PREDICTORS OF MUSCULOSKELETAL SYMPTOMS AMONG OFFICE WORKERS IN COSTA RICA BASED ON THE CUPID (CULTURAL AND PSYCHOSOCIAL INFLUENCE ON DISABILITY) STUDY AND COMPARISON WITH OTHER SPANISH-SPEAKING COUNTRIES

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DEDICATION

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Presented to the Faculty of The University of Texas

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in Partial Fulfillment

of the Requirements

for the Degree of

DOCTOR OF PUBLIC HEALTH

THE UNIVERSITY OF TEXAS
SCHOOL OF PUBLIC HEALTH
Houston, Texas
August, 2014

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Ann Arbor, MI 48106 - 1346

ACKNOWLEDGEMENTS

This work would not have been possible without the support of many people that helped me in different ways during this journey. First, I want to thank Dr. Sarah Felknor, the Fogarty International Center and all the staff at the Southwest Center for Occupational and Environmental Health. I also want to thank my committee members, Dr. David Gimeno, Dr. George Delclos, and Dr. David Douphrate that provided support and guidance. Among my family members, especially I want to thank my parents, Olga and Carlos Manuel, my sisters Olga and Marta who provided special support, my daughter María José, my nephews and nice, Mauricio, Adrian, Oscar, Andres and María Laura. Most importantly, I thank God for being with me all the way.

PREDICTORS OF MUSCULOSKELETAL SYMPTOMS AMONG OFFICE WORKERS IN COSTA RICA BASED ON THE CUPID (CULTURAL AND PSYCHOSOCIAL INFLUENCE ON DISABILITY) STUDY AND COMPARISON WITH OTHER SPANISH-SPEAKING COUNTRIES

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ABSTRACT

Objectives: To determine the prevalence and incidence of upper extremity (UE) and low back musculoskeletal pain (LBP) in two lower and middle-income Spanish-speaking countries (i.e., Costa Rica and Nicaragua) and Spain, a high income economy, and examine if the differences between countries are explained by physical, organizational, psychosocial and/or individual factors.

Methods: A secondary analysis of office worker data collected as part of the multinational CUPID study in Costa Rica, Nicaragua and Spain, between 2007 and 2011. A total of 1020 subjects participated at baseline (96.4% of those approached) and 90.2 % at follow-up. Six outcome measures were created for each anatomical region, three on baseline prevalence: (1) pain in last 12 months, (2) pain in past month, (3) disabling pain; and three on incidence at follow-up: (4) pain in past month, (5) disabling pain, (6) persistence of pain. After stepwise selection of covariables (i.e., sociodemographic and work-related characteristics, physical demands, health beliefs, somatizing tendency, and mental health), multivariate logistic

regression was used to estimate the association between country and each of these outcomes.

Results: Prevalence and disabling UE pain were approximately 2-fold higher in Costa Rica and Nicaragua than in Spain. Incidence of UE was also between 2 and 3-fold higher. Prevalence and disabling LBP were higher in Costa Rica and Nicaragua than in Spain and the incidence was mostly higher in Nicaragua, as compared to Spain.

Conclusion: Musculoskeletal pain was common in all three countries, with higher prevalence and incidence in Costa Rica and Nicaragua. Contrary to previous studies, our study shows that developing (low and middle income) economies might have higher prevalence and, in some instances, incidence of UE/LB pain as compared to Western or high-income economies (Spain). Differences among the three countries were only partially explained by the risk factors analyzed, possibly due to unmeasured factors such as ergonomic conditions, personal activities (hobbies, sports, home responsibilities, etc.), previous work exposure (work history), and/or compensation and public benefits systems.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

BACKGROUND

Musculoskeletal disorders

Musculoskeletal disorders (MSDs) are conditions that affect nerves, tendons, muscles, and supporting structures of the body (1,2). These disorders are also called cumulative trauma disorders (CTDs), overuse syndromes, repetitive strain injuries, and repetitive motion disorders (3). Usually, they are not acute injuries; there is slow development of the disorder over time. Injury can take weeks, months or even years to develop (2). Some of the first symptoms associated with the development of MSDs are muscle fatigue, pain, discomfort on movement, numbness, and tingling, especially at night. In a more advanced stage, symptoms of swollen joints, reduction of strength, and decrease in range of motion in joints, can make it difficult to perform personal tasks, such as buttoning, brushing hair or teeth, opening doors, etc. (2). It is important to identify early symptoms and treat the disease at an early stage (3). Recovery takes less time if treated early; if the disease is identified at a late stage, recovery is difficult and, in some cases, may even require surgery (2). Reporting of symptoms may be influenced by an individual's pain thresholds, relations with employer, employer receptivity, job insecurity, and cultural influences (4). Cultural differences influence workers' perception, tolerance of pain and willingness to report, which may influence the progression from symptoms to disability (5).

Some examples of MSDs include localized muscle fatigue (neck torsion syndrome), tendon-related disorders such as tendonitis and tenosynovitis, nerve entrapment syndromes of median, ulnar and radial nerves (pronator teres syndrome, carpal and cubital tunnel syndrome), and hand-arm vibration syndrome (3).

Risk factors for MSDs

Musculoskeletal symptoms seem to have an etiology that is multifactorial (4,6,7). Risk factors are difficult to identify because non-work-related activities also contribute to the development of the disease (8). For instance, daily life activities such as sports and housework represent additional stress to the musculoskeletal tissue (4). Work-related risk factors associated with the onset of MSDs include exposure to physical, organizational and psychosocial factors (9,10), as well as individual factors (7,11). When two or more risk factors are present, there is a markedly increased risk for the development of MSDs (3,4). It is also known that each risk factor contributes differently to the development of disease, depending on the nature of the disorder and the anatomical area that is involved (3).

There are different conceptual models that describe the potential pathways for the development of musculoskeletal disorders. One parsimonious approach is presented by the National Institute for Occupational and Health (NIOSH) (Fig. 1), which describes the different factors involved in MSD development (12).

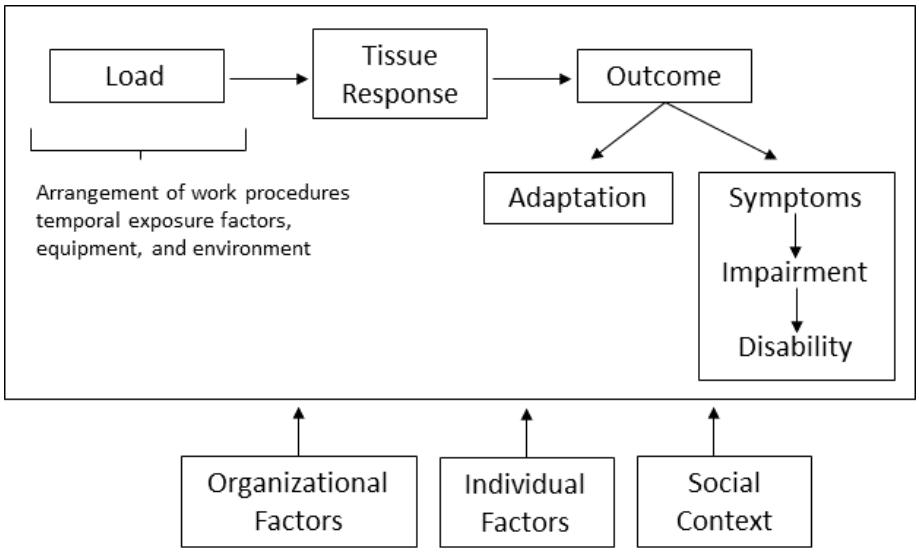

Figure .1 Conceptual model for the development of MSDs (Source: NIOSH, 2001) (12)

This NIOSH model includes physical load, organizational, individual and social factors that will be summarized as follows.

Physical load. Physical demands that arise from the job may generate musculoskeletal outcomes based on biomechanical strain in the body (13). Muscle exertion and intensity may lead to muscle fatigue, generating discomfort or pain in muscles which could indicate a disabling MSD (3). Identified physical factors that contribute to the development of MSDs are repetition, high force (8), non-neutral body postures (4), awkward joint postures, prolonged constrained posture, direct pressure (3), insufficient recovery time, segmental or whole body vibration, and local or whole-body exposure to cold (4). Identified risks factors for low back are heavy lifting, frequent twisting, bending and whole body vibration. Risks factors for upper extremities are repetition, high force and vibration (14). The attributable fraction (AF), i.e., the estimated proportion of back disorders that could be reduced if the risk is controlled or eliminated, is between 14% and 32% if static work postures are reduced. For upper extremity disorders, the AF for repetition is 53-71%, force 78%, and a combination of repetition and force 88-93% (4).

Organizational factors. Work organization influences physical demands and musculoskeletal outcomes (13), as well as psychosocial features (4). The way work is organized may generate stress, physical and psychological strain and, as a result, an increase in biomechanical strain (13,15). Stress may increase muscle tone, reduction of blood flow and supply of oxygen to tissue, which may contribute to the development of MSDs (7,15). Some organizational factors are intensive load, monotonous work, low job control (16), scheduling, and high job demands (13).

Individual factors. Individual factors mediate the body response to biomechanical

loading (14) and may have different effects depending on age, gender, previous symptoms (7), socio-economic status, and ethnicity (4). Systemic diseases such as rheumatoid arthritis, gout, lupus, and diabetes are identified risk factors for MSDs. whereas obesity, smoking and muscle strength are suspected risk factors (4). Other individual factors such as work style (17), behavioral responses to working long hours, fast paced work, applying excessive forces to keyboard or mouse, or inadequate work breaks (18) can influence musculoskeletal outcomes among computer users. Certain personal characteristics have shown an effect on MSD development. For example, high work demand may lead to higher number of injuries among older workers (13). Differences regarding gender showed that women have higher risk than men (6). A prospective cohort study showed that women were twice as likely as men to have discomfort symptoms in the neck, shoulder and arm/hand regions (19). Some explanations for these differences may be attributed to different anthropometry that could increase discomfort among women due to a misfit with working station. In addition, women tend to have more responsibilities than men in household duties and child rearing activities, with less time to recover outside of work. Also, women seem to have a difference in pain threshold since they are more likely to report symptoms than men (19). For carpal tunnel syndrome, there are other etiologic factors that may disproportionately affect women such as pregnancy, rheumatoid arthritis, hypothyroidism, acute trauma, wrist fracture, anomalous muscle and diabetes mellitus (3).

Social context. Recently, there is an increased interest in the contribution of psychological and social factors to the development of MSDs (7,12). Research studies have identified certain psychosocial risk factors such as monotonous work, excessive workload, time/deadline pressures, information overload, electronic performance monitoring, and

reduced social interaction opportunities (18). According to the National Research Council, modification of psychosocial risk factors may reduce MSDs symptoms (14). For back disorders, the AF are: low job satisfaction, 17% to 69%; low social support at work, 28 to 48%; high job demands, 21% to 48%; monotonous work , 23%; and high perceived stress, 17%. The attributable fraction for the upper extremities are high job demand, 33% to 58%; low decision latitude, 37% to 64%; low social support, 28% to 52%; and few rest break opportunities, 33% to 70% (4).

According to Marras, the impact of risk factor interactions may be greater than any individual factor and studies that better quantify the interaction of biomechanical load, soft tissue tolerance and psychosocial factors are needed in order to better understand the pathways of musculoskeletal injuries. This information is relevant for the development of better preventive strategies that may help to reduce the incidence of musculoskeletal disorders among employees (12).

Computer use and musculoskeletal disorders

In Western countries, musculoskeletal disorders are a major cause of morbidity and disability, and these are often attributed to computer use (20). Computers have become an essential tool for office work among different professional occupations (21). The number of workers using computers to perform their jobs has been increasing in the last two decades (6,22) and associated health-related problems have been increasing as well. The most common complaints among computer users are visual problems and musculoskeletal disorders (MSDs) (23). Some studies show that fifty percent of newly hired computer users who engaged in prolonged periods of typing often experienced MSDs symptoms within the

first 12 months of work (8,24) and 46% had musculoskeletal symptoms in neck/shoulder and hand/arm after the first month of follow up (24).

Musculoskeletal disorders across countries

Some studies suggest that MSD prevalence in low-middle income economies could be lower than in high income economies (25); however, it is not clear if physical and psychosocial risk factors are different in developing countries (26). Cultural circumstances may influence the difference in prevalence of musculoskeletal symptoms among workers performing similar jobs (20,27). Information about MSDs, computer use and its implications on workers' health have received little attention in Latin America (28), which is the target of this dissertation.

Work-related MSDs are becoming a worldwide health problem (29), increasing among office employees since the early 1990s (8). These disorders can vary from mild symptoms to functional impairment (3,8), impacting quality of life (4,9), decreasing productivity, increasing time loss (30), medical expenses and costs due to disability (3,4). Disability due to MSDs is considered an expensive health problem of modern times (7,12). According to the National Research Council, low back and upper extremities musculoskeletal disorders are a national health problem that has a high cost in United States (14). MSDs represent more than one third of work-related illness reported (1,4) with an estimate of approximate over 500,000 employees affected each year (31). According to the Bureau of Labor Statistics, in 2011 there were 387,820 new cases of musculoskeletal disorders, accounting for 33 percent of all injury and illness cases (32). Despite some studies suggesting a positive association between MSDs and country socioeconomic development status, this

has not been consistently studied nor has sufficient attention been devoted to closely examining the possible factors underlying such an association.

The CUPID Study

One recent and important study that analyzes the effects and interactions among all of these various risk factors is the ongoing Cultural and Psychosocial Influences on Disability (CUPID) study, which began in 2006. The principal investigator is Dr. David Coggon from the University of Southampton in the United Kingdom. The CUPID study aims to examine the influence of health beliefs and expectations based on culture on musculoskeletal disorders (MSDs) and MSD related disability (33). CUPID is a worldwide longitudinal study with participation of 18 countries from Africa (South Africa), Asia (Lebanon, Iran, Japan, Pakistan and Sri Lanka), Australasia (Australia and New Zealand), Europe (Estonia, Greece, Italy, Spain and the United Kingdom) and South and Central America (Brazil, Ecuador, Colombia, Costa Rica and Nicaragua). Data was collected at baseline and a follow up 12 months later. Local investigators in each country coordinated the data collection and provided unidentified data files back to the CUPID coordinating team at the University of Southampton (33).

Results from this study in different countries shows that prevalence of MSD symptoms among office workers vary. For example, in Sri Lanka the one month prevalence of low back pain is 12%, shoulder 12%, elbow 7%, and wrist/hand 8% (26), whereas in Japan the corresponding values are as follows: low back pain, 28%; shoulder, 17%; elbow, 5%; and wrist/hand, 7% (34). In Sri Lanka the one year prevalence of any pain is 56.9%, forearm/hand 42.6%, and shoulder/arm 32.0% (35). In contrast, in New Zealand the one year

prevalence for any pain is 84%, low back 45%, shoulder 38%, elbow 21%, and wrist/hand 33% (36). In Brazil the one year prevalence for low back 71.5%, shoulder 83.8%, elbow 84.9%, and wrist/hand 72.1% (37). The one month prevalence of multi-site pain is 40% in Crete and the incidence of low back pain in Spain is 19.0% (38). However, analysis of other Latin American countries that participated in CUPID has not been performed, and questions remain as to whether the incidence, prevalence and distribution of MSDs differs among these countries as well as with other countries, such as Spain, that may share similar cultural and linguistic characteristics, but differ in other aspects, such as socio-economic level. The CUPID study data provide a unique opportunity to examine these issues.

