Influences on the use of observational methods by practitioners when identifying risk factors in physical work

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Keywords: Ergonomics; Practitioners; Observational methods; Risk Assessment

ABSTRACT

Most observational methods for musculoskeletal disorder risk assessment have been developed by researchers to be applied in specific situations, and practitioners could find difficulties in their use in real work conditions. The main objective of this study was to identify the factors which have an influence on how useful the observational techniques are perceived to be by practitioners and to what extent these factors influence their perception. A survey was conducted on practitioners regarding the problems normally encountered when implementing these methods, as well as the perceived overall utility of these techniques. The results show that practitioners place particular importance on the support the methods provide in making decisions regarding changes in work systems and how applicable they are to different types of jobs. The results of this study can serve as guide to researchers for the development of new assessment techniques that are more useful and applicable in real work situations.

PRACTITIONER SUMMARY

A survey about the use of ergonomics assessment methods for identifying risk factors in physical work was conducted among practitioners. The reasons to find a method more or less useful were analyzed. The support the methods provide in making decisions regarding changes in work systems and how applicable they are to different types of jobs were found to be the main reasons.

1. Introduction

The methods for assessing exposure to risk factors for work-related musculoskeletal disorders (MSDs) can be classified in different ways, e.g. according to the degree of accuracy and precision of data collection, how invasive the measuring technique is for the work done by the employee, the field of applications, or the level of training required by the practitioner to use them correctly (Beek and Frings-Dresen 1998; Wells et al. 1997; Malchaire 2011; Li and Buckle 1999). Instrument-based or direct measurement methods employ sensors attached to the subject for measuring certain variables. These methods collect accurate data, but are invasive and require the employment of highly trained and skilled technical staff to ensure their effective operation (David 2005; Trask and Mathiassen 2012). Direct methods are preferred by researchers, but are unsuitable for use in real work situations (Li and Buckle 1999).

Observational methods are based on direct observation of the worker during the course of his work. Although these methods use data collection systems that are not very accurate and provide rather broad results, they have the advantages of being straightforward to use, applicable to a wide range of working situations and appropriate for surveying large numbers of subjects at comparatively low cost. Additionally, since they are relatively easy to use, they require a lower level of expertise than other techniques and do not require complex calibration processes. Therefore, these techniques appear to be best matched to the needs of occupational safety and health practitioners who have limited time and resources at their disposal and need a basis for establishing priorities for intervention (Genaidy, Al-Shedi, and Karwowski 1994; David 2005).

However, although observational methods are easier to use than those of other types of techniques, the practitioners are faced with several problems when using them in real work environments. They must be able to select, apply, and justify the use of one or more risk assessment methods. Previous research studies have addressed the utility and classification of observational methods based on criteria such as the need for appropriate instruments, the level of training required or the risk factor assessed (Takala et al. 2010; David 2005; Li and Buckle 1999; OHSCO 2008; Malchaire 2011) and for this purpose, have analysed the technical characteristics of each model. The results of these studies can serve as a guide for choosing the most appropriate method in each case, but no correlation is made between this classification and the extent to which the methods are actually used and how they are perceived by practitioners. Some previous research studies have addressed the problem of determining which observational measurement techniques are used in practice by conducting surveys on certified professional ergonomists (Dempsey, McGorry, and Maynard 2005) , or on Joint Health and Safety Committees members (Pascual and Naqvi 2008). According to Dempsey et al. (2005) the ergonomists surveyed responded that they used a certain method because they found it to be most appropriate for the task assessed. However, this response leads to the question: why is one method considered to be more appropriate than another for use in practice?

Pascual and Naqvi (2008) classified different ergonomic analysis tools according to how user friendly they were. Although these two works offer very useful information, knowing the reasons why practitioners perceive the observational techniques to be of more or less utility can be of great aid in developing new assessment methods which are applicable to and focused on use in actual practice.

