

Factors associated with return to work following a hand injury: a qualitative/quantitative approach

Fatores associados ao retorno ao trabalho após um trauma de mão: uma abordagem qualiquantitativa

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Abstract

Objectives: To describe workers who returned to work after a hand injury and to analyze the factors associated with this outcome three years after discharge from rehabilitation. **Methods:** An observational, cross-sectional study was carried out with triangulation of quantitative and qualitative methods. The quantitative analysis used a database with sociodemographic, functional and clinical information on 35 individuals who were classified into two groups (return/no return to work). Multivariate analysis was conducted using the CART (Classification and Regression Tree) algorithm to assess the predictive value of four models, thereby identifying workers who had returned or not returned to work. Using the results from the statistical analysis, a semi-structured form was prepared for interviews, which were conducted with seven workers randomly selected from the sample. **Results:** Out of the 35 workers who participated in this study, 30 returned and five did not return to work. The majority were male, married and of low educational level, and the mean age was 37 years. The variables with the greatest predictive power were grip strength, occupational performance scores, occupational category and age. The qualitative analysis confirmed the multifactorial nature of the return to work and demonstrated that the presence of a professional to follow-up the process, adjustments to the workstation and working hours (to enable treatment continuity) and also accident benefits may contribute to a successful return. **Conclusions:** This study showed the complexity of the return to work by workers with hand injuries, highlighting a number of factors associated with this outcome and the importance of individualized assessment centered on the worker.

Key words: return to work; work accident; hand trauma.

Resumo

Objetivos: Descrever os trabalhadores que retornaram ao trabalho após um trauma de mão e analisar os fatores que se associaram a esse desfecho após três anos da alta da reabilitação. **Métodos:** Foi realizado um estudo observacional, de corte transversal, com triangulação dos métodos quantitativo e qualitativo. A análise quantitativa utilizou um banco de dados com informações sociodemográficas, funcionais e clínicas referentes a 35 indivíduos, classificados em dois grupos (retornou/não retornou ao trabalho). Foi conduzida análise multivariada, utilizando o algoritmo *CART* (*Classification and Regression Tree*) para avaliar o valor preditivo de quatro modelos, identificando trabalhadores que retornaram ou não ao trabalho. A partir dos resultados da análise estatística, foi elaborado um roteiro semiestruturado para as entrevistas que foram realizadas com sete trabalhadores selecionados aleatoriamente da amostra. **Resultados:** Dos 35 trabalhadores que participaram deste estudo, 30 retornaram e cinco não retornaram ao trabalho. A maioria era do sexo masculino, com média de idade de 37 anos, casada e de baixa escolaridade. As variáveis com maior força preditiva foram força de preensão, escores do desempenho ocupacional, categoria ocupacional e idade. O estudo qualitativo confirmou a natureza multifatorial do retorno ao trabalho, demonstrando que a presença de um profissional para acompanhar o processo, alguns ajustes no posto e no horário de trabalho, possibilitando uma continuidade do tratamento, e o auxílio-acidente podem contribuir para o sucesso do retorno. **Conclusões:** Este estudo evidenciou a complexidade do retorno ao trabalho de trabalhadores com lesão de mão, apontando vários fatores associados a esse desfecho e a importância de uma avaliação individualizada, centrada no trabalhador.

Palavras-chave: retorno ao trabalho; acidente de trabalho; trauma de mão.

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Introduction ◻◻◻

Occupational accidents have been pointed out as one of the main causes of work leave and constitute a significant public health problem in Brazil and worldwide¹. Long-term absenteeism can have serious economic and social implications on workers and society. Hence, work reintegration has been considered an important parameter in the analysis of the impact of these accidents in workers' lives^{2,3}.

From 1999 to 2003, 1,875,190 work accidents were reported in Brazil, of which 72,020 led to permanent disability⁴. In 2005, 26.2% of the total reported accidents were wrist, hand and finger injuries. Considering only typical accidents, i.e. those occurring at the workplace, the most commonly affected body parts were the fingers (29.3%) and hands (9.5%)⁵.