Public Health Significance

This dissertation can contribute to the public health field in several ways. First, CUPID is a longitudinal study that can inform the development of musculoskeletal symptoms and the associations of different contributing factors. Many cross-sectional studies have examined MSDs, but inferential studies of causal effect are limited. Second, our study, centered on certain Latin American countries, can provide valuable information on the impact of between country differences regarding the prevalence/incidence of musculoskeletal symptoms among office workers, as well as the influence of other factors, such as computer use. Information about computer users and MSDs is available in developed countries but studies on these topics are scarce in Latin America. Third, in recent years, there has been an increase in service industries in Latin America, including Central America, such as call centers and software manufacturing companies. This is likely to have been associated with an increase in computer use and, possibly, associated health problems. For example, in Costa

Rica, the governmental insurance office, Instituto Nacional de Seguros (INS) in 2006 reported 28,509 claims (23.3%) due to ergonomic related injuries and overexertion. This percentage of claims (23.3%), at least initially, seems to be lower than the percentages of claims in developed countries, i.e. United States (U.S.) percentage of claims (33%), but expenses due to payment of days away from work could be significant because, on average, musculoskeletal disorders result in more time lost from work than other type of cases. According to the U.S. Bureau of Labor Statistics in 2011, the median time to recuperate from musculoskeletal disorders was 11 days in comparison to 8 days for other cases.

Fourth, this study can provide information to better understand the development of musculoskeletal symptoms and characterize the risks associated with MSDs in Latin America. If valid, this information could be used to inform the prevention of MSDs among office workers and allow the development of prevention programs and intervention initiatives to improve workers' health. Lastly, this study may provide valuable information to inform the development of future research, intervention programs and impact assessment of MSDs among office employees in Latin America.

Study Objectives

Overall Research Goal:

To estimate the prevalence, incidence and persistence of musculoskeletal symptoms and identify the predictors of symptoms among office employees in three countries (Costa Rica, Nicaragua and Spain) that may better inform the development of effective interventions to prevent musculoskeletal disorders in this population.

Study question 1:

Is the prevalence, incidence and persistence of low back musculoskeletal symptoms and associated disabling pain for daily living tasks among office employees similar in Spanish-speaking countries?

Aims:

1. To estimate the prevalence of low back musculoskeletal symptoms and associated disabling pain for daily living tasks in a sample of office workers from Costa Rica, Nicaragua and Spain.
2. To estimate the incidence and persistence of low back musculoskeletal symptoms and associated disabling pain for daily living tasks in a sample of office workers from Costa Rica, Nicaragua and Spain.
3. What determinants could explain the differences in the prevalence and/or incidence of low back musculoskeletal symptoms and associated disabling pain for daily living tasks among office workers in Costa Rica, Nicaragua and Spain?

Study question 2:

Is the prevalence, incidence and persistence of upper extremity (i.e., shoulder, elbow and wrist/hand) musculoskeletal symptoms and associated disabling pain for daily living tasks among office employees similar among Spanish-speaking countries?

Aims:

1. To estimate the prevalence of upper extremity musculoskeletal symptoms and associated disabling pain for daily living tasks in a sample of office workers from Costa Rica, Nicaragua and Spain.
2. To estimate the incidence and persistence of upper extremity musculoskeletal symptoms and associated disabling pain for daily living tasks in a sample of office

workers from Costa Rica, Nicaragua and Spain.

3. What determinants could explain the differences in the prevalence and/or incidence of upper extremity musculoskeletal symptoms and associated disabling pain for daily living tasks among office workers in Costa Rica, Nicaragua and Spain?

Covariables to be examined for both goals:

1. Sociodemographic characteristics: sex, age, dominant hand, age finished full time education, height, and smoking.
2. Physical demands: use of keyboard, repetitive wrist/hand movements, repeated elbow bending, hands above shoulders height, lifting weights of 25 Kg or more by hand, climbing up or down stairs and kneeling/squatting.
3. Work-related factors: including employee's job history (i.e., years at current job, hours worked/week, contract type, another job), job organization characteristics (i.e., piece work payment, target piece work, bonus payment, and work under pressure) and psychosocial aspects of the work (i.e., job control, social support, job satisfaction, job security).
4. Health beliefs related to musculoskeletal symptoms: causes and prevention of pain, negative beliefs about prognosis of symptoms and awareness of the term repetitive strain injury (RSI) or work-related upper extremity disorder (WRULD) or cumulative trauma disorder (CTS) or musculoskeletal disorder (MSD), knowledge of other people with musculoskeletal complaints.
5. Somatising tendency: faintness or dizziness, pains in the heart or chest, nausea or upset stomach, trouble breathing, numbness or tingling or feeling weak in parts of the body, hot or cold spells.

6. Mental health: good, intermediate, or poor.

METHODS

Study Design

The present study is a secondary analysis of office workers, based on data collected as part of CUPID study in Costa Rica, Nicaragua and Spain. The study started in 2006; data were collected at baseline and at follow-up 12 months later. Local investigators in each country coordinated the data collection and provided unidentified data files back to the CUPID coordinating team at the University of Southampton in the United Kingdom.

Study sample and recruitment

Each participating country was initially asked to recruit workers from the occupational group of interest for the present study (i.e., office workers that used computers regularly) as well as two other groups, nurses and workers with tasks that involved repetitive manual activities with arms or hands. The inclusion criteria were: workers between 20 and 59 years of age who had been working at least 12 months in their current job (33). Following power calculation guidance from the principal investigator of CUPID, it was determined that an adequate sample size to detect differences between countries in the prevalence of symptoms, disability, and risk factors was 200 workers per occupational group.

In all three of our specific study countries (Costa Rica, Nicaragua and Spain), participants were randomly sampled from payroll records; data were collected by interviews in Spanish (33). Among the 1,020 office employees approached to participate in the study

from all three countries, there was 96.4% participation: Costa Rica 91%, Nicaragua 100% and Spain 98% (33). In Costa Rica, data collection was conducted between March 2009 and July 2011. Office workers were recruited at the central offices of the Costa Rican Social Security System (Caja Costarricense de Seguro Social - CCSS); the number of subjects that participated at baseline were 249. In Nicaragua data collection was conducted between February 2008 and November 2010. Office workers were recruited from the Ministry of Labor and Nicaraguan Institute of Social Security; the number of subjects that participated at baseline was 300. In Spain, data collection was conducted between November 2007 and February 2010. Office workers were recruited from four hospitals and a university in Barcelona; the number of subjects that participated at baseline was 471 (38). Seventy-three responders were excluded because they did not meet the inclusion criteria (age 20-59 years of age and worked at current job at least one year): 25, 15 and 33 from Costa Rica, Nicaragua and Spain, respectively. The final number of subjects analyzed at baseline was 947 (93.0%): 224 from Costa Rica, 285 from Nicaragua, and 438 from Spain. Participation at follow up 12 months later from the three countries was 90.2 % (853 subjects): from Costa Rica, 92.4% (206 subjects); Nicaragua, 89.1% (254 subjects); and Spain, 89.7% (393 subjects).

Data Collection

Questionnaire data were collected for each study participant by a questionnaire that was adapted in each country to the specific language and context. Questions were first developed in English (33) and then translated into Spanish (38) with independent back translation into English to detect misinterpretations and modifications to the Spanish version (38). Additional adjustments to local terminology were done to ensure better understanding

of the questions by the respondents. Questionnaires were pilot tested in each country with similar population than the intended population and that was not included in the final sample.

There were two questionnaires, one for the baseline data collection and a second one for the follow-up. The baseline questionnaire (see Appendix A) included sections on demographics (i.e., age, sex, education, height and dominant hand), health-related behaviors (i.e., smoking habits) and work-related data (i.e., occupation, time working at current job, physical activities related with work, job control, social support, job satisfaction, job security). The section on health-related information asked about pain at six different anatomical regions (low back, neck, shoulder, elbow, wrist/hand and knee), disabling pain in these regions for daily tasks activities in the past month and past 12 months using diagrams similar to the Nordic Questionnaire (39) and that have been used in prior studies (33); awareness of other people with pain; believes related to cause and prevention of pain (fear-avoidance beliefs) adapted from the Fear Avoidance Beliefs Questionnaire (40); awareness of repetitive strain injuries; mental health based on the Short Form-36 (SF-36) (41); somatic symptoms using the Brief Symptom Inventory (BSI) (42), and sickness absence in the past 12 months. The follow-up questionnaire (Appendix B) asked information about changes in job, pain at the same six anatomical regions, any disabling pain for daily living tasks in the past month, somatic symptoms during the past 7 days, mental health in the past month, and sickness absence in past 12 months.

Outcome Variables

Regarding study question 1, the outcome of interest was low back pain, indicated as present or absent. For disabling pain, participants reporting LBP were asked whether it

interfered with daily activities. Pain was classified as disabling if it was difficult or impossible to perform activities such as cutting toe nails, getting dressed and doing normal jobs around the house and non-disabling if otherwise.

Regarding study question 2, the outcome of interest was upper extremity musculoskeletal pain, a dichotomous variable was created indicating absence or presence of pain in each of three body parts (shoulder, elbow and wrist/hand), considering laterality (right or left), and then combined to obtain a single UE musculoskeletal pain variable. For the analysis, these six body parts were grouped into a main UE body location given the sample limitation to analyze each body location separately. For the study of disabling pain, those who had pain were asked whether the pain did interfere with daily task activities around the house or with daily activities such as combing or brushing hair, bathing/showering, getting dressed, opening bottles, jars, or taps, writing, locking and unlocking doors. Pain was classified as disabling if it was difficult or impossible to perform any of the activities mentioned and non-disabling if pain did not interfere with everyday activities.

We created six outcome measures for each outcome of (UE and LB) musculoskeletal pain, three on baseline prevalence: (1) pain in last 12 months, (2) pain in past month, (3) disabling pain; and three on incidence at the 12-month follow-up: (4) pain in past month, (5) disabling pain, (6) persistence of pain. Pain prevalence and disabling pain were calculated at baseline, whereas incident pain was calculated among participants who were pain-free at baseline and developed pain at the 12-month follow-up. Likewise, disabling pain was calculated among participants who did not have disabling pain at baseline and developed disabling pain at follow-up. Persistent pain was calculated among subjects with pain at

baseline that continued at follow-up.

Independent variable/covariables

Regarding the independent variable and covariables examined for both study questions, the main independent variable of interest was country and the covariables were (a) sociodemographic characteristics, (b) physical demands, (c) work-related characteristics, (d) health beliefs related to musculoskeletal symptoms, (e) somatising tendency, and (f) mental health.

Regarding sociodemographic characteristics, the following variables were considered: sex coded as male (0) or female (1); age at the time of the baseline survey categorized as between 20 to 29 years (0), 30 to 39 years (1), 40 to 49 years (2), and 50 to 59 years (3); education attainment was assessed by a proxy, age in years when full time education (years) was completed categorized as less than 14 (0), 14 to 16 (1), 17 to 19 (2) and 20 or more (3). Participant's dominant hand was coded as left (0), right (1) or both equally (2). Height was measured in centimeters and treated as a continuous variable.

Regarding physical demands the variable indicated absence (coded 0) or presence (coded 1) of physical demands if the job required to use a keyboard > 4 hours, other repeated wrist/hand movements > 4 hours, repeated elbow bending > 1 hour, hands above shoulder height > 1 hour, lifting 25 Kg (56 lbs) by hand, or kneeling or squatting > 1 hour.

Regarding work-related characteristics, for employee job history the following variables were considered: years at current job less or equal to 5 years (coded 0) or more than 5 years (coded 1); number of hours worked per week categorized as less than 30 hours (coded 0), 30-49 hours (coded 1) and equal or more than 50 hours (coded 2); permanent

(coded 0) or temporal (coded 1) contract type; and having another job (coded 1) or not (coded 0).

For the study of job organization characteristics the following variables were considered: incentives present (coded 1) if piecework (the person gets paid according to the number of articles or tasks made or finished in the day, i.e., "incentives") or if bonus payment (the person get paid a bonus if he/she makes or finishes more than an agreed number of articles or task in the day) or no incentives present (coded 0); work under time pressure due to a target number of articles or tasks to make or finish in the day or because it is required to complete tasks by a fixed time (coded 1) or no time pressure (coded 0).

For the study of psychosocial aspects the following variables were considered: lack of choice if the person can decide how the work is done, what is done, or work timetable and breaks (coded 0) or if the person cannot decide (coded 1); lack of support if the person does not have support from colleagues or supervisor/manager when he/she has difficulties at work (coded 1) or if the person has support (coded 0); job dissatisfaction if the person is dissatisfied or very dissatisfied with his/her job (coded 1) or very satisfied or satisfied (coded 0); perception of job insecurity in case of a significant illness that kept them off work for three months, if the perception is rather unsafe or very unsafe (coded 1) or very safe or safe (coded 0).

Regarding health-related variables, the following were considered: adverse health belief if completely agree or agree (coded 1) to the following: pain is commonly caused by people's work, physical activity is harmful (physical activity should be avoided and rest is needed to get better), poor prognosis (neglecting pain problems can cause permanent health problems, disagree that pain usually get better within 3 months) and unsure, completely

disagree or tend to disagree (coded 0); awareness of repetitive strain injury (RSI), work-related upper extremity disorder (WRULD) or cumulative trauma syndrome (CTS) (coded 0) or no awareness (coded 1); awareness of someone outside work with pain (coded 1) or no awareness (coded 0). Regarding somatising tendency the variable of interest was the number of distressing somatic symptoms in past week categorized as no somatic symptoms (coded 0), one somatic symptom (coded 1), and 2 or more somatic symptoms present (coded 2) indicating as having a symptom if moderately, quite a bit or extremely to the following symptoms: faintness or dizziness, pains in the heart or chest, nausea or upset stomach, trouble getting breathing, numbness or tingling or feeling weak in parts of the body, hot or cold spells. Finally, a variable indicated good mental health (coded 0), intermediate or poor mental health (coded 1).

Data Analysis

Characteristics of participants such sociodemographic, work-related characteristics, and psychosocial aspects of work, the prevalence of pain and its associated disabling pain for UE/LB as well as the incidence of pain and its associated disabling pain for UE/LB were analyzed using descriptive statistics, including frequencies, proportions and standard errors. Differences between countries were assessed by chi-square tests with a significance level of $p \leq .05$.

For each outcome we followed Hosmer and Lemeshow's model-building guidelines [43]. However, following Amick *et al.* [44], and due to the large number of covariables, we selected covariables for the final models by groups (sociodemographic, employment, health-related and working conditions). First, we selected covariables with a p-value <0.25 in the

association with the outcome of interest within each group of variables. Second, we created two separate models: an individual-level model including all the covariables selected from step 1 regarding sociodemographic, employment and health; and an organizational-level model including all the covariables selected from step 1 regarding working conditions. All covariables with a p-value <0.10 were then combined into a multivariate model. In the reduced model only covariables with a p-value < 0.05 were included. Hosmer and Lemeshow's goodness-of-fit test were conducted for each model with acceptable values (43). These significant covariables were used to estimate adjusted odd ratios to explain the differences in prevalence/incidence between countries with Spain as the reference group. Logistic regression was used to calculate odd ratios (OR) and their corresponding 95% confidence intervals (95%CI) for the association between the independent variable (country) and each of the six health-related outcomes. The statistical analysis was performed using Stata version 13 software (45).