The main objective of this study was to identify the factors which have an influence on how useful the observational techniques are perceived to be by practitioners and to what extent these factors influence their perception. The work was focused on physical risk factors and associated observational assessment methods. There is a wide range of potential contributory factors to MSDs and their assessment requires an equally broad range of methods, therefore it is very difficult to include all of them in a single study. For this purpose, the most common problems faced by practitioners when using these techniques were identified, as well as the extent to which these problems were perceived in the case of each method. Subsequently, the problems perceived in the case of each observational technique were correlated with the overall utility of the methods perceived by the practitioners. To achieve this main objective, it was first necessary to achieve a secondary objective: learning the demographic and academic profile of the practitioners (who are not necessarily certified) who make use of the observational methods required for ergonomics assessment, and determining which techniques they use and how frequently they use them.

2. Methods

In the first phase of the study, the authors and a group of certified professional ergonomists reviewed the most common problems faced by practitioners when implementing the observational techniques in real situations. Certain previous studies, as well as workshops and interviews with practitioners all served to identify five groups of problems. Subsequently, a survey was drafted to gather the opinion of 244 practitioners from 20 countries regarding eleven commonly used observational techniques. Besides basic demographic information, respondents were requested to indicate the extent to which each type of problem was encountered in the case of each different method, and the perceived overall utility of each technique.

2.1 Classification of the most common problems

Previous studies, workshops and discussions with practitioners (University of Surrey 2003; Buckle and Li 1996; Li and Buckle 1999; David et al. 2008; David 2005) led to the identification of several issues that need to be addressed. The results of these studies were analyzed by the authors and nine ergonomics professionals. All of them had great experience with MSDs prevention and observational assessment techniques. Several workshops were developed and a list of the problems most commonly found by the practitioners was obtained. After obtaining the list, the work team focused on grouping the problems found based on the general characteristics of the observational methods to which they were related. A list of eight groups of fundamental issues was initially obtained (groups of issues): Information, Training,

Instrumentation, Cost, Complexity, Time, Adaptability and Validity. The working group later decided to decrease the number of groups to five because they found them to be quite related and they aimed to simplify the development of the subsequent survey. Finally, the groups of issues were named as follows: Information/Training, Cost/Instrumentation, Complexity/Time, Adaptability and Significance.

The Information/Training group contained problems related to the training, skills and education of the practitioners who used each technique and the difficulty encountered in finding related information. Those responsible for assessing risks should possess a certain level of experience and know-how in order to be able to use the techniques correctly (OHSCO 2008). The level of know-how required varies depending on the technique (Takala et al. 2010). The current legislative frameworks in many countries do not guarantee that this condition is met. For example, the legislation of different European and American countries does not require companies to ensure that those responsible for carrying out this type of assessments have specific training or qualifications. In countries in which training or qualifications are required, they are limited to very basic training. For example, under Spanish law, companies should have Joint Health and Safety Representatives or Joint Health Safety Committees (JHSC) formed by the company's employees or agents. As for their characteristics, the law simply states that they must have sufficient capacity, have the necessary means, and there must be a sufficient number of such practitioners (Jefatura del Estado Español, 2003). The training required for an employee of a company to be a JHSC member can be limited to 30 classroom hours, and is not necessarily related to ergonomics. Such requirements are similar to those found in the Occupational Health and Safety Act (Government of Ontario (Canada) 2011), and less restrictive requirements can be found under the laws of certain Latin-American countries. Therefore, in many cases the practitioners do not have the training recommended to use ergonomic analysis tools or to correctly interpret the results obtained from their use. This problem is addressed from time to time by means of self-training and the search for information by practitioners. Nevertheless, original information on a particular method can be difficult to access. Practitioners may lack the means required to access this information. Therefore, they may obtain it from alternative sources, which in many cases, offer incomplete or incorrect data due to multiple interpretations. These difficulties are compounded for practitioners who do not speak English, since the original information sources are usually in this language. Consequently, training and the ease with which information can be accessed with respect to a specific technique can influence on the extent to which practitioners perceive a technique to be applicable and useful.

