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# Psychometric Properties of the Spanish Version of the Work Ability Index in Working Individuals

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**Abstract**
It is increasingly important to have validated instruments to assess the ability to work. Thus, the aim of this study was to evaluate the psychometric properties of the Spanish version of the Work Ability Index (WAI) in working individuals. A cross-sectional study was conducted on 360 workers (men and women) in a high-complexity public hospital and in a public university. The participants were between 40 and 75 years, with a contract of at least 11 h weekly. The ability to work was assessed using the WAI and the perception of health through the Short Form 36 Health Survey version 2 (SF-36 v2). The concurrent validity was analyzed, correlating the WAI with the SF-36 v2. An exploratory factor analysis was performed to test construct validity. In addition, the internal consistency of the WAI was analyzed using the standardized Cronbach's alpha coefficient. The WAI showed a positive and statistically significant correlation ($p < 0.001$) with the SF-36 v2. The exploratory factor analysis showed three factors interpreted as, "Mental Resources", "Diseases and Health-Related Restrictions", and "Self-perception of Work Ability". The reliability of the factors was acceptable, except for the second factor, which was poor. The WAI demonstrated acceptable psychometric properties, such as internal consistency, concurrent and construct validity, constituting a reliable instrument to measure work ability for the population of active working individuals in the service sector.

**Keywords** Workers · Psychometric properties · Work Ability Index · Reliability · Validity

## Introduction

The ability to work is a determining factor for active individuals that drives the workforce. Thus, in work health and safety, work ability is understood as the balance between a person's resources and the demands of the environment. Personal resources include aspects like education, professional competence, values and attitudes as well as physical-functional aptitudes and health. The demands of the environment encompass the working environment and the real contents of the task/job, job requirements and organization [1]. Recognizing this ability is of crucial importance, as it gives rise to the assessment of actions to maintain and promote personal resources, while allowing for the development and improvement of the working environment, this emphasizes the investment and its long-term effects on the ability to work throughout one's working life [2].

The evaluation of the ability to work allows health professionals to assess a person with respect to their aptitudes to carry out tasks relevant to the job. On the one hand, data were collected on the ability to perform tasks safely, identifying functional deficits so as to plan preventive and rehabilitation strategies. On the other, work disability can be determined [3–5]. This heightens the need for reliable instruments to evaluate the effects of health promotion programs and identify individuals with work rehabilitation

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needs [6]. This is done with the aim of enabling health professionals, human resources managers, employers and other interested parties to support an active and healthy workforce.

In this context the Work Ability Index questionnaire (WAI) was created [2, 7]. The WAI is a questionnaire that can be self-applied or administered by personal interview to evaluate factors of work, health, work ability and functional ability [2]. This instrument has exhibited good measurement properties (e.g., adequate internal consistency and stability through various nationalities) [8]. Thus, it has become the most used instrument in the field of the occupational health, both in clinical practice and in research [9]. The WAI has been translated into more than 20 languages and is widely used in several countries/cultures worldwide [8, 10, 11, 12, 13, 14]. However, in Spanish-speaking Latin American populations, studies that assess the psychometric properties of the instrument are few and have limitations (e.g., inadequate statistical analysis, small samples) that limit their scope [12, 15].

The limitations in these studies contrast with the need to validate the result measurements of the work, like the WAI, and instruments of the job performance related to health in the contexts where they will be used [16, 17]. In this light, it is essential that the instruments be valid for the researchers, professionals and individuals [18] of the area in which they will be applied.

Having the psychometric properties of WAI in Spanish will make it possible to adjust, define, implement and evaluate plans, programs, public policies, and work-related strategies. This is because in Chile the population that makes up the workforce has undergone major changes, including an increase in the average age of working individuals, from 39.3 years in 1990 to 44.5 years in 2017 [19]. In this same period, the gross years of active working life increased by 28.5%, from 28.1 to 37.4 years [19]. This has led to occupational health making the prevention of the decline in work capacity associated with age a priority objective in order to enhance and prolong working life. Thus, one of the first steps to implement this objective is to measure and monitor work capacity. In this context, it is essential to have validated and reliable Spanish-language instruments that ensure quality evidence of the measurements that derive from their use.

