

Musculoskeletal and Neurological Injuries Associated With Work Organization Among Immigrant Latino Women Manual Workers in North Carolina

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Background *This analysis examines the associations of work organization attributes among Latino women in manual occupations with musculoskeletal and neurological injuries.*

Methods *Participants included 234 women in western North Carolina. Outcome measures included epicondylitis, rotator cuff syndrome, back pain, and carpal tunnel syndrome. Independent measures included indicators of job demand, job control, and job support, as well as personal characteristics.*

Results *Latina workers commonly experienced epicondylitis, rotator cuff syndrome, back pain, and CTS. Awkward posture and decision latitude were associated with epicondylitis. Rotator cuff syndrome was associated with awkward posture and psychological demand. Awkward posture and psychological demand, and decreased skill variety and job control were related to CTS.*

Conclusions *Work organization factors are potentially important for musculoskeletal and neurological injury among vulnerable workers. Research is required to understand the associations of work and health outcomes of these women. Policy initiatives need to consider how work organization affects health.* Am. J. Ind. Med. 57:468–475, 2014.

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INTRODUCTION

The way in which work is organized affects the health of workers [Sauter et al., 2002]. This is particularly the case for vulnerable workers, who often have few options for alternative employment [Landsbergis et al., 2012; Grzywacz et al., 2013]. Low wage manual work provides less flexibility in how the job is done, and may provide more structural constraints, such as line speed, high hand force work, or more frequent awkward postures [Niedhammer et al., 2008]. Minorities and immigrants are more likely to be over-represented in hazardous manual labor jobs [Pransky et al., 2002; Chung-Bridges et al., 2008; Forst et al., 2010]. Immigrant women constitute one of the most vulnerable worker groups [Arcury et al., 2014]. However, little research has considered the association of work

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organization with the health of immigrant women. Arcury et al. [2014] report in an analysis of full-time employed immigrant Latino women that greater job demands (heavy load, awkward posture, and psychological demand) were associated with more musculoskeletal and depressive symptoms, and worse mental health-related quality of life; less decision latitude (lower skill variety and less job control) was associated with more musculoskeletal and depressive symptoms, and greater support (supervisor's power and safety climate) was associated with fewer depressive symptoms and better mental health related quality of life.

A few studies have considered the association of work organization characteristics with clinical health measures. For example, high job strain (defined as high job demands and low job control based on measures from the Job Content Questionnaire [Karasek et al., 1998]) and low social support have been associated with the incidence of carpal tunnel syndrome [Harris-Adamson et al., 2013]. Greater psychosocial job demand, but not social support, has been associated with incidence of CTS [Silverstein et al., 2010]. Suggestive associations of work organization factors, such as structural constraints, decision latitude, and job satisfaction, with rotator cuff syndrome, have been reported [Silverstein et al., 2008]. Although Latino workers have a greater burden of work-related injuries and are less likely to have health insurance than do other workers [Sears et al., 2012], the majority of studies that have investigated the relationship between work organization and musculoskeletal disorders have been conducted among primarily non-Latino white populations.

The job demand-control-support model [Karasek, 1979; Johnson and Hall, 1988; Karasek et al., 1998; Snyder et al., 2008] provides a framework for examining the association of work organization with clinical musculoskeletal injuries experienced by immigrant Latina workers. This model argues that greater physical and psychological demands in a job increase the risk of injury and illness. However, the negative health effects of physical and psychological demands can be moderated with greater worker control [Hoven and Siegrist, 2013], such as the ability to make decisions about work and to use a greater variety of skills, and by greater social support from supervisors, such as a positive work safety climate [Zohar, 2002].

This analysis examines the associations of work organization attributes among Latino women in manual occupations with clinically assessed musculoskeletal and neurological injuries, including epicondylitis, rotator cuff syndrome, back pain, and carpal tunnel syndrome. The work organization attributes include indicators of job demands (heavy load; awkward posture; and psychological demand), job control (skill variety and decision latitude); and supervision (perceived supervisor control and work safety climate). Personal characteristics (age, years lived in US, language, and poultry processing worker) are included in multivariate analysis.

METHODS

Data for this analysis are from a study comparing Latino poultry processing workers occupational injuries with those among other Latino manual workers [Arcury et al., 2012a; Cartwright et al., 2012; Pichardo-Geisinger et al., 2013; Rosenbaum et al., 2013]. Data were collected from 2009 to 2011. The study was approved by the Wake Forest School of Medicine Institutional Review Board. All participants provided signed informed consent.

