

## Stressors influence work ability in different age groups of nursing professionals: 2-year follow-up

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**Abstract** *Work stressors influence work ability – WA - and increasing age is associated with functional aging. We sought to establish whether work stressors differentially influence WA in young and aging nursing professionals. A cohort (2009-2011) composed of 304 workers at a hospital in Sao Paulo responded questionnaires Effort-Reward Imbalance (ERI), Job Stress Scale (JSS), Work-Related Activities That May Contribute To Job-Related Pain and/or Injury (WRAPI) and Work Ability Index (WAI). Changes in perceived exposure to stressors in each age group (< 45 and ≥ 45 years old) were compared to delta-WAI (difference between initial and final WAI score) by means of the Mann-Whitney test. There was a worsening in WAI ( $p = 0.609$ ) without difference between the groups. WA impairment was associated with intensification of stressors ERI ( $p = 0.004$ ), overcommitment ( $p = 0.002$ ), social support ( $p = 0.014$ ) and WRAPI ( $p = 0.004$ ) among the younger workers, but with poorer ERI ( $p = 0.047$ ) only among the older ones. While among the younger workers WA was influenced by the intensification of various stressors, in the case of the older ones it was influenced by effort-reward imbalance only, indicating that interventions should be differentiated according to age groups.*

**Key words** *Work ability evaluation, Workload, Work environment, Working conditions, Occupational health*

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## Introduction

Issues related with functional aging became relevant starting in the 1980s as a function of the population aging, social transformations, changes in the world of work and longer stay of workers in the labor market<sup>1-6</sup>. As a result, subjects like sustained employability of aging workers, productivity at work, sustainability of social security systems and workers' health promotion stimulated studies on work ability<sup>1-6</sup>. The relevance of work ability enhancement as a health promotion strategy is particularly acknowledged in societies undergoing population aging<sup>1-3</sup>.

Work ability is understood as a worker's condition to perform his or her job as a function of the work demands, his or her state of health and physical and mental capacity<sup>1-3,7,8</sup>. Characterized by impaired work ability, functional aging results from a complex interaction among several factors, including sociodemographic aspects, state of health, values, skills and the job characteristics<sup>1-3,6,9</sup>. While increasing age was found to be a risk factor for impaired work ability, several studies detected associations between chronological and functional aging that might involve other factors<sup>3,6,10-12</sup>.

Impaired work ability is predictive of sick leaves among young workers<sup>13</sup> and of early exit from the profession among older ones<sup>14</sup>. Workers in different age ranges might be subjected to also different stressors as a function of the position they occupy in the organization's hierarchy, the activities they perform at the job and/or their strategies of coping with embarrassing situations in the workplace<sup>3,6,11</sup>. The literature emphasizes the need for priorities and differentiated modalities of intervention to promote and protect the work ability of aging workers<sup>2,3,15</sup>.

Few studies on work ability were conducted with workers from different age ranges, using a longitudinal design and targeting nursing professionals in particular. Nursing work characteristically involves exposure to stressors originated in the physical and mental loads imposed on workers, which are associated with negative outcomes, such as leaving the profession, injury and illness, absenteeism, dissatisfaction with work, poorer quality of life and impaired work ability<sup>4,6,9,16-19</sup>. Thus being, we consider important to establish whether the effect of stressors on work ability varies as a function of age.

The aim of the present study was to investigate changes in work ability among nursing professionals along two-year follow-up and to

investigate associations between work stressors and changes in work ability as a function of the participants' age.

## Method

The present was a cohort study with 2-year follow-up (2009-2011) conducted at a medium-sized, high-complexity philanthropic hospital in São Paulo, Brazil, which received a quality certification from the *Joint Commission International*.

At the onset (2009) all 613 active nursing professionals were invited to participate in the study. Workers who did not participate because they were on vacation, the ones who did not respond the questionnaire or returned it incomplete, and those who did not sign an informed consent form were considered losses. A total of 514 workers from the eligible ones (83.8%) participated in this stage of the study. Participants and non-participants did not differ as a function of sex, age, job title or work ability index at baseline ( $p = 0.77$ ). Statistically significant difference was found in their average time as nursing professional (6.3 vs. 7.9 years,  $p = 0.013$ ). Participants also differ from non-participants as the hospital sector ( $p < 0.001$ ): the adherence of participants to the study allocated to the materials and surgical units and chronic patient wards was lower. A total of 204 workers included in the initial stage did not participate at the end of follow-up in 2011, and further six workers transferred to non-nursing functions were excluded. As a result, the final sample comprised 304 participants (59.1% of the initial group of participants).

