

# Aging and work: a challenge for the rehabilitation schedule

## Envelhecimento e trabalho: um desafio para a agenda da reabilitação

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### Abstract

**Background:** The rapid aging of the workforce has motivated the development of studies that seek to maintain good health conditions, work ability, autonomy and the social integration of workers. **Objectives:** To present the theoretical framework, available measurements and models for promoting work ability. **Discussion:** In the field of rehabilitation, the sedimentation of the conceptual model of the ability to work has a normative role and may be useful for assessing whether a person has a temporary or permanent loss of capacity as well as for defining a specific rehabilitation program. The concept may further help determine different aspects, both internal and external to the person, that could result in improved or restored work ability. **Conclusion:** In order to enhance the available measurements, propose new interventions for promoting work ability and to further its use as an outcome measure in rehabilitation, it is necessary to assume that the predictors relate to the individuals, their work and their life outside of work in dynamic interactions that require analytical methods which account for the multidimensionality of the construct.

**Keywords:** physical therapy; aging; work ability; rehabilitation; disability.

### Resumo

**Contextualização:** O envelhecimento acelerado da população trabalhadora tem motivado o desenvolvimento de estudos que buscam manter boas condições de saúde, capacidade para o trabalho (CT), autonomia e integração social dos trabalhadores. **Objetivos:** Apresentar o arcabouço teórico, as mensurações disponíveis e os modelos de promoção da CT. **Discussão:** No campo da reabilitação, a sedimentação do modelo conceitual de CT tem função normativa e pode ser útil para avaliar o que é necessário para se classificar uma pessoa com perda temporária ou permanente da CT e definir um programa de reabilitação específico. O conceito pode ajudar ainda a determinar diferentes aspectos, internos e externos à pessoa, os quais podem contribuir para melhorar ou restaurar a sua capacidade para o trabalho. **Conclusão:** Para se aprofundar nas mensurações disponíveis, propor novas aferições e intervenções para promover a CT, além de potencializar seu uso como desfecho na reabilitação, é necessário assumir que os preditores se relacionam com o indivíduo, o trabalho e a vida fora do trabalho a partir de interações dinâmicas, que exigem métodos analíticos que deem conta da multidimensionalidade do constructo.

**Palavras-chave:** fisioterapia; envelhecimento; capacidade para o trabalho; reabilitação; incapacidade.

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## Introduction : : : .

The aging of the workforce will become an increasingly important topic in modern society as the number of people over 50 years old increases in coming decades. In Europe, it is expected that the population over 65 will grow from 19.2% to 36.3% by 2050<sup>1</sup>. The speed at which the Brazilian population will age will be even greater, given that the decrease in birth and mortality rates have contributed to an increase in both the elderly and the economically productive age group<sup>2</sup>. The life expectancy of Brazilians rose from 67 to 73.1 years between 1991 and 2010 and will reach 74.8 years by 2015, which would lead to an increase in people over 60 years old in the economically active population (EAP). In 1977, elderly people accounted for 4.9% of the EAP; in 1988, for 9%, and it is expected that by 2020 at least 13% of the EAP will be senior citizens<sup>3</sup>. Although this will have an economic impact regarding pension and retirement funding, its main effect will be on healthcare expenses, which will present a major financial challenge<sup>1,4</sup>. Due to this issue, several studies on maintaining good health conditions, work ability, independence and the social integration of workers throughout the aging process have been conducted.

Certain Brazilian health and work indicators demonstrate the serious need to develop measures for minimizing such problems. In 2007, the National Social Security Institute registered 653,090 accidents and occurrences of occupational diseases, of which 580,592 involved temporary leaves and 8,504 permanent disabilities<sup>5</sup>. Regarding the private sector, the National Social Security Institute recorded 1,384,242 disability benefits paid in 2008, the majority involving workers between 30 and 49 years old. The duration of these benefits increased with age<sup>6</sup>.

