

# Work Ability of Workers in Different Age Groups in a Public Health Institution in Brazil

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**Objectives.** The aim of this study was to determine the associations between demographics, work, lifestyle, housework, and the work ability of workers. **Methods.** Employees between the ages of 20 and 69 (N = 651), employed at a Brazilian public institution, responded to a questionnaire on demographics, work, lifestyle characteristics, and work ability. **Results.** Work ability decreased significantly with age among the women. The younger group had higher scores on the work ability index than the older age groups, except for mental resources. The logistic regression analysis showed that higher age, lower education, and long work history at the institution were significantly associated with reduced work ability. **Conclusions.** The progressive aging, the low level of education, and the long duration work in the studied institution were related to a reduction in work ability, which increases the risk of work disability or early retirement.

aging workers    work ability index    cross-sectional study

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## 1. INTRODUCTION

The population of most developed countries is aging as a result of several factors, especially the large baby boom that occurred after the Second World War. In Brazil the aging process has been accelerated by a sharp decline in fertility [1]. For example, the same decrease (58%) in fertility rate that occurred in England over a period of 100 years took only 30 years in Brazil, from 1970 to 2000.

The changes in the age structure of the population can be seen as an increase in the oldest age groups. The consequences of these changes are apparent in the increase of social demands and health care. On the other hand, the Brazilian government has focused on the monetary aspects related to the social security system, as well as on retirement legislation, in order to keep employees at work for a longer time. At the end of 2003 changes in retirement legislation were passed

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with respect to the public sector. The changes set the minimum age for retirement at 55 years for women and 60 years for men if other conditions (e.g., the number of years contributed to the social security system) have been fulfilled.

Data from the European Union [2] show that, at the age of 55 to 59, the rate of participation in the labor force is around 50%. This low rate indicates a need for policies and programs to preserve, promote, and improve the work ability of the population to keep people working until retirement age. On the other hand, the aging process reflects life and work conditions, and, in the developing countries, these conditions may be more hazardous than in developed countries [3].

Although life expectancy is increasing in Brazil, the difficult life and work conditions lead to different levels of disabilities and diseases during worklife. In addition, globalization has caused major changes in the economics of all countries, and its effects on the labor market of developing countries can be stronger than in developed ones due to the fragile economies, which are reflected in the work and life conditions.

Other important aspects to consider are the large size of Brazil and the great differences in the economic, social, and health indicators of the different regions. Certainly the aging of the labor force may not be the most pressing question to be dealt with today through policies and investments, but it will become more acute as the mean age of the population increases remarkably during the next 30 years [4].

The composition of the Brazilian population in 2001–2002 showed that the 40–59 age group comprised 19.8% of the total population. According to the definition of aging workers [5], 45 years is the age at which measures to promote work ability should be adopted. On the other hand, in developing countries this age should be lower for preventive measures, to around 30–35 years [6].

There are 5 million government employees with permanent jobs in Brazil. These workers generally stay in the same job until retirement, and their work ability needs immediate attention. This aging question is less acute in the private sector, where young workers dominate.

In Finland, older age groups have increased in the working population, factors related to their work ability have been identified, and programs have been put into operation to preserve their work ability [7, 8, 9]. The Finnish experience was used in creating an aging and work orientation matrix [10]. The matrix emphasizes the key role of the company or organization in solving the problems related to workforce aging.

The objective of our study was to determine the associations of the demographics, work, lifestyle, and housework with work ability by age group and to identify the risk factors of reduced work ability during aging among employees in a public health institution in Brazil.