The group of Cost/Instrumentation issues encompassed the problems pointed out by practitioners relating to the technical requirements of the observational techniques and the cost of the application. The application of the techniques should be cost effective for the organization concerned (David 2005). In this regard, the cost to undertake assessments and analyze the dates will vary for different methods. Appropriate equipment and tools must be available to collect the data and information needed for the selected risk assessment method (Takala et al. 2010). The practitioners stated that at times they did not

have the appropriate equipment to apply certain techniques, or they did not have the proper training to use these instruments. Although they were not the only influential factors, the quantity and complexity of the necessary equipment are related to a great extent to the cost of using the techniques, both as regards the price of the equipment itself and the time required for its use.

The group of Complexity/Time issues encompasses the problems relating to the complexity of and time required to carry out the methods. In Malchaire (2011) the observational techniques are classified according to this criterion. A typical complaint voiced by practitioners is that the methods can be time consuming and labour intensive (University of Surrey 2003; Buckle and Li 1996). For example: "Too much detailed paper work…", "Forms could be very difficult to answer…", " It is difficult to obtain the data requested for the method…", "It takes a lot of time to gather information or fill out questionnaires…". Occupational safety and health practitioners have limited time at their disposal to carry out assessment, therefore practitioners need techniques to assess exposure that are easy and quick to use. The complexity of the method and time consumed can significantly influence how useful the practitioners judge it to be.

The analysis of the problems found confirmed the need for the techniques to be sufficiently flexible to be applied to a range of jobs, and comprehensive and reliable for a range of risk factors. Problems such as "Methods do not always fit into a practical situation" were classified under the group of Adaptability issues. The range of factors considered by different methods varies widely, and many of them assess risks on certain parts of the body and under specific conditions (Li and Buckle 1999; David 2005; OHSCO 2008). The conditions which are required to be met by the task for a specific technique to be applied determine the extent to which this the method can be adapted to the specific situations in the case of each job. The requirement for an assessment technique to be sufficiently flexible to be applied to a range of jobs was one of several key factors identified by practitioners (David 2005).

Practitioners are faced with preventing or reducing the number of musculoskeletal disorders in the workplace and need a basis for establishing priorities for intervention. The observational techniques were developed mostly to establish general relationships between work stressors and the prevalence of musculoskeletal disorders, rather than to settle a problem found in the case of a specific job (Malchaire 2011). The group of issues of significance encompasses the problems practitioners have in interpreting or making practical use of the results obtained for the observational methods. Some key demands, for example, are that the results should be easy to interpret, that they should be useful in finding problems but should also serve as a guide for determining the causes and possible resolutions, in order to demonstrate the need for workplace improvements to managers and encourage changes in the work system within their organization.

2.2 Survey

Once the groups of issues were formed, a survey was drafted whose purpose was to gather the opinion of practitioners regarding the extent to which these problems were found in the case of specific observational methods. For this purpose, information from *ergonautas.com* was used. *Ergonautas* is a web platform (http://www.ergonautas.upv.es) which is directed by the team who carried out this research study. It mainly aims to provide online information and software in the Spanish language for the application of a number of tools used for the ergonomics assessment of jobs. It currently has over 90,000 registered users from 60 different countries. Nearly 5,000 of those users are registered on the web as professional users. The difference between a user registered as a professional and a standard user is that the former pay to use online software and are provided with more advanced options, whereas the latter do not pay for the software but have less options. Upon registration, professional users complete a personal profile form.

2.2.1 Selection of survey respondents

The web platform database was used to analyze the profiles of 4,824 registered professionals. Professionals who had not initiated a session on the platform web in the past 6 months were eliminated. Finally, a list of 1,500 users who were registered as professionals from companies with more than 10 employees and who had carried out ergonomics assessments using the platform software was obtained.

