

# Study of Resistance to Stress and Burnout among Public Health Professionals: The Case of Nurses and Physicians at Ibn Sina Hospital in Rabat Morocco

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## Abstract

Occupational stress presents a major public health problem. It is the subject of many works in Morocco and in the world. Our work focuses on the study of stress resistance among nurses and physicians working in services at Ibn Sina Hospital in Rabat, Morocco. The aim of this study is to analyze the relationship between resistance status, burnout and level of psychological distress. A self-questionnaire is provided to all respondents. It includes questions about socio-demographic and professional, clinical, also neuropsychological tests such as the stress resistance test (CTRS), the burnout scale (MBI) and the general health questionnaire (GHQ12). This study shows that 42% of nurses and physicians have a high level of emotional exhaustion, high level of depersonalization affects 49% of nurses and physicians and subjects with low professional achievement account for 67% and 54% of nurses and physicians suffer from psychological distress. The stress test reveals that 88% of subjects have a low or moderate level of stress resistance and only 12% have good resistance. Thus, our study sheds new light on the understanding of stress at work by using new measurement and evaluation methods such as TRS, with the aim of reducing or eliminating the impact of occupational stress in hospitals.

## Keywords

Work Stress, Resistance, Burnout, Psychological Distress, Nurses, Physicians, Risk

## 1. Introduction

Stress is an adaptive response to the requirements and constraints. It is essential for the proper functioning of the body [1] [2]. Many research studies have shown the link between medical and paramedical activity and professional stress [3] [4] [5]. Stress is defined as a transaction between a person and their professional environment [6]. Thus, the nurses and physicians develop a coping strategy to increase its resistance to the adverse effects of stress [7]. However, some people develop a stress face resistance and others are unable to resist, giving rise to a job stress which can lead to long term, burnout and physical health disorders [8] [9] [10].

Nevertheless, burnout is one of the most serious complications of occupational stress [11]. It is characterized by a varied symptomatology around three major components: emotional exhaustion, depersonalization and self-accomplishment. In fact, more the relationship between the individual and the professional environment is disturbed over the risk of burnout is important [12] [13]. Furthermore, professional stress can be the main cause of psychosomatic and cardiovascular disease [14] [15] [16] [17]. Work stress can be caused by organizational, occupational and/or personal factors [18] [19].

In addition, the complexity of the professional tasks, the quality of care requirement, the emotional overload, the role conflicts and the noise make the nurses' and physicians' activity more difficult and increase sensitivity to stress [20]; some studies have shown that the noise nuisance can generate a state of stress [21]. Additionally, according to a study conducted by Israel *et al.* (2014) on noise pollution, noise in workplaces can worsen the state of stress, disrupting the quality of work and impairing cognitive activity of nurses and physicians [22] [23] [24]. Noise can also disrupt neuroendocrine functions by increasing the secretion of certain neurotransmitters such as noradrenergic and ACTH (Adreno Cortico Trophin) [25].

In Morocco, studies of the effect of noise on neurocognitive status of nurses and physicians remain very limited. For this purpose, our work consists

- To study stress resistance among medical and paramedical personnel practicing in hospital services, by assessing risk factors.
- To study the impact of stress resistance on burnout and psychological distress.

## 2. Materials and Methods

### 1) Population and study area

The target population for this study is nurses and physicians with a total of 100 persons. In fact, the study was carried out among people aged between 24 and 45, working in the intensive care, medical imaging, laboratory, emergency and operating theater departments of Ibn Sina Hospital in Rabat city, Morocco.

### 2) Procedures and scales

In order to collect the data, the participants in the survey are asked to com-

plete a questionnaire containing information on socio-demographic characteristics, health history and perceived stress effects. Each subject had to pass the computerized stress test (CTRS), the general health questionnaire (GHQ12) and the emotional exhaustion (MBI) scale.

