors and strains.

**Methods:** A cross-sectional survey was carried out among nurses in five Chinese hospitals. Hardiness was measured along with stressors as antecedents of burnout, burnout, and consequences of burnout. For the hardiness profile identification, data were analyzed by k-means cluster analysis and MANOVA.

**Results:** Three profiles were identified, consisting of individuals who scored: (1) average on commitment and control, and high on challenge, classified as the novelty seeker profile, (2) average on commitment and challenge, and high on control, labeled as the rigid control profile, and (3) high on all hardiness dimensions, classified as the hardy profile. Importantly, this result reveals that non-hardy nurses do not form a homogenous group.

**Discussion:** Nurses with a hardy profile showed the lowest levels of burnout and consequences; for the other two profiles, nurses with the novelty seeker profile were more likely to experience burnout than nurses with a rigid control profile.

**Keywords:** Hardiness; Person-centered research; Burnout; Nursing; Cluster Analysis

### Nursing and Health Care System Changes

Of all health professionals, nurses are exposed to especially high levels of workplace psychosocial stressors such as work overload, role ambiguity and contact with pain and death. This high exposure to workplace stressors is found among nurses internationally [1-3]. Health care system changes that took place throughout the last decade were driven largely by scarceness of resources. These changes include increasing patient readmission, a persistent emphasis on clinical

efficacy, and higher demands from patients with acute and chronic diseases [4-6]. These result in increasing stressor levels negatively affecting nurses' job satisfaction [7], and with the potential to decrease the quality of nursing care provided to patients [8,9].

While healthcare in general has changed rapidly across many countries, the transformation has been particularly marked in the Peoples' Republic of China. During the past three decades, China has experienced rapid growth in its economic output and important changes in its demographic structure which together have significantly increased the demands both for primary healthcare and for more health professionals, particularly for nurses. Since the late 1990s, the Chinese government has carried out several reforms of the primary health care [10-12]. These reforms greatly improved healthcare – for example, the number of health care professionals has been increasing – but still left much to be desired, especially for the health workforce. The physician-nurse ratio generally showed a rising trend between 2008 (1:0.54) and 2012 (1:0.61), but was far below the international standard (1:2 ~ 4). Since the first health care reforms, there has also been a gradual shift from the traditional mode of disease-centered healthcare to a more holistic approach that encompasses biological, psychological and social aspects of the patients, resulting in nursing practice in China becoming increasingly demanding [11,13]. As a consequence, Chinese nurses are confronted with increasing stressors and, consequently, higher levels of strain [13-15].

### Stressors, Burnout and Burnout Consequences

Burnout is a specific work-related strain which, in nursing, is a consequence of stressors (burnout antecedents) stemming from the psychologically and emotionally challenging relationships among caregivers and their patients, team working, shift working, and the requirement for high skill levels [16,17]. Particularly negative stressors include: high workload, lack of clarity about tasks and goals (role ambiguity), contact with pain and death, and conflictual interactions with other nurses, physicians, patients, and their relatives [18,19]. Burnout consists of three sub-dimensions: (1) emotional exhaustion, which is frequently considered the main symptom of burnout [20]; (2) depersonalization, specified as the development of negative, cynical attitudes toward patients; and (3) lack of personal accomplishment, defined as the tendency to believe that one is no longer effective in working with patients. Various consequences of burnout in healthcare have been studied. Among the psychological effects, depression has been considered to be strongly related to burnout [21]. An important physical consequence is musculoskeletal pain which was found to be related to burnout in the Health 2000 Study [22,23]. At the organizational level, intentions to leave the job is an important outcome of burnout [24].

### The Role of Hardiness in the Burnout Process

The availability of personal resources such as hardiness can mitigate burnout and its consequences [25-27]. Hardiness was proposed by Kobasa [28] as a personality characteristic that provides a unique and active way of understanding a person's goals, difficulties, and interactions with other individuals [29,30]. More specifically, Kobasa proposed three dimensions of hardiness – commitment, control, and challenge – that affect relationships among stressors and strains.

Existing evidence confirms that hardy individuals perform better and stay healthier when confronted with stress [31-37]. In a recent study, researchers found that people with high levels of hardiness employ greater effort and, as a result, experience less work fatigue [30]. Moreover, there is evidence that hardiness is negatively related to

burnout in nurses [38,39,36,40], although the magnitude of this effect varies across different burnout sub-dimensions [41].