Consequently, the aim of the present study was to evaluate the psychometric properties of the Spanish version of the WAI in working individuals. Thus, the construct validity and reliability of the WAI was assessed. In addition, the criterion validity was analyzed considering the Short Form 36 Health Survey version 2 (SF-36 v2) for this since this evaluation has been established as a predictor of a worker's health capacity in the medium and long term [2].

## Materials and Methods

The reporting of the paper follows the STROBE guidelines (https://www.equator-network.org/reporting-guidelines/strobe/). This is to ensure effective and clear communication of all the important aspects of this research.

### Study Design

A cross-sectional study was conducted, where the target population was comprised of workers (men and women) in the services area, specifically in a high-complexity public hospital and a public university. From a total of 4355 workers between the two establishments, a stratified sample of 360 individuals was obtained. The study was carried out between August 2018 and March 2019. The sociodemographic characteristics of the sample are shown in Table 1.

The participants were between 40 and 75 years, with a contract of at least 11 h weekly. Care was taken that they had a suitable comprehension level of Spanish to respond to the instruments adequately. In order to ensure the representativeness the various age groups in the study, the population was divided into three groups of 120 people each: (1) 40 to 49; (2) 50 to 59; and (3) 60 and over. Pairing by gender and workplace was also done. Individuals who had a medically certified permanent disability were not included.

### Procedure

During the work day, the workplaces were visited and the participants were called to individual interviews. The workers were informed of the aim of the study and about their participation. Special emphasis was placed on data confidentiality. All the participants reconfirmed their decision to participate in the study by signing the informed consent. The personnel in charge of applying the instruments were instructed specially in this purpose before beginning the study. Study data were collected and managed using REDCap electronic data capture tools hosted by the Universidad de La Frontera.

### Instruments

#### Sociodemographic Data Questionnaire

First, a specially designed questionnaire was used to record the sociodemographic data of the participants (see Table 1).

**Table 1** Sociodemographic characteristics of the participants

| Variable | n (%) | M (SD) | Range Min–Max |
|---|---|---|---|
| Age | | 53.79 (8.11) | 40–75 |
| Sex | | | |
| Female | 190 (52.78) | | |
| Occupation | | | |
| Health professional | 37 (10.28) | | |
| Administrative | 91 (25.28) | | |
| Health technician | 56 (15.56) | | |
| Service and maintenance attendant | 93 (25.83) | | |
| University instructor | 83 (23.06) | | |
| Marital status | | | |
| Single | 74 (20.56) | | |
| Cohabiting | 8 (2.22) | | |
| Separated | 23 (6.39) | | |
| Married | 207 (57.5) | | |
| Divorced | 39 (10.83) | | |
| Widowed | 9 (2.5) | | |
| Number of children | | 0.53 (0.79) | 0–4 |
| Years of education | | 16.1 (4.01) | 3–29 |
| Level of education | | | |
| Incomplete primary | 0 (0) | | |
| Complete primary | 3 (0.83) | | |
| Incomplete secondary | 4 (1.11) | | |
| Complete secondary | 87 (24.17) | | |
| Incomplete technical college | 1 (0.28) | | |
| Complete technical college | 102 (28.33) | | |
| Incomplete university | 4 (1.11) | | |
| Complete university | 159 (44.17) | | |
| Months of work | | 246.48 (151.13) | 1–588 |
| Hours of work per week | | 43.38 (3.55) | 12–44 |
| Monthly income[a] | | | |
| Less than 276,000 | 9 (2.5) | | |
| Between $276,000 and $500,000 | 122 (33.89) | | |
| Between $500,001 and $750,000 | 69 (19.17) | | |
| Between $750,001 and $1,000,000 | 21 (5.83) | | |
| Over $1,000,000 | 139 (38.61) | | |
| Tobacco consumption | | | |
| Never | 264 (73.33) | | |
| Occasional | 31 (8.61) | | |
| Habitual | 65 (18.06) | | |

*M* mean, *SD* standard deviation, *min* minimum, *Max* maximum

[a]Amount in Chilean pesos; n = number of individuals; % = percentage

### Work Ability Index

The ability to work was measured by the Work Ability Index (WAI) in Spanish [12, 15], which has 7 items. Items 2, 3 and 7 consist of 2, 14 and 3 sub-items respectively. These items explore the worker's perception about their ability to work. The index was calculated by considering the sum of the items following the standardized method provided by the Finnish Institute of Occupational Health (FIOH) to obtain the WAI score [2, 6]:

1 "Current work ability compared with the lifetime best", which can vary on a scale from 1 to 10 points.