Data collection was performed by means of a self-report questionnaire. The first part of the instrument included questions on sociodemographic, lifestyle and functional characteristics, to wit: sex, age, marital status, educational level, family monthly income, child-rearing responsibility, alcohol intake, smoking, body weight and height (to calculate the body mass index), practice of physical activity, age at entering the workforce, time on the job, time as nursing professional, work shift, total weekly workload (at the hospital, other jobs and household chores), second job, workplace violence, recent history of work-related illness and work accidents. The second part of the questionnaire consisted in the version of the *Job Content Questionnaire (Job Stress Scale - JSS)* validated for Brazil<sup>20</sup>. Based on the demand-control model, JSS scales demand,

control and social support measure the strain induced by environmental psychosocial stressors at the workplace. Part three consisted in the Brazilian version of the *Effort-Reward Imbalance Questionnaire* – ERI<sup>21</sup>. ERI variables effort-reward imbalance and overcommitment are also used to assess environmental psychosocial stressors at the workplace. Part four consisted in the version of questionnaire *Work-Related Activities That May Contribute To Job-Related Pain and/or Injury* – WRAPI validated for Brazil<sup>22</sup>. WRAPI was designed to assess situations at the workplace that might be associated with musculoskeletal injury. The last part of the questionnaire consisted in the Brazilian version of the *Work Ability Index* (WAI)<sup>7,8</sup>, which was used to assess the dependent variable, namely, work ability. WAI comprises seven dimensions and its total score varies from 7 to 49. The scores of work ability were categorized into excellent, good, moderate and poor work according to the criteria formulated by Tuomi et al.<sup>7</sup> for workers aged 35 years old or older and by Kujala et al.<sup>13</sup> for workers under 35.

Descriptive analysis was performed to characterize the sample in the terms of mean, median, standard deviation (SD), minimum and maximum values in the case of the quantitative variables and of proportions for the categorical ones. Cronbach's alpha was used to assess the instruments' reliability.

The participants were classified according to age as young (< 45 years old) or aging ( $\geq$  45 years old). This cutoff point was selected on the grounds that the functional capacity begins to decrease and the incidence of aging-related health problems to increase by age 45 years old<sup>2,3,5</sup>.

To characterize changes in work ability we calculated the difference (delta) between the final (2011) and initial (2009) scores on WAI; positive values indicated improved WA and negative values poorer work ability.

As the literature does not provide parameters to assess changes in the exposure to work stressors, we developed criteria based on the scores attributed to the investigated ones. Thus greater exposure was defined as follows: (a) increase of more than 1 point on the work demand score (1 point represents 6.7% in scale score); reduction of more than 1 point (representing 5.6% in scale score) on the (b) control at work and (c) social support at work scores; (d) increase of 0.7 points or more on the ERI score (this cutoff point corresponds to the 60<sup>th</sup> percentile considering the distribution of the variable); (e) increase of more than 1 point on the overcommitment score (1

point corresponds to 5.6% of the highest possible score on a 18-point scale); and (f) increase of 15 points or more on WRAPI (corresponding to a 10% change in a 150-point scale).

The adherence of the quantitative variables to the normal distribution was assessed by means of the Kolmogorov-Smirnov test. The two groups defined per age range were compared as to WAI score, sociodemographic, lifestyle and work-related characteristics by means of the Mann-Whitney, chi-square or Fisher's exact test. The aim of these analyses was to identify the characteristics of each individual group and differences between them.

Next we investigated possible differences in exposure to stressors along follow-up between the groups by means of the chi-square test. The aim of this analysis was to establish whether the participants' perceived exposure to stressors along follow-up differed as a function of age.

Finally, we compared the changes in WAI (delta WAI) as a function of the participants' perception of changes in exposure to work stressors (worse or not worse) within each group by means of the Mann-Whitney test. The aim of this analysis was to establish whether and which changes in exposure to the various stressors influenced work ability in each group.

The significance level was set as  $p < 0.050$  in all the analyses.

The instruments' reliability was assessed at the onset of follow-up by means of Cronbach's alpha; the results were: demand = 0.64; control = 0.47; social support = 0.82; effort = 0.74; reward = 0.83; overcommitment = 0.73; WRAPI = 0.93; and WAI = 0.71.

The study was approved by the ethics committee of Samaritano Hospital (ruling no. 07/09) and School of Public Health, University of São Paulo (ruling no. 257.518) and complied with the principles of Declaration of Helsinki. Participation was voluntary, the participants signed an informed consent form and the individual results were kept confidential.

## Results

Tables 1 to 3 describe the results corresponding to the continuous and categorical variables. The participants' average age at the onset of follow-up was 35.9 (SD = 9.0) years old, being that 16.0% were 45 years old or older. Most participants were female (79.9%) and married or lived with a

partner (53.3%); the monthly family income was up to the equivalent of five times the minimum wage for 43.4% of the sample.

About 5.6% of the sample reported regular alcohol intake (2 or more days per week) and 38.2% regular practice of physical activity. About 44.1% showed obesity or overweight and the average body mass index was 25.5 (SD = 4.4).

The average age at entering the workforce was 16.7 (SD = 3.3) years old, the average time as nursing professional 11.7 (SD = 7.8) years and the average time on the job 6.8 (SD = 6.7) years. The total weekly workload (hospital, second job and household chores) was 57.9 (SD = 18.4) hours, on average. Night work was reported by 38.5% of the participants and a second job by 18.8%. Relative to the job title distribution, 32.3% were registered nurses (involved in direct patient care or management), 50.3% nursing technicians, 8.9% nursing assistants and 5.9% performed other auxiliary tasks. As concerns the hospital areas, 35.9% of the participants worked in intensive care units, 31.6% in non-critical care units, 18.8% in the emergency department, 10.9% in the surgical and materials units and 3.0% in areas not related with direct patient care. The level of workplace violence was rated low (average score 7.7 on a scale ranging from 7.0 to 21.0, SD = 1.1). About 10.5% of the participants reported a past history of work accidents and 10.2% of work-related illness.