Two types of studies concerning hardiness are evident in the literature to date: examinations of the principal effect and of the moderating effect of hardiness on stressors and strains [37]. Across both types of study, hardiness is either considered to have an overall score, or else the hardiness dimensions are examined separately. Both approaches are variable-centered because they emphasize identifying differences in relationships between variables using regression or structural equation modeling [42]. Several authors have questioned and discussed both approaches [43,44]. They point out that simple correlations between overall hardiness and other variables, or between separate dimensions of hardiness and other variables, cannot provide an accurate indication of the importance of individual differences in hardiness dimension levels, that is, the hardiness dimension profiles of distinct groups of persons. Little is known about the combined and potentially synergistic influence of dissimilar hardiness dimension levels. Sandvik et al. [45] compared individuals with roughly equal dimension levels to those with unequal dimension levels and found that being high in hardiness with a balanced profile is related to healthy immune and neuroendocrine responses to stress. An examination of the unbalanced individuals showed the greatest discrepancies between control and challenge, with challenge always being lower than control. This shows that for a more complete and realistic understanding of hardiness, the three dimensions need to be explored more systematically in combination.

## A Person-Centered Approach to the Study of Hardiness

Person-centered research includes two steps: (1) identifying subgroups of individuals (profiles) that share similar patterns of variable levels (internal cohesion) and (2) validating that the identified profiles are indeed unique. This is done by comparing the relationships that these profiles have with other related variables (external adhesion). Internal cohesion and external adhesion are two important defining features of profiles in person-centered research [42,46].

### Identification of Hardiness Profiles

Researchers have adopted a person-centered approach in various fields [46-48]. Yet even though this approach has gained momentum in recent years, to date it has been used in only two hardiness studies: (1) Johnsen, Hystad, Bartone, Laberg, and Eid [49] studied Norwegian soldiers and found four hardiness profiles: Hardy, non-hardy, sensation seeker (low on control and commitment but high on challenge), and rigid control (low on challenge but medium to high on control and commitment). (2) Ladstätter, Garrosa, and Dai [50] studied whether,

in accordance with hardiness theory, individuals would naturally form two subgroups, hardy and non-hardy, and confirmed this using cluster analysis. However, they pointed out that more profiles might exist that further research could uncover.

Using these aforementioned studies as a starting point and allowing hardiness profiles to have high, medium, and low levels, it would be possible to find  $3^3 = 27$  hypothetical profiles. However, not all possible profiles may exist. Deriving from theoretical hardiness research, we should find individuals with profiles that are high (hardy), low (non-hardy), and medium (unresponsive) across dimension levels. Individuals high on all three dimensions see life as a constantly varying phenomenon that motivates them to learn and change (challenge), are convinced that through this developmental process, they exert power over changes and situations in a fashion that turns them into fulfilling experiences (control), and share this effort and learning in a valuable way with other individuals and organizations (commitment). Individuals with low levels on all dimensions are not interested in learning new skills but prefer routine (challenge), cannot imagine they could have a real influence on anything (control), and care little for others, things and events (commitment). In short, such people lack the existential courage and motivation to do the hard work of turning stresses to advantage [51,52,36,37].

Furthermore, Maddi [52] provides an excellent description of how individuals with heterogeneous hardiness dimensions levels would act. Considering these and other profiles that have been found in previous empirical studies [50,49,53,45] we yield a list of twelve hardiness profiles that might be found, as shown in Table 1.

### Validation of Hardiness Profiles

In step two, the identified profiles are compared to each other regarding the relationships they have with stressors and strains. Significant differences in the relationships across the identified profiles validate their uniqueness. Ladstätter et al. [50] found that hardy individuals experience lower levels of stressors, burnout, and burnout consequences than non-hardy individuals. Johnsen et al. [49] found a similar result regarding the hardy and non-hardy profiles although they focused on subjective health complaints, including psychological distress and reduced quality of life. Additionally, Johnsen et al. found that the rigid control profile had the highest symptom levels, whereas the sensation seeking profile had the lowest symptom levels.