Embedded in this discussion and motivated by the growth of early retirements in municipal offices not strictly for reasons of a medical nature, researchers from the Finnish Institute of Occupational Health developed the concept of work ability (WA) in the 1980s. To Tengland<sup>7</sup>, this concept is fundamental for a number of areas, especially those related to work and rehabilitation, and it may help define the necessary skills and typical activities in different types of work. Thus, the process of determining which activities are inherent to specific jobs can be conducted rationally and systematically so that occupational diseases and accidents in the workplace can be reduced.

In the field of rehabilitation, sedimentation of the concept of WA has a normative role and may be useful for assessing whether a person has a temporary or permanent loss of capacity, as well as for defining a specific rehabilitation program. The concept may also help determine different

aspects, both internal and external to the person, that could result in improved or restored WA. Finally, WA has been used in many countries as a basis for legal decisions regarding pensions or compensations, as in the case of Sweden, where economic compensation is awarded to workers who have lost at least 25% of their capacity due to a disease, injury or accident<sup>7</sup>.

Given the research developed by the Study Group on Disability and Work, the aims of this study are to present the concept of WA, its available measurements, and models for promoting WA in order to maximize its use in rehabilitation.

## Definition of the object and measurement : : : .

The conceptual model is represented by a holistic framework incorporating the individual's characteristics, factors related to work and the environment outside the workplace. Individual resources include health, functional capacity, knowledge and skills, and values and attitudes. Work includes the environment, content, demand and the work community. Regarding WA, supporting equipment (e.g. occupational health and safety) and the family and community (friends and neighbors) are considered. The final category is the macro-environment, which is society with all its infrastructure, policies and services<sup>8</sup>.

This model has changed in the last decade due to the evolution of society and changes in the working world related to globalization and new technologies. The theoretical framework of the WA construct increasingly deviates from traditional models that focus exclusively on medical aspects of health since it is concerned with functional capacity and the idea of balance between work demands and individual resources and incorporates a multidimensional perspective<sup>8</sup>. Thus, the consensus is that WA cannot be assessed only by individual characteristics and work demand. Most current studies emphasize that the concept of WA should include context and temporality. It must be understood as a system formed in concrete situations involving the worker, his work and its organization<sup>8,9</sup>. The dimensions involved refer to the life on the job, the work itself and the individual; the main goal is to preserve WA and prevent disabilities, creating a positive foundation for decision-making and action.

Based on epidemiological studies, Lindberg et al.<sup>10</sup> introduced the notion of a *continuum* of factors that promote the sustainability of the capacity for work. In this perspective, the individual can move up and down, from excellent capacity to

incapacity for work throughout his lifetime, depending on the impact of contextual factors that support or undermine this capacity.

It is important to distinguish WA from work performance: performance is related to the worker's individual characteristics (motivation, satisfaction, behavior and attitudes), while ability incorporates an interaction between the productive potential of the worker, his characteristics and those related to his work. This distinction is central to understanding the relationship between the factors that mediate and/or moderate WA<sup>11</sup>.

Three indicators have been commonly used to measure WA (estimated WA, WA score, and WA index), and the strong correlation between them suggests that the construct has adequate validity<sup>8</sup>. An important issue is the perspective to be adopted, i.e., assessments based on worker self-perception or the perception of health professionals, administrators or others. Assessments for insurance purposes are usually centered on the individual's health and functionality. On the other hand, WA assessments include not only the individual but also his work and surroundings.

The most commonly used indicators are: 1) Estimated WA – the individual is asked to assess his status according to three options: completely able to work; partially unable to work and completely unable to work. To analyze groups of workers, the scale is usually presented as the dichotomy “completely able to work” and “limited ability to work” and the results are used to create an aggregate index based on those reporting a partial or complete inability to work; 2) WA score – a scale from zero to ten that indicates the current capacity for work, with zero representing the complete inability to work and ten indicating the best WA. In this assessment, the individual is asked to compare his current WA with his best ever WA; 3) WA Index (WAI) – includes a self-assessment of health and WA and has a predictive character. This index can be used by occupational health services and allows early diagnosis of WA loss, which is an important point for use in prevention, maintenance and health promotion programs. The WAI consists of seven items, each containing one or more questions, totaling 60 topics: current ability to work compared to lifetime best (item 1); ability to work with respect to the demands of work (item 2), the current number of physician-diagnosed diseases (item 3); estimated work loss due to illness (item 4); absenteeism from work due to disease in the past year (item 5); self-prognosticated WA in two years' time (item 6) and mental resources (item 7). The instrument provides a final score ranging between 7 and 49, with WA and the need for corrective steps classified as follows: low (7 to 29 points - restore WA); moderate (28 to 36 points – improve

WA); good (37 to 43 points – support WA) and excellent (44 to 49 points – maintain WA).