## 2. STUDY POPULATION AND METHODS

This study used a cross-sectional design with a questionnaire survey and the determination of a work ability index (WAI) [7, 8]. It covered all workers in a public health institution in Brazil. They answered a questionnaire covering sociodemographics characteristics (i.e., age, gender, marital status, and education). In addition, a personal job description was requested covering occupation, work activities, chief or leadership position, work in other jobs, and time of work at the institution. The life style characteristics were identified through the collection of personal attributes regarding weight and height, housework, physical activity, leisure activity, and smoking habits. The body mass index (BMI) was classified into three categories: normal ( $\leq 24.9$ ), overweight (25–29.9) and obese ( $\geq 30$ ). The WAI was evaluated according to its seven items, namely, the current work ability compared with the best in life, work ability in relation to job demands, the number of current diseases diagnosed by a physician, estimated work impairment due to diseases, the occurrence of sick leave during the past 12 months, the person's own prognosis of work ability 2 years later, and a personal evaluation of his or her mental resources. The prescribed score of the WAI was then calculated [7, 8] and classified into the following four categories: poor (7–27 points), moderate (28–36 points), good (37–43 points),

and excellent (44–49 points). The response rate was 89.5%, comprising 651 workers from 29 occupations.

The mean age of the workers was 43.1 (*SD* 10.6) years for the women and 49.0 (*SD* 10.7) years for the men. The women comprised 63.7% of the study population. Table 1 shows the demographics, work, and lifestyle characteristics of the participants by age group. The distribution of the participants by gender and age group showed that the women were younger than the men (80.7% of the 20- to 34-year age group, decreasing in each age group to 46.6% of the

oldest group); among the men, this trend was the opposite. The older workers had less education, most of the workers (56.4%) in the 55- to 69-year age group having 4 years of education. In the younger age groups, the length of education was more commonly >11 years (88.2%). In relation to marital status, the most frequent category was married; the youngest group had a large proportion of single persons.

A descriptive data analysis was carried out comprising means, standard deviations, the chi-square test for association, and an analysis of variance using EPI Info™ version 6.04d<sup>1</sup>. A

**TABLE 1. Demographic, Work and Life Style Characteristics and Age Group of the Subjects**

Variable	Category	Age Group								P-Value
		20–34		35–44		45–54		55–69		
		N	%	N	%	N	%	N	%	
Gender	Female	96	80.7	122	70.9	135	59.5	62	46.6	
	Male	23	19.3	50	29.1	92	40.5	71	53.4	
	Total	119	100	172	100	227	100	133	100	
Education <sup>1</sup>	None at all	—	—	—	—	4	1.7	21	15.8	
	4 years	4	3.4	20	11.6	64	28.2	75	56.4	
	8 years	10	8.4	25	14.6	47	20.7	16	12.0	
	11 years	73	61.3	94	54.6	84	37.0	16	12.0	
	University	32	26.9	33	19.2	28	12.4	5	3.8	
	Total	119	100	172	100	227	100	133	100	
Marital status	Single	49	41.2	25	14.6	18	7.9	7	5.2	
	Married	59	49.6	121	70.3	173	76.2	102	76.7	
	Divorced/widowed	11	9.2	26	15.1	36	15.9	24	18.1	
	Total	119	100	172	100	227	100	133	100	
Work demand	Physical	6	5.0	36	21.0	96	42.3	82	61.7	
	Mental	33	27.7	41	23.8	35	15.4	15	11.3	
	Physical/mental	80	67.3	95	55.2	96	42.3	36	27.0	
	Total	119	100	172	100	227	100	133	100	
Leadership	Yes	9	7.6	9	5.2	9	4.0	2	1.5	
	No	110	92.4	163	94.8	218	96.0	131	98.5	
	Total	119	100	172	100	227	100	133	100	
Other job	Yes	40	33.6	54	31.4	66	29.1	24	18.0	
	No	79	66.4	118	68.6	161	70.9	109	82.0	
	Total	119	100	172	100	227	100	133	100	
Time of work at institution <sup>1</sup>	Under 1 year	50	42.0	28	16.3	14	6.2	1	0.7	
	2–10 years	67	56.3	78	45.3	41	18.0	5	3.8	
	11–20 years	2	1.7	50	29.1	71	31.3	38	28.6	
	21–30 years	—	—	15	8.7	96	42.3	69	51.9	
	31–50 years	—	—	1	0.6	5	2.2	20	15.0	
	Total	119	100	172	100	227	100	133	100	

<sup>1</sup> <http://www.cdc.gov/EpiInfo/Epi6/ci6.htm>

Table 1. (continued)