### The Study

#### Aims

The aim of this study is to enhance our understanding of hardiness

**Table 1:** Hardiness Dimension Level Profiles Found in Other Studies.

Hardiness dimensions			Profile label	Described theoretically	Found empirically
Commitment	Challenge	Control			
High	High	High	Hardy	M	J*, L*
Medium	Medium	Medium	Unresponsive	M	
Low	Low	Low	Non-hardy	M	J*, L*
High	Low	Low		M	
Low	High	Low	Non persistent novelty seeker	M	
Low	Low	High		M	
Medium	Low	Medium			B/S
High	Medium	High			B/S
High	Low	High	Rigid control		B/S, J*
High	Low	Medium			B/S
Medium	Medium	High	Rigid control		B/S
Medium	High	Low	Sensation seeker		J*

Note. B/S – Bartone et al. (2011) and Sandvik et al. (2013), J – Johnsen et al. (2013), L – Ladstätter et al. (2014), M – Maddi (2013).

\* Person centered research approach

through a person-centered method. Using a confirmatory approach, we will focus only on the profiles that have been found either in a person-centered study or in at least two variable-centered research studies including past theoretical hardiness research. Our hypotheses regarding the identification of hardiness profiles are as follows:

Hypothesis 1: There will be a hardy profile that is high in commitment, challenge, and control.

Hypothesis 2: There will be a non-hardy profile that is low in commitment, challenge, and control.

Hypothesis 3: There will be a rigid control profile with medium or high commitment levels, low or medium challenge, and high control levels.

Hypothesis 4: There will be a sensation seeker profile showing medium levels on commitment, high on challenge, and low on control.

Our hypotheses regarding the relationships of hardiness profiles with stressors, burnout, and burnout consequences are as follows:

Hypothesis 5: Hardy individuals will show the lowest perceived stressors, burnout, and burnout consequences.

Hypothesis 6: Non-hardy individuals will show highest perceived stressors, burnout, and burnout consequences.

Hypothesis 7: The rigid control profile will show higher perceived stressors, burnout, and burnout consequences than hardy individuals.

Hypothesis 8: The sensation seeker profile will show low perceived stressors, burnout, and burnout consequences.

## Design

This survey was conducted in China in 2015 using a cross-sectional design.

## Participants

Convenience sampling was used to recruit non-ICU nurses from five Chinese hospitals. The overall response rate was 84.2% which is similar to comparable research in Chinese nursing [13]. After excluding individuals with missing data ( $n=17$ ), the sample comprised 325 participants whose age ranged from 20 to 45 years ( $M = 26.5$ ,  $SD = 4.6$ ). Of the 325 participants, 316 were females and 9 males. Although there are no national statistics about the age and gender of nurses in China available [54], similar small numbers of male nurses were found in comparable studies [55,13].

## Data collection

We used the Chinese version of the Nursing Burnout Scale - Short Form (NBS-SF) [19,56,57]. This questionnaire consists of 52 items and is organized into four scales measuring nursing-specific occupational elements relevant to the (1) hardiness, (2) stressors as antecedents of burnout, (3) burnout, and (4) consequences of burnout. Responses are on a 4-point Likert-type scale, ranging from 1 (*I totally disagree*) to 4 (*I totally agree*).

## Hardiness

Hardiness was measured with 12-items, with 4 items each for commitment (e.g., 'My daily work satisfies me and makes me totally devoted to it') ( $\alpha = .77$ ), challenge (e.g., 'When it is possible I try to have new experiences in my daily work') ( $\alpha = .73$ ), and control (e.g., 'Though I try hard I do not obtain my work goals', reverse scored) ( $\alpha = .74$ ). A confirmatory factor analysis (CFA) revealed that the hypothesized three-factor structure of hardiness fits the data well,  $\chi^2(47) = 203.47$ ,  $p < .001$ , goodness-of-fit index (GFI) = .94, adjusted goodness-of-fit index (AGFI) = .89, root mean square error of approximation (RMSEA) = .08, normed fit index (NFI) = .92, Tucker-Lewis index (TLI) = .90, comparative fit index (CFI) = .93).

## Stressors

Stressors are evaluated via 16 specific items divided into the four subscales of: (a) conflictual interaction, which assesses troubled and difficult relations with doctors, patients, and relatives (e.g., 'The doctors talk to me in an authoritarian way') ( $\alpha = .76$ ); (b) work overload, measuring the overload of quantitative and qualitative demands (e.g., 'I have to attend too many patients') ( $\alpha = .73$ ); (c) experience with pain and death, evaluates the level to which nurses are sensitive to patients' pain (e.g., 'It affects me when I apply painful treatments') ( $\alpha = .78$ ); and (d) role ambiguity, measures nurses' perceived clarity of information about their labor and their organizational role (e.g., 'The orders I receive are vague and ambiguous') ( $\alpha = .81$ ).