Participants

Participants were recruited from a four county area in western North Carolina. The sample design had two components: (1) dwellings in Latino neighborhoods in the four counties were mapped and listed; and (2) the four counties were surveyed to identify dispersed dwellings with Latino residents. A total of 4,376 potential Latino dwellings were listed, with about two-thirds in neighborhoods. The dwelling list was randomized proportionately with two-thirds from neighborhoods and one-third from dispersed dwellings.

Interviewers visited randomly selected dwellings. Residents were screened for inclusion criteria: self-identified as Latino or Hispanic, worked 35 hr or more per week in a manual labor job, and 18 years or older. Manual labor in poultry processing was defined as non-supervisory work in a poultry processing plant with job categories from receiving through sanitation. Other manual labor was defined as employment in non-managerial jobs in industries such as landscaping, construction, restaurant work, hotel work, child care, and manufacturing. Non-poultry workers with previous work in poultry were excluded if they had more than 6 months employment in poultry processing, or had worked in poultry processing in the previous 2 years. More than one resident per dwelling could be recruited. Of 1,681 dwellings contacted, 965 were screened, for a screening rate of 57%. Of 1,526 individuals screened, 957 were eligible for enrollment, with 742 completing interviews (77.5% participation rate). The participants included 319 women (77.6% participation rate), with 173 employed as poultry processing workers (82.0% participation rate), and 146 employed as other manual workers (73.0% participation rate). Of those, 234 women (128 employed in poultry processing, and 106 employed in other manual work) attended data collection clinics and are included in this analysis.

Data Collection

Data collection included an interviewer-administered survey questionnaire completed in participants' homes and a clinical evaluation completed at a research clinic. The survey questionnaire included items to measure basic personal

characteristics information (e.g., age, preferred language), types of work performed for pay, and work organization characteristics. All interviews were conducted in Spanish and took approximately 60 min to complete. Participants were given a \$10 incentive for completing the survey questionnaire.

Clinics were scheduled on Sundays at seven locations in the four study counties. Participants were scheduled for a clinical evaluation within 30 days of completing the survey questionnaire. Participants completed musculoskeletal and neurological examinations at the clinics. Those who attended the clinic were given an incentive of \$30. For the musculoskeletal examination, participants first completed a short interview questionnaire that documented any pain at the elbows, shoulders, or low back on 2 or more days in the last month. Two board-certified physicians with fellowship training in sports medicine conducted all of the musculoskeletal examinations of the elbow, shoulder, and back.

For the neurological examination, participants' height and weight were recorded; and they reported if they had numbness, pain, or weakness in their hands for 2 or more days in the previous month. If they answered affirmatively, they completed the Katz hand diagram [Katz and Stirrat, 1990] to indicate distribution of symptoms. Participants also completed bilateral nerve conduction studies by using a Teca TD10 Electromyograph (Teca Corporation, Pleasantville, NY). The studies were performed by experienced technicians blinded to the participants' occupation and clinical evaluations. Hands were warmed to 32°C, and median and ulnar antidromic sensory studies were performed, stimulating the wrist and recording with ring electrodes 140 mm distally on the second and fifth fingers. The onset and peak latencies were recorded, and those without median sensory potentials underwent orthodromic median motor studies recording from the abductor pollicis brevis muscle.

Measures

Outcome measures included physician diagnosed epicondylitis, rotator cuff syndrome, back pain, and carpal tunnel syndrome [Cartwright et al., 2012; Rosenbaum et al., 2013]. Epicondylitis was defined as self-reported pain at either epicondyle area on 2 or more days in the previous month and one of the following on exam: presence of pain at the lateral epicondyle with resisted active wrist extension, pain at the medial epicondyle with resisted active wrist flexion, or tenderness to palpation over the medial and lateral epicondyle regions physical exam [Werner et al., 2005]. Rotator cuff syndrome was defined as self-reported pain at the shoulder on 2 or more days in the previous month and one of the following on exam: presence of pain with resisted abduction, internal rotation, external rotation, or forward flexion of the shoulder, or tenderness to palpation over the bicipital groove or lateral shoulder. Low back pain

was defined as self-reported low back pain on 2 or more days in the previous month and one of the following on exam: presence of pain with active flexion, extension, side-bending to right or left, or twisting to right or left, or tenderness to palpation anywhere.