Variable	Category	Age Group								P-Value
		20–34		35–44		45–54		55–69		
		N	%	N	%	N	%	N	%	
Occupation <sup>1</sup>	Auxiliary nursing	73	92.4	87	67.0	74	41.3	16	15.0	
	Auxiliary service	4	5.1	32	24.6	74	41.3	59	55.1	
	Auxiliary maintenance	2	2.5	6	4.6	16	9.0	21	19.6	
	Attendant <sup>1</sup>	—	—	5	3.8	15	8.4	11	10.3	
	Total	79	100	130	100	179	100	107	100	.0000
Household activities	Yes	89	74.8	155	90.1	187	82.4	107	80.4	
	No	30	25.2	17	9.9	40	17.6	26	19.6	
	Total	119	100	172	100	227	100	133	100	
Physical activities	Yes	65	54.6	86	50.0	93	41.0	46	34.6	
	No	54	45.4	86	50.0	134	59.0	87	65.4	
	Total	119	100	172	100	227	100	133	100	
Leisure activities	Yes	119	100	169	98.3	216	95.2	119	89.5	
	No	—	—	3	1.7	11	4.8	14	10.5	
	Total	119	100	172	100	227	100	133	100	
Smoking habits	Yes	41	34.4	75	43.6	113	49.8	69	51.9	
	No	78	65.6	97	56.4	114	50.2	64	48.1	
	Total	119	100	172	100	227	100	133	100	
Body mass index <sup>2</sup>	Normal	88	73.9	82	48.5	100	46.7	57	45.2	
	Overweight	22	18.5	66	39.1	84	39.3	51	40.5	
	Obesity	9	7.6	21	12.4	30	14.0	18	14.3	
	Total	119	100	169	100	214	100	126	100	

Notes. 1—the 20–34 and 35–44 age groups were grouped for the chi-square test. 2—missing data: 3 in the 35–44 age group, 13 in the 45–54 age group, and 7 in the 55–69 age groups. The cut points of the categories were respectively 24.9, 25, and 29.9, 30.

logistic regression analysis was carried out using SAS version 6<sup>2</sup> with total points of the WAI as the dependent variable. For this procedure, the crude score of the WAI was transformed to a dichotomous variable using the cutpoint of 36.5 to divide the categories into poor–moderate and good–excellent groups in the search for risk factors of reduced work ability. The independent variables were age group, gender, education, duration of work at the institution, BMI, housework, amount of physical activity, and duration of smoking in years. The selection of these variables was based on their significance in the chi-square test or in the analysis of variance. The work variables did not include work demand because it was covered by item 2 of the WAI (work ability in relation to work demands). Data

on chief or leadership position was excluded, since only 4.4% of the participants held such a position. The duration of smoking in years had been added to the model to investigate the possible association with reduced work ability.

### 3. RESULTS

In the youngest group, the mixed work demand category physical and mental was the most frequent. The results for the 35- to 44-year-old group were similar, except that 21% belonged to the category physical. Physical and mixed (physical and mental) demands dominated in the 45- to 54-year-old group. In the oldest group, 61.7% of the employees held jobs with physical

<sup>2</sup> SAS Institute, Cary, NC, USA

demands. Only a few persons had a leadership position, and their number slightly decreased as age increased. In the youngest group, over one third also had another job, and this proportion decreased with age, reaching 18% in the oldest group. The duration of work at the institution increased with age, and 66.9% of the oldest group had worked there for more than 20 years. The most frequent occupation was auxiliary nursing in the 20- to 34- and 35- to 44-year-old groups. Auxiliary nursing and auxiliary service work were more frequent among the workers aged 45–54 years, and in the oldest age group auxiliary service dominated.

Housework was more frequent in the 35- to 44-year-old group, followed by the 45- to 54-year-old group, and the oldest age group. Physical activity was reported by at least 50% of the workers aged 20–34 and 35–44 years. The proportion decreased with age, but 34.6% of the workers over 54 years were still active. All the workers in the 20- to 34-year-old group reported having leisure activities. With age, these activities decreased slightly. Smoking was more frequent among the oldest groups. It decreased gradually with a decrease in age, to about 34% among the

to the physical demands of the work), item 3 (the number of current diseases diagnosed by a physician), and item 6 (own prognosis of work ability in 2 years' time). For the items concerning mental resources, the older workers had better scores than the younger ones.