Tables 1 to 3 show the sociodemographic, lifestyle and work-related variables that exhibited statistically significant difference between the groups: time as nursing professional ( $p < 0.001$ ), time on the job ( $p < 0.001$ ), total weekly workload ( $p < 0.001$ ), night work ( $p = 0.010$ ) and hospital area ( $p = 0.019$ ). The results were expected in the case of the first two variables just mentioned as a function of their correlation with chronological age. Relative to the remainder of the variables, the weekly workload (62.6 vs. 57.0 hours, on average), percentage of participants who performed night work (55.1% vs. 35.3%) and percentage of participants who worked at the surgical and materials units (24.5% vs. 8.2%) were higher among the older workers compared to the younger ones.

As Table 1 further shows, the average score on WAP was 46.2 (SD = 4.2) at the onset (2009) and 42.3 (SD = 5.0) at the end (2011) of follow-up. Impaired work ability (moderate or low) was found in 49 (16.1%) participants at the onset and in 65 (21.4%) at the end of follow-up. WAI did not exhibit statistically significant difference

between the groups at either onset ( $p = 0.465$ ) or end ( $p = 0.464$ ) of follow-up. Neither the changes (delta) in the WAI score (between 2009 and 2011) exhibited statistically significant difference between the groups ( $p = 0.609$ ).

Table 4 shows that the groups did not differ as to perceived changes in exposure to work stressors.

That lack of difference notwithstanding, the effects of stressors on work ability differed between the groups. Table 5 shows that for the younger workers (< 45 years old) increased perceived exposure to stress was associated with poorer work ability (higher negative delta WAI value, i.e., greater negative difference between the initial and final assessment). The variables involved were effort-reward imbalance ( $p < 0.001$ ), overcommitment ( $p < 0.001$ ), social support ( $p = 0.002$ ) and WRAPI ( $p = 0.001$ ). Among the older workers ( $\geq 45$  years old) only poorer effort-reward imbalance was associated with worsening WAI score ( $p = 0.014$ ). Neither demand nor control was associated with scores on work ability in either group.

## Discussion

The results of the present 2-year cohort study showed that work ability did not differ between the younger (< 45 years old) and older ( $\geq 45$  years old) workers at the onset of follow-up (2009). Work ability exhibited slight impairment in the course of follow-up, which was similar between the groups. Statistically significant difference was neither found in the participants' perceived exposure to work stressors at the onset and end of follow-up.

The aforementioned similarities notwithstanding, the groups differed as to the type of stressors associated with impaired work ability. Indeed, while work ability was influenced by all the investigated stressors (except for demands and control at work) in the younger group, it was associated with effort-reward imbalance only in the older one.

The physical and mental functional capacity might begin to decline at age 45 years old in association with reduction of the cardiorespiratory and musculoskeletal capacity and of the cognitive functions<sup>1-3,5,11,12</sup>. However, in the present study the work ability profile was similar between the groups. Several factors related to the individual, work environment and conditions and the macrosocial environment interfere in the relationship between chronological and functional

**Table 1.** Descriptive statistics of variables associated with Work Ability Index – WAI – and demographic, lifestyle and functional characteristics per age-range group, nursing staff, São Paulo.

Variable	n	Mean	Standard deviation	Minimum	Maximum	p <sup>(M)</sup>
WAI - 2009						
< 45 years old	255	42.7	4.1	27.0	49.0	0.465
≥ 45 years old	49	42.1	4.7	24.0	49.0	
Total	304	42.6	4.2	24.0	49.0	
WAI - 2011						
< 45 years old	255	42.4	4.9	26.0	49.0	0.464
≥ 45 years old	49	41.8	5.3	26.0	49.0	
Total	304	42.3	5.0	26.0	49.0	
Delta-WAI (2009 to 2011)*						
< 45 years old	255	-0.3	4.4	-19.0	11.0	0.609
≥ 45 years old	49	-0.3	4.2	-13.0	12.0	
Total	304	-0.3	4.4	-19.0	12.0	
Body mass index						
< 45 years old	251	25.3	4.4	17.7	46.0	0.103
≥ 45 years old	49	26.2	4.2	19.7	42.9	
Total	300	25.5	4.4	17.7	46.0	
Age at entering the workforce						
< 45 years old	248	16.7	3.2	8.0	26.0	0.847
≥ 45 years old	47	16.9	3.6	9.0	27.0	
Total	295	16.7	3.3	8.0	27.0	
Time as nursing professional						
< 45 years old	247	9.4	5.3	1.0	27.0	< 0.001
≥ 45 years old	48	23.6	7.6	5.0	37.0	
Total	295	11.7	7.8	1.0	37.0	
Length of time in the company						
< 45 years old	255	4.9	4.7	0.2	19.7	< 0.001
≥ 45 years old	49	16.7	7.2	0.7	37.4	
Total	304	6.8	6.7	0.2	37.4	
Total weekly workload						
< 45 years old	220	57.0	18.5	30.0	128.0	0.021
≥ 45 years old	39	62.6	17.3	37.0	96.0	
Total	259	57.9	18.4	30.0	128.0	
Workplace violence						
< 45 years old	242	7.7	1.1	7.0	14.0	0.090
≥ 45 years old	48	7.5	1.1	7.0	11.0	
Total	290	7.7	1.1	7.0	14.0	