A combination of symptoms, based on the Katz hand diagram, and nerve conduction abnormalities was used to define carpal tunnel syndrome [Katz and Stirrat, 1990]. Two physicians, blinded to the participant's occupation and nerve conduction results scored the hand diagrams as "unlikely" (0), "possible" (1), "probable" (2), or "classic" (3) for CTS on the basis of the published methods for scoring of the diagram [Katz and Stirrat, 1990]. If the hand diagram was scored a 1, 2, or 3, then the participant was assigned a score of "1" for symptoms; if not, the participant was assigned a "0." Peak median and ulnar sensory latencies were compared. If the median was less than 0.49 ms longer than the ulnar, it was scored a "0"; if it was 0.50–0.79 ms longer, it was scored a "1"; and if it was greater than 0.80 ms longer, it was scored a "2" [Violante et al., 2007]. The symptom score and nerve conduction score were then added; and a total score of 0 was defined as "no carpal tunnel syndrome," 1 to 2 as "possible carpal tunnel syndrome," and 3 as "definite carpal tunnel syndrome." This scoring system was applied to each wrist. In addition, individuals were defined as having "no carpal tunnel syndrome" if both wrists were scored as "0," "possible carpal tunnel syndrome" if one or both wrists were scored a "1 or 2," and "definite carpal tunnel syndrome" if either wrist was scored a "3." For this analysis, possible and definite carpal tunnel syndrome were combined into one category.

Measures for work organization included indicators of job demands (heavy load, awkward posture, and psychological demand), job control (skill variety and decision latitude), and support (perceived supervisor control and work safety climate) [Arcury et al., 2014]. The scales on which these indicators are based are in the appendix. Heavy load and awkward posture were measured with an established physical workload instrument that has been used in previous research with immigrant Latinos [Bot et al., 2004; Grzywacz et al., 2007]. Response categories ranged from "seldom/never" (1) through "almost always" (4). Heavy load was assessed with the average of 12 items ($\alpha = 0.70$), and awkward posture was assessed with the average of six items ($\alpha = 0.80$), coded such that higher values indicate greater exposure. Psychological demand, was assessed with items from the Job Content Questionnaire [Karasek et al., 1998] with response options ranging from "seldom/never" (1) through "almost always" (4). Psychological demand is the mean of four items ($\alpha = 0.74$). Higher values indicate greater levels for the concept.

Skill variety and decision latitude were also assessed using items modified from the Job Content Questionnaire [Karasek et al., 1998] with response options ranging from "seldom/never" (1) through "almost always" (4). Skill variety

is the mean of three items ($\alpha = 0.70$); and decision latitude is the mean of three items ($\alpha = 0.81$). Higher values indicate greater levels for each concept. Each of these measures has been used previously with immigrant Latino worker populations [Grzywacz et al., 2008, 2012; Arcury et al., 2014].

Perceived supervisor control was assessed with seven items from the social power scale [Hinkin and Schriesheim, 1989]. Participants stated whether their supervisor had control over pay, benefits, promotions, job assignments, and making work difficult. Response options ranged from “strongly disagree” (1) through “strongly agree” (4). Perceived supervisor control is the mean of the seven items ($\alpha = 0.74$) coded such that higher scores indicate greater perceived control. This measure has been used in previous studies of immigrant Latino workers [Arcury et al., 2014]. Work safety climate was assessed with the Perceived Safety Climate Scale [Gillen et al., 2002]. This measure has been used in previous studies of immigrant Latino workers [Arcury et al., 2012b,c, 2014; Swanberg et al., 2012]. Nine of the items in the scale used a four-point Likert format. The tenth item included three response categories. After an analysis of internal consistency, one of the nine four-point Likert format items was discarded due to lack of fit within the scale. A total Work Safety Climate was calculated by summing the remaining nine items ($\alpha = 0.73$). Values range from 9 to 39, with higher values indicating better work safety. Measures of perceived supervisor control and work safety climate were not applied to women who were self-employed.

Personal characteristics used in the analysis include age (in years), years lived in US, speaking an indigenous language, and poultry processing worker versus other manual worker. In addition, information on the percent of participants who are currently married and number of co-resident children are included to describe the sample.

Analysis

All statistical analyses were adjusted for the stratified cluster sampling design of the study with sites being strata and dwellings being clusters. Continuous sample characteristics (age, years lived in US, and work organization indicators) were summarized using means and standard errors (SE). Categorical characteristics (language, marital status, number of children, employment, and presence of musculoskeletal injuries) were summarized using frequencies and percentages. Logistic regression models were used to examine the associations between work organization indicators and prevalence of each of the musculoskeletal and neurological injuries. We first fit bivariate models, and unadjusted odds ratios (OR) with 95% confidence intervals (CI) are reported. Next we fit multivariable models for rotator cuff syndromes and CTS; and adjusted ORs are reported.