2A "Work ability in relation to the physical demands of the job" based on one question, on a scale of 1 to 5 points.
2B "Work ability in relation to the mental demands of the job" based on one question, on a scale of 1 to 5 points.
3 "Number of current diseases diagnosed by a physician" based on a list of 51 diseases that define a score on a scale of 1 to 7 points.
4 "Estimated work impairment due to diseases" based on one question that scores from 1 to 6 points.
5 "Sick leave during the past year (12 months)" based on one question (5 categories) about the number of absences with a score that ranges from 1 to 5 points.
6 "Own prognosis of work ability two years from now" based on one question that scores 1, 4 or 7 points.
7A "Appreciation of the ability to enjoy daily activities" based on a score between 1 and 5 points.
7B "Feeling active and alert" based on a score between 1 and 5 points.
7C "Feeling full of hope for the future" based on a score between 1 and 5 points.

From the results of these items a score is obtained ranging between 7 and 49 points. A higher score indicates a greater ability to work. It must be considered that low values on the WAI do not indicate an individual disability but an inconsistency in the current work and the worker's ability for this job in particular in the future. From this score, the subjects can be classified in: poor (7–27 points); moderate (28–36 points); good (37–43 points); and excellent (44–49 points) Work Ability [2].

It should be noted that a committee made up of researchers with expertise in the cultural adaptation of assessment instruments and the authors analyzed the content of the WAI items in Spanish [12, 15], concluding that these were adequate to be applied to the participants.

#### Short Form Health Survey Version 2 (SF-36 v2)

In addition to the application of the WAI, the related health and quality of life questionnaire, the SF-36 v2, was administered in Spanish [20]. The SF-36 v2 provides a health status profile and is applicable to both individuals with various pathologies and a healthy population. The SF-36 v2 is intended for people aged 14 or over and was administered via a personal interview. The SF-36 v2 assesses eight health domains [20, 21]:

(1) Physical functioning (10 items)
(2) Role limitations due to physical health problems (4 items)
(3) Bodily pain (2 items)
(4) Perceptions of general health (5 items)
(5) Energy/fatigue (vitality) (4 items)
(6) Social functioning (2 items)
(7) Role limitations due to personal or emotional problems (3 items)
(8) Mental health in general (5 items)

The SF-36 v2 also includes a transition question about the change in general health status compared to the previous year. This item is not used for the calculation of any of the 8 main domains. For each domain, the items are encoded, totaled and transformed to a scale with a range of 0 (the worst state of health) to 100 (the best state of health). In addition, the questionnaire enables the calculation of two summary scores, mental and physical, using the average sum of the scores of the eight main domains. On the one hand, the first four domains report on the measurement of the physical component, while the last four report on the measurement of the mental component.

### Sample Size

For the adequate implementation of the Exploratory Factor Analysis (EFA), a number equal to or greater than 300 participants is needed [22, 23]. Therefore, this study included 360 participants.

### Statistical Methods

A descriptive analysis was done of the main study variables using statistics of central tendency (i.e., mean) and dispersion (i.e., standard deviation).

#### Construct Validity

An EFA was performed to evaluate the construct validity and determine the number of factors. This was done using the weighted least squares extraction method, parallel analysis, Pearson's correlation matrix. A relation was assumed among the factors; therefore, the decision was made for an Promin rotation [24]. The relevance of performing an EFA was analyzed by Bartlett's test of sphericity and the Kaiser–Meyer–Olkin (KMO) index. Goodness-of-fit indices were also determined, considering limit values of the comparative fit index ($CFI \geq 0.95$), the root mean square error of approximation ($RMSEA \leq 0.06$) and the standardized root mean square residual ($SRMR \leq 0.08$) as per the cutoff scores established by Hu and Bentler [25].

#### Internal Consistency

The internal consistency of the factors of the instrument was estimated by calculating the standardized Cronbach's alpha coefficient. A Cronbach's alpha coefficient of 0.50–0.69 is considered poor, 0.70–0.79 acceptable, 0.80–0.89 good, and

equal to or greater than 0.90 excellent [26]. McDonald's Omega index was also calculated. This considers the same reference values as Cronbach's alpha. In addition, Pearson's correlation coefficient was used to analyze the correlation of each item with the total score on the WAI, after excluding each item (corrected item correlation by superposition). A Pearson's correlation coefficient value of 0.3 major or greater was considered satisfactory.