The Brazilian version of the WAI has good psychometric properties regarding the validity of construct and criteria, as well as reliability, and can be used for both individual WA assessment and population surveys<sup>12</sup>. Another advantage of this index is the possibility of following outcomes over time.

## Predictive factors for WA ...

The literature on predictive factors for WA is extensive and can be grouped into three categories: individual factors, work factors and factors regarding life outside the workplace. Among individual factors, age<sup>13,14</sup>, marital status<sup>15,16</sup>, psychosomatic disorders<sup>17</sup>, self-perception of health<sup>18,19</sup>, depression<sup>9,20</sup>, physical problems<sup>21</sup> and lifestyle habits, such as smoking, drinking and physical activity<sup>22,23</sup> stand out. Work-related predictors include environmental and ergonomic conditions and physical and mental demands<sup>14</sup>. Factors for life outside of work involve the support of family and friends, well-being and satisfaction with life<sup>24,25</sup>. It should be emphasized that even though these predictors are presented separately, they relate dynamically and form a network connected to the sustainability of WA; understanding how these interactions occur may be critical to WA preservation<sup>1,26</sup>.

### Age and education

Some studies have shown a negative association between age and WA, but this relationship is non-linear<sup>11,15,21</sup>. Although there is general consensus that increased age is associated with a decrease in physiological capacity, it follows that this will only affect WA if work performance is dependent on physiological capacity. In addition, other work characteristics related to the environment or organization can reduce the negative effect of age on WA. Extending and changing this network of relationships and factors outside work, such as socioeconomic status and social support, may also positively affect WA and minimize the deleterious effects of age.

A study with public workers showed that the first decline in WA occurred between 40 and 44 years, and the second around 55 years<sup>11</sup>. There is evidence that after 45, WA deteriorates around 1.5% per year<sup>27</sup> and the number of disabilities grows<sup>24,28</sup>. Changes occur as the years pass that are also due to factors external to the individual, such as the type of work. Thus, jobs in which mental demand prevails may prevent cognitive limitations that are common with aging<sup>13</sup>. According to these findings, it appears that the changes resulting from aging do not only bring losses, and that physical and

psychosocial conditions affect the relationship between age and WA<sup>29</sup>.

Education also has a positive relationship with WA, i.e., a high educational level is associated with a greater chance of retaining WA and, again, this relationship can be modulated by the physical and psychosocial load of the work. In general, jobs with a lighter physical load and greater worker control are reserved for people with higher educational levels<sup>8</sup>.

## Health

A poor self-perception of health is strongly associated with low WA, and this relationship is maintained even when controlled for age<sup>30,31</sup>. Health is essential for a good WA and its deterioration increases the chances of WA reductions. Nevertheless, not all healthy people are able to work and not all those who have health problems have difficulties performing their jobs<sup>32,33</sup>. According to Lindberg et al.<sup>10</sup>, this is due to the fact that the concept of health has long been associated with the concept of capacity, inasmuch as disease has been linked with disability. Currently science assumes that there are gradients of health, i.e., that health cannot be understood or treated as a dichotomous construct. Thus, a person can experience good health despite the presence of chronic diseases and vice versa. Likewise, work absenteeism is not due only to the occurrence of diseases, but reflects the worker's own perceptions about his health and depends on several factors, such as the demands of work and of the ability to cope with them.

The complexity of relationships between the different factors that comprise the WA conceptual model has been demonstrated since the initial studies undertaken. Seitsamo and Ilmarinen<sup>34</sup> used correspondence analysis to characterize groups of workers according to the variables self-perceived health, lifestyle and WA. The results showed that there was a good perception of health and WA among workers who were motivated and satisfied with life. Decreased WA and poorer health perception occurred among passive workers who did not exercise regularly and reported no leisure activities. Studies conducted in Brazil have also confirmed the association between good health, high WA and good working conditions, both in the administrative sector and among electricians<sup>19,23</sup>.