An e-mail was sent to the 1,500 professionals selected with information regarding the study and instructions on how to participate in it. These professionals were requested to confirm and if necessary, to update their data, job, and their use of observational measurement techniques for activities relating to their company in our database. Those taking part in the study were rewarded with a free renewal of their registration on the web platform. Responses were obtained from 954 users, and, after reviewing the updated data, 167 respondents were eliminated due to changes in their job or profile. Finally, a list of 787 practitioners was obtained.

2.2.2 Survey development

The survey was developed by the same work team which had taken part in the previous phase of the study and consisted of two parts (See Appendix A). In the first part of the survey, demographic information (age and sex) and information regarding how much experience the respondents had in assessing ergonomic risks was obtained. Respondents were asked if they had official qualifications or certification enabling them to carry out tasks relating to ergonomics and occupational risk prevention in their company. The wording of this question was carefully considered to avoid confusion given that the laws and regulations regarding the qualifications and certifications required differ in each country. Finally,

respondents were requested to indicate whether, in their opinion, they had received enough information regarding the assessment of ergonomic risks to appropriately perform their job-related tasks.

In this first part, the respondents were also requested to indicate which of the ergonomics assessment methods included on a list of observational techniques they had used and, if not, why not. In order to select the techniques to be included in the survey the record of accesses *ergonautas* was used. The web offers more than 20 online applications of diverse observational assessment methods. Each time that a user completes an ergonomics assessment with a specific software application, the record of accesses is brought up to date, making it possible to know how many times each tool is used and by which users. The record of accesses for 2011 was analyzed to determine how many times each tool was used by professional users. The team that selected the methods to be included in the survey initially intended to limit the number to ten to prevent the survey from being excessively long so that respondents would not become bored. However, the analysis of the statistics on the online tools showed that eleven were used significantly more than the rest, and therefore the number of methods was increase to eleven. The selected methods were: NIOSH lifting equation (NIOSH) (Waters et al. 1993), Snook and Ciriello Tables (Snook and Ciriello 1991) and Technical guide for the assessment and prevention of risks related to manual handling of loads[1] (GINSHT) (INSHT 1998) for manual materials handling assessment; Rapid Entire Body Assessment (REBA) (Hignett and McAtamney 2000), Rapid Upper Limb Assessment (RULA) (McAtamney and Corlett 1993) and Owako Working Posture Assessment System (OWAS) (Karhu, Kansi, and Kourinka 1977) for posture assessment; Job Strain Index (JSI) (Moore and Garg 1995), Occupational Repetitive Action (OCRA) (Occhipinti 1998) and OCRA Checklist (Colombini et al. 2000) for repetitive movements assessment; LEST (Guelaud et al. 1977) and Chaffin Biomechanical Model[2] (BiomechEEC) (Chaffin 1969).

Therefore, respondents filled out a preliminary section indicating which observation methods they used. For each method they indicated, they were asked to complete a form with seven questions about the method's usability and utility. In these forms, one question was about how frequently they had used each method. One question was drafted for each of the five groups of issues (see section 2.1), an attempt being made to make sure the questions were clear for the practitioners. Those surveyed were requested to respond whether they perceived each type of problem, and to what extent. The last question asked respondents to make an overall consideration regarding the characteristics of the method, the way in

[1] GINSHT is used to refer to a method described in INSHT (1998) for the assessment of the manual handling of loads published by the National Institute of Safethy and Hygiene in the Workplace under the Ministry of Employment and Social Security of the government of Spain. The method is based on ISO 11228-1:2003: Ergonomics - Manual handling - Part 1: Lifting and carrying.

[2] BiomechEEC is a computerized biomechanical model based on the proposal in Chaffin (1969). Although it cannot strictly be considered to be an observational method, it was included in the study becaise it was one of the methods most used by practitioners.

which the method was used and the benefits that were obtained from its use, so as to give their opinion on how useful they perceived the method to be.