Human Subjects Considerations

Ethical approval was obtained from the research ethics committee in each country and a written informed consent was obtained from all participants (33), as well as from The University of Texas Health Science Center Committee for the Protection of Human Subjects. In Costa Rica, ethical approval was obtained from the Ethics Committee at the Universidad Nacional. In Nicaragua, approval was obtained from the Ethics Committee for Biomedical Research at the Universidad Nacional Autónoma de Nicaragua (33) and in Spain by the Parc Salut Mar Ethics Committee of Barcelona and its Health and Safety Committee (38).

JOURNAL ARTICLE 1

Low back pain among office workers in three Spanish speaking-countries: findings from the CUPID study.

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Key words: Cross-national studies; Longitudinal; Musculoskeletal pain; Risk factors.
Word count (main text): 3,509
Tables: 3
Figures: 0

Journal Proposed for Article Submission: Pain

ABSTRACT

Objectives: To estimate differences in prevalence and incidence of low back pain (LBP) and associated disabling pain, among office employees in Costa Rica, Nicaragua and Spain.

Methods: We analyzed office worker data collected as part of the multinational CUPID study from Costa Rica, Nicaragua and Spain, at baseline and after 12 months. For the current analysis, 1020 subjects were included at baseline (96%) and 90% at follow-up. Six outcome measures were examined, three on baseline prevalence: (1) LBP in last 12 months, (2) LBP in past month, and (3) disabling LBP; and three at follow-up: (4) incidence of LBP in past month, (5) incidence of disabling LBP, and (6) persistence of LBP. We used logistic regression to estimate the association, odd ratios (OR) and their corresponding 95% confidence intervals (95%CI), between country and these outcome measures, adjusting for socio-demographic, job and health variables.

Results: After adjusting for covariates, prevalence of LBP in the past month among office employees in Costa Rica (46.0%) and Nicaragua (44.2%) was higher than in Spain (33.6%). Incidence was 37.0% in Nicaragua (OR=2.49; 95% CI: 1.57-3.95), 14.9% in Costa Rica (OR=0.74; 95% CI: 0.41-1.34), and 19.0% in Spain (reference group). Incidence of disabling pain was also higher in Nicaragua, 17.2% (OR=2.49; 95% CI: 1.43-4.34) and Costa Rica, 13.6% (OR=1.89; 95% CI: 1.03-3.48) compared to Spain (7.7%), while incidence of LBP in the past month and persistence of LBP was only higher in Nicaragua.

Conclusion: LBP prevalence and disabling pain were higher in Costa Rican and Nicaraguan office workers than in Spain but incidence was mainly higher in Nicaragua. The socio-demographic, job-related and health-related variables we examined did not fully explain the country differences. Future studies are needed to examine if other working conditions (e.g.,

workplace ergonomics) and/o cultural determinants explain the remaining differences.

Background

Low back pain (LBP) is a common worldwide musculoskeletal health problem [1-3], a major cause of sickness absence and disability [4,5] and is costly [3,5]. LBP is a leading cause of disability in workers younger than 45 years, and has a lifetime prevalence of 60%-80% [3,6,7]. Prevalence of LBP differs substantially by industry, occupation [7] and between workers in different professions [2]. Nevertheless, given the computerization of jobs brought about by rapid and continuous technological advances [3], most jobs may be, at least partially, performed in an office working with a computer while seated for long hours [5,8]. Thus, office workers are a good case study since they may represent a large section of the workforce and be comparable across countries.

The prevalence of LBP has also been shown to vary by country [9] in relation to their income level. Also, a recent study among European countries showed that high income economies have higher prevalence than low- and middle-income economies [10]. However, there have been no comparative epidemiological studies in areas such as Central America, one of the fastest growing populations worldwide that have traditionally suffered from a significant lack of reliable (or any) data on musculoskeletal health, and even less on LBP.

Moreover, it is unknown whether the distribution of the potential LBP etiologic factors also differs in relation to the socioeconomic conditions of the country, and/or whether country differences in LBP prevalence could be explained by the relative importance of the multiple factors involved such as physical (e.g., manual material handling has been associated with higher prevalence of LBP) [7,11], psychosocial (e.g. high job demands and low

social support have been shown to predict LBP and related disability) [12] or individual, whether demographic (e.g., increasing LBP prevalence among older age groups) [4] or health-related (e.g., individual tendency to somatization has been linked to higher LPB prevalence) [13,14]. Thus, this study aims to (1) determine the prevalence and incidence of LBP in two middle-income Spanish-speaking countries (i.e., Costa Rica and Nicaragua) and Spain, a high income economy; and, (2) to examine if the differences between countries can be explained by physical, psychosocial and individual factors.

Methods

Study design and participants

This was a secondary analysis of office workers from data collected as part of the Cultural and Psychosocial Influences in Disability (CUPID) study, centered on three participating Spanish-speaking countries: Costa Rica, Nicaragua and Spain. The CUPID study aims to examine the influence of health beliefs and expectations, based on culture, on musculoskeletal disorders (MSD) and their related disability [15]. CUPID is a worldwide longitudinal study with participation of 18 countries from all continents. In our three study countries, office workers who regularly used computers were randomly sampled from payroll records; data were collected by interviews in Spanish at baseline and at follow-up 12 months later [15]. In Costa Rica, data collection was conducted between March 2009 and July 2011 at the central offices of the Costa Rican Social Security System. In Nicaragua, the sample was recruited between February 2008 and November 2010 among office workers from the Ministry of Labor and Nicaraguan Institute of Social Security. In Spain, data collection was conducted between November 2007 and February 2010; office workers were recruited from

four hospitals and a university in Barcelona [16]. Additional information regarding the characteristics of the sample and the data collection process can be found elsewhere [18]. Ethical review and approval was obtained in each country by their institutional review committees, as well as by The University of Texas Health Science Center Committee for the Protection of Human Subjects.

The overall participation rate was 96% (1,020 participants) for the three countries: Costa Rica, 91%; Nicaragua, 100%; and Spain, 98% [15]. Participants who did not meet the inclusion criteria (i.e., age 20-59 and worked at current job at least one year) were excluded (n=25 in Costa Rica, n=15 in Nicaragua, n=33 in Spain). The number of subjects analyzed at baseline was 947 (93%), 224 from Costa Rica, 285 from Nicaragua, and 438 from Spain, with a follow up percentage of 90.2% (Costa Rica 92%, Nicaragua 89.1% and Spain 90%).

Questionnaire

Baseline and follow-up questionnaires were first developed in English [15] and then translated into Spanish with independent back-translation into English [16]. Each country pilot tested the questionnaires to ensure understanding of the questions by the respondents. Both questionnaires, baseline and follow-up, were administered by interview in all three countries. Information collected at baseline included demographics (age, sex, education, height, and dominant hand), health-related behaviors (i.e., smoking habits) and job-related data (i.e., occupation, time working at current job, physical activities related with work, job control, social support, job satisfaction, job security). In addition, there was a section on health-related data with questions on LBP in the past month and past 12 months using diagrams similar to the standardized Nordic Questionnaire [17]; difficulty performing daily activities in

the past month per each region; awareness of other people with pain; questions related to cause and prevention of pain adapted from the Fear Avoidance Beliefs Questionnaire [18]; awareness of repetitive strain injuries or similar term; mental health questions based on the Short Form-36 (SF-36) [19]; somatic symptoms questions from the Brief Symptom Inventory (BSI) [20], and absence from work due to LBP in the past 12 months. The follow-up questionnaire collected information on any changes in job, new or continuing LBP, difficulty performing daily activities in the past month, somatic symptoms in the past 7 days, mental health during the past month, and absence from work due to pain in past 12 months.

Outcomes

The outcome of interest was low back pain, indicated as present or absent. For disabling pain, participants reporting LBP were asked whether it interfered with daily activities. Pain was classified as disabling if it was difficult or impossible to perform activities such as cutting toe nails, getting dressed and doing normal jobs around the house, and non-disabling if otherwise.

We created three outcomes measures at baseline and three at follow-up. Baseline measures were (1) prevalence of LBP in last 12 months, (2) prevalence of LBP in past month, and (3) prevalence of disabling LBP. Follow-up measures were: (4) incidence of LBP in past month, (5) incidence of disabling LBP, and (6) persistence of LBP. Incidence of pain/disabling pain were calculated among participants who were pain-free/no disabling pain at baseline and developed pain/disabling pain at follow-up. Persistence of pain was calculated among participants with pain at baseline that continued with pain at follow-up.

Independent variable and covariables

The main independent variable was country: Costa Rica, Nicaragua and Spain (the latter used as the reference category). We examined the following covariables: (a) socio-demographics (i.e., sex, age, years when full time education was completed, participant's dominant hand, and height); (b) employment-related variables (i.e., years at current job, number of hours worked per week, contract type, other jobs); (c) working conditions related to physical demands (i.e., use of a keyboard > 4 hours, other repeated wrist/hand movements > 4 hours, repeated elbow bending > 1 hour, hands above shoulder height > 1 hour, lifting 25 Kg. (56 lbs.) by hand, kneeling or squatting > 1 hour or climbing up or down > 30 flights of stairs per day) and psychological demands (i.e., incentives, bonus payment, time pressure, lack of choice, lack of support, job dissatisfaction, and perception of job insecurity); (d) health-related variables (i.e., adverse health beliefs, awareness of the term "repetitive strain injury", awareness of someone at work or outside work with LBP, somatizing tendency and mental health). Additional information on these variables can be found elsewhere [15].

Statistical analysis

Chi-square tests were used to compare participants' characteristics between the countries. To estimate the association [odd ratios (OR) and corresponding 95% confidence intervals (95% CI)] of the covariables under study and the LBP outcomes we used logistic regression. We created separate models for each outcome (prevalence, incidence and persistence of pain) and built multivariate models following Hosmer and Lemeshow's recomendations [21]. In order to analyze the large number of covariables to examine, as suggested by Amick *et al.* [22], we grouped then into categories (i.e., sociodemographic,

employment-related characteristics and health-related and working conditions). First, a univariate analysis was performed between the outcome of interest and all covariables within each category to select covariables with a p-value of <0.25. Second, all covariables selected were grouped into an individual-level model, which included sociodemographics, employment-related characteristics and health-related variables, and an organizational-level model that included all the covariables regarding physical demands and psychosocial demands of the job. Third, covariables with a p-value of <0.10 were combined into a multivariate model and those with a p-value of <0.05 were included in the final model. These variables were used to calculate adjusted logistic regression models to examine the association between country and each of the six health outcomes, using Spain as the reference. Hosmer and Lemeshow's goodness-of-fit tests indicated all the final models had good fit [(21)]. All analyses were carried out in Stata IC 13 [(21)].

Results

The characteristics of participants and significant variables are presented in Table 1. Spain had the largest participation of women (83.6%) followed by Nicaragua (72.6%) and Costa Rica (62.5%), and participants were older than in Costa Rica and Nicaragua. The significant physical demands were high usage of keyboard for more than 4 hours per day (>90.0%), and lifting 25 Kg. (56 lbs.) by hand. A small group of participants (59) had to lift loads; this was higher in Nicaragua (13.3%) than in Costa Rica (5.4%) or Spain (2.1%). The significant psychosocial demands of the job were working under time pressure (Nicaragua 80.0%, Costa Rica 78.1% and Spain 54.3%), lack of support from supervisors/co-workers and the presence of incentives (piecemeal work or payment of bonus for additional

articles/tasks completed per day). Regarding adverse health beliefs, less than 29% of participants believed that LBP is commonly caused by work, less than 16% believed that physical activity is harmful (physical activity should be avoided and rest is needed to recover) and less than 24% that it had a poor prognosis (believed that pain does not improve and that neglecting pain is dangerous). There was less awareness of the term "repetitive strain injury" in Costa Rica (27.4%) than in Nicaragua (34.0%) and Spain (59.8%) and more than 60% of participants knew someone at work or outside work with LBP. A smaller group did not report any somatizing symptoms (21% - 33%) and a large majority had more than two symptoms (40-61%). Regarding mental health, Nicaragua had the highest reports of poor mental health (35.6%), followed by Costa Rica (30%) and Spain (24.4%).

Table 2 summarizes the crude and adjusted ORs for the prevalence of LBP and disabling pain by country. Crude ORs were approximately 2 fold higher among Costa Rican and Nicaraguan participants as compared to Spain. After adjustment (see Table 2 footnote for covariables), the ORs decreased anywhere from 13% to 39% (lowest, 1.18 and highest, 2.16). Costa Rica had higher rates for pain prevalence, but slightly lower for disabling pain. The prevalence of one and 12-month pain showed statistically significant differences in Costa Rica, but not in Nicaragua. Differences for disabling pain remained after adjustment.

At follow up, 120 subjects developed new LBP, 78 subjects developed disabling pain and 206 had persistent pain (Table 3). The incidence of LBP and disabling pain were higher in Nicaragua (37.0% / 17.2%, respectively) than Costa Rica (14.9% / 13.6%) and Spain (19.0%/ 7.7%). Crude and adjusted ORs for Nicaragua were approximately 2.5 fold higher as compared to Spain. For Costa Rica, the incidence and persistence of LBP was lower compared to Spain, but incidence of disabling pain was about 2 fold higher. The adjusted

odds ratios (see Table 3 footnote for covariables) changed little, but in some cases were higher than the crude ORs. Differences for the incidence and persistence of pain remained for Nicaragua but not Costa Rica.

Discussion

Our findings show disparities in low back pain in countries that share similarities in culture but are at different levels of economic development. To the best of our knowledge, this is the first study that examined incidence, prevalence and disabling pain in the low back among office workers that perform similar jobs in low-and-middle income economies such as Costa Rica and Nicaragua, and compared them with a high-income economy (Spain). We found that LBP is common among office workers in all three countries, but with a higher prevalence of pain and disabling pain in Costa Rica and Nicaragua than Spain. Incidence of pain was higher in Nicaragua, but not Costa Rica, as compared to Spain. The differences among countries persisted despite adjustments for sociodemographic, organizational, physical demands, and health-related factors.

Comparing our findings to other CUPID studies, we found higher prevalence rates among office workers than, for example, those reported in Japan (22%) [23] and New Zealand (45%) [24]. A lower one-year prevalence of LBP (42.3%) was also reported for office clerks in the Fourth European Working Conditions Survey, which included 27 countries [25]. One month prevalence of LBP was also higher in Costa Rica and Nicaragua than in Sri Lanka (12%), another country participating in CUPID, among the same population [26]. Regarding the prevalence of disabling LBP, this was higher in Nicaragua and Costa Rica as compared to 22% for the overall CUPID study [27] and 7% in Sri Lanka [26] among a similar worker group.