### 2.1. Computerized Test of Stress Resistance (CTSR)

This test initiated by André Rey, under the name of “Test points to organize”. In 2011, an automated version was developed in collaboration with Seldage. The results obtained made it possible to produce, in collaboration with Philippe Wallon, a computer-generated version generating emotional stress [26] [27]. The computerized test consists of 15 lines, 6 boxes per line and 11 points dispersed differently per box. The principle of the test is that the candidate must organize the points, discover the hidden forms and trace the geometric shapes (two squares and a triangle), listening, with the help of headphones a sound sample per line, in a 40 seconds interval per line.

### 2.2. Maslach Burnout Inventory (MBI)

The Maslach Burnout Inventory (MBI) is used to assess burnout among nurses and physicians [28], it is composed of 22 items divided into three dimensions: Emotional Exhaustion (EE) evaluated using nine items, the dehumanization of the relationship (DR) or “Depersonalization” (DP) (five items) and Personal Accomplishment (PA) (eight items). Each item is rated from 0 to 6. A high level of burnout manifested through high scores for the EE and DP sub-scales, combined with a low score on the PA sub-scale, with a reversal for a low burn-out level [29] [30].

### 2.3. General Health Questionnaire (GHQ12)

GHQ12 is a self-questionnaire quantifying the degree of subjective psychological suffering. In our work, we chose the short version in 12 items (each item is rated from 0 to 3), where the response choices to statements are: “No more than usual”, “Not at all”, “Rather more than usual” and “Much more than usual” [4] [31] [32] [33]. For reading test results, we used dichotomous scoring (0-0-1-1).

## 3. Results and Discussion

### 3.1. Socio-Demographic Characteristics of Nurses and Physicians

**Table 1** presents the results of the socio-demographic and socio-economic distribution of 100 nurses and physicians practicing at Ibn Sina Hospital in Rabat, 50% of whom are female and 50% male.

The average age of the respondents is  $30.14 \pm 0.48$  years, with a minimum age of 23 years and a maximum age of 44 years. This age distribution was Gaussian with an asymmetry coefficient of 1.18 and a flattening coefficient of 1.17, While 62% of these respondents are single and 35% are married, their level of education is almost high for most. In addition, 71% work day and night against 25%

**Table 1.** Socio-demographic characteristics of the cases studied.

Variable	Modality	SEXE		Total with %
		Male	Female	
Age	Under 25 years	-	3	3
	Between 25 & 35 years	41	43	84
	Between 35 & 45 years	9	4	13
Civil status	Single	34	28	62
	Married	15	20	35
	Widower	1	2	3
Level of study reached	BAC + 3 years	36	35	71
	BAC + 5 years	4	5	9
	More than 5 years after BAC	10	10	20
Socio-economic level	Good	11	14	25
	Average	39	36	75
Work time	Day	13	12	25
	Day/Night	36	35	71
	Night	1	3	4
Seniority	Under 4 years	23	20	43
	Between 4 & 8 years	17	22	39
	Between 8 & 12 years	5	5	10
	More than 12 years	5	3	8
Number of hours/week	Between 35 & 55	46	43	89
	Between 55 & 75	4	7	11
Total		50	50	100

exercise only during the day. However, 84% of the respondents are between 25 and 35 years old and 43% have a seniority of less than 4 years and 39% between 4 years to 8 years. This makes it possible to draw the idea that most of the respondents are new recruits (Table 1).

### 3.2. Characteristics of Antecedents Related to Health Status of Nurses and Physicians

The distribution of health care providers according to their state of health shows that 77% answered that they didn't suffer from any disease against 10% who declared to suffer from a chronic disease (asthma 5.75%, hypertension 2.29%, hyperthyroidism in one case 1%, and two cases 2% of chronic sinusitis). However, 13% of these respondents did not report anything.