Multivariate models were first fit with the entire sample but excluding the supervisor support measures; some individuals were self-employed and the supervisor support scales were not collected. Multivariable models were then fit with those participants who were not self-employed, but with all of the work organization measures, including the supervisor support indicators. Measures of each work organization measure (heavy load, awkward posture, psychological demands, skill variety, decision latitude, perceived supervisor control, and work safety climate) as well as the personal characteristics age and years lived in the US were entered into logistic regression models as continuous measures, and indigenous versus non-indigenous language and poultry processing versus other manual work were entered into the logistic regression models as categorical measures. All analyses were performed by SAS 9.3 (Cary, NC) and *P*-values less than 0.05 were considered statistically significant.

RESULTS

The mean age of the participants was 34.9 years (SE = 0.64; Table I). They had lived in the US an average of 11.3 years (SE = 0.40). A minority (15.8%) lived in households in which an indigenous language was spoken when they were a child. Most (78.3%) were married; they had an average of 1.8 (SE = 0.08) children living with them. About half (54.7) were employed in poultry processing, with the remainder employed in other manual occupations. Thirteen (5.5%) participants had epicondylitis, 16.2% had rotator cuff syndrome, 20.4% had back pain, and 48.9% had

TABLE I. Personal Characteristics, Employment Characteristics, and Musculoskeletal Injuries of Latina Woman Manual Workers, Western North Carolina, 2010 (n = 234)

Personal and employment characteristics, and musculoskeletal injuries	n	%	Mean	SE
Age (in years)			34.9	0.64
Years lived in US			11.3	0.40
Indigenous language	37	15.8		
Currently married (not used in analysis)	184	78.3		
Number of co-resident children (not used in analysis)			1.8	0.08
Employment				
Poultry processing	128	54.7		
Other manual work	106	45.3		
Musculoskeletal and neurological injuries				
Epicondylitis	13	5.5		
Rotator cuff syndrome	38	16.2		
Back pain	48	20.4		
Carpal tunnel syndrome	115	48.9		

TABLE II. Work Organization Indicators, Latina Woman Manual Workers, Western North Carolina, 2010 (n = 234)

Organization of work	Mean	SE	Range
Job demands			
Heavy load	1.71	0.03	1.00–3.45
Awkward posture	2.03	0.05	1.00–4.00
Psychological demand	2.43	0.06	1.00–4.00
Job control			
Skill variety	1.89	0.05	1.00–4.00
Decision latitude	1.84	0.06	1.00–4.00
Support			
Perceived supervisor control (excludes self-employed; n = 202)	2.34	0.03	1.00–3.57
Work safety climate (excludes self-employed; n = 197)	24.66	0.24	13.00–32.00

carpal tunnel syndrome. The indicators of work organization are reported in Table II.

Several of the work organization characteristics were associated with epicondylitis, rotator cuff syndrome, and carpal tunnel syndrome (Table III); none of the work organization measures were associated with back pain. Among the demand measures, heavy load was not associated with the presence of any of the musculoskeletal injuries. Awkward posture had a significant, positive association with the presence of rotator cuff syndrome and carpal tunnel syndrome; it had a positive association with the presence of epicondylitis, but at the trend level. Psychological demand had a significant, positive association with rotator cuff syndrome. The job demands measure, skill variety, had an inverse association with the presence of carpal tunnel syndrome. Decision latitude had inverse associations with the presence of epicondylitis and carpal tunnel syndrome. The support measures did not have significant associations with the presence of musculoskeletal injuries; however, perceived supervisor control was associated with the presence of rotator cuff syndrome at the trend level.

None of the work organization measures were associated with back pain. Epicondylitis was not included in the multivariate analysis due to the small number of cases. Awkward posture maintained its positive association with the presence of rotator cuff syndrome (Table IV). Skill variety maintained its inverse association with the presence of carpal tunnel syndrome. Several personal characteristics were also significantly associated with musculoskeletal injuries in the multivariate analysis. Greater age was associated with rotator cuff syndrome and carpal tunnel syndrome. Years lived in the US was inversely associated with carpal tunnel syndrome, while working in poultry processing versus other manual work had a positive association with carpal tunnel syndrome.

