Safety Science 93 (2017) 199–213

Contents lists available at ScienceDirect

Safety Science

journal homepage: www.elsevier.com/locate/ssci

# Work constraints leads to accident: Questionnaire validity and a qualitative interpretation of the cutoff point

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ARTICLE INFO

*Article history:*
Received 2 July 2016
Received in revised form 5 November 2016
Accepted 18 December 2016

*Keywords:*
Psychometrics
Epidemiology
Methods
Human engineering
Occupational health
Health personnel

ABSTRACT

French-speaking ergonomists conceive constraint as a work situation in which the worker has his power to act, think and decide reduced or hampered, which can facilitate the occurrence of work accidents. A questionnaire with five items was elaborated to measure constraint addressed to nursing staff members. From February to September 2013, a census was carried out at Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo, Brazil, one of the biggest hospital complexes in the world. The census response rate was approximately 92%. The construct validity and criterion's of the questionnaire was checked. After the former, four items remained, two of these measured time constraint and the other two Personal Protection Equipment constraint. The gold standards of the criterion validity were work accident involving exposure to biological fluid (WABIF) caused by sharp objects, WABIF through patient's body fluid contact and work incident (or almost accident) involving these two kinds of WABIF. Criterion validity was performed with both Item Response Theory (IRT) and Classical Test Theory (CTT) paradigms using logistic regression. Only WABIF by contact and incident got criterion validity. The results of the IRT paradigm showed that it is possible to go beyond the CTT cutoff point and reach a more qualitative interpretation when a relationship is established between the cutoff point value and the b parameter value of the category of each item. Hence, we find the intensity of the item (represented by its category) sufficient to him/her being at that risk.



## 1. Introduction

French-speaking ergonomics comprehend this subject as the specific study of human labour in real work situations (Tersac and Maggi, 2004), or work activities (Guérin et al., 2001), with their real working conditions – the resources the worker has to perform his work – and its effective results, which are associated directly with three aspects of the employer institution: prescribed work; working conditions determined by the company; expected results. Usually people who define prescribed work do not consider the laborers in real work situations. They are also responsible for dictating the working conditions and the expected results. All of these results have as consequences demands or constraints to which the worker is exposed in order to carry out his work activities (Falzon and Sauvagnac, 2007; Guérin et al., 2001). Consequently, the worker exposed to constraint has his power to act, think or decide reduced or hampered. Constraint can be in different forms, such as the time expected by the institution for the worker to do his job, the means provided to reach the expected results and the unusual variability – at least, initially – in the work situation. Tersac and Maggi (2004) call attention to the fact that variability can also be a consequence of features inherent to the organization of the work itself. Another phenomenon of French-speaking ergonomics is regulation, defined as the action through an operative mode which the worker does to attain results, after realizing that his actual results were insufficient (Falzon, 2007). When the regulation is not achieved, there is an imbalance between constraints to which the worker is exposed and the resources available to him in order to carry out his work activity (Falzon and Sauvagnac, 2007; Guérin et al., 2001). Work overload occurs when this imbalance is caused by high constraints and low worker resources, which can lead to situations that contribute both to worker illness and to work accidents as well as the almost accident.

The Brazilian Ministry of Labour and Employment (2005), of the Brazilian government annex II of Regulatory Standard number 32

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http://dx.doi.org/10.1016/j.ssci.2016.12.013
0925-7535/

(NR32), defines biological agents as bacteria, prions, parasites, fungi and viruses, among which human immunodeficiency virus (HIV) and hepatitis B virus (HBV) and C (HBC) are highlighted due to their level of mortality and morbidity. In Brazil, the most common work injury among health workers, especially among nursing staff, is work accidents caused by exposure to biological fluid (WABIF) which could contain these biological agents (Assunção et al., 2012; Balsamo et al., 2006). WABIF can be characterized by the contact of any patient body fluid with an injury on the worker's body caused by a contaminated sharp object with biological fluid, or when a patient's biological fluid comes into contact with the worker's skin or his/her mucosa. WABIF damages often go beyond worker physiological trauma, as HIV seroconversion, or its threat which affects the emotional balance of the worker, his relatives and friends (CDC, 2008). The World Health Organization (WHO) reports that WABIF among health workers has global relevance (Prüss-Üstün and Corvalán, 2006; Prüss-Üstün et al., 2003; World Health Organization, 2002), mainly due to the occupational component of exposure to HIV, HBV and HCV and the fact that health professionals represent approximately 0.6% of the world population.

This study aims to validate a constraint questionnaire addressed to nursing staff to check if constraint leads to work accident. For this, we use construct validity and criterion's. Specifically in the latter, we apply a crossover between the cutoff point and b parameter from the Item Response Theory (IRT) intending to reach not only a point on the construct specter as a whole that indicates a severe or unsafe construct level to the worker, but also the level of each item that indicates this unsafe condition. This will enable us to perform a qualitative interpretation about the cutoff point.