At follow up, the incidence of LBP was higher in Nicaragua than Spain and lower in Costa Rica. However, incidence comparisons to other CUPID countries is limited at this time, as only a handful have reported results on incidence and persistence of LBP.

Presently, sitting is the most common posture in the workplace [28] , including office workers who, in addition, use computers frequently. In our study, more than 90% reported using a computer keyboard during more than half their work shift, a task almost always performed while sitting, reflecting a sedentary occupation. Although relationships between sitting/sedentary occupations and LBP are inconsistent, some findings from our study are interesting, in comparison to other CUPID study populations and countries. We found higher 12-month LBP prevalence (over 60%) in Costa Rica and Nicaragua than that reported among nurses, who have a less sedentary occupation. These figures are higher than for nurses in Australia (56%) [29], Estonia (56.1%) [30], and New Zealand (57%) [24]. On the other hand, LBP prevalence was lower in Spain. The one month prevalence of LBP among nurses in Brazil (45.1%), and Italy (49.1%) was similar to that in our Costa Rican and Nicaraguan office workers, but higher than in Spain. This is despite the fact that activities involving physical loading, such as lifting patients, are more common among nurses than office workers, suggesting physical demands may not play an important role in LBP in office workers.

Regarding the significant risk factors examined, we found consistent factors for both 1 and 12-month LBP prevalence, as well as disabling pain. These risk factors included awareness of someone at work with LBP, somatizing tendency and poor mental health (Appendix I). Less consistent were lifting by hand, lack of support, time pressure, health beliefs regarding pain and having another job. For incidence of LBP and disabling pain, poor

mental health was a consistent factor, but awareness of someone outside work with pain, somatizing tendency, incentives and using the keyboard for more than 4 hours were less consistent. Regarding persistence of pain, the significant factors were having a short-term contract, health beliefs regarding pain and awareness of the concept of repetitive strain injury or a similar term. Our results seem to be consistent with other studies regarding somatization and mental health. For example, another CUPID study (New Zealand) reported similar results for the association between somatization and LBP [31] but a systematic review reports no evidence to support pain-prone personality with LBP [14]. In addition, this review reports association between cognitive factors such as attitudes, fear avoidance beliefs and depression, anxiety, distress and the development of pain and disability [14], that are similar to our findings. Another CUPID study (Spain) reported that association of LBP with low mood and somatizing tendency are more likely predictors of incidence than persistence [16], which is also supported by our findings. Despite adjustments for these factors, in our study differences among countries persisted, ranging from 1.2 to 2 fold for prevalence of LBP in Costa Rica and Nicaragua, compared to Spain, and about 2-fold higher for incidence in Nicaragua than in Spain, but not Costa Rica.

However, the question on what factors could explain differences among these countries remains. Some unmeasured factors on ergonomic conditions (chairs, tables, cubicles), physical demands (number of hours sitting, constrain posture, etc.), previous exposures (work history) or non-work related activities (leisure activities, hobbies, sports, etc.) could help explain these differences. In addition, cultural differences could contribute to explain the differences, although there were similarities. We looked at three countries that shared language, with similarities in culture but other aspects of culture such as Hofstede's

dimensions (e.g., power distance, uncertainty avoidance and masculinity) [32] and social characteristics (e.g., social networks, trust and participation) [33] were not included in the CUPID study.

Regarding compensation and financial support system for MSDs, they were similar among countries. Overall, Spain provides more benefits than Costa Rica and Nicaragua. For example, social security provision for unemployment is not provided in Costa Rica and Nicaragua and it is provided in Spain. Costa Rica usually provides financial support for ill-health retirement; Nicaragua does not provide support and Spain sometimes. Regarding compensation for work-related MSDs, all countries provide compensation for sickness up to three months. All three provide free access to healthcare for MSDs through primary care doctors and hospitals for insured employees, but there could be important differences in quality of healthcare provided for MSDs detection and management. In this regard, there are significant differences in the total expenditure/capita (at exchange rate) with the lowest expenditure in Nicaragua ($144), followed by Costa Rica ($951) and Spain ($2,808) [34]. Although these differences would not explain the patterns for incidence of pain, they could contribute to the persistence of pain and/or disabling pain. Information regarding testing and treatment for LBP are available for each country, and could therefore be further explored.

Strengths of our study are related to its longitudinal design, information collected using standardized questions that had been previously validated with acceptable reliability [15], and very high response rates of over 90% at both baseline and follow-up in all three countries. Study limitations include the possibility of some selection bias due to the healthy worker effect if subjects with LBP were absent when the survey was collected. There could also be an element of information due to varying interpretation of pain in different cultures

[27], but this bias could have been reduced through the use of pain diagrams. Recall bias could have happened, as participants necessarily had to rely on their ability to recall pain during the previous year and past month. In addition, disabling pain was coded based on self-reported data of difficulty to perform daily activities and not determined by clinical assessments or physical examinations. Although persistent pain was defined when present at both baseline and follow-up, this does not mean that some participants could have been pain-free in the interval, which would have affected the calculations of incident pain. Lastly, although we did not find physical demands to be associated with LBP, many details on physical activities at work and outside work were not captured in this study. For example, although a small percentage of participants reported having another job (7.6%), no detailed information on physical demands at these other or prior jobs was gathered, nor on recreational activities, workstation ergonomic conditions, duration of sitting posture at work and freedom to alternate postures, frequency of lifting, twisting, type of lift, or manual materials handling. The only questions in this area were limited to having to lift weights of 25 Kg or more by hand (which was only performed by a small minority of participants), climbing more than 30 flights of stairs in a day, or having to kneel or squat for more than one hour per shift. Consequently, some associations between physical demands and LBP may have been missed. Future studies should consider including more detailed questions of this nature.

In summary, LBP prevalence and disabling pain among office workers in Costa Rica and Nicaragua were higher than in Spain but incidence was mainly higher in Nicaragua. The sociodemographic, job-related, psychosocial and health-related variables we examined did not fully explain the country differences. But mental health and somatizing tendency seem to play an important role in the prevalence and incidence of LBP, as well as of disabling LBP.

Future studies should explore the effect of educational interventions that focus on the reduction of negative beliefs about back pain, improvement of mental health and reduction of somatizing tendency. This study provides information that is lacking in Latin America [35], to the best of our knowledge no other studies on prevalence and incidence of LBP among office workers is available in Costa Rica and Nicaragua.

Acknowledgements

Funding for this research was supported by Grant No. 5T42OH008421 from the National Institute for Occupational Safety and Health (NIOSH) / Centers for Disease Control and Prevention (CDC) to the Southwest Center for Occupational and Environmental Health (SWCOEH), a NIOSH Education and Research Center, Fogarty grant No. 5D43TW000644-13 and Colt foundation CF/03/05. We thank the University of Southampton coordinating team, all coordinators in Nicaragua, Costa Rica and Spain, data collectors and all organizations that allowed their employees' participation; and all the workers that participated in the study.

Table 1. Sample characteristics by country.

	Costa Rica (n = 224)		Nicaragua (n = 285)		Spain (n = 438)		
	n	%	n	%	n	%	p-value*
Sociodemographic characteristics							
Sex							p<0.001
Male	84	37.5	78	27.4	72	16.4	
Female	140	62.5	207	72.6	366	83.6	
Age (years)							p<0.001
20-29	73	32.6	95	33.3	73	16.7	
30-39	64	28.6	100	35.1	165	37.7	
40-49	56	25.0	63	22.1	152	34.7	
50-59	31	13.8	27	9.5	48	11.0	
Employment-related characteristics							
Contract type							p<0.001
Permanent	189	85.1	279	98.9	352	80.4	
Temporary	33	14.9	3	1.1	86	19.6	
Working conditions							
Physical demands of the job							
Use of a keyboard > 4 hours	215	96.4	256	89.8	424	96.8	p<0.001
Lifting 25 Kg (56 lbs) by hand	12	5.4	38	13.3	9	2.1	p<0.001
Psychosocial demands of the job							
Time pressure	175	78.1	228	80.0	238	54.3	p<0.001
Lack of support	60	26.8	115	40.4	94	21.5	p<0.001
Incentives	141	63.2	74	26.0	115	26.3	p<0.001
Health-related variables							
Adverse health beliefs LBP							
Commonly caused by people's work	32	14.3	83	29.1	98	22.4	p<0.001
Physical activity is harmful	10	4.5	34	11.9	68	15.5	p<0.001
Poor prognosis	54	24.1	27	9.5	97	22.2	p<0.001
Awareness of RSI, WRULD or CTS**	61	27.4	97	34.0	262	59.8	p<0.001
Someone at work with LBP	137	61.2	197	69.1	348	79.5	p<0.001
Someone outside work with LBP	137	62.0	172	60.4	363	82.9	p<0.001
Somatising tendency (number of symptoms)							p<0.001
0	46	20.7	76	26.8	145	33.1	
1	40	18.0	43	15.1	118	26.9	
≥2	136	61.3	165	58.1	175	40.0	
Mental Health							p<0.01
Good	156	70.0	183	64.4	331	75.6	
Poor	67	30.0	101	35.6	107	24.4	

* P-value from Chi-squared test;

** Repetitive strain injury (RSI), work-related upper limb disorder (WRULD) or cumulative trauma syndrome (CTS).

Table 2. Prevalence of low back pain by country at baseline.

	Prevalence of pain in the last 12 months			Prevalence of pain in past month			Prevalence of disabling pain		
		OR (95%CI)			OR (95%CI)			OR (95%CI)	
	%	Crude	Adjusted	%	Crude	Adjusted	%	Crude	Adjusted
Spain (n=438)	53.4	1	1	33.6	1	1	15.1	1	1
Costa Rica (n=224)	67.9	1.84 (1.31-2.58)	1.71 (1.17-2.48)	46.0	1.69 (1.21-2.34)	1.47 (1.01-2.14)	27.2	2.12 (1.43-3.15)	1.87 (1.17-2.98)
Nicaragua (n=285)	61.1	1.37 (1.01-1.85)	1.19 (0.85-1.67)	44.2	1.57 (1.15-2.13)	1.18 (0.83-1.69)	27.7	2.16 (1.50-3.12)	1.98 (1.27-3.07)

[a] Adjusted for sex, age, awareness-someone at work with pain, somatizing, mental health, lifting 25 Kg (56 lbs) by hand.
[b] Adjusted for sex, age, other job, awareness-someone at work with pain, somatizing, mental health, lifting 25 Kg (56 lbs) by hand, lack of support.
[c] Adjusted for sex, age, prognosis, awareness-someone at work with pain, somatizing, mental health, time pressure, lack of support.

Table 3. Incidence and persistence of low back pain by country.

	Incidence of pain in past month			Incidence of disabling pain			Persistence of pain		
		OR (95%CI)			OR (95%CI)			OR (95%CI)	
	%	Crude	Adjusted	%	Crude	Adjusted	%	Crude	Adjusted
Spain (n=438)	19.0	1	1	7.7	1	1	56.8	1	1
Costa Rica (n=224)	14.9	0.74 (0.41-1.34)	0.88 (0.46-1.68)	13.6	1.89 (1.03-3.48)	1.83 (0.94-3.59)	56.0	0.97 (0.55-1.69)	1.24 (0.67-2.31)
Nicaragua (n=285)	37.0	2.49 (1.57-3.95)	2.38 (1.44-3.92)	17.2	2.49 (1.43-4.34)	2.53 (1.38-4.62)	75.9	2.39 (1.37-4.16)	2.51 (1.36-4.66)

[a] Adjusted for sex, age, somatizing, mental health, use of a keyboard > 4 hours, incentives.
[b] Adjusted for sex, age, awareness-someone outside work with pain, mental health and non-disabling pain at baseline.
[c] Adjusted for sex, age, contract, prognosis, awareness of RSI, WRULD or CTS.

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JOURNAL ARTICLE 2

Upper extremity musculoskeletal pain among office workers in three Spanish speaking-countries: findings from the CUPID study.

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Key words: Cross-national studies; Longitudinal; Musculoskeletal pain; Risk factors.
Word count (main text): 3,774
Tables: 3
Figures: 0

Journal Proposed for Article Submission: Occupational and Environmental Medicine

ABSTRACT

Objectives: To estimate prevalence and incidence of upper extremity musculoskeletal pain (UEMP) and related disabling pain among office employees in Costa Rica, Nicaragua and Spain**.**

Methods: Secondary analysis of office workers data collected as part of the multinational CUPID study in Costa Rica, Nicaragua and Spain, at baseline and after 12 months. We included 947 (93%) participants at baseline and 90% at follow-up. Multivariate logistic regression was used to estimate the association (odds ratio [OR] and corresponding 95% confidence intervals [95%CI]) between country and six outcomes, three on baseline prevalence: (1) UEMP in last 12 months, (2) UEMP in past month, (3) disabling UEMP; and three on 12-months incidence: (4) UEMP in past month, (5) disabling UEMP, (6) persistence of UEMP, after adjusting for socio-demographic, job-related and health-related covariables.

Results: Prevalence and incidence of UEMP among office employees in Costa Rica and Nicaragua were similar or higher than that reported in Spain. UEMP prevalence in the past month was highest in Costa Rica (53.6%), followed by Nicaragua (51.9%) and Spain (38.4%). Compared to Spain (33.2%), the incidence of UEMP was 50.4% in Costa Rica (OR=2.04; 95% CI: 1.34-3.12), 60.2% in Nicaragua (OR=3.04; 95% CI: 1.34-3.12). Incidence of disabling UEMP was higher in Nicaragua (OR=2.57; 95% CI: 1.50-4.41) and Costa Rica (OR=2.16; 95%CI: 1.22-3.84) compared to Spain.

Conclusion: UEMP prevalence and disabling pain were approximately 2 fold higher, and for incidence between 2 and 3 fold higher, in Costa Rica and Nicaragua than in Spain. Between-country differences were only partially explained by the socio-demographic, job-related and health-related factors analyzed. Thus, research is needed to study additional work-related

factors, such as ergonomic conditions, and cultural differences and their impact on UEMP.

Background

Musculoskeletal disorders (MSDs) are a major cause of morbidity and disability [1] and have been identified as the most common work-related problem impacting tens of millions of workers [2]. In the U.S., for instance, in 2012 there were 388,060 new cases of MSDs, accounting for 34 percent of all injury and illness cases [3]. MSDs can vary from mild symptoms to functional impairment [4], impacting quality of life [5,6], decreasing productivity, and increasing lost time [7], medical expenses and costs due to disability [4,5]. MSDs are considered a high cost national health problem in United States [8] representing more than one third of work-related illness reported [5,9] with an estimate of over 500,000 employees affected each year [10]. While MSDs affect workers in all employment sectors, the rapid incorporation of information technology in the workplace has resulted in most jobs including some attributes of office-based tasks that are risk factors for upper extremity MSDs, including poor body posture, long working sitting hours or repetitive motions. These may partly explain upper extremity MSDs as highly prevalent MSDs among workers around the world [5].