2.2.3 Survey procedure

The survey was conducted using online forms on the *ergonautas* platform. On the first page of the survey, information was offered regarding the way in which the survey was to be completed. After this first page, a second page was shown with the first part of the survey. When they had completed this first part, the respondents were shown the forms for each method (those they had chosen in the first part of the survey). The first survey was received in November 2012 and the survey completion period ended in April 2013.

2.2.4 Data analysis

A descriptive statistical analysis was carried out on the responses received as well as a Spearman's Rank-Order Correlation test, using the 955 forms on the assessment methods. The aim of the test was to determine whether there were any correlations between the assessments of the methods in each group of issues, and the overall utility of the methods perceived by the practitioners.

3. Results

Responses were received from 267 practitioners. Given that the number of practitioners invited to take part in the survey was 787, the response rate was approximately 34%. 23 of the surveys received were eliminated from the study because the time taken to completely the survey by the respondents was excessively short. The criteria set was that respondents should have taken at least one minute and a half to respond to the first part of the survey and at least one minute to complete each form relating to the methods assessed. Therefore, the data received from a total of 244 practitioners were finally analyzed. The second part of each survey consisted of a form for each method used by the survey respondent. In total, 955 forms were analyzed. The average time taken to complete the surveys was 12 minutes and 14 seconds, starting from the time the survey was presented until the time at which the data was received. The country of origin of those surveyed was distributed as follows: Spain (21.31%), Chile (11.07%), Colombia (10.25%), Mexico (9.84%), Venezuela (8.61), Argentina (8.61%), Peru (6.56%), USA (4.92%), Ecuador (4.51%), Guatemala (3.28%), Costa Rica (2.05%) and other countries (8.61%). The age of the survey respondents was distributed as follows: Younger than 25 (29.10%), from 26 to 35 years old (39.75%), from 36 to 45 years old (23.36%) and older than 45 (7.79%). 62.30% were men and 37.70% women.

18.85% of the respondents had less than three years of experience in the assessment of ergonomic risks, 28.69% had 3 to 6 years of experience, 39.34% had from 6 to 9 years of experience, 13.11% had from 9 to 12 years of experience and 5.74% had more than 12 years of experience. 199 respondents (81.56%) indicated that they had an official qualification or certification enabling them to carry out tasks relating to

ergonomics and occupational risk prevention in their company, whereas 45 (18.44%) responded that they had no such certification. When asked whether they considered themselves to have enough training in ergonomics risk assessment to carry out their tasks appropriately, 146 (59.84%) responded affirmatively, whereas 98 (40.16%) did not believe that they had enough training.

The number of different assessment methods used by each practitioner varied from one to eight, four being the number of methods most commonly used and the average being 3.91. Table 1 shows the results obtaining regarding the assessment methods used. The methods most frequently used were RULA, NIOSH lifting equation ,REBA and OWAS while the Snook and Ciriello Tables and the Biomechanical Model were the methods that were least used among those included in the study. When respondents answered that they do not use a method they were asked about the reason. The main reasons were: “I do not know this method “ or “I have not enough knowledge to use it”.

The answers regarding the observational methods are shown in Table 2. The Overall Utility of all the methods was scored highly. Only JSI, GINSHT, the Biomechanical Model and the NIOSH lifting equation were assessed by 10% or more of the respondents as "Hardly useful" or "Useless". OWAS, LEST, REBA and RULA were considered to be “Useful” or “Very useful” by more than 95% of the respondents. As for the group of Information/Training issues, more than 50% of those surveyed identified some type of shortcoming in the case of OCRA (59.18%), OCRA Checklist (57.90%), LEST (54.55%) and the Snook and Ciriello Tables (51.73%). The GINSHT and Snook and Ciriello Tables were scored the best in terms of Cost/ Instrumentation, over 60% of those surveyed considering the human and material costs involved to be low with respect to other methods. OCRA, OCRA Checklist, and the Biomechanical Model were perceived as the methods with the most issues relating to Complexity/Time. More than the 30% of those surveyed considered these methods to be more complex and time consuming than the other techniques. OWAS and LEST were the most versatile methods (Group of adaptability issues). More than the 87% of respondents indicated that they could be applied to enough or many types of jobs, and adapted well, or very well, to particular situations. Finally, OCRA, RULA, OWAS, REBA and LEST were scored the highest in terms of Significance. More than the 90% of those surveyed believed that the results of these methods appropriately reflect the current risk relating to the job and aided in determining the need to intervene in the case of this job.