The analysis between the demographics and the work ability categories (Table 4) showed that the categories poor and moderate increased with age. The category excellent decreased with age, comprising over half of the youngest age group and at least one third of all the other age groups. The percentage of workers in the category good was similar in all the age groups, except the oldest. In relation to gender, the women were more prone to be in the poor and good categories, and more men were rated as having moderate or excellent work ability, but the differences were not significant. In relation to education, the category not at all comprised the largest proportion of the poor, moderate and excellent categories. Workers with education of 4 years or more were distributed more or less evenly among the work ability categories, and at least two thirds of these workers had either a good or excellent work ability rating. However, the group

**TABLE 2. Mean Work Ability Index (WAI) and Standard Deviation by Age Group and Gender of the Participants. Variance Analysis**

Gender	Mean WAI								P-Value
	20–34 n = 119		35–44 n = 172		45–54 n = 227		55–69 n = 133		
	%	SD	%	SD	%	SD	%	SD	
Female	42.9	4.1	40.5	5.5	40.0	5.9	38.4	6.5	.0000
Male	43.6	3.9	42.9	4.7	41.3	5.1	40.0	6.2	ns

youngest group. In relation to BMI, 73.9% of those 20–34 years of age were in the category normal. In the other age groups, the percentage of workers in this category was over 45%. Obesity was a characteristic of 7.6% of the youngest age group, and it increased with the age, reaching 14.3% in the oldest group.

The mean WAI (Table 2) varied more among the women than among the men. The analysis of the work ability items by age group (Table 3) showed better performance for the youngest age group for item 2 (work ability in relation

**TABLE 3. Work Ability Index (WAI) Items by Age Group and Chi-Square Test**

WAI Items	P-Value	Young/Older
Item 2. Work ability in relation to the physical demands of the work	.0003	Y>O
Item 3. Number of current diseases diagnosed by a physician	.0001	Y>O
Item 6. Own prognosis of work ability 2 years from now	.0000	Y>O
Item 7a. Enjoying daily tasks	.0128	Y<O
Item 7b. Active and alert	.0219	Y<O

TABLE 4. Demographic Characteristics and Work Ability Index (WAI) Class

Variable	Category	WAI Class										P-Value
		Poor		Moderate		Good		Excellent		Total		
		N	%	N	%	N	%	N	%	N	%	
Age group <sup>1</sup>	20–34	1	0.8	4	3.4	51	42.8	63	53.7	119	100	.0004
	35–44	3	1.7	28	16.3	74	43.0	67	39.0	172	100	
	45–54	5	2.2	45	19.8	95	41.9	82	36.1	227	100	
	55–69	8	6.0	31	23.3	50	37.6	44	33.1	133	100	
Gender <sup>1</sup>	Female	14	3.3	68	16.4	180	43.4	153	36.9	415	100	ns
	Male	3	1.3	40	17.0	90	38.1	103	43.6	236	100	
Education <sup>1</sup>	None at all	3	12.0	7	28.0	4	16.0	11	44.0	25	100	
	4 years	6	3.7	35	21.5	62	38.0	60	36.8	163	100	
	8 years	5	5.1	21	21.5	36	36.7	36	36.7	98	100	
	11 years	3	1.2	37	13.8	121	45.3	106	39.7	267	100	
	University	—	—	8	8.2	47	48.0	43	43.8	98	100	
Marital status	Single	1	1.0	13	13.1	39	39.4	46	46.5	99	100	
	Married	13	2.8	81	17.8	188	41.3	173	38.1	455	100	
	Divorced/widowed	3	3.1	14	14.4	43	44.3	37	38.2	97	100	

Notes. 1—the poor and moderate WAI categories were grouped for the chi-square test.

with a university-level education had no workers in the poor category. The differences between the level of education and work ability were highly significant. In relation to marital status, poor and good work ability was slightly more common among those divorced or widowed. The category moderate was more frequent among the married

workers, and the excellent category dominated among the single workers.