Upper extremity musculoskeletal pain (UEMP) is common in office work environments worldwide [11,12]. Availability of statistical data, however, is uneven and most findings come from high income economies such as the European Union member countries and the U.S. For instance, European data shows that the one-year prevalence for neck/upper-limb pain is 41.3% among office clerks [13]. But data from low- and middle-income countries such as those in the Central America region is lacking [14,15]. Only recently, the first Central

American Survey of Working Conditions and Health reported high exposure to repetitive movements (>43%) in Central America, including Costa Rica and Nicaragua, but without distinguishing by occupation [15].

The etiology of MSDs, and by extension that of UEMP, is multifactorial [5,16,17]. Work-related risk factors associated with the onset of MSDs include physical and psychosocial factors [6,7,18], as well as individual characteristics [16,19]. Psychological and social factors [16,20], including the role of culture[21], are increasingly being considered important contributing factors for MSD and related disability [22-24]. However, it is not clear whether these risk factors may explain the difference in upper extremity MDS prevalence (and/or incidence) between high income and low- and middle- economies for specific occupational groups such as office workers [25].

The aim of this study was to estimate the prevalence and incidence of upper extremity musculoskeletal pain (UEMP) and associated disabling pain, among office workers in two Spanish-speaking middle-income economies, Costa Rica and Nicaragua, and compare them to a Spanish-speaking high-income economy, Spain. In addition, we examined whether sociodemographic, employment and working conditions, and health-related factors explained any differences in prevalence and/or incidence in these three countries.

Methods

Study design and participants

We examined office workers in Costa Rica, Nicaragua and Spain using data collected as part of CUPID (Cultural and Psychosocial Influences on Disability), an international longitudinal multi-country study [21], aimed to examine the influence of health beliefs and

expectations based on culture on MSD and their related disability. In each country, a minimum of 200 office workers who used computers regularly were randomly sampled from payroll records and two rounds of interviews were conducted, at baseline and 12 months later (follow-up). In Costa Rica, the sample was recruited at the Central offices of the Costa Rican Social Security System between March 2009 and July 2011. In Nicaragua, participants were recruited between February 2008 and November 2010 among employees of the Ministry of Labor and Nicaraguan Institute of Social Security. In Spain, data collection occurred between November 2007 and February 2010 among workers from four hospitals and a public university in Barcelona [26]. Detailed information about the data collection and characteristics of the study sample can be found elsewhere [21]. Ethical review and approval was obtained prior to data collection by institutional review committees in each country. Approval for this analysis was obtained from the University of Texas Health Science Center Committee for the Protection of Human Subjects.

Participation rates were 91% in Costa Rica, 100% in Nicaragua and 98% in Spain [21]. The overall final sample was of 947 (93%) participants after excluding 73 subjects who did not meet the inclusion criteria (20-59 years of age and worked at current job at least one year). At baseline there were 224 (90%) participants in Costa Rica, 285 (95%) in Nicaragua, and 438 (93%) in Spain. Participation at follow up (n=853) was 92% in Costa Rica, 89% in Nicaragua and 90% in Spain.

Questionnaire

The interviewer-administered questionnaires, both baseline and follow-up, were first developed in English [21] and then translated into Spanish with independent back translation

into English to detect misinterpretations and modifications to the Spanish version [26]. Additional adjustments to local terminology were done to ensure better understanding of the questions by the respondents. Questionnaires were pilot tested in each country with workers similar to the intended population; these workers were not included in the final sample.

The baseline questionnaire included sections on demographics (i.e., age, sex, education, height, and dominant hand), health-related behaviors (i.e., smoking habits) and work-related data (i.e., occupation, time working at current job, physical activities related with work, job control, social support, job satisfaction, and job security). The section on health-related information asked about pain at different anatomical regions including shoulder, elbow, and wrist/hand in the past month and past 12 months using Standardized Nordic Questionnaires style diagrams[27]; disabling pain in these regions for daily tasks activities in the past month; awareness of other people with pain; beliefs related to cause and prevention of pain (fear-avoidance beliefs) adapted from the Fear Avoidance Beliefs Questionnaire [28]; awareness of repetitive strain injuries; mental health based on the Short Form-36 (SF-36) [29]; somatic symptoms using the Brief Symptom Inventory (BSI) [30], and sickness absence in the past 12 months. The follow-up questionnaire asked about job changes, pain at the same anatomical regions, disabling pain for daily living tasks in the past month, somatic symptoms during the past 7 days, mental health in the past month, and sickness absence in past 12 months.

Outcomes

The outcome of interest was upper extremity musculoskeletal pain (UEMP), a dichotomous variable was created indicating absence or presence of pain in each of three

body parts (shoulder, elbow and wrist/hand), considering laterality (right or left), and then combined to obtain a single UEMP variable. For the analysis, these six body parts were grouped into a main body location of UEMP given the sample limitation to analyze each body location separately. For the study of disabling pain, those who had pain were asked whether the pain did interfere with daily task activities around the house or with daily activities such as combing or brushing hair, bathing/showering, getting dressed, opening bottles, jars, or taps, writing, locking and unlocking doors. Pain was classified as disabling if it was difficult or impossible to perform any of the activities mentioned and non-disabling if pain did not interfere with everyday activities. This classification has been used in previous CUPID studies [31].

We created six outcome measures, three on baseline prevalence: (1) pain in last 12 months, (2) pain in past month, (3) disabling pain; and three on incidence at the 12-month follow-up: (4) pain in past month, (5) disabling pain, (6) persistence of pain. Pain prevalence and disabling pain for upper extremity were calculated at baseline, whereas incident pain was calculated among participants who were pain-free at baseline and developed pain at the 12-month follow-up. Likewise, disabling pain was calculated among participants who did not have disabling pain at baseline and developed disabling pain at follow-up. Persistent pain was calculated among subjects with pain at baseline that continued at follow-up.

Independent variable and covariables

The main independent variable is country (Costa Rica, Nicaragua and Spain) with Spain as the reference. The covariables examined were: (a) socio-demographic characteristics (sex, age, years when full time education was completed, participant's

dominant hand and height); (b) employment-related characteristics (i.e., years at current job, number of hours worked per week, contract type and other jobs); (c) working conditions including physical job demands (i.e., use of a keyboard > 4 hours, other repeated wrist/hand movements > 4 hours, repeated elbow bending > 1 hour, hands above shoulder height > 1 hour, lifting 25 Kg. (56 lbs.) by hand, kneeling or squatting > 1 hour or climbing up or down > 30 flights of stairs per day) and psychosocial job demands (i.e., incentives, bonus payment, time pressure, lack of choice, lack of support, job dissatisfaction, and perception of job insecurity); (d) and, health-related variables (i.e., adverse health beliefs, awareness of repetitive strain injury (RSI) or similar terms, awareness of someone outside work with pain, somatizing tendency and mental health). More detailed information on these variables can be found elsewhere [21].

Statistical analysis

Initially, participant characteristics were compared between the three countries by chi-square tests. Then, we used logistic regression to calculate odd ratios (OR) and their corresponding 95% confidence intervals (95%CI) for the association between the independent variables and the UEMP outcomes. For each outcome we followed Hosmer and Lemeshow's model building guidelines [32]. However, following Amick *et al.* [33], and due to the large number of variables, we selected variables for the final models by groups (socio-demographic, employment, health-related and working conditions). First, we selected variables with a p-value <0.25 in the association with the outcome of interest within each group of variables. Second, we created two separate models: an individual-level model including all the variables selected from step 1 regarding socio-demographic, employment

and health; and an organizational-level model including all the variables selected from step 1 regarding working conditions. All variables with a p-value <0.10 were combined into a multivariate model. In the reduced model only variables with a p-value < 0.05 were included. These variables were used to estimate adjusted odd ratios to explain the differences in prevalence/incidence between countries with Spain as the reference group. Hosmer and Lemeshow's goodness-of-fit tests indicated all the final models have good fit [32]. All analyses were performed using Stata IC13 [34].

Results

Table 1 summarizes the characteristics of participants by country. More than 63% of participants were female and most were less than 50 years old. There were younger participants in Nicaragua, followed by Costa Rica and lastly Spain. A large majority of participants worked 31-49 hours per week (full time job) and had a permanent contract (86.6%). Physical demands were similar among the three office groups, with high usage of keyboard for more than 4 hours per day (>90%), other activities that required repetitive hand movement (>71%) and a small group of participants (50) had to climb more than 30 flights of stairs per day. Significant psychosocial demands of the job were working under time pressure (>54%) and lack of support from supervisors and co-workers (>22%). Adverse health beliefs regarding upper extremity pain were rare. Less than 33% of participants believed that pain is commonly caused by work, less than 13% thought that physical activity should be avoided and rest is needed to recover (physical activity is harmful) and less than 22% believed that pain does not improve and that neglecting pain is dangerous (poor prognosis). Somatizing tendency was present in the large majority and often subjects had more than two symptoms

(40-61%) compared to a smaller group that did not show any symptoms (21% - 33%). Regarding mental health, Spain had the lowest percentage of poor mental health (24.4%), followed by Costa Rica (30%) and Nicaragua (35.6%).

Intermediate results are provided for comparison purposes with other CUPID studies that reported hand and wrist prevalence. The one month prevalence showed that there was a higher prevalence of pain in Nicaragua (39.3%), followed by Costa Rica (38.0%) and Spain (16.7%). The 12 month prevalence was also higher in Nicaragua (54.4%) than in Costa Rica (46.4%) or Spain (23.3%). Table 2 shows crude and adjusted ORs for the prevalence of upper extremity pain and disabling pain, which were approximately 2 fold higher among Costa Rican and Nicaraguan participants as compared to Spain. After adjustment for relevant variables associated with MSK pain in each country (see Table 2 footnotes), the ORs decreased anywhere from 4.5% to 30% (lowest, 1.32 and the highest, 1.94). Statistically significant differences remained for prevalent one and 12-month pain, but not for disabling pain.

Among the 853 participants that completed the follow up, 265 subjects developed pain in the upper extremities at follow up (Table 3). The incidence of pain in Spain was 33.2%, 50.4% in Costa Rica and 60.2% in Nicaragua with ORs that ranged from 2.04 to 3.15 compared to Spain. Subjects without disabling pain at baseline (581) who developed disabling pain at follow up (89) were 9.9% in Spain, 19.3% in Costa Rica and 22.1% in Nicaragua. The adjusted odds ratios changed little, with the incidence of pain and disabling pain still showing a 2 to 3 fold higher risk for Costa Rica and Nicaragua as compared to Spain. Among subjects reporting pain at baseline (388), 46.7% had persistent pain at follow up (181). As compared to Spain, Nicaragua had a higher prevalence but Costa Rica had a

lower prevalence of persistent pain, and this pattern did not change in the adjusted models.

Discussion

Our findings demonstrate disparities in UEMP even among countries of a somewhat shared cultural background but with different economies. The present study is apparently the first to examine the prevalence and incidence of UEMP and disabling pain in Nicaragua and Costa Rica, two low- and –middle income countries, among office workers while comparing these results to those from participants performing similar office jobs in Spain, a high-income country with a shared language and cultural similarities. We found that both prevalent and incident upper extremity pain and disabling pain varied by country, generally showing higher percentages in Costa Rica and Nicaragua than in Spain. In addition, differences among these three countries persisted after adjusting for several sociodemographic, health-related and employment factors as well as working conditions, including physical and psychosocial risk factors. The between-country differences were mostly independent of several factors such as basic demographic indicators, health-related factors and employment and working conditions.

There are a limited number of studies to which our findings can be compared, particularly concerning office workers which were the focus of our study. Results from previous publications from the CUPID study reported significant variations in the prevalence of musculoskeletal pain among office workers performing similar tasks. None of the previous studies examined upper extremity pain as was done in our study (i.e., collapsing several upper extremity anatomical sites into a single upper extremity outcome); however, several did examine hand and wrist pain, a subset of upper extremity pain. For example, the one

month prevalence of hand and wrist pain in Sri Lanka (8%) [25] and Japan (6%) [35], two countries of very different economic level, was much lower than the prevalence in Costa Rica (38%) and Nicaragua (39%). The one year prevalence of hand and wrist pain in New Zealand (33%) [36] was similar to that in Costa Rica (46%) and Nicaragua (54%). Other studies have shown that up to 50% of newly hired computer users who engage in prolonged periods of typing often experience MSD symptoms within the first 12 months of work and 46% have musculoskeletal pain in the neck/shoulder and hand/arm areas after the first month of follow up [37], which are similar to our results. Regarding the one month prevalence of disabling pain, there was a large variation in rates among countries in the CUPID study, more than 14 fold [38], with Pakistan (2.2%) and Japan (2.3%) [38], Spain (12.6%) and Brazil (31.3%) [38] at the lower end, and, at the higher end, Costa Rica (27.4%) and Nicaragua (31.6%).

Regarding the potential influence of confounding factors, we found that the incidence and persistence of UEMP were to some extent related to health beliefs that pain is commonly cause by people's work, somatizing and awareness of someone at work with UEMP and job-related conditions. Palmer *et al.* found that persistence of pain was more common among people that believe pain is caused by their work and expect symptoms to continue being a problem 12 months later [39]. Similar results were found in a prospective study by Macfarlane et Al., where somatizing was reported as an important predictor of the onset of forearm pain [40]. Our findings regarding the role of somatization are in concordance with those observed in previous studies [35,41-44]. People who tend to worry about common symptoms might be more aware of musculoskeletal pain and be more likely to report [38]. In addition, our findings are in agreement with previous reports on disabling wrist and hand pain such as knowing

someone outside work with arm pain and adverse beliefs (poor prognosis of arm pain), both of which may increase the reported prevalence [38]. Job-related variables such hours worked per week and contract type have been less consistently associated with these outcomes. Physical demands of the job such as using the keyboard and other hand movement for more than 4 hours and repeated elbow bending for more than 1 hour were not significant predictors in our study, although a high proportion of participants (>90%) reported using the keyboard for more than 4 hours per day. In addition, a significant association was found for climbing more than 30 flights of stairs per day, which is difficult to explain. Psychosocial demands of the job that were significant predictors were time pressure and lack of support. Nevertheless, adjustments for these factors did not greatly reduce the differences observed between Costa Rica, Nicaragua and Spain, which remained at 1.5 to 2 fold, after adjustment.

The question, therefore, remains: what could explain the differences between these three countries? There could be unmeasured predictive factors such as ergonomic conditions, previous work exposure (work history) or personal activities (hobbies, sports, home responsibilities, etc.). Unfortunately, the CUPID study did not collect information to examine the role of these factors. In relation to ergonomic conditions, due to limited resources, it was not possible to perform ergonomic assessments of working conditions and work practices using direct observations [45]. While all study participants performed similar office jobs, ergonomic differences in work settings (e.g., not all cubicles, chairs, tables, etc. are designed equal) might explain some of the between country-differences.

Also, research has shown that cultural differences should not be overlooked when examining health disparities [46] and, thus, there could be cultural differences that could contribute to the observed differences in prevalence and incidence of UEMP between the

countries under study. Certainly, the three countries we studied shared the same language, had similarities in culture, but CUPID did not include other cultural (e.g., Hofstede's power distance, uncertainty avoidance, individualism and masculinity dimensions) [47] and societal aspects (e.g., social networks and participation, societal trust) [48].