Hand trauma affects individuals in the productive age group and every injury, however small, is associated with a level of disability that can limit the performance of occupational and daily activities. A longitudinal study observed work accident victims for five years and showed that hand trauma had caused half of the permanent disability cases⁶. Other studies^{7,8} verified that 26% of patients with hand injuries had some permanent work restriction at the time of discharge and that these traumas have a greater impact on work than on activities of daily living.

The literature points to the need to advance the understanding of the return-to-work (RTW) process, a need that is justified by macro-structural factors such as the increase in health care costs, low levels of employment for people with disability and the lack of knowledge about the long-term repercussions of accidents⁹. Furthermore, a definition of the factors that interfere in the RTW can contribute to the understanding of this process, and thus help the professional in clinical decision-making.

In the current World Health Organization (WHO) proposal to classify human function and disability – the International Classification of Functioning, Disability and Health (ICF) – the participation of the individual in the workforce is an important topic because it relates directly to health. The ICF scheme defines work as an external factor that could influence functioning at its three levels: body structure and function, activity and participation, and personal aspects, such as motivation and satisfaction. In the same way, work can be influenced by functionality and personal factors. According to the ICF model, work is not the only factor that interferes in worker participation in the work environment. External factors such as domestic environment, leisure and social support can act as facilitators or barriers to work participation¹⁰.

Psychological and clinical characteristics, economic aspects and workplace organizational, psychosocial and physical

factors are being associated with RTW^{9,11,12}. However, it is not yet possible to accurately predict which workers with recent hand trauma will develop a chronic disability. An explanation for this would be the variability of research methods, diagnosis, type and severity of the injury, and also the presentation of findings. A study demonstrated that the subjective evaluation of patients in relation to the severity of the accident, to their ability to cope and to the possible consequences of the occupational accident was more predictive of the duration of absenteeism than of the severity of the illness. These authors recommend the use of models that include clinical variables and the workers' subjective interpretation of their RTW process to better predict this outcome¹³.

In 2004, a longitudinal study was performed at the Hand Rehabilitation Department of Hospital Maria Amélia Lins, Fundação Hospitalar do Estado de Minas Gerais, Brazil, with the purpose of documenting rehabilitation outcomes from patients who had suffered work-related accidents that resulted in traumatic hand injuries¹⁴. The findings pointed to the need to analyze the situation of these workers in relation to work reintegration. The complexity of this matter justifies the search for a deeper understanding of issues related to RTW, especially at a moment when the redefinition of care models for worker rehabilitation is being discussed in Brazil. Thus, the objectives of this study were to describe workers who returned to work after a hand injury and to analyze factors associated with this outcome three years after discharge from rehabilitation.

Methods ◻◻◻

An observational, cross-sectional study was carried out with a quantitative and qualitative approach. To achieve the proposed objectives, we employed methodological triangulation, which refers to the insertion of multiple techniques, observers and research methods to amplify the references and views of the investigated object¹⁵.

For the quantitative analysis, we used the Figueiredo database, which contained information on 42 individuals¹⁴. The sample was described in relation to gender, age, marital status, educational level, work status, type of accident, occupation, affected side, dominance, causing agent, diagnosis, duration of professional practice and duration of rehabilitation. Grip strength was measured on the date of the discharge from rehabilitation using a Jamar dynamometer (Sammons Preston Inc., Bollingbrook, IL, USA), and the Canadian Occupational Performance Measure (COPM) was used to assess occupational performance¹⁶. Three years after the completion of rehabilitation, we were able to reach 35 of the workers by telephone and enquire about their work status.

The statistical analysis consisted, initially, of the description of the studied variables. Central tendency measures (mean) and dispersion (standard deviation) of quantitative variables were described according to the RTW. Levene's test was employed to verify the equality of variances of grip strength on the affected and non-affected sides, and the *t* test for independent samples to assess the difference between groups in relation to the RTW and to grip strength. The non-parametric Mann-Whitney U test was used to compare groups in relation to quantitative variables, and Fisher's exact test in relation to nominal variables. All statistical analyses considered $\alpha=0.05$.