The work demand category physical was most common among the workers with poor or moderate work ability (Table 5). Mental work was associated with a good work ability rating. Mixed work (physical and mental) had the same

TABLE 5. Work Characteristics and Work Ability Index (WAI) Class

Variable	Category	WAI class										P-Value
		Poor		Moderate		Good		Excellent		Total		
		N	%	N	%	N	%	N	%	N	%	
Work demand	Physical	10	4.5	56	25.5	75	34.1	79	35.9	220	100	.0225
	Mental	2	1.6	11	8.8	64	51.6	47	38.0	124	100	
	Physical/mental	5	1.7	41	13.3	131	42.7	130	42.3	307	100	
Leadership <sup>1</sup>	Yes	—	—	2	6.9	13	44.8	14	48.3	29	100	.0250
	No	17	2.7	106	17.1	257	41.3	242	38.9	622	100	
Other job	Yes	2	1.1	25	13.6	70	38.0	87	47.3	184	100	ns
	No	15	3.2	83	17.8	200	42.8	169	36.2	467	100	
Time of work at institution <sup>1</sup>	Under 1 year	—	—	2	2.2	31	33.3	60	64.5	93	100	.0000
	2–10 years	3	1.6	26	13.6	90	47.1	72	37.7	191	100	
	11–20 years	3	1.9	28	17.4	73	45.3	57	35.4	161	100	
	21–30 years	10	5.6	49	27.2	63	35.0	58	32.2	180	100	
	31–50 years	1	3.9	3	11.5	13	50.0	9	34.6	26	100	
Most frequent occupations <sup>1</sup>	Auxiliary nursing	5	2.0	31	12.4	112	44.8	102	40.8	250	100	.0063
	Auxiliary service	10	5.9	37	21.9	64	37.8	58	34.4	169	100	
	Auxiliary maintenance	1	2.2	17	37.8	12	26.7	15	33.3	45	100	
	Attendant	—	—	9	29.0	11	35.5	11	35.5	31	100	

Notes. 1—the poor and moderate WAI categories were grouped for the chi-square test.

TABLE 6. Life Style and Household Activities and Work Ability Index (WAI) Class

Variable	Category	WAI Class										P-Value
		Poor		Moderate		Good		Excellent		Total		
		N	%	N	%	N	%	N	%	N	%	
Body mass index <sup>1</sup>	Normal	7	2.1	45	13.8	140	42.8	135	41.3	327	100	.0120
	Overweight	2	0.9	39	17.4	88	39.6	94	42.1	223	100	
	Obese	7	8.9	18	23.1	34	43.6	19	24.4	78	100	
Smoking habits	Yes	9	3.0	53	17.8	121	40.6	115	38.6	298	100	ns
	No	8	2.2	55	15.6	149	42.2	141	40.0	353	100	
Household activities	Yes	16	3.0	96	17.8	225	41.8	201	37.4	538	100	ns
	No	1	1.0	12	10.6	45	39.8	55	48.6	113	100	
Physical activities	Yes	5	1.7	38	13.1	119	41.0	128	44.1	290	100	ns
	No	12	3.3	70	19.4	151	41.8	128	35.5	361	100	
Leisure activities	Yes	16	2.6	100	16.0	262	42.1	245	39.3	623	100	ns
	No	1	3.6	8	28.6	8	28.6	11	39.2	28	100	

Notes. 1—the poor and moderate WAI categories were grouped for the chi-square test.

proportion of workers in the categories good and excellent. A chief or leadership position was not frequent in the studied population, but those in leadership positions more commonly had excellent or good work ability. Workers with other jobs often had an excellent work ability rating. The analysis of the years of work at the institution showed an increase in the proportion of workers with poor or moderate work ability until 30 years of service, after which a decrease occurred. In the work ability category good, the highest prevalence was found for the longest service group (50%). In the category excellent, newcomers dominated (64.5%), but in all the other service categories about one third of the workers had an excellent work ability rating. The occupation auxiliary nursing predominated in the work ability categories of good and excellent. Auxiliary service accounted for 21.9% of the workers in the category moderate and for 5.9% of those with a poor rating. Auxiliary maintenance jobs were more common in the moderate category than the other occupational groups (37.8%). There were no attendants in the poor category, but they comprised 29% of the moderate category.