M = Mann-Whitney test; \* Delta-WAI: difference in WAI score between 2009 and 2011.

**Table 2.** Descriptive statistics of quantitative variables related to work stressors per age-range group, nursing staff, São Paulo.

Variable	N	Mean	Standard deviation	Minimum	Maximum	p <sup>(M)</sup>
Work demands - 2009						
< 45 years old	252	14.1	2.2	8.0	19.0	0.646
≥ 45 years old	47	14.3	2.3	8.0	18.0	
Total	299	14.2	2.2	8.0	19.0	
Work demands - 2011						
< 45 years old	255	15.0	2.1	6.0	20.0	0.828
≥ 45 years old	49	15.0	2.1	10.0	19.0	
Total	304	15.0	2.1	6.0	20.0	
Control at work - 2009						
< 45 years old	252	17.8	1.9	11.0	24.0	0.497
≥ 45 years old	45	18.0	2.2	13.0	22.0	
Total	297	17.8	1.9	11.0	24.0	
Control at work - 2011						
< 45 years old	255	17.7	2.1	10.0	23.0	0.269
≥ 45 years old	49	18.0	1.7	13.0	22.0	
Total	304	17.8	2.1	10.0	23.0	
Social support at work - 2009						
< 45 years old	254	20.5	2.7	11.0	24.0	0.869
≥ 45 years old	47	20.4	3.0	13.0	24.0	
Total	301	20.5	2.8	11.0	24.0	
Social support at work - 2011						
< 45 years old	255	19.7	3.1	11.0	24.0	0.247
≥ 45 years old	49	20.3	2.7	14.0	24.0	
Total	304	19.8	3.0	11.0	24.0	
Effort-reward imbalance - 2009						
< 45 years old	252	0.4	0.2	0.2	1.7	0.393
≥ 45 years old	44	0.5	0.2	0.2	0.9	
Total	296	0.4	0.2	0.2	1.7	
Effort-reward imbalance - 2011						
< 45 years old	254	0.5	0.2	0.2	1.4	0.990
≥ 45 years old	49	0.5	0.4	0.2	2.3	
Total	303	0.5	0.2	0.2	2.3	
Overcommitment - 2009						
< 45 years old	254	12.2	3.1	6.0	22.0	0.501
≥ 45 years old	47	12.6	3.3	6.0	21.0	
Total	301	12.3	3.1	6.0	22.0	
Overcommitment - 2011						
< 45 years old	254	12.4	3.4	6.0	24.0	0.867
≥ 45 years old	49	12.8	4.0	6.0	22.0	
Total	303	12.5	3.5	6.0	24.0	
WRAPI - 2009						
< 45 years old	254	59.9	34.9	0.0	150.0	0.227
≥ 45 years old	43	53.7	36.8	2.0	127.0	
Total	297	59.0	35.2	0.0	150.0	
WRAPI - 2011						
< 45 years old	252	63.5	34.8	0.0	143.0	0.057
≥ 45 years old	49	53.7	35.3	0.0	141.0	
Total	301	61.9	35.0	0.0	143.0	

M = Mann-Whitney test; WRAPI – Work-Related Activities That May Contribute To Job-Related Pain and/or Injury score.