## 2. Method

The Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo (HCFMUSP), Brazil, is one of the biggest complex hospitals in the world. The Instituto Central (ICHC) is one of the principal buildings of this complex and it can be considered the main one if the criterion is the quantity of different clinical areas reunited only in one building. From February to September 2013, a nursing staff census was carried out at the ICHC. The ICHC is considered the pioneer building of the complex, which was opened in 1944 and was extended in 1981. Today this complex has more than five specialized institutes, two auxiliary hospitals, a rehabilitation division, an associated hospital as well as other units, such as a management building and an institute for Aids patients (Almeida and Moraes, 2012; HCFMUSP, 1997). About 46% (N = 1003) of patient beds at the complex belong to the ICHC, which physically corresponds to more than one third of the total complex area (352 mil $m^2$). Monthly, approximately 100 thousand people are attended at the ICHC and it offers to the population an emergency room, outpatient clinics, infirmaries, intensive care units and operating theatres. The ICHC also offers medical care specialized in the digestive system and liver transplants, renal and kidney transplants, hematology and bone marrow transplants, gynecology and obstetrics and burns. The population attended at the ICHC come not only from São Paulo capital or São Paulo state as a whole, but also from other Brazilian states and foreign countries. The ICHC clients reflect the reality faced day-to-day at the hospital complex.

We applied a standard training to form instructors and another to interviewers intending to minimize response biases of the study's participants, who were ICHC nursing staff members working directly with the hospital's patient. Both instructors and interviewers were aware about the study's aims. Instructors trained all interviewers at the field research. They were present in at least five interviews realized by each trainee interviewer because the instructors needed to warrant that trainee were administered very well the questionnaire, e.g., preventing suggestions to the participants answers. The project is part of a study which was presented and accepted by two Ethics committees of research on human beings, one at the School of Public Health, University of São Paulo, and another which belongs to HCFMUSP. Interviewers only performed the data collection with workers who consented to it. EPI-DATA software was used to record interviewee answers.

### 2.1. Variables

Below are the constraint items with their respective response categories:

- Item 1: If in an emergency situation the nursing staff member can carry out his/her tasks according to the technical guidelines (1-Yes; 0-No).
- Item 2: If nursing staff production is delayed when he/she executes the assigned tasks with the necessary care according to the technical guidelines (4-Always; 3-Often; 2-Sometimes; 1-Rarely; 0-Never).
- Item 3: If the nursing staff member was required to work in another job sector (5-More than once a week; 4 Weekly; 3-Monthly, more than once; 2-Monthly, once at least; 1-Less than once a month; 0-No).
- Item 4: If Personal Protection Equipment (PPE) hampers the execution of a good job (4-Always; 3-Often; 2-Sometimes; 1-Rarely; 0-Never).
- Item 5: How often did the nursing staff member not use PPE (4-Always; 3-Often; 2-Sometimes; 1-Rarely; 0-Never).

These items were written as questions, which were asked to the participants at the interviews. This questionnaire is cumulative in that the higher its intensity, the higher the constraint. Therefore, we inverted the first item to perform the analysis.

Items 1 and 2 measure constraint caused by time pressure. This constraint form is typical for hospital workers who deal constantly with emergency situations (Martin and Gadbois, 2007). In addition, nursing staff in Brazil must follow standard operational procedures (procedimentos operacionais padrões – POP) to carry out their respective functions in health institutions (Guerrero et al., 2008). Each POP strictly determines how nursing staff tasks should be done, how each stage of the task is to be carried out and the sequence to be followed. One of the essential POP targets is to guarantee the expected result for each task for the team. Thereby, item 1 was elaborated to determine whether the nursing staff member can achieve the POP even if he/she is faced with an urgent situation under the pressure of the hospital system. Item 2 aimed to determine if accomplishing POP delays the expected results.

Item 3 considers management constraint form (Tersac and Maggi, 2004), specifically the nursing staff turnover in several ICHC sectors. We can characterize constraint as the case when a nursing staff member is removed from his/her usual sector where he/she performs his/her day-to-day work activity, i.e., the place where he/she masters his/her tasks, to another where he/she has less experience. In this environment, the worker has fewer skills and resources to draw upon when faced with situations considered trivial for experienced workers in that sector. Then, his/her regulation capacity is impaired.

This constraint situation of item 3 was one finding of the dissertation developed using qualitative methodology and French-speaking ergonomics (Donatelli, 2013). This dissertation aimed to comprehend ICHC nursing staff members through the analysis of two WABIF, which occurred in this worker population. This study