Also, a multivariate analysis was later conducted using the CART (Classification and Regression Tree)¹⁷ algorithm to assess the prediction strength of four models, thereby identifying the individuals who had or had not returned to work. A minimum value of 0.01 was adopted as an exclusion criterion of the variables in each model, and cross-classification was performed to test the goodness of fit of the models. The final model's goodness of fit was assessed by means of risk estimate, which identifies cases that were misclassified. Statistical analyses were performed using SPSS 12.0 and Answertree 2.0 statistical packages.

The response variable was defined as RTW (yes/no), and the predictive variables were divided into four models:

- Model 1: all predictive variables were used;
- Model 2: demographic and occupational variables (gender, age, educational level, marital status, occupational category, and duration of professional practice);
- Model 3: functional variables (grip strength of affected side, COPM-performance score, COPM-satisfaction score);
- Model 4: clinical variables (diagnosis, injury to dominant hand, type of accident, classification of causing agent and duration of rehabilitation).

Based on the results of the statistical analysis, a semi-structured form was created for interviews. Seven workers were randomly selected for individual interviews that were recorded and fully transcribed for inclusion in a database for analysis. The qualitative analysis consisted of decomposing the text, separating components and using only what was compatible with the object of study¹⁸. Content analysis was the chosen method, consisting of ranking, classification and final analysis of the information¹⁹. Thematic units were defined according to the three steps suggested by Bardin²⁰. The interviews allowed the categorization process by means of grouping the answers according to specific affinity, therefore permitting the thematic organization of results. The most relevant topics were prioritized and ranked into categories. All respondents signed an informed consent form prior to the interviews. The present research was authorized by the Research Ethics Committee of UFMG under approval ETIC 011/06.

Results

Of the 35 workers who participated in this study, 30 returned to work and five did not return to work. The majority was male (85.7%), mean age of 37 years (SD=11.87), married (57.1%) and with low educational level, i.e. incomplete elementary or middle school education (54.3%). The most frequent occupations were production of industrial goods and services (65.7%) and commerce/services (20%). The typical work accidents accounted for 94.3% of the total, and only 65.7% of the workers were formally employed. The most frequent diagnoses were tendon injuries (37.1%), fractures (22.9%), followed by nerve injuries (14.3%) and crush injuries (14.3%). Machines and cutters were the main causing agents of injuries, with 54.3% and 22.9%, respectively. In just over half of the cases, the non-dominant side was the most affected side (54.3%). The grip strength of the affected side had a mean of 27 kgf (SD=10.24) for the RTW group and 13 kgf (SD=7.17) for the no-RTW group ($p=0.008$). The non-affected side had a mean grip strength of 41 kgf (SD=11.13) for the RTW group and 36 kgf (SD=13.22) for the no-RTW group ($p=0.387$).

Fisher's exact test showed an association between occupational category and RTW ($p=0.013$). Of the 30 workers who returned to work, 21 worked in the production of industrial goods/services, seven were commerce/services workers and two belonged to another occupational category. No difference was found between groups in relation to age, duration of professional practice, duration of rehabilitation, COPM-satisfaction and COPM-performance.

The median values of the duration of professional practice and duration of rehabilitation for the RTW group were 60 months and 54 days, respectively. Considering the same variables for the no-RTW group, the median values were 180 months for duration of professional practice ($p=0.180$) and 63 days for duration of rehabilitation ($p=0.811$). The COPM-performance and COPM-satisfaction mean scores obtained at the time of discharge from rehabilitation for the RTW group were 7.92 (SD=1.99) and 7.56 (SD=2.31), respectively. For the no-RTW group, the mean COPM-performance score was 7 (SD=1.63; $p=0.131$) and the mean COPM-satisfaction score was 7 (SD=1.80; $p=0.374$).

Multivariate analysis

A multivariate analysis was conducted by means of the decision tree with CART algorithm, considering as response the variable RTW and as predictive variables all of the variables from model 1. The analysis of Figure 1 showed that the factors associated with RTW were: grip strength, COPM-satisfaction score, occupational category and age. Grip

strength appears as the variable that most strongly predicts RTW. From the total of 27 workers with grip strength >15.83 kgf, 26 worked in repair/maintenance services, production of industrial goods/services and administrative services and all of them returned to work. Of the workers who had grip strength ≤15.83 kgf, the ones who returned to work were those who had a COPM-satisfaction score >9.5. The workers with grip strength ≤15.83, COPM-satisfaction score ≤9.5 and age >30.5 did not return to work.