### Concurrent/Criterion Validity

The concurrent validity of the WAI was analyzed by comparing its score with that of the SF-36 using Pearson's correlation coefficient.

The descriptive analysis, item-total correlation and the correlation between the WAI and SF-36 v2 were performed using the Stata v.14 statistics software [27]. The internal consistency indices and the EFA were estimated in the Factor program v.10.8.04 [28].

## Results

### Descriptive

The participants obtained an average score of 34.18 (SD = 3.01; range 23–45). The sample was categorized according to work ability. Thus, 3.06% presented a poor work ability, 75.28% a moderate ability, 21.39% a good ability and 0.28% an excellent ability. Table 2 shows the items with their respective responses. The results of the SF-36 v2 can be seen in Table 3.

### Construct Validity

Bartlett's test of sphericity was significant ($\chi^2$ (45) = 783.7, $p < 0.001$). The KMO index was 0.74. Taken together, these tests indicate that the data exhibit suitable characteristics to perform the EFA.

The factors were extracted by parallel analysis, which offers a structure composed of three factors. The first factor explains 31.7% of the variance, the second 12.7% and the third 12.2%. Altogether the three factors account for 56.6% of the total variance.

The factorial weights range between 0.572 and 0.934 for the first factor, between 0.21 and 0.681 for the second factor and between 0.465 and 0.844 for the third factor. The factorial weights are detailed in Table 4. In previous studies [10, 11, 29], the first factor has been called "Mental Resources" and groups items 8, 9 and 10. The second factor is comprised of items 4, 5, 6 and 7 and is called "Diseases and Health-Related Restrictions". The third factor is "Self-perception of Work Ability" and groups items 1, 2 and 3.

An examination of the Inter-factors Correlation Matrix revealed that these presented moderate correlations [30]

**Table 3** Short Form 36 Health Survey version 2 values

| SF-36 v2 | M (SD) | Range Min–Max | Cronbach's alpha |
|---|---|---|---|
| Total | 81.12 (12.71) | 29.6–100 | |
| Physical dimension | 83.05 (12.52) | 27.69–100 | |
| Mental dimension | 75.38 (14.77) | 20–93.33 | |
| Physical function | 89.16 (13.11) | 25–100 | 0.81 |
| Physical role | 90.08 (16.21) | 6.25–100 | 0.85 |
| Bodily pain | 65.06 (19.61) | 10–90 | 0.65 |
| Overall health | 76.16 (18.32) | 10–100 | 0.68 |
| Vitality | 71.56 (19.43) | 12.5–100 | 0.8 |
| Mental function | 86.38 (19.28) | 12.5–100 | 0.84 |
| Emotional role | 89.64 (15.21) | 25–100 | 0.75 |
| Mental health | 80.54 (18.94) | 20–100 | 0.85 |

*M* mean, *SD* standard deviation, *Min* minimum, *Max* maximum

**Table 2** Values of the items on the Work Ability Index

| Item | M (SD) | Range Min–Max | Bias | Kurtosis |
|---|---|---|---|---|
| Current work ability compared with the lifetime best | 8.73 (1.37) | 4–10 | −0.925 | 0.15 |
| Work ability in relation to the physical demands of the job | 4.34 (0.74) | 1–5 | −0.883 | 0.39 |
| Work ability in relation to the mental demands of the job | 4.38 (0.74) | 1–5 | −0.949 | 0.355 |
| Number of current diseases diagnosed by a physician | 4.12 (1.76) | 1–7 | 0.078 | −0.673 |
| Estimated work impairment due to diseases | 5.66 (0.66) | 2–6 | −2.234 | 5.373 |
| Sick leave during the past year (12 months) | 4.09 (1.17) | 1–5 | −0.968 | −0.365 |
| Own prognosis of work ability 2 years from now | 6.68 (1.19) | 1–7 | −3.829 | 13.984 |
| Appreciation of the ability to enjoy daily activities | 3.6 (0.71) | 1–4 | −1.782 | 2.574 |
| Feeling active and alert | 3.61 (0.67) | 1–4 | −1.745 | 2.59 |
| Feeling full of hope for the future | 3.62 (0.69) | 1–4 | −1.841 | 2.867 |