## Burnout

The burnout measure consists of 12 items and is subdivided into the three dimensions of emotional exhaustion (e.g., 'In my work, I often feel emotionally and physically exhausted') ( $\alpha = .80$ ), depersonalization (e.g., 'With regard to my patients, I do not involve myself in their problems; it is as if they do not exist') ( $\alpha = .77$ ), and personal accomplishment (e.g., 'Nobody considers me, I feel like "a maid for everything"', reverse scored) ( $\alpha = .72$ ) as proposed by Maslach and Jackson (1986). A CFA revealed that the hypothesized three-factor structure of burnout fits the data well,  $\chi^2(47) = 199.71$ ,  $p < .001$ , GFI = .93, AGFI = .89, RMSEA = .08, NFI = .91, TLI = .90, CFI = .93).

## Consequences of burnout

Consequences of burnout are measured with 12 items separated into three subscales that measure psychological (e.g., 'I feel lifeless like having no strength to do anything') ( $\alpha = .75$ ), physical (e.g., 'My work is affecting my physical health') ( $\alpha = .78$ ), and organizational consequences (e.g., 'Often, I desire to change profession') ( $\alpha = .82$ ).

## Ethical Considerations

The study was approved by the ethics committees of the Shandong College of Traditional Chinese Medicine and the study hospitals. Confidentiality was ensured and participants were informed that they could withdraw from the study at any point without adverse effects on their employment.

## Data Analysis

To ensure the reliability of the NBS-SF scale, we calculated Cronbach's alphas.

## Identification of hardiness profiles

In the first step of the person-centered analysis, we used the k-means cluster analysis, which maximizes variability between clusters (i.e., profiles) and minimizes variability within clusters, thus satisfying the requirements of a good cluster solution [58]. The k-means cluster technique produces distinct profiles that, in general, are clearly interpretable. We performed the cluster analysis on z-scores transformed from hardiness dimensions scores.

## Validation of hardiness profiles

To confirm that the clusters extracted from the data were in fact distinct, we compared the identified profiles to each other to assess their relationships with stressors and strains using one-way MANOVA. All statistical procedures were performed using SPSS v.21.0.

## Results

### Reliability and descriptive statistics

Cronbach's alphas, means, standard deviations, and minimum and maximum values of all study variables are shown in Table 2.

**Table 2:** Descriptive Statistics and Cronbach Alphas for all Variables.

Variables	M	SD	Min	Max	Alpha
<b>Hardiness</b>					
Total	2.81	0.36	1.00	4.00	.75
Commitment	2.68	0.50	1.25	4.00	.77
Challenge	2.86	0.49	1.00	4.00	.73
Control	2.91	0.44	1.25	4.00	.74
<b>Stressors</b>					
Role ambiguity	2.03	0.50	1.00	4.00	.81
Contact with death and pain	2.92	0.47	1.00	4.00	.78
Troubled interaction	2.48	0.56	1.00	4.00	.76
Work overload	2.74	0.55	1.00	4.00	.73
<b>Burnout</b>					
Emotional exhaustion	2.46	0.60	1.00	4.00	.80
Depersonalization	2.03	0.54	1.00	3.50	.77
Lack of personal accomplishment	2.14	0.55	1.00	4.00	.72
<b>Consequences</b>					
Psychological	2.13	0.52	1.00	4.00	.75
Organizational	2.70	0.60	1.25	4.00	.82
Physical	2.63	0.50	1.00	4.00	.78

Note.  $N = 325$ .

**Table 3:** Pearson Correlations between the Hardiness Dimensions and their Associates for the Total Sample and for each Profile separately.