Figure 2 shows the analysis with the CART algorithm that was performed considering RTW as the response variable and, as predictive variables, only demographic and occupational variables. The variables that identified the highest number of workers who returned to work (n=25) were duration of professional practice ≤174 months and occupational category in administrative services, commerce/services and industrial services, among others. Figure 3 demonstrates that grip strength is once again the main predictive variable of RTW. The best path of the decision tree was grip strength >15.83 kgf and COPM-performance score >6.6 (n=23). Figure 4 shows that the clinical factors associated with RTW were: causing agent, type of injury and duration of rehabilitation. The causing agent was the clinical variable with the greatest predictive power.

It is important to highlight that all models showed good fit and low estimated risk, which indicates that the information was correctly classified in most cases. The cross-classification presented stable models, with the estimated risk by this method very close to the final model, which is also an indication of good fit of models.

Qualitative analysis

During the interviews, it was possible to confirm the multiplicity of factors that interfere in the RTW. The workers were willing to return to productive activity, demonstrating that this helped to overcome their functional limitations. *"I think that the desire to go back to work was stronger, you know"* (W1). *"[...] I couldn't stand [not working] anymore and I was in pain"* (W2). The importance and the meaning of work were highlighted in several reports. *"I miss work!"* (W2). *"I like having an occupation, doing something and being useful in something"* (W3).

Grip strength also emerged as a factor associated with RTW because several workers reported difficulties during the accomplishment of tasks that require strength: *"[...] I didn't have enough strength to hold, like, to use the hammer"* (W5). Consequently, some adjustments to the job were needed. However, these difficulties did not prevent the workers from performing their professional activity as they developed strategies to overcome the difficulty: *"[...] this problem can be fixed with the help of [the other hand]. It can be fixed"* (W1).

Other difficulties found at the time of RTW were pain during the execution of tasks, joint stiffness and limited range of motion. *"[...] any effort is painful... I don't have as much strength, you know"* (W4). *"I can't close my fingers, so that limits my hand strength a lot"* (W3). Activities that require a lot of effort were also pointed out as difficult to execute. *"I couldn't lift heavy parts, you know what I mean?"* (W4). Some workers pointed out that the injury to the dominant hand also hindered the RTW: *"[...] the other hand we can go without, [but] this one is essential. We need it for everything!"* (W2). There were also some limitations