*M* mean, *SD* standard deviation, *Min* minimum, *Max* maximum

**Table 4** Structure and factor load of the exploratory factor analysis

| Item | Factor 1 Mental resources | Factor 2 Diseases and health-related restrictions | Factor 3 Self-perception of work ability |
|---|---|---|---|
| Current work ability compared with the lifetime best | 0.038 | 0.143 | **0.465** |
| Work ability in relation to the demands of the job | −0.075 | 0.058 | **0.844** |
| Work ability in relation to the mental demands of the job | 0.118 | −0.081 | **0.615** |
| Number of current diseases diagnosed by a physician | −0.088 | **0.681** | −0.016 |
| Estimated work impairment due to diseases | 0.116 | **0.527** | −0.052 |
| Sick leave during the past year (12 months) | −0.029 | **0.36** | 0.086 |
| Own prognosis of work ability 2 years from now | 0.114 | **0.206** | −0.021 |
| Appreciation of the ability to enjoy daily activities | **0.698** | 0.059 | 0.004 |
| Feeling active and alert | **0.934** | −0.029 | −0.013 |
| Feeling full of hope for the future | **0.572** | −0.001 | 0.035 |

Factor loads of the relevant items for each factor (> 0.2) are highlighted in bold

among themselves; in particular, factors 1 and 2 are correlated in 0.43, factor 1 and 3 in 0.45, and factor 2 and 3 in 0.41.

The analysis presented excellent goodness-of-fit indices: CFI = 0.999, RMSEA = 0.015 and RMSR = 0.0261.

### Concurrent Validity

Positive and significant associations were found between work ability and the total SF-36 v2 score ($r = 0.4$, $p < 0.001$; 95% CI 0.3–0.48). Likewise, work ability was associated positively and significantly with the physical dimension ($r = 0.38$, $p < 0.001$; 95% CI 0.29–0.47) and with the mental dimension ($r = 0.34$, $p < 0.001$; 95% CI 0.25–0.43). In addition, work ability presented a positive and statistically significant correlation with all the domains on the SF-36 v2, specifically with the Physical Functioning ($r = 0.26$, $p < 0.001$; 95% CI 0.16–0.35), Role-Physical ($r = 0.2$, $p < 0.001$; 95% CI 0.1–0.3), Bodily Pain ($r = 0.35$, $p < 0.001$; 95% CI 0.25–0.44), General Health ($r = 0.32$, $p < 0.001$; 95% CI 0.22–0.41), Vitality ($r = 0.36$, $p < 0.001$; 95% CI 0.27–0.45), Social Functioning ($r = 0.27$, $p < 0.001$; 95% CI = 0.17–0.36), Role-Emotional ($r = 0.17$, $p = 0.002$; 95% CI 0.07–0.27) and Mental Health ($r = 0.34$, $p < 0.001$; 95% CI 0.25–0.43).

### Item-Total Correlation

The analysis of the correlation of each item with the total score on the WAI makes it possible to justify the contribution of the majority of the items to the measurement. However, the items "Sick leave during the past year (12 months)" and "Own prognosis of work ability two years from now" obtained values below 0.3.

### Internal Consistency

Reliability, evaluated using the standardized Cronbach's alpha, of the first and third factor was 0.70 and 0.78 respectively. The reliability of the second factor was 0.5. The values of the McDonald's Omega index were similar (see details in Table 5).

## Discussion

The value of the WAI as a predictive instrument of health conditions and its utility justified the aim of this study, which was to assess the psychometric properties of the Spanish version of the WAI in working individuals, for which several aspects concerning the instrument itself were evaluated.

The EFA contributes evidence of validity to a structure of the WAI of three domains: "Mental Resources" and groups items 8, 9 and 10, "Diseases and Health-Related Restrictions" made up of items 4, 5, 6 and 7, and "Self-perception of Work Ability", which groups items 1, 2 and 3. This factorial structure was consistent with other studies [10, 11, 12, 29]. However, Peralta et al. [12] report 3 factors, but with different configurations of the items. In addition, our analysis highlights that item 7 (i.e., Own prognosis of work ability 2 years from now) presented a similar load in more than one factor, which agrees with the studies by Abdolalizadeh et al. [11] and Kaewboonchoo and Ratanasiripong [10]. Also, this item presented a total score-item correlation of 0.17, which casts doubt its contribution to the total value of the WAI. The failure of this item in this sample could be due to the participants' lack of understanding of the item or that it does not discriminate given the limited nature of its score (i.e., 1, 4 or 7). Finally, it is worth noting that the measurement properties tend to be dependent of the sample [31].