Further, differences related to the compensation and financial support system for work-related MSDs may or may not provide additional explanation for the differences because of similarities among countries. Comparing the local unemployment rates for each country reported at the beginning of the study, Costa Rica seems to have the lowest rate (less than 5%), followed by Spain (5-9%) and Nicaragua (10-14%) [21]. At follow-up (2010) (i.e., in the midst of the worldwide economic recession, the unemployment rate in Costa Rica (7.3%) was higher than that reported at the beginning of the study, for Nicaragua (8%) it was lower and for Spain (20%) was substantially higher [49].

Spain provides more benefits regarding financial support for health-related incapacity for work than Costa Rica and Nicaragua. For example, Spain provides social security provision for unemployment, whereas the other two countries do not. Regarding special financial support for ill-health retirement, Costa Rica usually provides support, Spain sometimes and Nicaragua does not. All countries provide compensation for work-related MSDs and sick pay in first three months [21]. There are no differences regarding access to healthcare for MSDs, as all three countries provide free access to primary care doctor, hospital and other practitioners through the employer or external services for insured employees. However, there could be important differences related to the quality of the healthcare services provided for MSDs detection and management among countries as reflected by the differences in total expenditure on health/capita (at exchange rate) [50]

between Nicaragua ($144), Costa Rica ($951) and Spain ($2,808). Whereas health care would hardly explain the incidence of pain per se, it may be a contributory cause to the persistence and pain and disabling pain. Still, data on what tests and treatments may be covered regarding UEMP in each country is not directly available and may change over time and by physician; thus, further studies will need to investigate these factors to test our hypothesis.

The strengths of the CUPID study are related to its longitudinal design and the high response rates at baseline (> 96%) as well as at follow-up (> 90.2%). Information was collected by standardized questions from validated instruments with predictive validity and acceptable reliability [21]. Some of the study limitations are related to selection bias due to the healthy worker effect if, for example, subjects with UEMP were absent on sick leave during the time that the surveys were collected. Information bias could have occurred related to the way symptoms are interpreted and understood in different cultures [38], but the use of diagrams to illustrate the anatomical sites is likely to have reduced this bias. Another possible bias was that pain was reported by participants depending on their ability to recall symptoms and disability, but was not confirmed by physical examinations or clinical assessments. In addition, while the study sample was formed by workers, the outcomes were not specifically work-related. This is particularly relevant for the disabling pain outcomes which reflect difficulty or impossibility when performing certain daily life tasks, but not job performance-related tasks. Still, we could assume that if a person has difficulties dressing themselves, the circumstances of this person are likely to impact their job performance, assuming they are even able to be present at their job.

In summary, Information about musculoskeletal pain and their implications for workers health has received little attention in Latin America [51], with most information coming from Western countries. To our knowledge, no other studies have estimated prevalence or incidence of UEMP and its association with risk factors in this region. Therefore, this study provides valuable information that can help the development of future research such as the impact of intervention initiatives to reduce UEMP among office employees in Latin America. Also, this information could be used to develop prevention programs to reduce UEMP. Collectively, this could contribute to improve health among office employees in Costa Rica and Nicaragua, as well as in Latin America.

Acknowledgements

Funding for this research was supported by Grant No. 5T42OH008421 from the National Institute for Occupational Safety and Health (NIOSH) / Centers for Disease Control and Prevention (CDC) to the Southwest Center for Occupational and Environmental Health (SWCOEH), a NIOSH Education and Research Center, Fogarty grant No. 5D43TW000644-13 and Colt foundation CF/03/05. We thank the University of Southampton coordinating team, all coordinators in Nicaragua, Costa Rica and Spain, all coordinators, data collectors and all organizations that allowed their employees' participation; and all the workers that participated in the study.

Table 1. Sample characteristics by country.

	Costa Rica (n = 224)		Nicaragua (n = 285)		Spain (n = 438)		
	n	%	n	%	n	%	p-value*
Socio-demographic characteristics							
Sex							p<0.001
Male	84	37.5	78	27.4	72	16.4	
Female	140	62.5	207	72.6	366	83.6	
Age (years)							p<0.001
20-29	73	32.6	95	33.3	73	16.7	
30-39	64	28.6	100	35.1	165	37.7	
40-49	56	25.0	63	22.1	152	34.7	
50-59	31	13.8	27	9.5	48	11.0	
Employment-related characteristics							
Hours worked/week							p<0.001
≤ 30	3	1.4	15	5.3	51	11.6	
31 - 49	209	93.7	266	93.3	386	88.1	
≥ 50	11	4.9	4	1.4	1	0.2	
Contract type							p<0.001
Permanent	189	85.1	279	98.9	352	80.4	
Temporary	33	14.9	3	1.1	86	19.6	
Working conditions							
Physical demands of the job							
Use of a keyboard > 4 hours	215	96.4	256	89.8	424	96.8	p<0.001
Other wrist/hand movements>4 hours	171	77.0	261	91.6	311	71.0	p<0.001
Climbing > 30 flights of stair/day	14	6.3	14	4.9	22	5.0	P=0.800
Psychosocial demands of the job							
Time pressure	175	78.1	228	80.0	238	54.3	p<0.001
Lack of support	60	26.8	115	40.4	94	21.5	p<0.001
Health-related variables							
Adverse health beliefs of UE pain							
Commonly caused by people's work	27	12.1	92	32.3	86	19.6	p<0.001
Physical activity is harmful	7	3.1	36	12.6	42	9.6	p<0.001
Poor prognosis	49	21.9	26	9.1	67	15.3	p<0.001
Someone at work with UE pain	127	57.0	159	56.0	191	43.6	p<0.001
Someone outside work with UE pain	108	49.5	146	51.4	198	45.2	P=0.300
Somatizing tendency (number of symptoms)							p<0.001
0	46	20.7	76	26.8	145	33.1	
1	40	18.0	43	15.1	118	26.9	
≥2	136	61.3	165	58.1	175	40.0	
Mental Health							p<0.010
Good	156	70.0	183	64.4	331	75.6	
Poor	67	30.0	101	35.6	107	24.4	

* P-value from Chi-squared test.

Table 2. Prevalence of upper extremity pain by country at baseline.

	Prevalence of pain in the last 12 months			Prevalence of pain in past month			Prevalence of disabling pain		
		OR (95%CI)			OR (95%CI)			OR (95%CI)	
	%	Crude	Adjusted	%	Crude	Adjusted	%	Crude	Adjusted
Spain (n=438)	50.7	1	1	38.4	1	1	25.3	1	1
Costa Rica (n=224)	67.0	2.03 (1.45-2.84)	1.94 (1.30-2.89)	53.6	1.89 (1.36-2.62)	1.66 (1.13-2.42)	36.2	1.67 (1.18-2.36)	1.34 (0.89-2.03)
Nicaragua (n=285)	68.8	2.14 (1.57-2.93)	1.77 (1.23-2.55)	51.9	1.74 (1.28-2.35)	1.46 (1.04-2.06)	39.3	1.91 (1.38-2.63)	1.32 (0.90-1.94)

[a] Adjusted for sex, age, hours worked/week, pain-commonly caused by people's work, physical activity is harmful, awareness-someone outside work with pain, somatizing, climbing > 30 flights of stair/day, time pressure lack of support.

[b] Adjusted for sex, age, pain-commonly caused by people's work, prognosis, awareness-someone outside work with pain, somatizing, climbing > 30 flights of stair/day, time pressure.

[c] Adjusted for sex, age, contract, pain-commonly caused by people's work, prognosis sawareness-someone outside work with pain, somatizing, mental health, climbing > 30 flights of stair/day, time pressure.

Table 3. Incidence and persistence of upper extremity pain by country.

	Incidence of pain in past month			Incidence of disabling pain			Persistence of pain		
		OR (95%CI)			OR (95%CI)			OR (95%CI)	
	%	Crude	Adjusted	%	Crude	Adjusted	%	Crude	Adjusted
Spain (n=438)	33.2	1	1	9.9	1	1	45.4	1	1
Costa Rica (n=224)	50.4	2.04 (1.34-3.12)	2.17 (1.36-3.47)	19.3	2.16 (1.22-3.84)	2.21 (1.20-4.04)	24.0	0.38 (0.22-0.66)	0.39 (0.22-0.71)
Nicaragua (n=285)	60.2	3.04 (2.06-4.50)	3.15 (2.05-4.83)	22.1	2.57 (1.50-4.41)	2.39 (1.35-4.22)	65.9	2.33 (1.44-3.76)	2.01 (1.18-3.44)

[a] Adjusted for sex, age, awareness-someone outside work with pain, somatizing.
[b] Adjusted for sex, age, lack of support and non-disabling pain at baseline.
[c] Adjusted for sex, age, pain-commonly caused by people's work, somatizing, climbing > 30 flights of stair/day.

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CONCLUSION

Information about musculoskeletal pain and their implications for workers health has received little attention in Latin America (28), with most information coming from Western countries. To our knowledge, no other studies have estimated prevalence and incidence of MSDs and association with risk factors among office workers in Central America or Latin America, except possibly Mexico (28). We examined the prevalence and incidence of musculoskeletal pain and disabling pain among office workers in Nicaragua and Costa Rica, two low-and –middle income countries, while comparing these results to those from participants performing similar office jobs in Spain (a high-income country) with a shared language and cultural similarities.

Contrary to previous perceptions, our study shows that developing (low-middle income) economies might have higher prevalence of UE/LB pain as compared to Western or high-income economies (Spain), at least in some cases. We found differences in UE/LB musculoskeletal pain even among countries of a somewhat shared cultural background but with different economies. Both prevalent and incident upper extremity musculoskeletal pain and disabling pain were approximately 2-fold higher in Costa Rica and Nicaragua than in Spain. For low back pain, prevalence and disabling pain were higher in Costa Rica and Nicaragua, but incidence was mainly higher in Nicaragua.

The socio-demographic, job-related and health-related variables we examined and adjusted for did not fully explain the country differences. Even so, mental health and somatizing tendency appear to play an important role in the prevalence and incidence of musculoskeletal pain. Differences among the three countries persisted after adjusting for significant risk factors, possibly due to unmeasured factors such as ergonomic conditions, personal activities (hobbies, sports, home responsibilities, etc.), and previous work

exposure (work history). Cultural influences and development level of the country could also explain some of these differences. However, the three countries shared the same language, had similarities in culture, and the participants performed similar jobs. On the other hand, there are likely to have been other socio-economic differences that could have been missed, because they were not measured, or there could be an element of residual confounding for those covariables we did examine. In either case, these should be explored in further studies.

The strengths of the CUPID study are related to its longitudinal design, which allows an approximation to a causal analysis of the association between various risk factors and MSDs. Information was collected with standardized questions from instruments that had been validated with acceptable reliability (33). Response rates were high in all three countries, i.e., more than 96% at baseline and more than 90% at follow-up. Study limitations include the possibility of an element of selection bias due to the healthy worker effect if subjects with musculoskeletal pain were absent when the survey was collected. Information bias could happen due to difficulties in recall when participants relied on their ability to recall pain during the previous year and past month. In addition, disabling pain was coded based on self-reported data of difficulty to perform daily activities, but this was not confirmed through clinical assessments or physical examinations. Lastly, more detailed information on physical activities at work and outside work was not well captured in this study. For example, there was no information on hobbies, sports or other personal activities, neither work history, ergonomic conditions of workstations, duration of sitting posture at work and/or freedom to alternate postures, frequency of lifting, twisting, type of lift, or manual material handling.

Having more detailed information on the determinants of these between-country

differences is important if we are to design effective interventions to reduce the burden of MSDs in Latin America. Among the possible interventions could be those that focus on the reduction of negative beliefs about back pain, improvement of mental health and reduction of somatizing tendency. Collectively, this could contribute to improve health among office employees in Costa Rica and Nicaragua.

APPENDICES

Appendix A: Baseline Questionnaire

Serial Number ☐☐ ☐ ☐☐ ☐☐ ☐☐☐

INTERNATIONAL SURVEY OF WORK AND HEALTH

Please fill in the date that you complete this form

Date: ☐☐ ☐☐ ☐☐
day *month* *year*

SECTION ONE: ABOUT YOURSELF

1. Please fill in your date of birth ☐☐ ☐☐ ☐☐
day *month* *year*

2. *and* your sex Male ☐ Female ☐

3. Are you right or left-handed? Right ☐ Left ☐ Both equally ☐

4. How would you best describe your ethnic origin? **[Options will vary by country.]**

White British ☐ Bangladeshi ☐ Indian ☐
Pakistani ☐ Black African/Caribbean ☐ Chinese ☐
Other *(please specify)* ☐ _____

5. How old were you when you finished full time education?

Under 14 years ☐ 14-16 years ☐ 17-19 years ☐ 20 years or older ☐

6. How tall are you? ☐☐☐ cms or ☐ ft ☐☐ in

7a) Have you ever smoked regularly (ie at least once per day for a month or longer)? No ☐ Yes ☐

b) If ***YES***, do you still smoke regularly? No ☐ Yes ☐

SECTION TWO: YOUR CURRENT WORK

8. What is your main occupation? _____ ☐☐

9. How long have you done this job?

Less than 1 year ☐ 1-5 years ☐ More than 5 years ☐

10. How many hours per week do you normally work in this job? ☐☐☐ Hours

11. Does an **average working day** in the job involve any of the following?

*(Please tick **No** or **Yes** for each question)*

		No	*Yes*
a)	Use of a keyboard or typewriter for more than four hours in total?	☐	☐
b)	Other tasks involving repeated movements of the wrist or fingers for more than four hours in total?	☐	☐
c)	Repeated bending and straightening of your elbow for longer than one hour in total?	☐	☐
d)	Working for longer than one hour in total with your hands above shoulder height?	☐	☐
e)	Lifting weights of 25 Kg (56 lbs) or more by hand?	☐	☐
f)	Climbing up or down more than 30 flights of stairs a day?	☐	☐
g)	Kneeling or squatting for longer than one hour in total?	☐	☐
h)	Piecework in which you are paid according to the number of articles or tasks you or your team make or finish in the day?	☐	☐
i)	A target number of articles or tasks that you or your team are expected to make or finish in the day?	☐	☐
j)	Payment of a bonus if you make or finish more than an agreed number of articles/tasks in the day?	☐	☐
k)	Working under pressure to complete tasks by a fixed time?	☐	☐

YOUR WORK

12. In your job, do you have a choice in deciding:

	Often	*Sometimes*	*Seldom*	*Never/ Almost Never*
How you do your work?	☐	☐	☐	☐
What you do at work?	☐	☐	☐	☐
Your work timetable and breaks?	☐	☐	☐	☐

1 When you have difficulties in your work, how often do you get help and support from your colleagues or supervisor/manager?

Often ☐ Sometimes ☐ Seldom ☐ Never ☐ Not applicable ☐

1 How satisfied have you been with your job as a whole, taking everything into consideration?

Very satisfied ☐ Satisfied ☐ Dissatisfied ☐ Very dissatisfied ☐

1 How secure do you feel your job would be if you had a significant illness that kept you off work for three months?

Very safe ☐ Safe ☐ Rather unsafe ☐ Very unsafe ☐

16. Do you have any other job(s)? No ☐ Yes ☐

If ***YES,*** what are your other job(s)?