The analysis of lifestyle and housework and work ability (Table 6) showed that, in relation to BMI, obesity was the most prominent among those with poor (8.9%) or moderate (23.1%) work ability and the least prominent among those

with excellent (24.4%) work ability. There were no clear differences in smoking habits between the work ability categories. Those who did housework were somewhat more common in the moderate work ability category and somewhat less common in the excellent category than those who did not do housework. Workers who had no physical activity were somewhat more frequent in the poor and moderate work ability categories than the physically active workers were. On the other hand, in the excellent work ability category more workers participated in physical activities, but the differences were not significant. The workers who did not report leisure activities more often had poor or moderate work ability.

Table 7 summarizes the univariate analysis of the factors that affected work ability in this study, namely, age group, level of education, duration of work at the institution, participation in physical activities, housework, and BMI. The findings for the variables physical activities and the duration of smoking were not significant however. The multiple logistic regression analysis showed significant associations in the model between a reduced WAI (<36.5), age group, level of education, and duration of work at the institution.

**TABLE 7. Single Effects of Demographics, Life-Style and Work Variables (ANOVA), and Work Ability Index (WAI). The Association With a Low WAI (<36.5 points), Logistic Regression Model ( $n = 651$ ), Odds Ratio (OR), and 95% Confidence Intervals (95%CI)**

Variable	Univariate Analysis	Logistic Regression Model	
	P-value	OR	95%CI
Age group	.0000	1.9**	1.18–3.18
Gender	.1347	1.3	0.90–2.12
Education	.0133	1.2*	1.01–1.55
Time of work at institution	.0000	1.2**	1.09–1.52
Physical activities	.0014	<i>ns</i>	
Household activities	.0012	<i>ns</i>	
Body mass index	.0030	<i>ns</i>	

Notes. \* $P < .05$ , \*\* $P < .01$ .

#### 4. DISCUSSION

This report presents results concerning the work ability of workers of a wide age range, several years of work in the same Brazilian institution, with mainly unqualified jobs, and mixed (physical and mental) or physical work demands.

In relation to the demographic, work, and lifestyle characteristics by age group, the predominance of the women was characteristic of the health sector, and the marital status distribution reflected the wide age distribution. The high mean age of both the men and the women and the number of workers 45 years of age and over was related to the greater stability of government jobs, relative to that in the private sector. The lower level of education in the older age groups was related to the type of work, which primarily comprised several unqualified occupations, the consequence being the proportion of workers in occupations with predominantly physical work demands increasing with age and the oldest group having the largest proportion of persons in physical jobs. The level of general education necessary to have a job at the institution included in the study increased also for unqualified jobs, following the trends of globalization in the Brazilian labor market.

The long careers of most of the workers at the institution were due to the stability of the jobs. The proportion of workers that also held another job decreased with age, although almost one fifth of the oldest group also held another job. The large number of workers in all the age

groups that had an extra job suggests that, in developing countries, the workload needed to reach a basic level of quality of life can be greater than in developed countries. Among the four most frequent occupations in this study, only one required a vocational education, auxiliary nursing. All the others did not.

Housework was reported by at least three quarters of both the men and the women in all the age groups. The physical activity in the studied population was more frequent in all the age groups when compared with the results of a wide Brazilian study [11]; this finding suggests that workers in this public health institution had adopted strategies to maintain their work ability. In relation to smoking habits, the prevalence of smoking in this study in all the age groups was higher than the estimated prevalence of the Brazilian population [12]. Being overweight was, however, less common in the 25- to 34-year-old group, but more common in all the other age groups in this study than in a population-based Brazilian study [13]. In the youngest age group, the prevalence of obesity was similar to that of an earlier Brazilian study, and it was smaller in the other age groups than in the corresponding age groups [14].

The analysis of variance of the work ability classes by gender and age group showed that the women's mean WAI decreased more with age than the men's did, although the women were younger than the men. Other studies carried out with the WAI in Brazil identified the same trend [15, 16]. In Finland, the mean WAI, by gender



in the same age groups and type of work, was similar [7, 8]. The analysis of items of the WAI indicated higher values for the younger workers on some items, but, for the items related to mental resources, the opposite was true, a finding also similar to an earlier one in another Brazilian study [15].