**Table 5** Analysis of internal consistency and item-rest correlation

| Items | IRC | CAID |
|---|---|---|
| Self-perception of work ability | | |
| Current work ability compared with the lifetime best | 0.4565 | 0.6852 |
| Work ability in relation to the physical demands of the job | 0.5699 | 0.4474 |
| Work ability in relation to the mental demands of the job | 0.4686 | 0.5508 |
| Standardized Cronbach's Alpha = 0.70 | | |
| McDonald's Omega = 0.71 | | |
| Diseases and health-related restrictions | | |
| Number of current diseases diagnosed by a physician | 0.3446 | 0.3024 |
| Estimated work impairment due to diseases | 0.3707 | 0.3637 |
| Sick leave during the past year (12 months) | 0.2656 | 0.3758 |
| Own prognosis of work ability 2 years from now | 0.1736 | 0.4580 |
| Standardized Cronbach's Alpha = 0.5 | | |
| McDonald's Omega = 0.52 | | |
| Mental resources | | |
| Appreciation of the ability to enjoy daily activities | 0.6189 | 0.6988 |
| Feeling active and alert | 0.7190 | 0.5883 |
| Feeling full of hope for the future | 0.5201 | 0.8024 |
| Standardized Cronbach's Alpha = 0.78 | | |
| McDonald's Omega = 0.8 | | |

*IRC* Item-rest correlation, *CAID* Cronbach's alpha if item deleted

In the study by Adel et al. [32], mental resources were the primary factor, contributing 37.6% of the total variance; the second factor was associated with the worker's perception of their work ability, covered by the items current work ability compared to the lifetime best and in relation to the demands of the job with 16.6% of the total variance. The third factor corresponded to the presence of diseases and health-related restrictions, contributing 10.9% of the total variance. These results are in line with our results, where the factor Mental Resources explained 31.7% of the variance, the factor Diseases and Health-Related Restrictions 12.7% and the factor Self-perception of Work Ability 12.2%.

The internal consistency of the factors "Mental resources" (standardized Cronbach's alpha = 0.78) and "Self-perception of work ability" (standardized Cronbach's alpha = 0.70) of the WAI was acceptable, except in the factor Diseases and health-related restrictions, which was poor (standardized Cronbach's alpha: 0.50). However, to contrast our analysis with the values reported in the scientific literature, the total internal consistency of the instrument was calculated. In our study, the internal consistency of the WAI is acceptable (standardized Cronbach's alpha = 0.75 and McDonald's Omega = 0.74). This result is consistent with reports in other studies where the reliability ranged between 0.66 and 0.9 [10, 11, 12, 29, 32, 33]. Thus, these results ensure good consistency in different populations. However, Kaewboonchoo and Ratanasiripong [10] reported that in a Thai population the internal consistency of the 3 factors was poor (Cronbach's alpha ≤ 0.58), with the lowest internal consistency being the factor "Diseases and health-related restrictions", which was 0.50. This discrepancy in internal consistency could be attributed to the concepts used in the Thai population being unfamiliar, explained by factors such as work culture, their work tasks or language differences in understanding the construct. To this may also be added the difference in the subjects evaluated. In the present study, the participants were from a high-complexity hospital and a public university, unlike the subjects evaluated in the Thai study, which included workers in the manufacturing industry.

On the other hand, the internal consistency reported in multiple studies is based on the entirety of the items, considering the WAI as one-dimensional, although this practice is not endorsed by methodological studies and potentially leads to an overestimation of the reliability of the instrument [34, 35]. Thus, our study, following current methodological recommendations, reports the internal consistency of each of the factors or domains that constitute a scale, in this case the WAI, in addition to adding other measures to internal consistency such as McDonald's Omega index [34, 36].