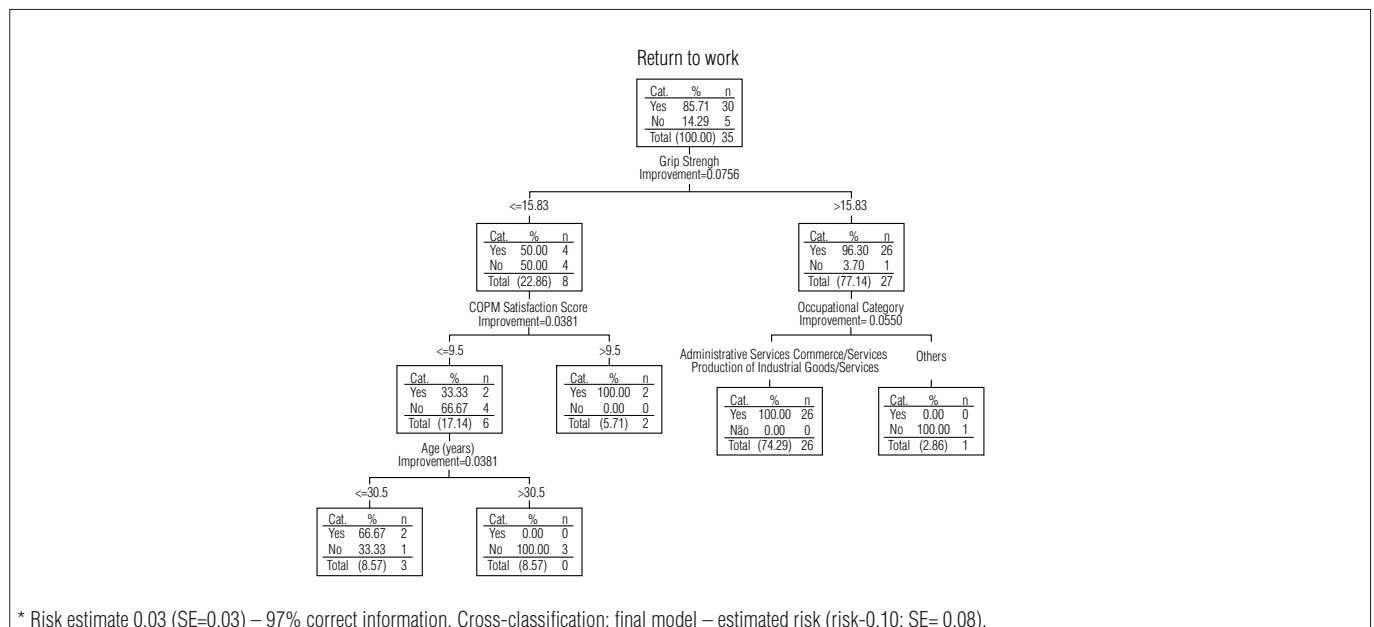


Figure 1. Model 1 – Decision tree, CART algorithm for return to work considering all predictive variables.*