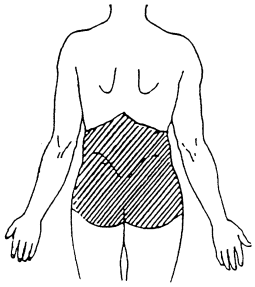
_____

_____

SECTION THREE: ACHES AND PAINS

LOW BACK PAIN IN PAST 12 MONTHS

17a) Have you had low back pain in the area shown below which lasted for more than a day at any time during the past 12 months? *(Do not include pain associated only with menstrual periods, pregnancy or during a course of a feverish illness.)*



No ☐ Yes ☐

If ***NO*****,** please go to question 22. If ***YES***, please continue.

b) Within the past 12 months, has the pain ever spread down your leg(s) to below the knee (sciatica)? No ☐ Yes ☐

c) If you add together all the days on which you have had low back pain, during the past 12 months, how long a period would that make?

1-6 days ☐ 1-4 weeks ☐ 1-12 months ☐

d) Have you consulted a doctor or a medical person or alternative practitioner because of low back pain during the past 12 months? No ☐ Yes ☐

e) During the past 12 months on how many days did low back pain prevent you from going to work?

0 days ☐ 1-5 days ☐ 6-30 days ☐ More than 30 days ☐

18. Do you expect that your back pain will be a problem in 12 months time?

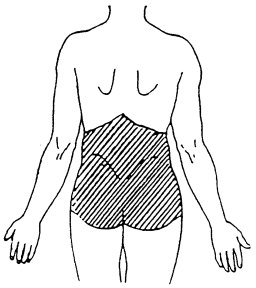
No ☐ Possibly ☐ Probably ☐ Definitely ☐

BACK PAIN

LOW BACK PAIN IN PAST MONTH

We are particularly interested in any back pain you may have had during the past month

19a) Have you had low back pain in the area shown below which lasted for more than a day at any time during the past month? *(Do not include pain associated only with menstrual periods, pregnancy or during a course of a feverish illness.)*



No ☐ Yes ☐

If ***NO*****,** please go to question 22. If ***YES***, please continue.

b) Within the past month, has the pain ever spread down your leg(s) to below the knee (sciatica)? No ☐ Yes ☐

c) If you add together all the days on which you have had low back pain, during the past month, how long a period would that make?

1-6 days ☐ 1-2 weeks ☐ More than 2 weeks ☐

20. During the past month, has low back pain at any time made it difficult or impossible to do any of the following activities?

		No	*Difficult*	*Impossible*
a)	Cutting your toe nails	☐	☐	☐
b)	Getting dressed	☐	☐	☐
c)	Doing the jobs that you normally do around the house	☐	☐	☐

21. Please think back to the last time that you were free from low back pain for a month or longer. When your most recent episode of low back pain then started, how did it begin?

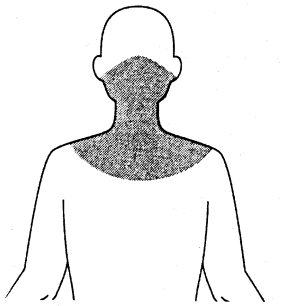
Suddenly (ie within less than a minute) while you were at work ☐

Suddenly (ie within less than a minute) but not while you were at work ☐

Gradually ☐

NECK PAIN IN PAST 12 MONTHS

22. Have you had pain in the neck in the area shown below which lasted for more than a day at any time during the past 12 months?



No ☐ Yes ☐

If ***NO*****,** please go to question 26. If ***YES***, please continue.

b) If you add together all the days on which you have had neck pain, in the past 12 months, how long a period would that make?

1-6 days ☐ 1-4 weeks ☐ 1-12 months ☐

c) Have you consulted a doctor or a medical person or alternative practitioner because of neck pain during the past 12 months? No ☐ Yes ☐

d) During the past 12 months on how many days did neck pain prevent you from going to work?

0 days ☐ 1-5 days ☐ 6-30 days ☐ More than 30 days ☐

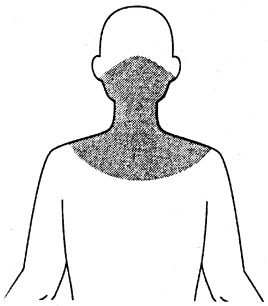
23. Do you expect that your neck pain will be a problem in 12 months time?

No ☐ Possibly ☐ Probably ☐ Definitely ☐

NECK PAIN IN THE PAST MONTH

We are particularly interested in any neck pain you may have had during the past month

24a) Have you had pain in the neck in the area shown below which lasted for more than a day at any time during the past month?



No ☐ Yes ☐

If ***NO***, please go to question 26. If ***YES***, please continue.

b) If you add together all the days on which you have had neck pain, during the past month, how long a period would that make?

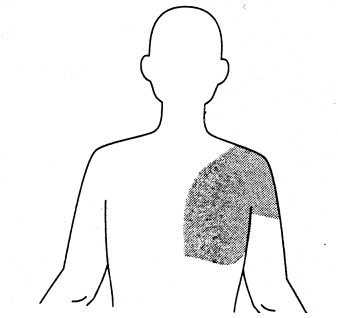
1-6 days ☐ 1-2 weeks ☐ More than 2 weeks ☐

25. During the past month, has neck pain at any time made it difficult or impossible to do any of the following activities?

		No	*Difficult*	*Impossible*
a)	Getting dressed	☐	☐	☐
b)	Doing the jobs that you normally do around the house	☐	☐	☐

SHOULDER PAIN IN PAST 12 MONTHS

26a) Have you had pain in the shoulder in the area shown below which lasted for more than a day at any time during the past 12 months?



No ☐ Right shoulder only ☐

Left shoulder only ☐ Both shoulders ☐

If ***NO***, please go to question 30. If ***YES*** please continue.

b) If you add together all the days on which you have had shoulder pain, in the past 12 months, how long a period would that make?

1-6 days ☐ 1-4 weeks ☐ 1-12 months ☐

c) Have you consulted a doctor or a medical person or alternative practitioner because of shoulder pain during the past 12 months? No ☐ Yes ☐

d) During the past 12 months on how many days did shoulder pain prevent you from going to work?

0 days ☐ 1-5 days ☐ 6-30 days ☐ More than 30 days ☐

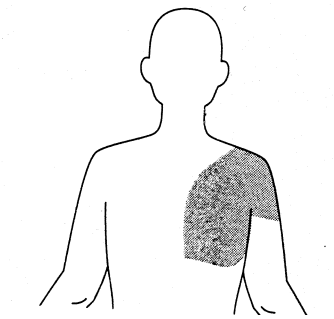
27. Do you expect that your shoulder pain will be a problem in 12 months time?

No ☐ Possibly ☐ Probably ☐ Definitely ☐

SHOULDER PAIN IN THE PAST MONTH

We are particularly interested in any shoulder pain you may have had during the past month

28. Have you had pain in the shoulder in the area shown below which lasted for more than a day at any time during the past month?



No ☐ Right shoulder only ☐

Left shoulder only ☐ Both shoulders ☐

If ***NO***, please go to question 30. If ***YES*** please continue.

b) If you add together all the days on which you have had shoulder pain, during the past month, how long a period would that make?

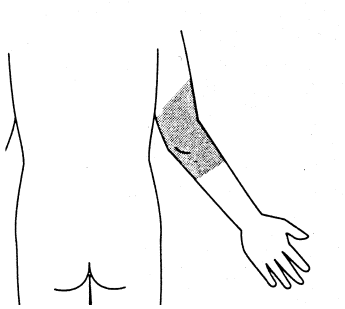
1-6 days ☐ 1-2 weeks ☐ More than 2 weeks ☐

29. During the past month, has shoulder pain at any time made it difficult or impossible to do any of the following activities?

		No	*Difficult*	*Impossible*
a)	Combing or brushing your hair	☐	☐	☐
b)	Bathing/Showering	☐	☐	☐
c)	Getting dressed	☐	☐	☐
d)	Doing the jobs that you normally do around the house	☐	☐	☐

ELBOW PAIN IN THE PAST 12 MONTHS

30. Have you had pain in the elbow in the area shown below which lasted for more than a day at any time during the past 12 months?



No ☐ Right elbow only ☐

Left elbow only ☐ Both elbows ☐

If ***NO,*** please go to question 34. If ***YES*** please continue.

b) If you add together all the days on which you have had elbow pain, in the past 12 months, how long a period would that make?

1-6 days ☐ 1-4 weeks ☐ 1-12 months ☐

c) Have you consulted a doctor or a medical person or alternative practitioner because of elbow pain during the past 12 months?

No ☐ Yes ☐

d) During the past 12 months on how many days did elbow pain prevent you from going to work?

0 days ☐ 1-5 days ☐ 6-30 days ☐ More than 30 days ☐

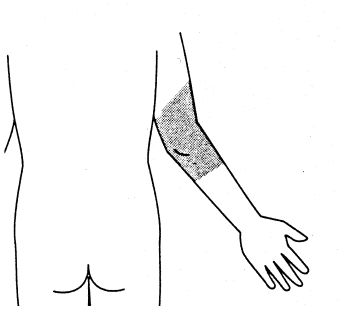
31. Do you expect that your elbow pain will be a problem in 12 months time?

No ☐ Possibly ☐ Probably ☐ Definitely ☐

ELBOW PAIN IN THE PAST MONTH

We are particularly interested in any elbow pain you may have had during the past month

32. Have you had pain in the elbow in the area shown below which lasted for more than a day at any time during the past month?



No ☐ Right elbow only ☐

Left elbow only ☐ Both elbows ☐

If ***NO,*** please go to question 34. If ***YES*** please continue.

b) If you add together all the days on which you have had elbow pain, during the past month, how long a period would that make?

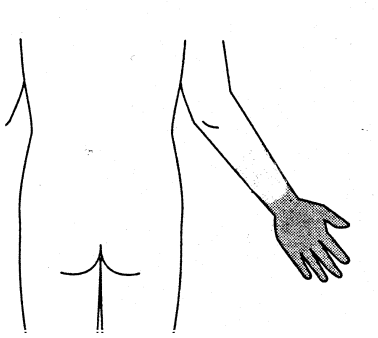
1-6 days ☐ 1-2 weeks ☐ More than 2 weeks ☐

33. During the past month, has elbow pain at any time made it difficult or impossible to do any of the following activities?

		No	*Difficult*	*Impossible*
a)	Opening bottles, jars or taps	☐	☐	☐
b)	Getting dressed	☐	☐	☐
c)	Doing the jobs that you normally do around the house	☐	☐	☐

WRIST AND HAND PAIN IN PAST 12 MONTHS

34. Have you had pain in the wrist or hand in the area shown below which lasted for more than a day at any time during the past 12 months?



No ☐ Right hand or wrist only ☐

Left hand or wrist only ☐ Both hands or wrists ☐

If ***NO,*** please go to question 38. If ***YES*** please continue.

b) If you add together all the days on which you have had wrist/hand pain, in the past 12 months, how long a period would that make?

1-6 days ☐ 1-4 weeks ☐ 1-12 months ☐

c) Have you consulted a doctor or a medical person or alternative practitioner because of wrist/hand pain during the past 12 months? No ☐ Yes ☐

d) During the past 12 months on how many days did wrist/hand pain prevent you from going to work?

0 days ☐ 1-5 days ☐ 6-30 days ☐ More than 30 days ☐

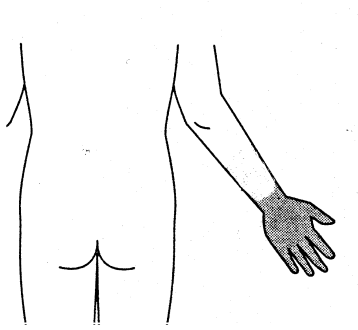
35. Do you expect that your wrist/hand pain will be a problem in 12 months time?

No ☐ Possibly ☐ Probably ☐ Definitely ☐

WRIST AND HAND PAIN IN THE PAST MONTH

We are particularly interested in any wrist/hand pain you may have had during the past month

36. Have you had pain in the wrist or hand in the area shown below which lasted for more than a day at any time during the past month?



No ☐ Right hand or wrist only ☐

Left hand or wrist only ☐ Both hands or wrists ☐

If ***NO,*** please go to question 38. If ***YES*** please continue.

b) If you add together all the days on which you have had wrist/hand pain, during the past month, how long a period would that make?

1-6 days ☐ 1-2 weeks ☐ More than 2 weeks ☐

37. During the past month, has wrist/hand pain at any time made it difficult or impossible to do any of the following activities?

		No	*Difficult*	*Impossible*
a)	Writing	☐	☐	☐
b)	Locking and unlocking doors	☐	☐	☐
c)	Opening bottles, jars or taps	☐	☐	☐
d)	Getting dressed	☐	☐	☐
e)	Doing the jobs that you normally do around the house	☐	☐	☐

KNEE PAIN IN THE PAST 12 MONTHS

38. Have you had pain in the knee in the area shown below which lasted for more than a day at any time during the past 12 months?

No ☐ Right knee only ☐

Left knee only ☐ Both knees ☐

If ***NO,*** please go to question 42. If ***YES*** please continue.

b) If you add together all the days on which you have had knee pain, in the past 12 months, how long a period would that make?

1-6 days ☐ 1-4 weeks ☐ 1-12 months ☐

c) Have you consulted a doctor or a medical person or alternative practitioner because of knee pain during the past 12 months? No ☐ Yes ☐

d) During the past 12 months on how many days did knee pain prevent you from going to work?

0 days ☐ 1-5 days ☐ 6-30 days ☐ More than 30 days ☐

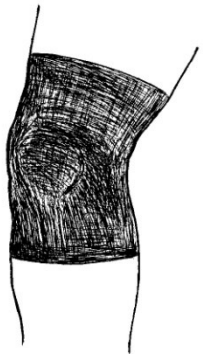
39. Do you expect that your knee pain will be a problem in 12 months time?

No ☐ Possibly ☐ Probably ☐ Definitely ☐

KNEE PAIN IN THE PAST MONTH

We are particularly interested in any knee pain you may have had during the past month

40. Have you had pain in the knee in the area shown below which lasted for more than a day at any time during the past month?



No ☐ Right knee only ☐

Left knee only ☐ Both knees ☐

If ***NO,*** please go to question 42. If ***YES*** please continue.

b) If you add together all the days on which you have had knee pain, during the past month, how long a period would that make?

1-6 days ☐ 1-2 weeks ☐ More than 2 weeks ☐

41. During the past month, has knee pain at any time made it difficult or impossible to do any of the following activities?

		No	*Difficult*	*Impossible*
a)	Walking up and down stairs	☐	☐	☐
b)	Walking on level ground	☐	☐	☐
c)	Getting dressed	☐	☐	☐
d)	Doing the jobs that you normally do around the house	☐	☐	☐

SECTION FOUR: OTHER PEOPLE'S PAIN

LOW BACK PAIN

42. Do you know anyone who has had low back pain in the past 12 months?

a) At work No ☐ Yes ☐

b) Outside work No ☐ Yes ☐

NECK PAIN

43. Do you know anyone who has had neck pain in the past 12 months?

a) At work No ☐ Yes ☐

b) Outside work No ☐ Yes ☐

PAIN IN THE ARM, SHOULDER OR HAND

44. Do you know anyone who has had pain in the arm, shoulder or hand in the past 12 months?

a) At work No ☐ Yes ☐

b) Outside work No ☐ Yes ☐

KNEE PAIN

45. Do you know anyone who has had knee pain in the past 12 months?

a) At work No ☐ Yes ☐

b) Outside work No ☐ Yes ☐

SECTION FIVE: YOUR VIEWS ON THE CAUSES AND PREVENTION OF PAIN

46. Based on your own views and what the doctor or others may have told you about pain in the arm, shoulder or hands, how strongly do you agree with the following statements?
(Tick one box on each line.)