Profile	Hardiness dimensions	Hardiness		Stressors				Burnout			Consequences		
		COM	CHA	ROL	CON	TRO	WOR	EMO	DEP	LAC	PSY	PHY	ORG
<b>Total Sample</b> $N=325$	Commitment			-.337**	.175**	-.199**	-.250**	-.386**	-.409**	-.548**	-.384**	-.354**	-.529**
	Challenge	.379**		-.297**	.159**	-.022	-.042	-.011	-.265**	-.197**	-.102	.004	-.025
	Control	.452**	.337**	-.368**	.135*	-.307**	-.280**	-.293**	-.425**	-.510**	-.242**	-.285**	-.243**
<b>Hardy</b> $n=173$	Commitment			-.200**	.152*	-.278**	-.243**	-.496**	-.452**	-.600**	-.398**	-.408**	-.493**
	Challenge	-.031		-.131	.174*	.143	.094	.209**	.018	.054	.026	.202**	.309**
	Control	.140	.285**	-.163*	.181*	-.282**	-.203**	-.161*	-.284**	-.211**	-.108	-.074	.018
<b>Rigid control</b> $n = 87$	Commitment			-.269*	.128	-.134	-.067	-.167	-.109	-.345**	-.116	-.088	-.364**
	Challenge	.119		-.444**	.068	-.357**	-.177	-.262*	-.398**	-.448**	-.010	-.248*	-.167
	Control	-.024	.442**	-.345**	-.130	-.602**	-.333**	-.522**	-.640**	-.548**	-.192	-.230*	-.104
<b>Novelty seekers</b> $n=65$	Commitment			.145	.056	-.138	-.169	-.279*	-.113	-.119	-.304*	-.317*	-.517**
	Challenge	-.055		.034	.140	-.040	.223	.145	-.279*	.199	.186	.287*	.315*
	Control	.292*	-.016	-.044	.033	-.233	-.047	-.203	-.256*	-.361**	-.079	-.301*	-.273*

COM=Commitment, CHA=Challenge, ROL=Role ambiguity, CON=Contact with death and pain, TRO=Troubled interaction, WOR=Work overload, EMO=Emotional exhaustion, DEP=Depersonalization, LAC=Lack of personal accomplishment, PSY=Psychological consequences, PHY=Physical consequences, ORG=Organizational consequences.

\* $p < .05$  level (2-tailed). \*\* $p < .01$  level (2-tailed).

### Associates of the hardiness dimensions

Pearson correlations between the hardiness dimensions and between these dimensions and associated variables appear in the upper part of Table 3 labeled as total sample.

### Cluster analysis

We conducted k-means cluster analyses with three-, four-, five-, and six-clusters and decided the three-cluster (three-profile) solution to be the most appropriate because: (1) various repetitions of the cluster analysis always culminated in the same hardiness pattern in the case of the three-profile solution whereas for the other solutions the patterns changed. (2) The three-cluster solution was easy to interpret within existing theoretical frameworks. (3) The one-way ANOVAs revealed non-significant mean differences for stressors, burnout, and burnout consequences between some of the profiles within the four-, five-, and six-profile solutions.

### Identified hardiness profiles

Table 4 shows the mean and the mean z-scores of each hardiness dimension by profile, the number of individuals, and the percentage of individuals in each profile. We used two methods to interpret our cluster. First, and in accordance with other researchers [42,50,49] we used z-scores for the interpretation of our results. We classified z-scores  $> 0.5$  as "high" scores, z-scores  $< -0.5$  as "low" scores, and z-scores between  $-0.5$  and  $0.5$  as "average" scores. Using these cut-off points for classification, nurses in cluster 2 have high levels on all three hardiness dimensions. This configuration corresponds to the hardy profile and thus supports Hypothesis 1. Since we did not find a non-hardy profile, Hypothesis 2 was not supported. Cluster 1, comprising nurses who score low on the two hardiness dimensions commitment and challenge, and average on control, resembles partly the rigid control profile of Hypothesis 3. Similarly, cluster 3 consists of nurses with low scores on commitment and control,

and average scores on challenge (sensation seekers), which partly supports Hypothesis 4.

For our second, more natural, interpretation approach we used 2.25 and 2.75 as cut-off points. For more information please see supplementary information file. In doing so, cluster 1 has average scores on commitment and challenge and high scores on control. Therefore we retained rigid control as the label for cluster 1. In the case of cluster 3, this analysis revealed medium (rather than low) scores on commitment and control, and high (rather than average) scores on challenge, hence we changed the profile name from sensation seeker to novelty seeker. We believe that this subtle change better resembles the features of the individuals in our study who are nurses, rather than soldiers as in Johnsen et al. [49] who coined this name.