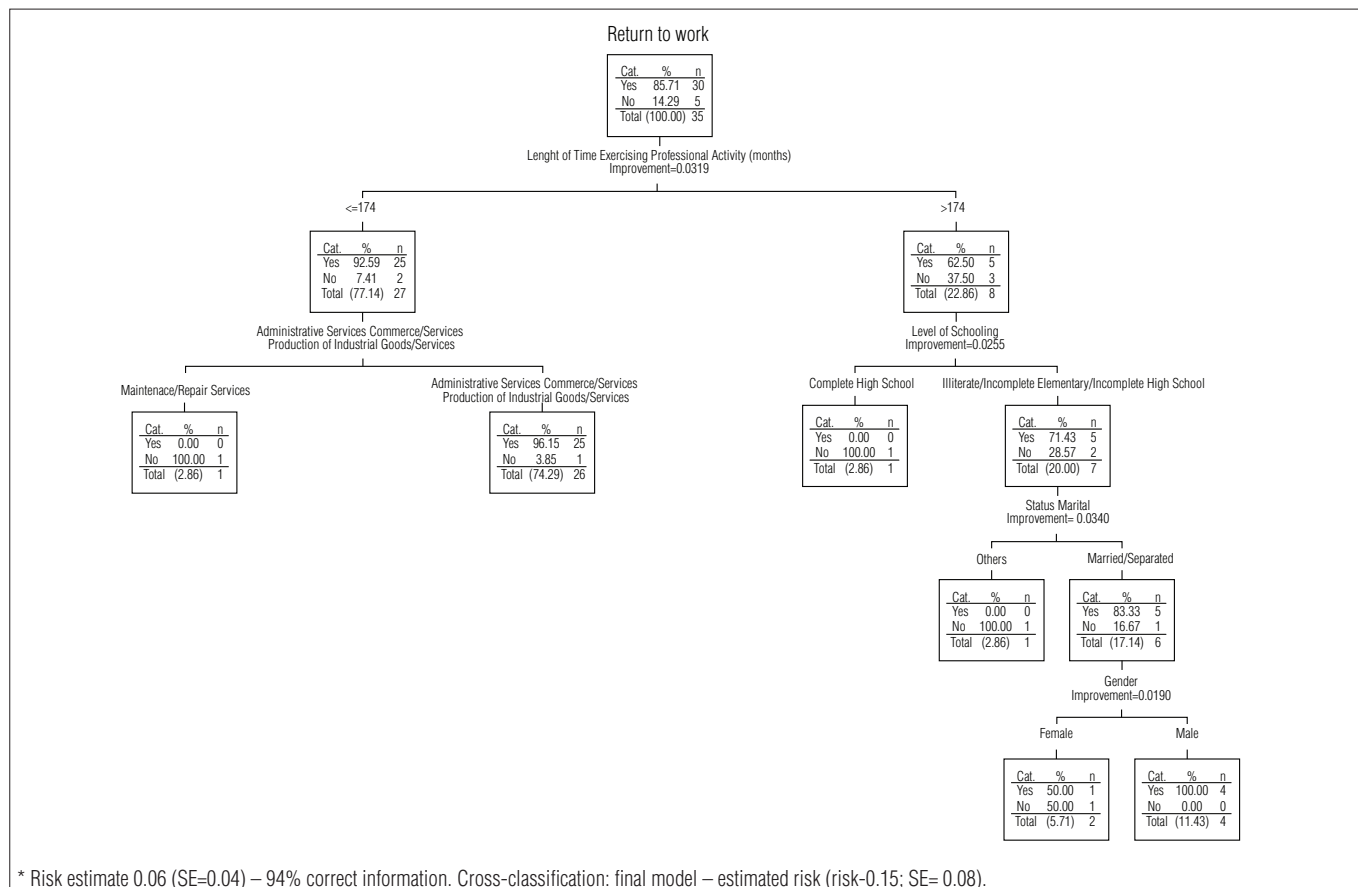


Figure 2. Model 2 – Decision tree, CART algorithm for return to work considering demographic and occupational variables.*

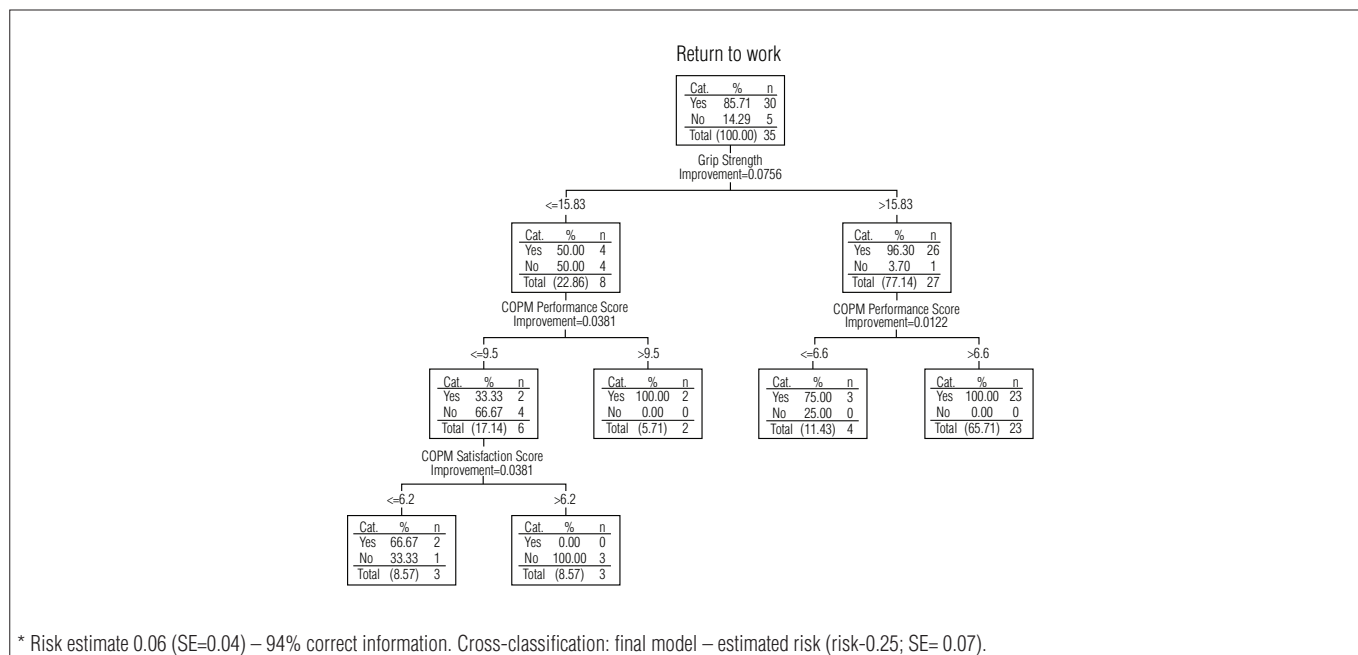
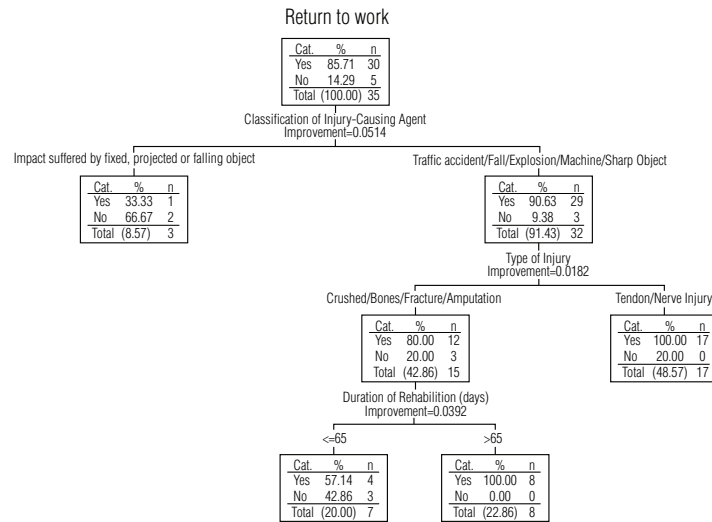