For someone with this problem ..	*Completely disagree*	*Tend to disagree*	*Unsure*	*Tend to agree*	*Completely agree*
Physical activity should be avoided as it might harm the arm	☐	☐	☐	☐	☐
These problems usually get better within three months	☐	☐	☐	☐	☐
Rest is needed to get better	☐	☐	☐	☐	☐
Neglecting problems of this kind can cause permanent health problems	☐	☐	☐	☐	☐
These problems are commonly caused by people's work	☐	☐	☐	☐	☐

47. Based on your own views and what the doctor or others may have told you about low-back pain, how strongly do you agree with the following statements? *(Tick one box on each line.)*

For someone with this problem ..	*Completely disagree*	*Tend to disagree*	*Unsure*	*Tend to agree*	*Completely agree*
Physical activity should be avoided as it might harm the back	☐	☐	☐	☐	☐
These problems usually get better within three months	☐	☐	☐	☐	☐
Rest is needed to get better	☐	☐	☐	☐	☐

Neglecting problems of this kind can cause permanent health problems	☐	☐	☐	☐	☐
These problems are commonly caused by people's work	☐	☐	☐	☐	☐

48. Have you ever heard or read about repetitive strain injury (RSI), work-related upper limb disorder (WRULD) or cumulative trauma syndrome (CTS)? **[Appropriate terms may vary by country.]**

No ☐ Yes ☐

SECTION SIX: YOUR HEALTH MORE GENERALLY

PAST 7 DAYS

49. Below is a list of problems people sometimes have. Please read each one carefully and circle the number that best describes HOW MUCH THAT PROBLEM HAS DISTRESSED OR BOTHERED YOU DURING THE **PAST 7 DAYS INCLUDING TODAY**

*Circle only **one number** for each problem and do not skip any items*

	Not at all	*A little bit*	*Moderately*	*Quite a bit*	*Extremely*
a) Faintness or dizziness	0	1	2	3	4
b) Pains in the heart or chest	0	1	2	3	4
c) Nausea or upset stomach	0	1	2	3	4
d) Trouble getting your breath	0	1	2	3	4
e) Numbness or tingling in parts of your body	0	1	2	3	4
f) Feeling weak in parts of your body	0	1	2	3	4
g) Hot or cold spells	0	1	2	3	4

PAST MONTH

50. These questions are about how you feel and how things have been with you **during the past month.** For each question, please give the one answer that best describes how things have been for you during the past month. How much of the time during the **past month**:

*Circle **one number** on each line*

	All of the time	***Most of the time***	***A good bit of the time***	***Some of the time***	***A little of the time***	***None of the time***
a) Were you a happy person?	1	2	3	4	5	6
b) Have you felt calm and peaceful?	1	2	3	4	5	6
c) Have you been a very nervous person	1	2	3	4	5	6
d) Have you felt downhearted and low?	1	2	3	4	5	6
e) Have you felt so down that nothing could cheer you up?	1	2	3	4	5	6

PAST 12 MONTHS

51. Over the past 12 months, on how many days in total have you been prevented from going to work because of

a) a problem with your back, neck, shoulder, elbow, wrist, hand or knees

0 days ☐ 1-5 days ☐ 6-30 days ☐ More than 30 days ☐

b) other illness

0 days ☐ 1-5 days ☐ 6-30 days ☐ More than 30 days ☐

Appendix B: Follow-up Questionnaire

Serial Number ☐☐ ☐☐☐ ☐☐☐

INTERNATIONAL SURVEY OF WORK AND HEALTH

Please fill in the date that you complete this form

Date: ☐☐ ☐☐ ☐☐
day *month*
year

SECTION ONE: ABOUT YOURSELF

1. Please fill in your date of birth ☐☐ ☐☐ ☐☐
day *month*
year

2. *and* your sex Male ☐ Female ☐

SECTION TWO: YOUR CURRENT WORK

3a) Do you still have the same main job as when we last questioned you about a year ago? No ☐ Yes ☐

If ***YES,*** please go to question 4. If ***NO,*** please continue

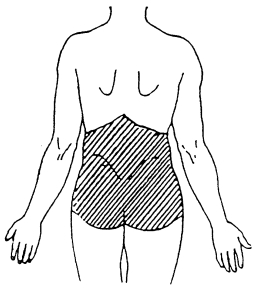
b) Did you leave that job because of medical problems with your back, neck, shoulder, elbow, wrist, hand or knee? No ☐ Yes ☐

c) And do you have another job now? No ☐ Yes ☐

SECTION THREE: ACHES AND PAINS

LOW BACK PAIN IN PAST MONTH

4a) Have you had low back pain in the area shown below which lasted for more than a day at any time during the past month? *(Do not include pain associated only with menstrual periods, pregnancy or during a course of a feverish illness.)*



No ☐ Yes ☐

If ***NO*****,** please go to question 8. If ***YES***, please continue.

b) If you add together all the days on which you have had low back pain, during the past month, how long a period would that make?

1-6 days ☐ 1-2 weeks ☐ More than 2 weeks ☐

5. During the past month, has low back pain at any time made it difficult or impossible to do any of the following activities?

		No	*Difficult*	*Impossible*
a)	Cutting your toe nails	☐	☐	☐
b)	Getting dressed	☐	☐	☐
c)	Doing the jobs that you normally do around the house	☐	☐	☐

6. During the past month on how many days has low back pain prevented you from going to work?

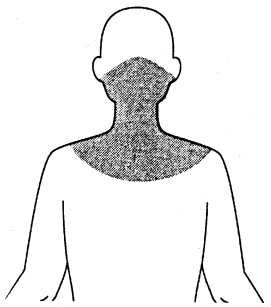
0 days ☐ 1-5 days ☐ More than 5 days ☐ Not applicable because unemployed ☐

7. Within the past month, has the pain ever spread down your leg(s) to below the knee (sciatica)? No ☐ Yes ☐

NECK PAIN

NECK PAIN IN THE PAST MONTH

8a) Have you had pain in the neck in the area shown below which lasted for more than a day at any time during the past month?



No ☐ Yes ☐

If ***NO,*** please go to question 11. If ***YES***, please continue.

b) If you add together all the days on which you have had neck pain, during the past month, how long a period would that make?

1-6 days ☐ 1-2 weeks ☐ More than 2 weeks ☐

9. During the past month, has neck pain at any time made it difficult or impossible to do any of the following activities?

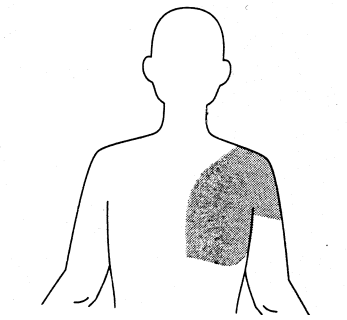
		No	*Difficult*	*Impossible*
a)	Getting dressed	☐	☐	☐
b)	Doing the jobs that you normally do around the house	☐	☐	☐

10. During the past month on how many days has neck pain prevented you from going to work?

0 days ☐ 1-5 days ☐ More than 5 days ☐ Not applicable because unemployed ☐

SHOULDER PAIN IN THE PAST MONTH

11a) Have you had pain in the shoulder in the area shown below which lasted for more than a day at any time during the past month?



No ☐ Right shoulder only ☐

Left shoulder only ☐ Both shoulders ☐

If ***NO***, please go to question 14. If ***YES*** please continue.

b) If you add together all the days on which you have had shoulder pain, during the past month, how long a period would that make?

1-6 days ☐ 1-2 weeks ☐ More than 2 weeks ☐

12. During the past month, has shoulder pain at any time made it difficult or impossible to do any of the following activities?

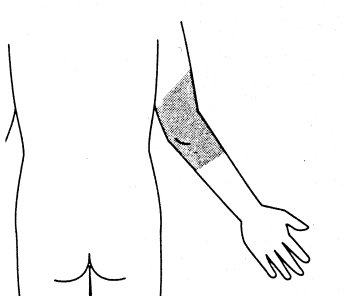
		No	*Difficult*	*Impossible*
a)	Combing or brushing your hair	☐	☐	☐
b)	Bathing/showering	☐	☐	☐
c)	Getting dressed	☐	☐	☐
d)	Doing the jobs that you normally do around the house	☐	☐	☐

13. During the past month on how many days has shoulder pain prevented you from going to work?

0 days ☐ 1-5 days ☐ More than 5 days ☐ Not applicable because unemployed ☐

ELBOW PAIN IN THE PAST MONTH

14a) Have you had pain in the elbow in the area shown below which lasted for more than a day at any time during the past month?



No ☐ Right elbow only ☐

Left elbow only ☐ Both elbows ☐

If ***NO,*** please go to question 17. If ***YES*** please continue.

b) If you add together all the days on which you have had elbow pain, during the past month, how long a period would that make?

1-6 days ☐ 1-2 weeks ☐ More than 2 weeks ☐

15. During the past month, has elbow pain at any time made it difficult or impossible to do any of the following activities?

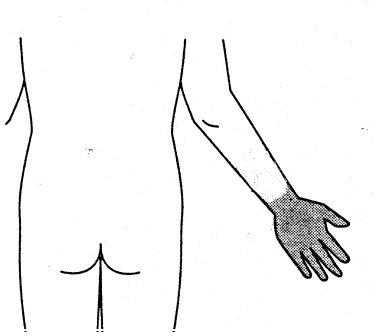
		No	*Difficult*	*Impossible*
a)	Opening bottles, jars or taps	☐	☐	☐
b)	Getting dressed	☐	☐	☐
c)	Doing the jobs that you normally do around the house	☐	☐	☐

16. During the past month on how many days has elbow pain prevented you from going to work?

0 days ☐ 1-5 days ☐ More than 5 days ☐ Not applicable because unemployed ☐

WRIST AND HAND PAIN IN THE PAST MONTH

17a) Have you had pain in the wrist or hand in the area shown below which lasted for more than a day at any time during the past month?



No ☐

Right hand or wrist only ☐

Left hand or wrist only ☐

Both hands or wrists ☐

If ***NO,*** please go to question 20. If ***YES*** please continue.

b) If you add together all the days on which you have had wrist/hand pain, during the past month, how long a period would that make?

1-6 days ☐ 1-2 weeks ☐ More than 2 weeks ☐

18. During the past month, has wrist/hand pain at any time made it difficult or impossible to do any of the following activities?

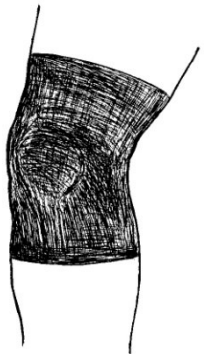
		No	*Difficult*	*Impossible*
a)	Writing	☐	☐	☐
b)	Locking and unlocking doors	☐	☐	☐
c)	Opening bottles, jars or taps	☐	☐	☐
d)	Getting dressed	☐	☐	☐
e)	Doing the jobs that you normally do around the house	☐	☐	☐

19. During the past month on how many days has wrist/hand pain prevented you from going to work?

0 days ☐ 1-5 days ☐ More than 5 days ☐ Not applicable because unemployed ☐

KNEE PAIN IN THE PAST MONTH

20a) Have you had pain in the knee in the area shown below which lasted for more than a day at any time during the past month?



No ☐ Right knee only ☐

Left knee only ☐ Both knees ☐

If ***NO,*** please go to question 23. If ***YES*** please continue.

b) If you add together all the days on which you have had knee pain, during the past month, how long a period would that make?

1-6 days ☐ 1-2 weeks ☐ More than 2 weeks ☐

21. During the past month, has knee pain at any time made it difficult or impossible to do any of the following activities?

		No	*Difficult*	*Impossible*
a)	Walking up and down stairs	☐	☐	☐
b)	Walking on level ground	☐	☐	☐
c)	Getting dressed	☐	☐	☐
d)	Doing the jobs that you normally do around the house	☐	☐	☐

22. During the past month on how many days has knee pain prevented you from going to work?

0 days ☐ 1-5 days ☐ More than 5 days ☐ Not applicable because unemployed ☐

SECTION SIX: YOUR HEALTH MORE GENERALLY

PAST 7 DAYS

23. Below is a list of problems people sometimes have. Please read each one carefully and circle the number that best describes HOW MUCH THAT PROBLEM HAS DISTRESSED OR BOTHERED YOU DURING THE **PAST 7 DAYS INCLUDING TODAY**

*Circle only **one number** for each problem and do not skip any items*

	Not at all	*A little bit*	*Moderately*	*Quite a bit*	*Extremely*
a) Faintness or dizziness	0	1	2	3	4
b) Pains in the heart or chest	0	1	2	3	4
c) Nausea or upset stomach	0	1	2	3	4
d) Trouble getting your breath	0	1	2	3	4
e) Numbness or tingling in parts of your body	0	1	2	3	4
f) Feeling weak in parts of your body	0	1	2	3	4
g) Hot or cold spells	0	1	2	3	4

PAST MONTH

24. These questions are about how you feel and how things have been with you **during the past month.** For each question, please give the one answer that best describes how things have been for you during the past month. How much of the time during the **past month**:

*Circle **one number** on each line*

	All of the time	***Most of the time***	***A good bit of the time***	***Some of the time***	***A little of the time***	***None of the time***
a) Were you a happy person?	1	2	3	4	5	6
b) Have you felt calm and peaceful?	1	2	3	4	5	6
c) Have you been a very nervous person	1	2	3	4	5	6
d) Have you felt downhearted and low?	1	2	3	4	5	6
e) Have you felt so down that nothing could cheer you up?	1	2	3	4	5	6

PAST 12 MONTHS

25. Over the past 12 months, on how many days in total have you been prevented from going to work because of:

a) a problem with your back, neck, shoulder, elbow, wrist, hand or knees

0 days ☐ 1-5 days ☐ 6-30 days ☐ More than 30 days ☐

b) other illness

0 days ☐ 1-5 days ☐ 6-30 days ☐ More than 30 days ☐

REFERENCES

(1) Bernard BP (Editor). Musculoskeletal Disorders and Workplace Factors: A Critical Review of Epidemiologic Evidence for Work-Related Musculoskeletal Disorders of the Neck, Upper Extremity, and Low Back. DHHHS (NIOSH) Publication No.97-141. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. National Institute for Occupational Safety and Health. 1997.

(2) Cal/OSHA. Easy Ergonomics, A Practical Approach for Improving the Workplace. Education and Training Unit, Consultation Service, California Department of Industrial Relations. California: Publications Division/CDE Press; 1999.

(3) Rempel DM, Harrison RJ, Barnhart S. Work-related cumulative trauma disorders of the upper extremity. JAMA 1992;267(6):838-842.

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