Finally, it is important to mention that, in the relationship between health and WA, an aspect that must also be analyzed is the discrepancy between formally registered work and informal (non-registered) work. In the specific case of our country, those in the formal labor market have access to benefits such as health care, social security, occupational health prevention programs, vacation, Christmas bonus and other

labor safeguards<sup>19,23</sup>. On the other hand, informal workers are deprived of such rights and are often exposed to poor working conditions. The association between poor working conditions and health problems has been known for more than two decades<sup>35,36</sup>, and it certainly affects WA.

## Psychosomatic disorders

Data from the *2000 Finnish Health Survey* showed that anxiety, psychosis and depression were the most prevalent mental disorders in a sample of 5,199 workers between 30 and 64 years old<sup>8</sup>. The study showed that depression was the most prevalent diagnosis in both men (7%) and women (11%). The probability of reporting restrictions in WA among women and men with depression were, respectively, 5.7 and 5.9 times higher than among the non-depressed. The current research on WA cannot conclude whether depression is a cause or consequence, although some authors argue that the individual's inability to cope with stressful events such as continuous exposure to high physical and psychological demands at work can trigger cognitive and behavioral changes, increasing the likelihood of future occurrences of depression symptoms and impaired WA<sup>8,10</sup>.

## Physical activity

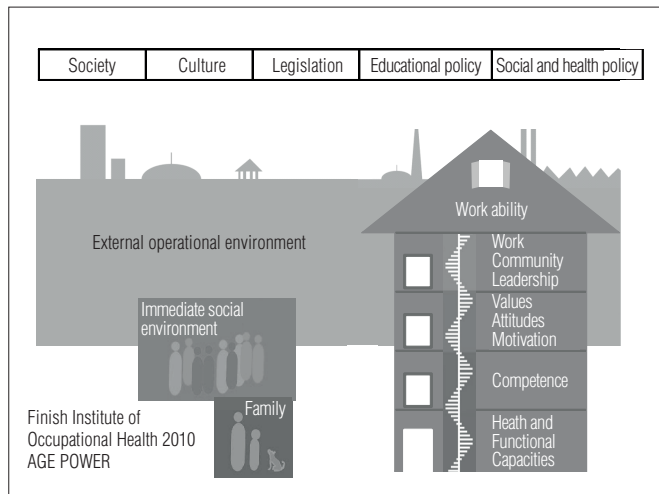
A longitudinal study showed that between the ages of 45 and 55 the physical capacity of workers of both sexes (measured by the maximum flexion and extension strength of the trunk) decreased around 40 to 50%<sup>30</sup>. However, the rigorous physical exercise could help to keep their physical capacity at stable levels for another 25 years, ensuring a good response to the demands of work<sup>31</sup>.

A recent systematic review showed that physical inactivity during leisure time was associated with low WA<sup>37</sup>. Kaleta, Makowiec-Dabrowska and Jegier<sup>38</sup> also showed that the risk of reporting lower WA was greater among men and women who got no regular physical activity than among those who exercised. The explanation given for this is that oxygen consumption can increase or decrease about 25% in men and women over 45 years old, and these variations depend on aerobic exercise habits during adult life<sup>39</sup>. Physical activity was also associated with a decreased rate of absenteeism and good WA, probably due to its beneficial effects on weight control and aerobic ability<sup>40,41</sup>.

## Physical demands and psychosocial factors

As can be seen in Figure 1, work and its various dimensions occupies the fourth level of the WA model and serves





**Figure 1.** New model – work ability and environment.

as a reference for the other levels. If the individual worker's characteristics align with his work, a good WA will result; if worker resources are not proportionally adapted to physical and mental demands of the work, WA may decrease<sup>42</sup>. Thus, a low WA associated with high physical demand work may be largely attributable to wear, fatigue and health impairment<sup>43</sup>. Tuomi et al.<sup>28</sup> investigated the work characteristics that best explained the WA of municipal workers, and the results showed that inappropriate postures and temperature were the variables most associated with WA decreases. Other important physical stressors were the use of excessive force, static muscle work, repetitive movements and noise<sup>28,37</sup>.