Figure 3. Model 3 – Decision tree, CART algorithm for return to work considering functional variables.*

to the performance of self-care and leisure tasks, however work was the most compromised dimension.

Other factors mentioned as hindrances to the RTW were fear of a new accident, fear of dismissal, time of sick leave and

an attitude of disregard on the part of the colleagues and the company. In contrast, support from the company and colleagues and the adjustment of the task facilitated the RTW for some of the respondents. *"I stayed there and did what I thought*



* Risk estimate 0.11 (SE=0.05) – 89% correct information. Cross-classification: final model – estimated risk (risk=0.17; SE=0.06).

Figure 4. Model 4 – Decision tree, CART algorithm for return to work considering clinical variables.*

I could do. Whatever I couldn't do, I put it aside for someone else to do. They understood" (W6).

There was no consensus regarding the possibility of retirement due to invalidity. Some workers preferred to maintain some kind of professional activity, even with functional limitations. *"I would have an income to support myself, but I didn't want to sit around. I wanted to work because I can't keep still [...] I feel like an animal in a cage" (W5),* while others pointed out that retirement could have been a solution to the threat of unemployment. *"Being the head of the household makes you worry about unemployment. It would be extremely difficult, you know [...] Retirement would solve that problem" (W7).* *"The labor market is demanding and prejudiced" (W3).*

The respondents suggested actions that would contribute to a successful RTW: a warm welcome on the part of the company and colleagues, the presence of a professional to help in the beginning of the process, a temporary change of department, flexible working hours to continue treatment, adjustment of the task to performance difficulties and accident benefits.

Discussion

The present study showed the multifactorial nature of the RTW for workers with hand trauma due to occupational accidents. The use of triangulation of the quantitative and qualitative methods allowed a combination of data and a broader view of the matter. Although the majority of participants returned to work, some of them are still not working, which shows the negative repercussion of this outcome on workers' lives. The studied sample is similar to the samples found in the

international literature on work-related hand trauma, in which there is a predominance of young, married men with a low educational level²¹.

The homogeneity of the studied sample regarding socio-demographic characteristics hindered the analysis and did not allow the analysis of the predictive validity of the variables educational level, marital status and gender in the RTW. The literature shows that workers with a higher educational level are more likely to find other work compared to those at an educational disadvantage. An explanation for the low success rate of reinsertion of uneducated workers is that a poorer technical qualification hinders allocation in new lines of work¹¹. Additionally, these workers tend to suffer more severe injuries with difficult recovery, such as amputations or crush injuries²².

Shorter durations of professional practice were associated with the RTW in a few occupational categories, with age being a factor that could explain this amount of time. Selander et al.¹¹ suggested that the RTW is facilitated in young people because of their better health status and motivation, in addition to their value in the labor market. The literature points to the gravity of occupational hand injuries, demonstrating that they require extended treatment and absenteeism, and result in higher levels of disability than other conditions²³. The present study showed that, in cases of complex hand injury at work, a longer duration of rehabilitation was positively associated with the RTW. When this occurs, the rehabilitation professional can follow up the worker's development throughout the process, stepping in according to the needs of each stage.