An attempt was made to find correlations between the answers to the questions for the five groups of issues and the overall utility perceived by the practitioners. The data were considered to be ordinal qualitative variables, and therefore, a non-parametric test was chosen (Siegel and Castellan 1988). Although it is possible to convert the ordinal scales to their numerical equivalents in order to analyze the data with parametric tests, and occasionally this might be useful, this approach may lead to a poor interpretation of the results. e.g. when the replies do not adapt to a normal distribution (Kitchenham and Pfleeger 2003). Consequently, we ran a Spearman’s Rank-Order Correlation test using the 955 available

cases. Positive correlations were found among the five independent variables (the ways in which the methods carried out by the practitioners were scored in reference to the five groups of issues) and the dependent variable (the overall utility of the methods perceived by the practitioners). In all cases the correlations were significant ($p<0.05$) with a confidence level of 95%. The results are shown in Table 3.

4. Discussion

The results obtained show a significant positive correlation between the Information/Formation, Cost/ Instrumentation, Complexity/Time, Adaptability and Significance variables (as defined in section 2.1), and the overall utility of the observational ergonomics assessment techniques perceived. Based on survey from which this data were obtained, it can be concluded that the lesser problems perceived in relation to each of the groups of issues, the more useful the assessment method is perceived to be by practitioners. The analysis of the correlation factors shows that certain variables have a greater influence than others on the utility perceived. The correlation was strong for the Significance variable (0.6102), moderate for Adaptability (0.5067), and weak for Cost/Instrumentation (0.3604), Information/Training (0.3331) and Complexity/Time (0.2314).

The strong correlation between the Significance variable and the perceived utility of the method indicate that practitioners place great importance on easily interpretable results that reflect the real level of risk. In this group it was also taken into consideration whether the results serve as a guide for determining causes and demonstrating the need for workplace improvements to managers, in addition to encouraging changes in the work system within their organization. In view of these results, significant effort seems to be required to develop techniques which do more than establish general relationships between work stressors and the prevalence of musculoskeletal disorders. In order to effectively improve job conditions, the tools must also support the process of making decisions regarding the redesign or re-engineering that logically follow when the risk is identified. It is logical to conclude that the development of techniques with these characteristics will enable practitioners to involve managers in changing the work systems in place.

The moderate correlation between the Adaptability variable and utility perceived (0.5067) indicate that the practitioners consider it important for observational methods to be applicable to a range of jobs, and to be comprehensive and reliable for a range of risk factors, while enabling specific aspects of the jobs analyzed to be considered. Developing techniques with these characteristics may be a challenge for researchers. Reaching a high degree of generalization and simultaneously taking specific situations into account may lead to the development of methods whose use is more complex and time-consuming. Nevertheless, based on the results of this study, practitioners place less importance on the complexity of the methods than their ability to be adapted to real situations when valuing the utility of the techniques.

Ultimately, special attention should be paid to the development of techniques which: support the making of decisions regarding changes in work systems; are applicable to different types of jobs; and enable

specific characteristics commonly found in relation to each job to be taken into consideration. Achieving this aim might lead to an increase in the complexity of these methods as well as in the training required by the practitioners, in addition to the cost and time required for their use. However, these factors appear to be less correlated with the overall utility of the methods.