### Validation of hardiness profiles

The MANOVA indicated significant differences among the profiles on the multivariate combination of stressors, burnout, and burnout consequence measures: Pillai's trace = 1.129,  $F(26, 622) = 31.042$ ,  $p < .001$ ,  $\eta^2 = .565$ . Subsequent one-way ANOVAs showed significant differences across all three profiles (Table 5), except for the stressors contact with death and pain and troubled interaction. Effect sizes showed small to moderate values which suggest that the profiles account for modest overall amounts of variance.

We then conducted post hoc pair-wise comparisons with Tukey's b. Results show that hardy nurses have significantly lower scores for role ambiguity, depersonalization, lack of personal accomplishment, psychological consequences, and organizational consequences, than nurses who have one of the other two profiles. This mainly supports Hypothesis 5. Hypothesis 6 could not be tested because we did not

**Table 4:** Cluster Analysis Results Showing Number of Participants per Cluster, Percentage of the Sample, Mean and Mean z-Scores for all Three Hardiness Dimensions.

	Cluster (Profile)		
	1 – Rigid control	2 – Hardy	3 – Novelty seekers
N	87	173	65
% of total (N = 325)	26.8%	53.2%	20.0%
Hardiness dimensions			
Mean (z-score)			
Commitment	2.31 (-0.75)	2.98 (0.60)	2.38 (-0.60)
Challenge	2.31 (-1.12)	3.11 (0.51)	2.92 (0.13)
Control	2.81 (-0.23)	3.17 (0.58)	2.37 (-1.24)

**Table 5:** ANOVA Results Showing Means and Standard Deviations of all Variables for the Overall Sample and the Three Profiles.

Variable	Overall	Profile						F(2,322)	$\eta^2$
	Sample	Hardy		Rigid control		Novelty seekers			
	M	M	SD	M	SD	M	SD		
<b>Stressors</b>									
Role ambiguity	2.03	(1.86) <sub>a</sub>	0.459	(2.18) <sub>b</sub>	0.434	(2.28) <sub>c</sub>	0.504	26.06***	.14
Contact with death and pain	2.92	(2.97) <sub>a</sub>	0.484	(2.86) <sub>a</sub>	0.441	(2.84) <sub>a</sub>	0.470	2.46	.02
Troubled interaction	2.48	(2.45) <sub>a</sub>	0.552	(2.47) <sub>a</sub>	0.527	(2.58) <sub>a</sub>	0.580	1.45	.01
Work overload	2.74	(2.64) <sub>a</sub>	0.561	(2.79) <sub>b</sub>	0.541	(2.91) <sub>b,c</sub>	0.483	6.37**	.04
<b>Burnout</b>									
Emotional exhaustion	2.46	(2.37) <sub>a</sub>	0.625	(2.52) <sub>a,b</sub>	0.526	(2.62) <sub>b</sub>	0.601	4.90**	.03
Depersonalization	2.03	(1.89) <sub>a</sub>	0.502	(2.20) <sub>b</sub>	0.479	(2.19) <sub>b</sub>	0.521	15.28***	.09
Lack of personal accomplishment	2.14	(1.93) <sub>a</sub>	0.474	(2.27) <sub>b</sub>	0.483	(2.51) <sub>c</sub>	0.563	36.35***	.18
<b>Consequences</b>									
Psychological	2.13	(2.01) <sub>a</sub>	0.523	(2.26) <sub>b</sub>	0.530	(2.28) <sub>b</sub>	0.435	10.38***	.06
Physical	2.63	(2.53) <sub>a,b</sub>	0.482	(2.66) <sub>a</sub>	0.477	(2.85) <sub>c</sub>	0.528	10.24***	.06
Organizational	2.70	(2.53) <sub>a</sub>	0.601	(2.86) <sub>b</sub>	0.549	(2.93) <sub>b</sub>	0.524	16.04***	.09

Means in the same row that have different subscripts are significantly different at  $p < .05$  in the Tukey's b pairwise comparisons.

\*\* $p < .01$ . \*\*\* $p < .001$ .

find a uniform non-hardy profile. The rigid control profile which we expected to have higher perceived stressors, burnout and burnout consequences than hardy individuals shows significantly higher means on role ambiguity, depersonalization, lack of personal accomplishment, as well as psychological and organizational consequences, thus partly supporting Hypothesis 7. Highest levels on stressors, burnout and consequences of burnout were found for the novelty seekers, an outcome that is totally opposite to Hypothesis 8.