The final score of the WAI correlated positively and significantly with the total score of the SF-36 v2, demonstrating criterion validity. Thus, better work ability was related to a better perception of health status. In this sense, our results support the idea that the absence of diseases and greater functional ability sustain the ability to work. However, although the relations are significant, their magnitude is small or moderate [30], ranging between 0.17 and 0.4. These results are similar to those reported by

Alexopoulos [14], who explains that weak correlations may be founded on the fact that each domain in itself does not have the same impact in the formation of the overall WAI score. The results of our study are in line with the results reported by Peralta et al. [12], although those reported somewhat greater magnitudes of the relations.

The studies that have evaluated the WAI present results attributed to the selection of the jobs, where physical work is considered a fundamental part of the work, as well as the healthy worker effect when the results are compared with the general population. This study found that the average on the WAI of the participants was 34.18 (SD = 3.01; range 23–45). A similar result was reported by Abdolalizadeh et al. [11] when assessing nurses and workers in the health area over 40 years of age (M = 35.89; SD = 6.86; range 14–49). However, our result is smaller than the one reported by Mancebo et al. [37], who evaluated 136 hospital workers (M = 40.32; SD = 5.04; range 26–49). Considering studies with samples with more than 400 workers in manufacturing companies, the average score on the WAI always appears greater than in workers in hospital services or others, with WAI values that range between 40.9 and 42.6 [10, 14, 29].

Originally [2], the scores for the work ability levels were based on the 15th percentile, median and 85th percentile of the distribution of the index in the total population, resulting in the categories (i) poor (7–27), (ii) moderate (28–36), (iii) good (37–43) and (iv) excellent (44–49). In turn, the study by Alexopoulos [14] reported that the cutoff scores were not valid, which is why the author suggest using the WAI scores linearly. Consequently, the present study only reported the individuals classified under these criteria; however, this classification was not used to perform complementary analyses. Future studies that analyze the relation between the WAI and variables like productivity or physical and mental health in certain populations could facilitate the estimation of cutoff scores and classification of work ability.

The weaknesses of this study include memory bias, as this is inherent to the use of self-report questionnaires. The requirement that individuals recall information about past health conditions entails the inherent risk of forgetting, inattention or confusion (i.e., recall and attentional bias), important aspects to bear in mind when interpreting the results. Nevertheless, the provision of adequate time and space in the interviews, the training of the interviewer in the systematic application of questionnaires (i.e., use of clear, direct and comprehensible language) made it possible to mitigate this risk. At another point, despite using a version culturally adapted to Spanish speakers and reviewed by the research team to ensure that the content was understandable, it is possible that the questions were not fully understood by the participants. This could partly explain the internal consistency results.

Another limitation is the sample used for the validation. This represents a type of working population characterized by hospital and education services jobs, so the extrapolation to workers with other cultural and educational conditions must be done with caution, and it is suggested that the validation be done on specific working populations. On the other hand, given that the sample included workers over 40 years of age, it is not possible to extrapolate the results to younger populations either. Finally, it should be mentioned that the sample size was appropriate; however, a larger sample size could impact the results. Consequently, future studies should include various working populations with different age ranges and large sample sizes.

Strengths of the present study include the sample being comprised of men and women of different ages as well as of workers in different job categories within the hospital and university services; as a result, for this type of population the results are well represented. The use of the version translated into Spanish ensured that the language included in the questionnaires would make the questions understandable, strengthening the internal validity of the instruments. The use of a suitable statistical analysis for studies of this type ensures a reliable instrument for use with health and academic objectives.

## Conclusions

The WAI demonstrated acceptable psychometric proprieties, such as internal consistency, concurrent and construct validity, constituting a reliable instrument to measure and monitor work ability for the population of working individuals active in the service sector. In this context, it can be used on individual and public levels in occupational health, both in preventing the loss of work capacity and in improving it, in the sense of adjusting, defining, implementing and evaluating plans, programs, public policies and work-related strategies.

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## Compliance with Ethical Standards

**Conflict of interest** Claudio Bascour-Sandoval, Francisco Soto-Rodríguez, Claudio Muñoz-Poblete and Gabriel Nasri Marzuca-Nassr declare that they have no conflict of interest.

**Ethics Approval** The study was conducted under the guidelines of the Declaration of Helsinki [38]. Thus, it had the approval of the Ethics Committee of the Universidad de La Frontera (ACTA N°013_18) and the South Araucanía Health Service (0000004 19.01.2018).

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