It is also necessary to make some considerations regarding the survey developed in this study. For the purpose of drafting the questions to be asked regarding the methods analyzed, the most common problems relating to their use were grouped under eight categories (groups of issues) The number of groups was finally decreased to five after combining certain of the categories initially considered. The aim was to make it possible to complete the form relating to each method in the shortest time possible. If there are too many questions, or it takes a long time for the respondents to answer the survey, than fatigue might become an issue, which would reduce the reliability of the data obtained (Brace 2013; Savage and Waldman 2008). For the same reason, the number of methods included in the survey was limited to eleven. There are a large number of observational techniques available to ergonomists and it is impossible to take them all into consideration in a single survey. The techniques selected were considered to be representative of those most commonly used by practitioners in their workplace.

Respondents were requested to complete a form on which they provided their opinion regarding the observational methods they most commonly use, but they were not required to do the same regarding the techniques they do not use. Doing so may have been useful in determining the reasons why a method was not used. However, not using a certain method might not have any correlation with the utility of the method. It might simply be the case that using a certain method was not necessary or that a practitioner had no knowledge of the method. When developing the survey it was considered to be preferable not to gather opinions regarding methods which were not used so as to guarantee that the responses related to methods that were well known by the respondents. The results have showed that this decision was in the correct way because in almost 64% of the cases the reason for not using a method was “I do not know this method “or “I have not enough knowledge to use it”.

One possible limitation of this study is that although the survey was conducted on 244 practitioners from 20 different countries, they were all Spanish speakers. It was found that one of the most commonly used methods was the Technical Guide for the Assessment of Manual Handling of Loads (GINSHT), developed by the National Institute of Safety and Hygiene under the Ministry of Employment and Social Security of Spain (INSHT 1998). The guide in which this observational method is described is written in Spanish, and the authors did not find any information on this method in English. Therefore, it may be not be known to practitioners who carry out their work in countries where Spanish is not spoken. Additionally, the survey respondents were selected from among the users of online software for the ergonomics assessment of jobs. Accordingly, all respondents used support software when using the observational assessment methods. This might have an influence on the results obtaining regarding

Complexity/Time, given that the use of software facilitates calculation tasks or the search for tabulated data. The results for this variable might have differed in the case that the respondents had used methods without computer support.

Finally, the survey was conducted on 244 practitioners from among those who were known to carry out ergonomics assessments of jobs in their companies. However, practitioners were not required to have any certification or qualifications other than those required in their respective countries to be able to carry out their work. This was the case because as previously indicated, the laws in each country differ in regard to the qualification, certification or training ergonomists are required to possess. As a result, in actual practice, the training profiles of the users of the observational methods are very diverse.

5. Conclusions

The main aim of this study was to determine the extent to which the requirements of observational methods, has an influence on the perceived overall utility of the methods, as perceived by the practitioners when using the methods in practice. The results show that, when judging the utility of an observational method, practitioners place particular importance on the support they provide in making decisions regarding changes in work systems, how applicable they are to difference types of jobs and whether they enable the specific characteristics of each job to be taken into consideration. Their complexity, the training required and time required for their use all appear to have less of an influence on the overall utility perceived. The results of this study can serve as guide to researchers for the development of new assessment techniques that are more useful and applicable in real work situations.

Acknowledgements

This work was supported by the *Programa estatal de investigación, desarrollo e innovación orientada a los retos de la sociedad* of the government of Spain under Grant TIN2013-42504-R.

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Appendix A – Survey[3]

Introduction

Thank you for your cooperation. As you were previously informed, the results of this survey will be kept completely confidential. In no case will the results which are made public be associated with specific people or companies.

Take the time you consider necessary to complete the survey. This survey is comprised of two parts. In the first part you are requested to provide information about yourself and the ergonomics assessment methods you usually use in your workplace. In the second part you will be requested to provide information regarding the experience you have using each of the methods selected.

When you have completed both parts of the survey, the data will be automatically sent to our server. Please be reminded that you are required to complete both parts of the survey in the same user session.

Thank you for your cooperation.

First part

- How old are you?

  ○Younger than 25 ○From 26-35 years old ○From 36 to 45 years old ○Older than 45

- You are a…

  ○Man ○Woman

- Do you have the qualifications or certification which officially enables you to carry out ergonomic and occupational risk prevention tasks in your company according to the laws of your country?