To assess how the hardiness dimensions are related to each other and to stressors, burnout, and consequences of burnout within a particular profile, additional bivariate correlations were calculated for each profile separately and are shown in Table 3. When comparing the overall sample correlations with those of the profiles, interesting changes of the correlation coefficients' magnitude and even their direction appear. Whereas for the overall sample the three hardiness dimensions are correlated with each other, the profiles show just one significant relationship between the three dimensions. Moving on to the relationships between hardiness dimensions and other variables, we found that challenge is negatively correlated to emotional exhaustion for the rigid control profile ( $r = -.262$ ,  $p < .05$ ) whereas for hardy nurses the relationship is positive ( $r = .209$ ,  $p < .01$ ). In the overall sample however, the relationship does not exist ( $r = -.011$ ,  $p = ns$ ). Several similar examples exist and overall the results of these additional analyses further support the distinctiveness of the three profiles.

### Discussion

Our discovery of the three-profile solution is interesting for several reasons. First, the profiles found in this study partially replicate profiles found in other person-centered studies [49,50]. Therefore, our study confirms naturally occurring subgroups within this population, although these vary both between and within occupations. This also shows that the hardiness construct is not as homogenous as previously thought across the nursing population. Second, the extraction of qualitatively different profiles (different levels on dimensions) and not just quantitatively different ones (equally high, medium or low on all dimensions), reinforces the person-centered analysis as an important tool in organizational research [42]. This does not mean that variable-centered methods should be substituted by person-centered approach. To the contrary, the two strategies should be viewed as complementary, providing different insights into the phenomenon of interest. Third, regarding the overall sample, the three hardiness dimensions correlate positively with each other and correlations between the hardiness dimensions and other variables (stressors, burnout, and burnout consequences) match well against past empirical research and theory

[37]. This supports the assumption that the hardiness theory applies equally to Chinese nurses. Fourth, the three profiles show different mean scores on stressors, burnout, and consequences. Furthermore, the profiles not only have different interrelationships among hardiness dimensions, but also have different correlations between hardiness dimensions and stressors, burnout, and consequences. This further supports the person-centered approach because it indicates that the homogeneity assumption underlying all variable-centered analyses does not hold.

### The nature of the hardiness profiles

The profile we most expected to find was the hardy profile. Hardy individuals (high on commitment, challenge, and control) have scores below average on stressors, on the burnout dimensions and on all three types of consequences. This result is consistent with existing variable-centered research in the field [36,19,37]. More surprising is that challenge is positively related with emotional exhaustion for hardy individuals, which suggests that within this group, the normally null or negative relationship inverts. A possible explanation would be that those with especially high challenge scores, and who therefore constantly seek new experiences, are over estimating their own personal capabilities. This constellation eventually leads to a state of emotional exhaustion. A similar explanation fits the positive relationships between challenge and both organizational and physical consequences which we found only for the hardy and novelty seeker profiles.

Another interesting result of the profile approach is the discovery that the negative relationships between challenge and both depersonalization and lack of personal accomplishment disappears in the hardy profile. Similar to the explanation given before, this might be due to having reached very high levels of challenge where an increase or decrease in challenge has no additional consequences. A similar effect takes place with regard to the relationship of control and all burnout consequences. The negative correlations found in the overall sample disappear for the hardy profile. Following the aforementioned idea of having reached a high level of, in this case control, an increase or decrease of control may no longer have consequences. This outcome indicates the potential existence of non-linear relationships between variables [59].

Another profile that we expected to find based on strong theoretical foundations and on two prior person-centered studies [50,49] – the non-hardy profile – could not be extracted from our data with our three profile solution. This could be due to particular ethical values involved in nursing, including among others privacy, justice, autonomy in decision making, precision and accuracy in caring, and individual and professional competency. These values suggest that some minimal level of hardiness traits are required, and non-hardy nurses may not exist. While Johnsen et al. identified a non-hardy profile, they based their identification and interpretation on z-scores. If they had cross-checked their interpretation, as done here, using the original scale ranging from 0 to 15, their low-hardy profile would rather be labeled a medium-hardy profile (with all three dimensions having a score of approximately 8) which would also make more sense because their study participants were Norwegian infantry soldiers and combat engineers deployed on a six-month mission to Kosovo who, generally speaking, should be more hardy than other non-military groups of individuals.