The distribution of respondents according to certain reactions and attitudes adopted in the face of stressors shows that 32% take coffee and 27% drink tea. To overcome the state of stress, 19% of respondents said they had used tobacco and 12% prefer to consume tonics. To compensate for the direct and/or indirect effects of stress, 22% of the respondents practice physical activities (sports). However, some consult their doctor (9%), others benefit from sick leave 7%, and 8%

are absent from work and 7% take sleeping pills. On the other hand, the respondents told to have a change in their eating behavior during the stress period. However, 51% said their appetite is down, while 33% say the opposite. For the question “your body weight changes or not, during the stress period”, 47% of people reported feeling a weight increase compared to 36% who saw it decrease.

### 3.3. Result of the Stress Test

#### 3.3.1. Validation of the Resistance Test

To evaluate the psychometric properties of the items, we performed an analysis of the accuracy and reliability of the answers provided by the respondents. The results of the analysis indicate that the test has internal consistency ( $\alpha = 0.54$ ). The validation results of the various items show that in general the scores obtained for the “sounds” proposed by the test are moderately accepted with a minimum score of 0 and a maximum score of 3.

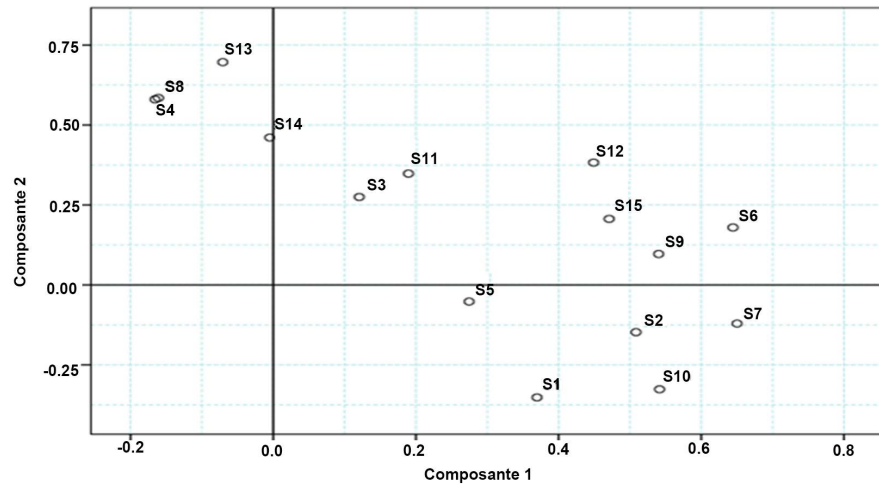
Nevertheless, the internal consistency of all items verified by principal component analysis. Three large groups of sound extracts have been released, the first group contains all the troublesome sounds, a second group gathers the soft sounds and a third groups the sounds without effects (**Figure 1**).

The two axes 1 and 2 alone absorb 75% of the total variation, which makes it possible to distinguish three large groups of correlated items. The first group (annoying sounds) located on the positive side of the axis 1, which is composed of the determining sounds that of the Rhythms musical S2; Insect S6; Storm S7; Accident S9; Ambulance S10; Childbirth S12 and Panic S15. The second group (soft sounds) located on the negative side of axis 1, where brings together the sounds of Musical mode S4; Wolves S8; Newborn S1. Finally third group taking an intermediate position and collecting the sounds (music OM S1, wagner S3, percussion S5, heart beat S11, choking S14). It is qualified, therefore, a group of sound extract without any effect (neutral).

#### 3.3.2. Study of the Distribution of Respondents According to Their State of Resistance

In this part, we applied the paired comparison method, while distinguishing between different groups of sounds. So the assessment made on the difference between the score of the first group, the second group and the third group. The determination of resistance states based on percentiles. The results shown in **Table 2**. The descriptive analysis show that the average stress resistance score is  $4.60 \pm 6.77$ , with a minimum score of  $-110$  points and a maximum score of 240 Successful boxes. The distribution of scores follows a normal distribution with an asymmetry coefficient of 0.90 and a flattening of 1.63 (4). Indeed, the prevalence of people with a low resistance state is 14% against 12% with a very high level of resistance. However, 74% of the respondents showed a moderate level of resistance, so, they qualified at risk, it is necessary to monitor them afterwards.