  ○Yes ○No

- Do you consider yourself to have received enough training on the assessment of ergonomic risks to carry out your tasks appropriately?

  ○Yes ○No

- How long have you been performing ergonomic risk assessments?

  ○Less than 3 years ○From 3 to 6 years

  ○From 6 to 9 years ○From 9 to 12 years

  ○Over 12 years

[3] This is a translation to English of the original survey in Spanish.

- Which of the following assessment methods do you usually use in your job? Please choose yes if you have used the method at least 3 times to assess a job in your company.

		If not, why not?			
	Yes	I do not know this method	I have not enough knowledge to use it	It is not necessary for my job	It is not a useful method
○ NIOSH lifting equation					
○ JSI (Job Strain Index)					
○ REBA (Rapid Upper Limb Assessment)					
○ OWAS (Owako Working Posture Assessment System)					
○ LEST					
○ Snook and Ciriello Tables					
○ OCRA					
○ OCRA Checklist					
○ BiomechEEC (Chaffin Biomechanical Model)					
○ LEST					
○ GINSHT (Technical guide for the assessment of manual handling of loads)					

<u>Second part</u>

With respect to the REBA method: [4]

- (A) Approximately, how frequently do use the REBA method in your job?

  ○Once a year or less ○Every 6 months ○Every three months

  ○Once a month ○More than once a month

- (B) Do you consider yourself to have enough training to use the REBA method appropriately and do you believe there is enough information available on this method and that it is easily accessible?

  ○Yes, I have enough knowledge regarding this method or I have all the required information and it is easily accessible.

  ○More training or information which is easier to access is needed

  ○No, I would need much more training and information

- (C) Compared to other methods, do you believe that the use of the REBA involves low costs to your company since its use requires few human (personnel) and material resources (orchestration)?

  ○Yes, the use of this method involves human and material costs which are lower than in the case of other methods.

  ○I consider the costs relating to the use of this method to be approximately the same as the costs relating to the use of another method.

[4] The second part of the survey was repeated for each of the methods chosen by the respondents in the first part. In this case the REBA method is used as an example

○No, the use of this method involves high human and material costs as compared to other techniques.

- (D) Compared to other methods, and with respect to the time required and how complex it is to use this method, you consider the REBA method to be…

  ○Especially simple and requires much less time than other techniques

  ○Somewhat simple and requires somewhat less time than other techniques

  ○The complexity and the time required is more or less the average for this type of techniques

  ○Somewhat more complex and requires somewhat more time than other techniques

  ○especially complex and requires much more time than other techniques

- (E) Do you believe the REBA method can be applied to many types of jobs and that it enables you to consider the specific situations of each job?

  ○Yes, the method is applicable to many types of jobs and it adapts well to almost all specific situations

  ○ It can be applied to quite a few types of jobs and adapts well to some specific situations

  ○ It can only be applied to some types of jobs and only in certain cases does the method adapt to very common situations

  ○ No, the method is very inflexible Very few jobs have the conditions required to be assessed and there is a failure to consider very common specific situations

- (F) In your opinion, do the results obtained when using the REBA method reflect the risk level of the job, are the results useful for determining whether intervention is required and do they serve as a guide to solve the problems found?

  ○Yes, the results always clearly reflect the current risk relating to the job and the need to adopt measures

  ○Yes, the results generally reflect the current risk relating to the job and the need to adopt measures

  ○From time to time the results do not reflect the current risk relating to the job, or do not serve to determine if it is necessary to intervene

  ○No, the results do not reflect the current risk relating to the job or do not they serve to determine if it is necessary to intervene

- (G) Taking into consideration the characteristics of the REBA method, the way in which you use it, and the benefits that are obtained from its use, you believe that the method is generally…:

  ○Very useful

  ○Quite useful

  ○Hardly useful

  ○Useless