There is also evidence that psychosocial factors at work such as high psychological demands, lack of autonomy<sup>37</sup> and stress at work<sup>8,10,44</sup> have a negative influence on WA. On the other hand, good social support at work, such as improvement in the attitude of supervisors towards their subordinates, is a predictor of positive WA.

Life outside work also interferes with WA: marital status, for example, increases the possibility of access to primary social support. Thus, single people, divorcees and widows are less likely to receive social support than couples, who tend to have a higher level of WA. Moreover, those who are undergoing divorce experience a temporary stress that can negatively impact WA<sup>45</sup>.

### Competence, values, attitudes and factors related to community and family

The worker's job skills and knowledge can also influence WA<sup>7,43</sup>. Ilmarinen, Tuomi and Seitsamo<sup>42</sup> conducted a study with 8,000 people over 30 years to empirically test the conceptual model of WA (Figure 1). In this model, health-related

resources are the foundation of the house, and those relating to life at work are on the upper floors. This distribution indicates that the connection with WA decreases from bottom to top, i.e., there is a stronger association with the basal factors than with those on the upper floors. Their results showed that in the sample studied, competence, values, attitudes and factors related to community and family were less significant in explaining the variation of WA with age than work or personal factors.

In the above-mentioned study, competence was inferred from the basic education required for the occupation and the type of activity, as well as the need for training. The values were operationalized by the leisure and motivation of the worker, while the family factors were operationalized by income and marital status. The authors emphasized the difficulties and the need to develop more sensitive parameters for assessing constructs such as competence, values and family support and reinforced the view that the promotion of WA is a multidimensional and interdisciplinary challenge.

### Promotion and maintenance of WA : : : .

Two major rehabilitation challenges are to maintain and increase the effectiveness of WA. To do this, it is important to have a clear definition of the construct, which will facilitate its assessment and the actions designed to maintain or promote it. After a WA assessment in a company, recommendations and measures for optimizing worker functioning and improving both conditions and the work community can be established. If WA is excellent, factors related to the workers' jobs and lifestyles can be analyzed and enhanced, which can help maintain the status quo. Thus, the WA index of a worker or of a group of workers may be regularly monitored, and preventive measures should be systematically adopted<sup>27</sup>.

In Figure 1, Ilmarinen<sup>46</sup> proposed a tetrahedral model of WA promotion. The four dimensions incorporated in this model have aspects that should be considered for the effectiveness of interventions. The first dimension includes worker and health aspects, functional capacity and lifestyle. The second dimension involves work and working conditions, which includes ergonomic aspects, hygiene and occupational safety, organization, tools, environment and physical load. The third dimension has to do with the work community and managerial interaction and relationships and, finally, the fourth dimension includes competencies and professional skills such as expertise, versatility, knowledge and new technologies. Thus, if campaigns to promote and maintain WA consider its multidimensionality, the chances of productivity growth and work quality will increase, not to

mention the quality of life and individual well-being of the worker, both during the economically productive period and in advanced age.

The models for promoting WA are designed to include the multiple domains of life. However, Lindberg et al.<sup>10</sup> still find flaws in them due to the fact that health assessment is not seen in a positive light and the variables of WA promotion studies are constructed using traditional risk factors. From this perspective, one of the challenges in promoting WA is the construction of positive indicators of health. Another important point in the development of interventions for promoting WA is that the determinants for promoting excellent WA or preventing poor WA are different. Prevention of poor WA appears to be more closely linked to psychosocial and organizational work factors, while promoting excellent WA is associated with environmental factors at work, well-defined tasks and positive feedback from leadership, indicating that approaches for excellent WA or poor WA should be differentiated.

In Gould et al.<sup>8</sup>, promoting WA among certain populations requires a greater commitment. These populations include the less educated, farmers, temporary workers, the unemployed, men who live alone, widows and elderly working women. These groups, which involve challenges outside the workplace, are more unprotected and require broader interventions that include education, social support, etc.