**Table 2** summarizes the overall results of the link between the level of stress and certain socio-economic and demographic parameters. The results of this



**Figure 1.** Diagram of principal component analysis after rotation.

**Table 2.** Distribution of respondents according to their state of resistance to stress.

Variable	Modality	Stress resistance test category			Total	Khi-2	p-value
		Low	Moderate	High			
Gender	Male	7	38	5	50	0.39	0.82(ns)
	Female	7	36	7			
<b>Total</b>		<b>14</b>	<b>74</b>	<b>12</b>	<b>100</b>		
Age	<30 ans	11	47	5	63	3.84	0.05*
	>30 ans	3	27	7			
<b>Total</b>		<b>14</b>	<b>74</b>	<b>12</b>	<b>100</b>		
Socio-economic level	Average	11	52	12	75	7.85	0.02*
	Good	3	22	0			
<b>Total</b>		<b>14</b>	<b>74</b>	<b>12</b>	<b>100</b>		

\*: significant difference at 5%; ns: no significant.

distribution show that 14% of the studied cases have a problem of resistance to proposed sounds of which half is female and more than three quarter with an age between 20 to 30 years. The results of the chi-square test show that age is significantly related to the state of resistance to stress ( $p < 0.05$ ). Indeed, the 14 cases declared very sensitive are almost all new recruits (less than 10 years old) and 10 of them are single. The chi-square test showed a significant correlation between the social level and the stress resistance test (chi-square = 6.43,  $p < 0.02$ ). Indeed, the 11 cases that are very sensitive to stress among the 14 identified belong to an average social level and three cases among them have a good social level. Our results are consistent with those confirmed by studies that show that noise decreases human performance As well, younger people are more vulnerable to stress than older [22] [23] [24] [34].

### 3.4. Maslach Burnout Inventory (MBI)

Calculation of Cronbach's alpha for this test is largely sufficient, 0.81. The results of the descriptive analysis of our sample show that the degree of burnout is very high compared to the standards established by Maslach and Jackson [30]. **Table 3** shows the distribution of each component of the MBI in the population as a whole, with reference to the evaluation criteria of Maslach (1986). However, 42% of nurses and physicians have a high level of emotional exhaustion, high level of depersonalization affects 49% of nurses and physicians and the percentage of staff with a low level of achievement is 67%.

**Table 4** illustrates the results of the chi-square test of independence between the different levels of MBI and certain socio-demographic factors. The results of this analysis show that sex, age, civil status, seniority and working hours are not significantly associated with MBI. A 63 are nurses (78.75% of all nurses), and 17 physicians (85% of all doctors). We remark that the physicians therefore more exposed to the risk of burnout compared to nurses. Indeed, the association between occupational status and the occurrence of emotional exhaustion is statistically significant ( $p < 0.05$ ).

### 3.5. Psychological Distress

The person considered in a state of distress if the score obtained by the test is lower than the threshold set in the literature (threshold less than 4) [5] [32]. The percentage of staff suffering from psychological suffering is 54%. The analysis of the results at the GHQ 12 show that the professionals obtain an average score of  $3.49 \pm 0.283$  with a minimum score of 0 and a maximum score of 10. The distribution of the scores follows a normal distribution with a coefficient of asymmetry of 0.58 and a flattening of 0.71.

The Chi 2 independence study between GHQ12 categories and socio-economic factors (gender, age, family status, work profile, and job seniority) shows no significant relationship. On the other hand, the number of hours worked per week is significantly related to mental suffering among the staff ( $p < 0.009$ ), which leads to the conclusion that the psychic state of the carers is very sensitive to the number of hours worked.