TABLE III. Bivariate Associations of Work Organization With Musculoskeletal Injuries, Latina Woman Manual Workers, Western North Carolina, 2010 (n = 234)

Work organization	Epicondylitis	Rotator Cuff syndrome	Carpal Tunnel syndrome
Job demands			
Heavy load			
Odds ratio	1.01	1.25	0.77
95% confidence interval	0.27–3.67	0.62–2.52	0.42–1.38
P-value	0.98	0.53	0.37
Awkward posture			
Odds ratio	1.74	2.13	1.53
95% confidence interval	0.91–3.37	1.41–3.20	1.12–2.08
P-value	0.09	<0.01	<0.01
Psychological demand			
Odds ratio	1.76	1.49	1.23
95% confidence interval	0.85–3.60	1.01–2.20	0.94–1.59
P-value	0.12	0.04	0.12
Job control			
Skill variety			
Odds ratio	0.83	0.89	0.55
95% confidence interval	0.45–1.53	0.55–1.42	0.39–0.79
P-value	0.56	0.62	<0.01
Decision latitude			
Odds ratio	0.36	0.71	0.72
95% confidence interval	0.15–0.85	0.47–1.07	0.54–0.96
P-value	0.01	0.10	0.02
Support			
Perceived supervisor control			
Odds ratio	0.84	0.53	0.88
95% confidence interval	0.23–2.95	0.26–1.08	0.49–1.58
P-value	0.78	0.07	0.67
Work safety climate			
Odds ratio	0.94	0.93	1.00
95% confidence interval	0.82–1.07	0.85–1.03	0.91–1.08
P-value	0.37	0.19	0.95

DISCUSSION

Latina manual workers in this study commonly experienced epicondylitis, rotator cuff syndrome, back pain, and CTS. The proportion of those diagnosed with these musculoskeletal injuries was similar to the proportion to the total sample of participants in the larger study that included men as well as women [Cartwright et al., 2012; Rosenbaum et al., 2013]. The prevalence for epicondylitis and CTS were similar to that reported in the literature for other working populations. Fan et al. [2009] reported 5.2% of workers with epicondylitis compared to 5.5% of the participants in this study. The prevalence of possible CTS was 40% and of definite CTS was 8.9% among the participants in this study. This compares with the 6.7% rate

TABLE IV. Multivariate Associations of Work Organization With Musculoskeletal Injuries, Woman Manual Workers, Western North Carolina, 2010 (n = 234)

Work Organization	Rotator Cuff syndrome			Carpal Tunnel syndrome		
	Odds ratio	95% CI	P-value	Odds ratio	95% CI	P-value
Models without supervision indicators (n = 234)						
Job demands						
Heavy load	1.19	0.46–3.11	0.71	0.93	0.43–1.98	0.85
Awkward posture	1.80	1.01–3.23	0.04	1.38	0.88–2.13	0.15
Psychological demand	0.80	0.49–1.32	0.39	0.76	0.51–1.12	0.17
Job control						
Skill variety	1.26	0.66–2.39	0.39	0.56	0.36–0.88	0.01
Decision latitude	0.71	0.39–1.27	0.25	0.93	0.62–1.38	0.71
Personal characteristics						
Age	1.06	1.02–1.11	<0.01	1.10	1.06–1.14	<0.01
Years lived in US	1.91	9.94–1.08	0.76	0.93	0.87–0.98	0.01
Indigenous versus non-indigenous language	2.65	0.77–9.07	0.11	0.71	0.31–1.58	0.40
Poultry processing versus other manual work	2.75	0.83–9.06	0.09	2.37	1.14–4.92	0.02
Models with supervision indicators (n = 202)						
Job demands						
Heavy load	1.27	0.48–3.36	0.61	0.96	0.42–2.13	0.91
Awkward posture	1.68	0.93–3.04	0.08	1.54	0.93–2.53	0.08
Psychological demands	0.91	0.55–1.52	0.74			
Job control						
Skill variety	1.54	0.78–3.06	0.21	0.49	0.29–0.81	<0.01
Decision latitude	0.84	0.46–1.53	0.57	0.84	0.51–1.39	0.51
Support						
Perceived supervisor control	0.62	0.24–1.60	0.33	1.31	0.58–2.94	0.51
Work safety climate	0.99	0.86–1.14	0.92	1.01	0.92–1.11	0.80
Personal characteristics						
Age	1.06	1.01–1.11	0.01	1.09	1.04–1.14	<0.01
Years lived in US	1.01	0.94–1.09	0.68	0.92	0.87–0.98	0.01
Indigenous versus non-indigenous language	3.33	0.87–12.65	0.07	0.92	0.37–2.27	0.86
Poultry processing versus other manual work	3.13	0.81–12.66	0.09	2.57	1.12–5.88	0.02