An important objective for maintaining WA is to help the worker persevere in his career, and the best way to increase the number of years worked is to begin WA promotion early in professional life. Thus, the aging of the population creates new challenges for WA promotion, since the number of people in advanced career stages is booming. Therefore, to maintain this population's WA, it is essential that individual resources are supported and that work characteristics, work culture and attitudes toward aging are supportive<sup>8</sup>.

## Conclusion ...

In Brazil, the prevalence of impaired WA ranged from 5.7% to 46.4% according to the methodology used and the population studied<sup>43</sup>. National research on this topic began in the late 1990s and, since then, studies have been conducted in several sectors: health<sup>47,48</sup>, transportation<sup>49</sup>, electrical<sup>12</sup>, administrative<sup>19,50</sup>, food and beverage<sup>51</sup> and non-specific industry<sup>21</sup>. Nearly all the Brazilian literature on the subject stems from cross-sectional studies that assessed predictors of WA and used multiple linear regression models or logistic regression for data analysis.

However, with the evolution of and changes to the WA conceptual model, some questions should be discussed and reconsidered. WA, as it has been presented herein, is a complex

conceptual, cultural and situational entity. This means that the way a young worker understands WA may not coincide with the views of an older worker, not to mention variations between different occupations or jobs or location in the formal or informal labor market, i.e., different criteria to assess this outcome may be necessary in different settings. We must also consider the fact unemployment can also interfere with the perception of WA<sup>8</sup>.

The idea that individuals are influenced by their social context is fundamental to the social sciences and has been much debated in empirical studies investigating the interaction between group attributes and individual attributes. Thus, the perception that an individual has of his health is related to the group to which he belongs and the context in which he lives<sup>52</sup>. WA perception is also subject to the worker's organizational environment. Therefore, it is essential to find study models and analytical tools that take the complexity of this phenomenon into account. Accordingly, longitudinal studies have been decisive for a better understanding of WA.

There are about ten currently available prospective studies that have followed the evolution and changes in WA over time, none of which were developed in Brazil. Given the difficulties of conducting longitudinal studies in this country, especially in the field of rehabilitation, our research group has implemented two strategies: to develop research on the topic from an interdisciplinary perspective that involves the participation of physical therapists, occupational therapists, sociologists, epidemiologists, occupational physicians and statisticians, and to select analysis strategies that allow for the multidimensionality of the construct. Thus, a multilevel approach, a possibility that has been recently explored in Latin America, is being used in one of our studies. It allows researchers to analyze the phenomenon from the micro- and macro-perspectives, i.e., considering both the subject and the surroundings to which he belongs<sup>53</sup>. This analysis technique can be understood as an extension of the traditional regression model, in which analyzed variables are grouped in different levels. This model is applicable to populations with a hierarchical structure (e.g. student and school, patient and hospital, employee and workplace.) In addition to allowing the incorporation of contextual factors in the analysis of the phenomenon, the multilevel approach has the advantage of considering observations of members of the same group, which is, thus, unlike a traditional regression and reduces the possibility of spurious results<sup>54</sup>.

In another study on WA, we are employing structural equation modeling, a technique that combines multiple regressions with factorial analysis, which explores explanatory relationships between multiple variables simultaneously and allows us to test complex relationships such as those proposed by the WA model<sup>55</sup>. The structural equation modeling is very useful when

one dependent variable becomes independent in subsequent analyzes<sup>56</sup>: for example, the WA variable can be an outcome of rehabilitation and a predictor of well-being, early retirement or morbidity and mortality in advanced age<sup>24,57</sup>.

WA has proven to be an interesting and challenging research goal. The proximity of the WA conceptual model and the contemporary theoretical framework of human functioning and disability have helped us to develop questions that could contribute to a greater understanding of the subject in the Brazilian population. Evidence that a better and longer careers rely heavily on this outcome and that excellent or good WA before retirement is associated with an improved ability for physical work, health and quality of life after five years of retirement reinforces the urgency

of including this outcome in the rehabilitation planning of professionals in our country.

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