### 3.6. Overall Analysis of the Three Tests

**Table 5** presents the results of the descriptive analysis of the three selected tests (MBI, TRS, GHQ12): The average score of the exhaustion dimension is

**Table 3.** Distribution of scores for each component of the Maslach Burnout (MBI) scale.

Dimension	MBI (%)			Total in %
	Low	Moderate	High	
Emotional exhaustion	20%	38%	42%	100
Depersonalization	13%	38%	49%	100
Personal achievement	67%	26%	7%	100

**Table 4.** Results of the chi-square test between MBI and selected socio-economic factors.

Variable	Modality	MBI			Total	Khi2	P value
		low	Moderate	high			
Gender	Male	10	23	17	50	3.2	0.2(ns)
	Female	10	15	25	50		
Age	Below 25 years	0	2	1	3	3.75	0.44(ns)
	between 25 and 35 years	16	30	38	84		
	Over 45 years old	4	6	3	13		
Professional status	Nurses	17	31	32	80	9.39	0.05 (s)
	Doctors	3	7	10	20		
Number of hours worked	35 to 55 hours	19	33	35	89	0.95	0.62(ns)
	56 to 75 hours	1	5	5	11		

**Table 5.** Descriptive study of the three selected tests (MBI, CTRS, GHQ12).

	Dimension	Min	Max	Mean	SD	Asymétrie	Kurtosis
	Emotional exhaustion	5	50	28.07	1.081	0.128	-0.728
<b>Test de maslash</b>	depersonalization	6	51	29.91	0.744	-0.034	0.969
	accomplishment	0	29	11.47	0.619	0.381	-0.167
<b>Stress resistance test</b>	X100	-110	240	4.6	6.771	0.909	1.634
<b>General health test</b>	GHQ	0	10	3.49	0.283	0.578	-0.711

Min: minimum; Max: maximum.

28.07 ± 1.08, with a minimum score of 5 points and a score of up to 50. The distribution of the scores follows a normal distribution with an asymmetry coefficient of 0.128 and a flattening of -0.73. The average score of depersonalization is 29.91 ± 0.73, with a minimum score of 6 points and a maximum score of 51, the distribution of scores follows a normal distribution with an asymmetry coefficient of 0.03 and a flattening of 0.97. Then the average score of the self-completion dimension is 11.47 ± 0.62, with a minimum score of 1 point and a maximum score of 29. The distribution of scores follows a normal distribution with an asymmetry coefficient of 0, 38 and a flattening of 0.17.

**Table 6** shows the multiple correlation results between the five demerits of the three tests (GHQ12, MBI and CTRS). It appears from this table that all dimensions are significantly correlated with each other with differences in the degree of significance and sign of correlation. However, the stress test correlated positively with professional achievement ( $r = 0.95$ ) and negatively with the other dimensions. On the other hand, the GHQ12 has been positively correlated with all dimensions except the resistance where the correlation is negative. However achievement is negatively correlated with exhaustion and dehumanization and positively correlated with GHQ12 and stress resistance.



**Table 6.** Multiple correlation of the dimensions of the three tests, two by two.

	GHQ	Em	Dep	Accp	Rés
GHQ	1	0.214*	0.94**	0.86**	0.72**
Emotional exhaustion		1	0.54**	-0.399**	-0.40**
Depersonalization			1	-0.981***	-0.95***
Accomplishment				1	0.95***
Resistance					1

\*. Correlation is significant at 0.05 (bilateral). \*\*. Correlation is significant at 0.01 (bilateral). \*\*\*. Correlation is significant at 0.001 (bilateral).

In light of these results, the group of resistant nurses and physicians in our sample can be described as having a low degree of exhaustion and depersonalization, a high degree of achievement, and low psychological suffering.