The rigid control profile (high on control, low/average on commitment and challenge) does not fit with the current, primarily variable-centered approach to hardiness theory. It was hypothesized to exist due to previous empirical work using a person-centered approach. Indeed, the rigid control profile found here overlaps considerably with the rigid control profile found in Johnsen et al. [49]. Again we draw attention to the very different populations from which the samples were drawn (nurses vs. soldiers) and that Johnsen et al. used z-scores for their interpretation which does not coincide with the original scale

interpretation. Besides the different profession, other variables might be the reason for the profile differences found between nurses and soldiers. For instance, it could be that gender has an effect on the differences. The Norwegian soldiers were mainly men (96.4%) whereas the Chinese nurses were almost entirely women. Rigid control individuals show values above the mean on role ambiguity and workload, on the three burnout dimensions, and on the three types of consequences. Contrary to hardy individuals, rigid control individuals show a negative correlation between challenge and emotional exhaustion, which is consistent with existing theory. Interestingly, the negative correlations between commitment and both depersonalization and lack of personal accomplishment found in the overall sample weakened significantly in the rigid control profile.

Nurses with the novelty seeker profile (high on challenge and average on commitment and control) show the highest scores on stressors, burnout and burnout consequences. This outcome is contrary to our hypothesis and to the results found by Johnsen et al. [49]. The reason for the different functioning of the profile we found could be that novelty seeking involves being open to and pursuing stimulating activities. However, in order to achieve objectives, this attitude needs to be accompanied by persistence in activities (commitment). Furthermore, impulsive behavior would also be associated with lack of premeditation which involves acting in the moment without regard to consequences and lack of perseverance is characterized by the inability to remain focused on boring or difficult tasks. It is therefore possible that individuals with the novelty seeker profile attitudes seek stimulating situations yet are less able to handle the concomitant stressors, and therefore have more burnout and other negative consequences.

### Study implications

The outcomes of this study could help to develop intervention programs targeted at the specific needs of nurses having different profiles. This would be especially important for nurses having either the rigid control or the novelty seeker profile. Novelty seekers, for instance, are most affected by burnout, however, they are probably more susceptible to intervention due to their high level of challenge which might help to start a self-recovery process after it is initiated by, for example, counselling sessions focusing on the importance of the control dimension. More generally, healthy practices implemented at the organization level may stimulate motivation, autonomy, and adaptive self-regulation strategies.

Regarding the person-centered method applied in this study, we found that using the original scale for the interpretation instead of the z-score scale provides a more natural view of profiles and helps to avoid redundant profiles. Thus we recommend future person-centered approaches analyze their data using both original and z-score scales for a comprehensive understanding and interpretation.

### Study limitations and suggestions for further research

First, this study is limited by its cross-sectional design. Future research should examine (1) how the hardiness profiles evolve over time to address issues of causal relationships, and (2) how profile-specific intervention programs affect the burnout process. Second, our study relied exclusively on self-report measures. Less subjective measures, such as peer reports, behavioral indicators and physiological concomitants, are needed. Third, in order to keep our results comparable to those of Johnsen et al.'s (2013) study of soldiers, we replicated the k-means cluster analysis. However, other analyses such as latent class analysis could have been used to test for different hardiness profiles.

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### Supplementary File

We note that, even though the cluster analysis should be performed using z-scores, interpretation of the profiles based on z-scores might not be the most adequate method since using z-scores places variables on a standard unit of measurement ( $M = 0$ ,  $SD = 1$ ) irrespective of special characteristics of that variable. This means, for example, that if all participants answer the items of a measure that have a range of 1 to 4 with only 1s and 2s, the z-scores of this measure will have a mean of zero and a standard deviation of 1. Interpreting the outcome of participants who have z-scores of 1 as high-scorers would be erroneous since in reality their score is only 2 which is definitely not a high score within the range of 1 to 4. For this reason, we used the original scores as a second, more natural, interpretation of the profiles. Since we used a scale ranging from 1 to 4, the mean would be at 2.5. In order to avoid arbitrariness in finding the cut-off values between low, medium, and high levels we fitted a normal probability distribution (mean = 2.5,  $SD = 0.5$ ) over the 1 to 4 scale. In doing so, 99.7% of the values fall into the range 1 – 4. Then, the z-scores of  $\pm 0.5$  correspond to the two cut-off points 2.25 and 2.75.