**Table 3.** Descriptive statistics of qualitative variables per age-range group, nursing staff, São Paulo.

Variable	< 45 years old (n = 255)		≥ 45 years old (n = 49)		Total (n = 340)		P
	N	%	N	%	N	%	
	Sex						
Female	202	79.2	41	83.7	243	79.9	0.475 <sup>(Q)</sup>
Male	53	20.8	8	16.3	61	20.1	
Marital status							
Married / partner	131	51.4	30	61.2	161	53.0	0.164 <sup>(Q)</sup>
Unmarried	123	48.2	18	36.7	141	46.4	
Not reported	1	0.4	1	2.0	2	0.7	
Monthly family income (times the equivalent of the minimum wage*)							
Up to 5	114	44.7	18	36.7	132	43.4	0.355 <sup>(Q)</sup>
5.1 or more	136	53.3	29	59.2	165	54.3	
Not reported	5	2.0	2	4.1	7	2.3	
Alcohol intake							
Sporadic (0 to 1 days / week)	231	90.6	47	95.9	278	91.4	0.232 <sup>(F)</sup>
Regular (2 or more days / week)	16	6.3	1	2.0	17	5.6	
Not reported	8	3.1	1	2.0	9	3.0	
Practice of physical activity (3 times/week in the past 12 months)							
Yes	93	36.5	23	46.9	116	38.2	0.169 <sup>(Q)</sup>
No	156	61.2	25	51.0	181	59.5	
Not reported	6	2.4	1	2.0	7	2.3	
Second job							
No	202	79.2	35	71.4	237	78.0	0.140 <sup>(Q)</sup>
Yes	44	17.3	13	26.5	57	18.8	
Not reported	9	3.5	1	2.0	10	3.3	
Night work							
No	158	62.0	21	42.9	179	58.9	0.010 <sup>(Q)</sup>
Yes	90	35.3	27	55.1	117	38.5	
Not reported	7	2.7	1	2.0	8	2.6	
Job title							
Registered nurse	80	31.4	18	36.7	98	32.2	0.548 <sup>(Q)</sup>
Nurse technician	135	52.9	26	53.1	161	53.0	
Nurse assistance	40	15.7	5	10.2	45	14.8	
Not reported	0	0.0	0	0.0	0	0.0	
Hospital area							
Unrelated to direct patient care	7	2.7	2	4.1	9	3.0	0.019 <sup>(Q)</sup>
Non-critical care units	83	32,5	13	26,5	96	31,6	
Intensive care units	94	36,9	15	30,6	109	35,9	
Emergency department	50	19,6	7	14,3	57	18,8	
Surgical and materials units	21	8,2	12	24,5	33	10,9	
Not reported	0	0,0	0	0,0	0	0,0	
Work accidents							
No	215	84,3	41	83,7	256	84,2	1,00 <sup>(F)</sup>
Yes	27	10,6	5	10,2	32	10,5	
Not reported	13	5,1	3	6,1	16	5,3	
Work-related illness							
No	213	83,5	42	85,7	255	83,9	0,797 <sup>(F)</sup>
Yes	27	10,6	4	8,2	31	10,2	
Not reported	15	5,9	3	6,1	18	5,9	

Q = chi-square test; F = Fisher's exact test. \* Minimum wage in December 2009 = R\$ 465.00. Note: results corresponding to baseline (2009).

**Table 4.** Perception of changes in exposure to work stressors per age-range group, nursing staff, São Paulo.

Stressor	< 45 years old (n = 255)		≥ 45 years old (n = 49)		Total (n = 304)		P <sup>(Q)</sup>
	N	%	N	%	N	%	
Work demands							
1 - Not worse (no change or improvement)	160	62.7	30	61.2	190	62.5	0.965
2 - Worse	92	36.1	17	34.7	109	35.9	
Not reported	3	1.2	2	4.1	5	1.6	
Control at work							
1 - Not worse (no change or improvement)	194	76.1	35	71.4	229	75.3	0.907
2 - Worse	58	22.7	10	20.4	68	22.4	
Not reported	3	1.2	4	8.2	7	2.3	
Social support at work							
1 - Not worse (no change or improvement)	159	62.4	35	71.4	194	63.8	0.118
2 - Worse	95	37.3	12	24.5	107	35.2	
Not reported	1	0.4	2	4.1	3	1.0	
Effort-reward imbalance							
1 - Not worse (no change or improvement)	155	60.8	26	53.1	181	59.5	0.738
2 - Worse	96	37.6	18	36.7	114	37.5	
Not reported	4	1.6	5	10.2	9	3.0	
Overcommitment							
1 - Not worse (no change or improvement)	170	66.7	31	63.3	201	66.1	0.869
2 - Worse	83	32.5	16	32.7	99	32.6	
Not reported	2	0.8	2	4.1	4	1.3	
WRAPI							
1 - Not worse (no change or improvement)	156	61.2	28	57.1	184	60.5	0.710
2 - Worse	95	37.3	15	30.6	110	36.2	
Not reported	4	1.6	6	12.2	10	3.3	

Q = chi-square test; WRAPI – Work-Related Activities That May Contribute To Job-Related Pain and/or Injury score.

aging<sup>2,3,6,11</sup>. Those mentioned relationships might be somehow mediated by enhanced knowledge and experience and better skills to work in an independent manner, in addition to the stronger ties to the job older workers tend to exhibit<sup>2,3,6,11</sup>. One additional factor that should be taken into consideration is the healthy worker effect, which consists in a process of progressive selection of workers whereby the ones who stay at the job tend to be the healthier ones<sup>23</sup>. The older workers in the present study population might have possibly been the ones who succeeded in maintaining better health conditions and coping resources along their career, for which reason they exhibited a better work ability profile than their younger colleagues.

It is worth to observe that the earlier, stronger and more frequent the exposure to intense work demands, the higher the risk of premature functional aging<sup>2,3,17</sup>. In the present study, work ability

impairment was associated with increased perceived exposure to workplace stressors in both groups. The workplace physical and psychosocial stressors are consistently identified in the literature as factors with negative effect on work ability, also among hospital workers<sup>6,9,17-19</sup>.