reported by Luckhaupt et al. [2013], the 7.8% prevalence reported by Dale et al. [2013], and the 10.8% prevalence reported by Silverstein et al. [2010] using samples largely composed of non-Hispanic white Americans. The level of rotator cuff syndrome is substantially greater for the participants in this study (16.2%) compared to the largely non-Hispanic white sample (7.5%) analyzed by Silverstein et al. [2008].

Work organization characteristics were associated with the presence of epicondylitis, rotator cuff syndrome, and CTS among the study participations. Awkward posture and decision latitude were associated with epicondylitis among the women in this study. Similarly, Fan et al. [2009] reported epicondylitis being associated with greater physical workload. Rotator cuff syndrome was associated with the job demand factors awkward posture and psychological demand among the study participants. Silverstein et al. [2008] reported that the associations of work organization factors, such as structural constraints, decision latitude, and job

satisfaction, with rotator cuff are suggestive. Job strain, as indicated by increased awkward posture (bivariate analysis) and psychological demand (multivariate analysis), and decreased skill variety (bivariate and multivariate analyses) and job control (bivariate analysis), were related to CTS among these Latina manual workers. Harris-Adamson et al. [2013] reported that high job strain and social support were associated with the incidence of carpal tunnel syndrome.

The results of this research should be interpreted in light of its limitations. The study sample is limited to currently full-time employed women. Some women with musculoskeletal and neurological injuries may have left the work force. Women with part-time employment may experience different rates of injury. This research was conducted in one part of one state, which limits the generalizability of the results to other locales. Because the study had a cross-sectional design, the injuries found among the participant cannot be definitely associated with their work in general or their current jobs.

This analysis provides important, although limited, evidence that work organization characteristics, particularly job control and job demands, are associated with the presence of clinically diagnosed musculoskeletal and neurological injuries among immigrant Latina workers. The pattern of these results is consistent with research focused on non-immigrant workers in the US [Silverstein et al., 2008, 2010; Fan et al., 2009; Harris-Adamson et al., 2013; Luckhaupt et al., 2013]. Further research examining clinically evaluated health outcomes among immigrant women workers is needed. Such research should use a longitudinal design so that the degree to which injuries and other health outcomes actually result from work can be assessed. This research should also expand measurement of the potential sources of injury (e.g., domestic responsibilities [Guendelman et al., 2001; Borrell et al., 2004; Grzywacz et al., 2009], and the kinds of injuries in terms of location (e.g., lower body) and type (e.g., dermatological, lacerations). Optimally, this research should include a large, heterogeneous sample that is diverse by occupation, sex, immigrant status, and ethnicity. Such research would allow comparisons in the prevalence of health outcomes and allow the delineation of the differential effects of work organization factors. However, as such large scale studies are rare, comparisons of specific populations should be conducted to determine these associations.

This research does support consideration of occupational safety policy, even with its limitations. Work demands, particularly in terms of posture and psychological demand, for the types of manual work held by the participants in this research need to be examined in light of current ergonomic standards. Ergonomic changes can reduce the risk of some musculoskeletal and neurological injuries [Lin et al., 2012; Kim and Nussbaum, 2013]. Increased frequency of breaks can reduce work injuries, sometimes without impeding productivity [Dababneh et al., 2001; Tucker et al., 2003]. Investigations of the psychological demands of workers in these manual industries, such as poultry and meat processing, show that high levels of productivity are demanded of workers [Fink, 1998; Lipscomb et al., 2007; Horton and Lipscomb, 2011; Arcury et al., 2014]. For poultry processing, the industry in which half of the study participants are employed, a current policy initiative from the US Department of Agriculture would increase work demands by increasing the rate of production [line speed; Federal Register Volume 77, Number 228 (Tuesday, November 27, 2012)], even in the face of evidence showing the detrimental health effects of this policy [Musolin et al., 2013].

In conclusion, this analysis indicates the potential importance of work organization factors as causes of occupational musculoskeletal and neurological injury among immigrant Latinas and other vulnerable workers. Further research is required to understand the associations of work and health outcomes of these women. Policy initiatives need to consider how work organization affects occupational health.

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