For the work ability items not shown in Table 3, there was no significant difference between the younger and older age groups. A possible explanation is the large number of workers in the older age groups (over 45 years) who had a good or excellent work ability rating. In the reference values from the Finnish study [7, 8], the percentage of workers in the excellent category decreased strongly after 49 years of age, and, in the good category, the same occurred after 59 years. On the other hand, the large concentration of workers over 45 years of age in the best work ability categories in this study in relation to the Finnish reference values suggests the presence of the healthy worker effect. In the case of the Brazilian labor market, the percentage of the population with a job covered by the social security system is around 40%; therefore, strong selection can be expected, especially among government employees, who have permanent jobs.

In relation to the WAI and the demographic, work, and lifestyle characteristics, the distribution by age group, education, and duration of work at the institution were found to be associated with reduced work ability in the logistic regression model. Therefore the increase in age, the duration of work at the institution, and the low level of education increased the risk of reduced work ability. Reduced work ability then created an increase in the risk of work disability and early retirement [17].

A low level of education is related to occupations with predominantly physical or mixed physical and mental job demands. The Finnish 11-year follow-up study [18] indicated that those doing work with physical demands were at the highest risk of work disability and early retirement. The length of work at the institution in this study was related to age and level of education; in other words, older persons

had been working at the institution longer, and most of them had a low level of education and no qualified occupations, in which the predominant demands of the work were physical or mixed. There was no association in the logistic regression model between gender and reduced work ability. However, the analysis of variance showed a larger decrease in the mean value of the WAI with age among the women and suggested that measures were needed to preserve their work ability.

The workers with low education were more prominent in the poor and moderate work ability categories, but those without any formal education comprised the largest proportion (44%) in the excellent category, when compared with the other age groups. This finding suggests a balance between the demands of work and competence, possibly due to attained experience. The duration of work at the institution in relation to the work ability categories showed that, after 30 years of work at the institution, the percentage of workers decreased in the poor and moderate work ability categories and increased in the good and excellent categories, showing the healthy worker effect.

The distribution according to work ability in relation to job demands showed that, in addition to the categories poor and moderate having more workers with physical and mixed work demands than mental work demands, over 35% of the workers in each work demand category had an excellent work ability rating. This was not an expected result, compared with the Finnish reference values, as discussed earlier. In addition 47.3% of the workers with excellent work ability held other jobs, but there were no significant differences in relation to those who did not have another job.

The work ability distribution of the workers with housework showed that workers reporting it more frequently had poor or moderate work ability. There was an association only in the analysis of variance, possibly because most of the population reported that they did housework (82.6%). The same trend was found in relation to do physical exercise, but less than half of the studied population reported such activities.

Leisure activity was reported by most of the population (95.7%), and therefore no association was found with work ability. However, the large percentage of obese workers with poor or moderate work ability suggests the need for measures to restore their work ability.

## 5. CONCLUSION

Work ability decreased significantly with age among the women. The younger group had higher scores on the WAI than the older age groups, except for mental resources. The logistic regression analysis showed that higher age, lower education, and long work history at the institution were significantly associated with reduced work ability. This increased the risk of work disability or early retirement.

This study was carried out to shed some light on the work ability of aging workers in a developing country and to stimulate the development of policies concerning aging and work, both in the workplace and at the governmental level, in such countries.

The Brazilian society, as are others, is based in the economy, which is supported by work. The ability to work is the basis of sustainable development in its society. Therefore, employees' work ability should be promoted in all age groups. In developing countries, promotion should be started as early as possible because of the fragile economy, which affects living and work conditions.

According to the results, there is an immediate need for measures to promote, preserve, and restore work ability among this population. This finding suggests that the maintenance of work ability in developing countries is already a challenge.