The participants' perceived exposure to work stressors along follow-up should be interpreted in the light of the nursing working conditions. Nursing work is characterized by demands originated by human care responsibilities, frequent contact with pain, intense physical loads, poor professional recognition/valorization, intensification in using new technologies, damaged work relations and in the specific case of registered nurses, increased demand for managerial skills<sup>6,16-19,24</sup>.

The present study evidenced a consistent impact of effort-reward imbalance on work ability among both the younger and the older workers.



**Table 5.** Descriptive statistics of delta-WAI\* and exposure to work stressors per age-range group, nursing staff, Samaritano Hospital, São Paulo, 2009-2011.

Exposure to stressors	< 45 years old						≥ 45 years old					
	N	Mean	Standard deviation	Minimum	Maximum	p **	N	Mean	Standard deviation	Minimum	Maximum	p **
<b>Work demands</b>												
1 - Not worse (no change or improvement)	160	0,0	4,2	-12,0	11,0	0,338	30	-0,6	4,7	-13,0	12,0	0,161
2 - Worse	92	-0,9	4,7	-19,0	8,0		17	0,3	3,5	-8,0	5,0	
Total	252	-0,3	4,4	-19,0	11,0		47	-0,3	4,2	-13,0	12,0	
<b>Control at work</b>												
1 - Not worse (no change or improvement)	194	0,0	4,5	-19,0	11,0	0,085	35	0,2	4,0	-8,0	12,0	0,272
2 - Worse	58	-1,2	4,0	-11,5	7,0		10	-2,3	5,0	-13,0	4,0	
Total	252	-0,3	4,4	-19,0	11,0		45	-0,4	4,3	-13,0	12,0	
<b>Social support at work</b>												
1 - Not worse (no change or improvement)	159	0,4	4,1	-12,0	9,5	0,014	35	0,0	4,3	-8,0	12,0	0,625
2 - Worse	95	-1,4	4,8	-19,0	11,0		12	-1,3	4,1	-13,0	3,0	
Total	254	-0,3	4,4	-19,0	11,0		47	-0,3	4,2	-13,0	12,0	
<b>Effort-reward imbalance</b>												
1 - Not worse (no change or improvement)	155	0,7	4,1	-12,0	11,0	0,017	26	0,8	3,5	-7,0	12,0	0,047
2 - Worse	96	-1,9	4,6	-19,0	9,5		18	-2,3	4,3	-13,0	5,0	
Total	251	-0,3	4,4	-19,0	11,0		44	-0,5	4,1	-13,0	12,0	
<b>Overcommitment</b>												
1 - Not worse (no change or improvement)	170	0,4	3,7	-11,0	11,0	0,002	31	0,5	4,1	-8,0	12,0	0,114
2 - Worse	83	-1,9	5,3	-19,0	10,0		16	-1,9	3,9	-13,0	5,0	
Total	253	-0,3	4,4	-19,0	11,0		47	-0,3	4,1	-13,0	12,0	
<b>WRAPI</b>												
1 - Not worse (no change or improvement)	156	0,4	4,2	-18,0	11,0	0,004	28	-0,1	4,3	-8,0	12,0	0,370
2 - Worse	95	-1,5	4,6	-19,0	8,0		15	-0,8	4,3	-13,0	5,0	
Total	251	-0,3	4,4	-19,0	11,0		43	-0,3	4,3	-13,0	12,0	

\* delta-WAI: difference in Work Ability Index score between 2009 and 2011; \*\* Mann-Whitney test; WRAPI – Work-Related Activities That May Contribute To Job-Related Pain and/or Injury score.

This finding might be accounted for by some aspects of the social and organizational context of work relative to the effort workers actually make and the reward they obtain, such as financial re-

ward, professional recognition, career opportunities and long-term job stability<sup>9,14,17</sup>. One study conducted in Brazil with nursing professionals that assessed several stressors found that ef-

fort-reward imbalance was the most relevant by far, particularly among the registered nurses<sup>16</sup>. In the “*Next-Study*” (*Nurses Early Exit*), which included nursing professionals from 10 European countries, effort-reward imbalance behaved as a strong predictor of job strain and was associated with poorer work ability in all age ranges and analyzed countries. In addition, it was a frequent reason for nurses to consider leaving the profession and early retirement<sup>9</sup>.

In addition to effort-reward imbalance, the younger workers in the present study also reported higher perceived exposure to the following stressors that impaired work ability: overcommitment, social support and activities likely to cause pain or injury. According to some evidences WAI reflects better the changes in work ability relative to tasks that pose strong physical demands compared to the predominantly mental activities<sup>1</sup>. Older workers tend to be in a career stage characterized by a shift from predominantly physical to predominantly mental activities and have resources to more effective strategies to cope with workplace stressors. These two factors might account for the lower frequency of associations between the investigated stressors and work ability among the older workers in the present study.

Overcommitted workers might underestimate the demands and overestimate their coping ability, which increases their susceptibility to exhaustion<sup>25</sup>. This fact explains the impairment in work ability found in the group of younger workers.

Social support alludes to the mutual assistance and interaction among peers and superiors and has a moderating effect on workplace psychosocial stressors and their deleterious consequences; in addition it is also associated with the state of health and well-being of workers<sup>26</sup>. The “*NEXT-Study*” found that social support significantly contributed to retain nursing professionals with impaired work ability in the workplace<sup>9</sup>.