#### 4. Discussion

The objective of this study is to evaluate the resistance to stress and to identify the most frequent dysfunctions among health professionals in order to prevent the consequences of professional stress. Our data reveal a relatively low rate of stress resistance among health workers practicing in Ibn Sina Hospital in Rabat/Morocco. Indeed, 14% of the staff do not have any stress resistance, 74% have a “moderate resistance” and only 12% have a “good resistance” to stress, if one refers to the results of the stress resistance test of Mottier (2013) [26]. With regard to the study population, and despite the fact that the medical and paramedical profession is considered to be one of the professions most affected by occupational stress [3] [4] [5], and according to the literature, our study, is one of the first Moroccan studies that deals with the effects of noise pollution as a factor generating stress in hospitals. We have applied this test to hospital-based physicians and nurses to provide health professionals with a cost-effective and reliable tool for assessing their state of resistance. A first paper-and-pencil version with auditory stimuli was conducted on a large population of candidates in vocational and paramedical schools, showing its relevance [26]. The analysis of the results of our study allows us to group the items into three large groups. A first group of annoying sounds that can disrupt perception and diminish the performance of nurses and physicians [22] [26] [27]. In addition, studies have identified the negative impact of noise pollution on the cognitive activities of nurses and physicians [29] [35] [36]. The second group of items brings together extracts of soft sounds, which can trigger pleasant feelings opposing the harmful effects of stressful emotions. Returning to literature, there are few studies on the positive effect of soft sounds on health. Soft music activates brain areas in a way similar to other emotional stimuli [37] and involves the limbic system while listening to music [38]. The treatment of musical sound uses common areas with the treatment of emotions [39]. The main beneficial effects of relaxing music in men are the help for relaxation, concentration, better self-control in the face of

stressful events and better performance on cognitive tasks [40].

Our study indicates a statistically significant relationship between the state of resistance to stress and the socio-economic difficulties of nurses and physicians. These same results are found by some studies [34] [41] [42].

Like the low level of resistance to stress and psychological suffering, burnout remains very high in our population. Our results reveal that 42% of nurses and physicians are emotionally exhausted and 49% of them have high scores of depersonalization as well as a reduction of accomplishment in 67%. However, these figures are consistent with most studies published around the world [34] [43] [44].

However, returning to the analysis of the factors associated with depersonalization in this population, unlike other studies [45] [46], we do not observe significant links between burnout, age, sex, marital status, length of service, number of hours worked and socio-economic level. On the other hand, professional status is very significantly related to burnout. These show that medical personnel are less resistant to stress than nurses. These data are opposed, then, to the results found by some studies; nurses are more susceptible to stress than physicians [47] [48]. With respect to the mental health of nurses and physicians, the analysis of the GHQ12 results indicates that 54% of nurses and physicians, suffer from psychological distress and the number of hours worked per week are significantly related to this suffering.

Our data also show a correlation between the stress test scores and the total GHQ12 score as well as the burnout score.

Our results also show that there is a better understanding of the relationship between stress resistance, mental health and burnout when considering individual differences, especially risk factors. Returning to studies done in Morocco and around the world, occupational stress mainly affects the care environment because of the specific nature of the profession, the increase in the workload, poor working conditions in hospitals, dissatisfaction at work and socio-economic difficulties of health personnel, particularly nurses [41] [47] [48].

This allows us to assume in this study that stress resistance depends on personal, occupational and environmental factors that may expose nurses and physicians to multiple and repeated occupational stress situations. [3]. In addition, during the clinical interviews, we talked about major dysfunctions related to the stress situation in hospitals. 8% of nurses and physicians miss work under stress, 7% take sleeping pills to sleep, 19% use tobacco, 12% prefer tonics to complete their work, 9% consult their doctor, 7% benefit from sick leave, 51% of respondents say they decrease their appetite under the effect of stress, and 10% suffer from chronic pathologies.

## 5. Conclusion

The results found in this context remain very encouraging despite the difficulties encountered during the sampling; the choice of subjects and the methods of

analysis have posed a great obstacle for us to deepen the statistical analyzes. To identify these difficulties, sampling should extend to other professional sectors.

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