Although the present study found a strong association between grip strength and the RTW, both in bivariate and

Multivariate analysis, this association cannot be considered final. The literature cites grip strength as an indicator of upper limb function²⁴; however, there is no consensus on the minimal amount of strength that is needed for professional practice. A study suggested that at least 9 kgf of grip strength, measured with a Jamar dynamometer, is necessary to accomplish most activities of daily living²⁵. Nevertheless, Rice, Leonard and Carter²⁶ reported that less than 9 kgf was sufficient for functional use of the hand, considering that the measure of grip strength alone is insufficient to predict hand function.

The present study found that some occupational categories (i.e. workers in repair/maintenance, production of industrial goods/services and administrative services) required a grip strength greater than 15 kgf to allow the RTW. This higher cut-off point, in comparison with the literature, could be explained by the type of professional activity of this sample, in which most workers belong to the manufacturing industry and perform tasks that demand the use of strength. An individual may have insufficient strength to execute a task even though his or her grip strength is considered normal²⁷.

Interviews confirmed the impact of grip strength and occupational performance on the RTW and the relationship between these variables and the occupational category. Manual laborers reported difficulties in performing their work as a result of the decrease in hand strength. A former study confirmed this association, showing that manual laborers had a longer period of absenteeism and subsequent difficulty in returning to the workplace²⁸.

The multivariate analysis showed that greater worker satisfaction in relation to occupational performance was associated with the RTW. A study²⁹ demonstrated that satisfaction is a predictor of clinical outcomes due to its influence on adherence to treatment. Improved satisfaction and clinical outcomes have been associated with the implementation of intervention approaches that incorporate individual preferences into the rehabilitation process³⁰. Thus, it is expected that the rehabilitation professional will choose interventions that are focused on the workers' perception of their difficulties in occupational performance.

Self-reported occupational performance is also associated with the RTW, indicating the importance of the worker's perception of this outcome. The interviews showed that several factors can interfere in the occupational outcome, such as the ability to adapt to the workplace. When facing functional limitations, some workers reported that they changed the

way they performed their work to achieve an adequate result. Krause, Dasinger and Neuhauser⁹ performed a systematic review of the literature and verified that the use of work adaptation programs facilitated the readjustment, in temporary and permanent terms. It is considered that implementing work modification strategies could be a good alternative to support workers in minimizing their disability through the use of their capabilities.

The workers' report indicated some factors that were not noticed in the quantitative study: the importance of work and the meaning of disability. Even with functional limitations, workers emphasized the desire to return to work. Sampaio³¹ argues that absenteeism reinforces in the workers the extent of their disability, especially by the loss of the social role derived from their work. The workers corroborated the evidence that RTW success does not necessarily imply full recovery from injury¹². The perception of pain, grip strength and functional disability in particular improved over the first months after the return to occupational activities. The need for follow-up and support during the process of RTW also became evident, with emphasis on the fear of a new injury. According to the workers, work organization characteristics, such as problems related to colleagues and high demands on tasks made the adjustment difficult. They also pointed out that healthy interpersonal relationships and a warm welcome to the workplace facilitated their reentry.

The instability of the Brazilian labor market and the scarcity of employment were also pointed as reasons for insecurity and fear. The implementation of public policies that give tax and technical incentives to companies and the restructuring of professional rehabilitation services may be a way to facilitate the return and maintenance of workers in the labor market.

The present findings agree with Young et al.³² who showed that the RTW is a dynamic phenomenon that involves several steps, including those concerning the adaptation of workers. This research, despite a few limitations such as the number of subjects and its cross-sectional design, provides information about the complexity and relevance of the matter and could aid the people responsible for the policies and management of workers' health programs. Considering that work is vital to life and that the experience gained from it is individual and irreplaceable, we hope to contribute to a shift to a model of care focused on the individual's uniqueness. This involves the adoption of new theoretical models and the expansion of the dialogue with workers to reach common solutions.

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