The impact of poorer WRAPI (work-related activities that might contribute to job-related pain and/or injury) on work ability evidenced the role played by the physical workload. The nursing working conditions are frequently associated with occurrence of musculoskeletal disorders resulting from inadequate transport and moving of patients, use of inappropriate equipment and furniture and biomechanically inadequate movements and postures<sup>6,17-19,24</sup>.

One study conducted in Brazil found that both demand and control were less relevant for

nursing professionals when assessed together with other psychosocial stressors<sup>16</sup>. In the present study neither demand nor control had negative effect on work ability. Relative to demand, this finding might be explained by the high prevalence of perceived strong demands, which might have made the sample homogeneous, with consequent loss of this variable’s effect. In turn, the lack of association between control at work and work ability might have been due to the scale’s structure: comprising six items only, it exhibits limitations in the capture of the evaluated construct. On reliability analysis, this scale exhibited low internal consistency ( $\alpha = 0.47$ ) as also other studies found<sup>10,20</sup>.

The response rate was 83.8% at the onset of the study, which is above the minimum appropriate value, 75%<sup>27</sup>. There was statistically significant difference in the length of time in the company and hospital area between participants and non-participants in this stage of the study. About 59.1% of the workers remained until the end of follow-up. The internal validity of the present study might be rated acceptable, while the external validity might be considered acceptable for hospitals with similar demographic characteristics and work organization and conditions.

The high rate of participation at the onset of the study notwithstanding, the aforementioned healthy worker effect might have been present causing disparity between the proportions of participants at the onset and end of follow-up. In that case, the relationships between work stressors and work ability might have been underestimated. As one further limitation, the difference in the number of participants in each group might have contributed to reduce the statistical power of the analyses in the group of older workers, to wit, this is to say, 225 younger workers ( $\leq 45$  years old) and only 49 older workers ( $\geq 45$  years old).

Work ability provides the grounds for the workers’ health, well-being and employability; the relevance of the mentioned issues is increasing within the world of work, more particularly among societies characterized by demographic aging<sup>2-4</sup>. Also employability is currently becoming an important issue as concerns the prevention of discrimination against aging nursing professionals<sup>28</sup>. The longitudinal design of the present study allowed us to establish causal relationships which showed that work stressors do affect the work ability of nursing professionals, although the various analyzed stressors had different effects on the participants as a function of their age.

The findings of the present study have implications for institutional and social policies targeting health promotion in the workplace, as they point to the importance of actions to control stressors derived from the work organization and conditions. The literature reports positive cost-benefit outcomes of interventions to control stress at work and highlights the relevance of continued actions to achieve long-term satisfactory results<sup>29,30</sup>.

There is not yet sufficient data on the performance of aging workers, and more particularly in the case of jobs with high demands<sup>4,31</sup>. Thus being, further longitudinal studies are needed to assess the progression of work ability impairment, provide functional aging estimates and assess interventions at work.

## Conclusions

The results of the present study revealed association between higher perceived exposure to work stressors and impaired work ability along follow-up. The impact of stressors on work ability differed as a function of the workers' age. While work ability was influenced by several of the analyzed stressors in the younger group (poorer social support, increased effort-reward imbalance, increased overcommitment and higher frequency of situations likely to cause pain/injury) only increased effort-reward imbalance had negative effect on work ability among the older workers.

These findings point to the need to develop preventive and corrective actions to enhance work ability; such actions should be adjusted and planned for workers in different age groups.

## Collaborations

MC Martinez, MRDO Latorre e FM Fischer participated equally in all stages of preparation of the article.