## REFERENCES

1. Carvalho JAM, Garcia R. O envelhecimento da população brasileira: um enfoque demográfico [The aging process in the Brazilian population: a demographic approach]. *Cad Saúde Pública*. 2003;19(3): 7–25.
2. Ilmarinen J. Challenges of the aging of the workforce in the European Union. In: Rantanen J, Lehtinen S, Kurppa K, Lindström K, Saarela KL, editors. *Work in the Global Village: Proceedings of the Conference International Conference on Work Life in the 21st Century (People and Work Research Reports 49)*. Helsinki, Finland: Finnish Institute of Occupational Health; 2002. p. 57–63.
3. Kalache A. Ageing in developing countries. In: Pathy MSJ, editor. *Principles and practice of geriatric medicine*. London, UK: Wiley; 1991. p. 1517–28.
4. Kinsella K. Dimensiones demográficas y de salud en América Latina y el Caribe [Health and demographic dimensions in Latin America and Caribbean]. In: Pérez EA, editor. *La atención de los ancianos: un desafío para los años noventa*. Washington, DC, USA: Organización Pan-americana de salud; 1994. p. 3–18.
5. World Health Organization (WHO). *Aging and work capacity: report of a WHO study group (WHO Technical Report Series, No. 835)*. Geneva, Switzerland: WHO; 1993.
6. Ilmarinen J. Aging and work-coping with strenghts and weaknesses [editorial]. *Scand J Work Environ Health* 1997;23 Suppl 1:3–5.
7. Tuomi K, Ilmarinen J, Jahkola A, Katajarinne L, Tulkki A. *Work ability index*. 2nd ed. Helsinki, Finland: Finnish Institute of Occupational Health; 1998.
8. Tuomi K, Ilmarinen J, Jahkola A, Katajarinne L, Tulkki A. *Índice de capacidade para o trabalho [Work ability index]* [translated and co-ordinated by Fischer FM]. São Carlos, Brazil: EdUFSCar, 2005.
9. Tuomi K, editor. *Eleven-year follow-up of aging workers*. *Scand J Work Environ Health* 1997; 23 Suppl 1:1–71.
10. Ilmarinen J. Promotion of work ability during aging. In: Kumashiro M, editor. *Aging and work*. London, UK: Taylor & Francis; 2003. p. 21–35.
11. Gomes VB, Siqueira KS, Sichieri R. *Atividade física em uma amostra probabilística da população do município do Rio de Janeiro [Physical activity in a probabilistic sample in the city of Rio*

- de Janeiro]. *Cad Saúde Pública* 2001; 17(4):969–76.
12. Silva VLC, Koifman S. Tabagismo na América Latina: problema prioritário de saúde pública [Smoking in Latin America: a major public health problem]. *Cad Saúde Pública* 1998;14 Suppl 3:109–15.
  13. Abrantes MM, Lamounier JA, Colosimo EA. Prevalência de sobrepeso e obesidade nas regiões Nordeste e Sudeste do Brasil [Overweight and obesity prevalence in northeast and southeast regions of Brazil]. *Rev Assoc Med Bras* 2003;49(2):162–6.
  14. Gigante DP, Barros FC, Post CLA, Olinto MTA. Prevalência de obesidade em adultos e seus fatores de risco [Prevalence and risk factors of obesity in adults]. *Rev Saúde Pública* 1997;31(3):236–46.
  15. Monteiro MS, Ilmarinen J, Gomes JR. Work ability, health and sickness absence of Brazilian female workers in a research center by age group. In: Ilmarinen J, Lehtinen L, editors. *People and Work Research Reports 65*. Helsinki, Finland: Finnish Institute of Occupational Health; 2004. p. 60–70.
  16. Bellusci SM, Fischer FM. Envelhecimento funcional e condições de trabalho em servidores forenses [Aging and work conditions in forensic workers]. *Rev Saúde Pública* 1999;33(6):602–9.
  17. Ilmarinen J. Functional capacities and work ability as predictors of good 3rd age. In: Shiraki K, Sagawa S, Yousef MK, editors. *Physical fitness and health promotion in active aging*. Leiden, The Netherlands: Backhuys; 2001. p. 61–80.
  18. Ilmarinen J. Promotion of work ability during aging. In: Kumashiro M, editor. *Aging and work*. London, UK: Taylor & Francis; 2003. p. 21–34.