## References

1. Tuomi K, Ilmarinen J, Martikainen R. Aging, work, life-style and work ability among Finnish municipal workers in 1981-1992. *Scand J Work Environ Health* 1997; 23(Supl. 1):58-65.
2. Ilmarinen J. Maintaining work ability. In: *Towards a longer worklife! Ageing and the quality of worklife in the European Union*. Helsinki: Finnish Institute of Occupational Health; 2006. p.132-148.
3. Ilmarinen J. *Promoting active ageing in the workplace*. Bilbao: European Agency for Safety and Health at Work; 2012.
4. Cloostermans L, Bekkers MB, Uiters E, Proper K. The effectiveness of interventions for ageing workers on (early) retirement, work ability and productivity: a systematic review. *Int Arch Occup Environ Health* 2015; 88(5):521-532.
5. Ilmarinen J. Aging and work. *Occup Environ Med*. 2001; 58:546-551.
6. Martinez MC, Latorre MRDDO, Fischer FM. A cohort study of psychosocial work stressors on work ability among Brazilian hospital workers. *Am J Ind Med* 2015; 58(7):795-806.
7. Tuomi K, Ilmarinen J, Jahkola A, Katajarinne L, Tulkki A. *Índice de capacidade para o trabalho*. São Carlos: EduFSCar; 2005.
8. Martinez MC, Latorre MRDO, Fischer FM. Validity and reliability of the Brazilian version of the Work Ability Index questionnaire. *Rev Saude Publica* 2009; 43(3):55-61.
9. Hasselhorn HM, Conway PM, Widerszal-Bazyl M, Simon M, Tackenberg P, Schmidt S, Camerino D, Müller BH, NEXT-Study Group. Contribution of job strain to nurses' consideration of leaving the profession—results from the longitudinal European nurses'early exit study. *Scand J Work Environ Health*; 2008; 6(Supl.):75-82.
10. Fischer FM, Martinez MC. Work ability among hospital food service professionals: multiple associated variables require comprehensive intervention. *Work* 2012; 41(Supl. 1):3746-3752.
11. Ilmarinen J, Tuomi K, Klockars M. Changes in the work ability of active employees over an 11-year period. *Scand J Work Environ Health* 1997; 17(Supl. 1):49-57.
12. Seitsamo J, Klockars M. Ageing and changes in health. *Scand J Work Environ Health* 1997; 23(Supl. 1):27-35.
13. Kujala V, Remes J, Laitinen J. Regional differences in the prevalence of decreased work ability among young employees in Finland. *Int J Circumpolar Health* 2005; 65(2):169-177.
14. Camerino D, Conway PM, Van Der Hei Jden BIJM, Estryn-Behar M, Consonni D, Gould D, Hasselhorn HM & The Next-Study Group. Low-perceived work ability, ageing and intention to leave nursing: a comparison among 10 European countries *J Adv Nursing* 2006; 56(5):542-552.
15. Ilmarinen J. 30 years' work ability and 20 years age management. In: *Age Management During the Life Course Proceedings of the 4th Symposium on Work Ability*. Tampere: University Press; 2011. p.12-22.
16. Silva AA, Souza JMP, Borges FNS, Fischer FM. Health-related quality of life and working conditions among nursing providers. *Rev Saude Publica* 2010; 44(4):718-725.
17. Fischer FM, Martinez MC. Individual features, working conditions and work injuries are associated with work ability among nursing professionals. *Work* 2013; 45(4):509-517.
18. Silva FJ, Felli VEA, Martinez MC, Mininel VA. A fadiga em trabalhadores de enfermagem, o presenteísmo e a (in)capacidade para o trabalho. In: Felli VEA, Baptista PCP, organizadoras. *Saúde do trabalhador de enfermagem*. Barueri: Manole; 2015. p. 289-304.
19. Lindegård A, Larsman P, Hadzibajramovic E, Ahlberg Junior G. The influence of perceived stress and musculoskeletal pain on work performance and work ability in Swedish health care workers. *Int Arch Occup Environ Health* 2014; 87(4):373-379.
20. Alves MGM, Chor D, Faerstein E, Lopes CS, Wenerck GL Versão resumida da "job stress scale": adaptação para o português. *Rev Saude Publica* 2004; 38(2):164-171.
21. Chor D, Werneck GL, Faerstein E, Alves MGM, Rotenberg L. The Brazilian version of the effort-reward imbalance questionnaire to assess job stress. *Cad Saude Publica* 2008; 24(1):219-224.
22. Coluci MZO, Alexandre NMC Adaptação cultural de instrumento que avalia atividades do trabalho e sua relação com sintomas osteomusculares. *Acta Paul Enferm* 2009; 22(2):149-154.
23. Weed DL. Historical roots of the healthy worker effect. *Occup Med* 1986; 28(5):343-347.
24. Magnago TSBS, Lisboa MTL, Griep RH, Kirchoho ALC, Camponogara S, Nonnenmacher CQ, Vieira LB Condições de trabalho, características sociodemográficas e distúrbios musculoesqueléticos em trabalhadores de Enfermagem. *Acta Paul Enferm* 2010; 23(2):187-193.
25. Siegrist J. Effort-reward imbalance and health in a globalized economy. *Scand J Work Environ Health* 2008; 6(Supl.):163-168.
26. Sargent LD, Terry DJ. The moderating role of social support in Karasek's job strain model. *Work Stress* 2000; 14(3):245-261.
27. Fowler Junior FJ. Nonresponse: implementing a sample design. In: Fowler Junior FJ. *Survey research methods*. New Castle: Sage Publications; 1990. p. 45-60.
28. Cotrim T, Simões A, Silva C. Age and Work Ability among Portuguese Nurses. In: *Age Management During the Life Course Proceedings of the 4th Symposium on Work Ability*. Tampere: University Press; 2011. p. 117-125.
29. Addley K, Boyd S, Kerr R, McQuillan P, Houdmont J, McCrory M. The impact of two workplace-based health risk appraisal interventions on employee life-style parameters, mental health and work ability: results of a randomized controlled trial. *Health Educ Res* 2014; 29(2):247-258.
30. Lamontagne AD, Keegel T, Louie A, Ostry A, Landsbergis PA. A systematic review of the job-stress intervention: evaluation literature, 1990-2005. *Int J Occup Environ Health*. 2007; 13(3):268-280.
31. Sluiter JK. High-demand jobs: Age-related diversity in work ability? *Appl Ergon* 2006; 37(4):429-440.

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