



Final Report to the National Institute of Occupational Safety and Health (NIOSH)
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“Work Strain and Symptoms of Musculoskeletal Disorders”

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ABBREVIATIONS

MSDs	Musculoskeletal disorders
CWHS	Communication Workers and Health Study
VDT	Video display terminal
JCQ	Job content questionnaire
PC	Personal computer

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SIGNIFICANT FINDINGS

These data showed that, given a broad spectrum of psychosocial, physical, and emotional factors studied, demands from the job was most consistently and strongly associated with having MSD symptoms in the hands, neck, shoulders, upper back, and lower back. Participants with high physical demands had the highest odds of having MSD symptoms. None of the other hypothesized job strain variables (control over work and the work environment, social support, the emotional burden of work, and the emotional rewards) was consistently associated with MSD caseness. Likewise, demands, control, social support, the emotional burden or rewards from work at home were not directly related to MSD symptoms, nor did they modify the relationship between any of the job strain variables (i.e., demands, control at work) and symptoms.

Participants with psychological morbidity (either psychosomatic symptoms, depression or anxiety) were more likely than those without to have MSD symptoms in at least one of the five MSD systems measured. State anxiety was directly related to symptoms in the hands, shoulders, and upper back while depression and psychosomatic symptoms acted as mediators between job and home demands and MSD symptoms, especially for symptoms in the lower back. Psychological morbidity modified the relationship with strain on MSD symptoms: low job support and depression, together, increased the odds exponentially of having neck or upper back symptoms, just as high job demands coupled with either high levels of depression or trait anxiety increased the odds of having low back symptoms.

In sum, these findings suggest that: 1) Job strain, as it has traditionally been defined in the Job Strain Model (high demands and low control), does not fit this population, since job demands were overwhelmingly the most important factor related to MSD symptoms; 2) Strain from stressful elements in the home environment were not consistently or directly related to MSD symptoms; 3) Strain from the 'double burden' of home and work did not increase the odds of having MSD symptoms; 4) Psychological morbidity indirectly affected the relationship between the stressful elements of work and MSD symptoms, especially low back symptoms; 5) The risk for MSD symptoms increased exponentially when workers suffer from psychological ill health and have either high demands or low social support at work.

USEFULNESS OF FINDINGS

Researchers can use these findings as the basis for additional work on theory and methods in order to expand the existing knowledge in this area. These findings provide evidence that for this population of women working in the customer service sector of the telecommunications industry job demands may be linked to MSD symptoms. Additional research, however, needs to be conducted to test the generalizability of these results, preferably using a longitudinal design to track the development of MSD symptoms over time. By including additional or more diverse working groups, women at different stages in the life course, and men, we can gain a better understanding of whether these results are specific to this study population or can be generalized to larger populations of workers, especially women workers outside of the customer service sector. Researchers may also find the results linking psychological morbidity and MSD symptoms useful for understanding the multidimensional nature of risk factors for MSDs and wish to explore the possible pathways in which MSDs develop. Evidence from this study may also encourage others to include mental health measures in future investigations to validate these results.

If this research is confirmed with other studies, health practitioners, public health professionals, policy makers, labor groups, and management could use these results as a basis to improve workers' health. Because the demands from work were found as the most important factor related to MSD symptoms, prevention of MSDs might begin with a better understanding of what these demands are and adjusting for them. Taken from this study, some changes in demands that could benefit workers may be more specific to the telecommunications industry or customer service work, such as the need for more time with customers and customer follow-up, an evaluation of monitoring or monitoring techniques, and a reasonable assessment of time and sales quotas. Other, more general changes, however, such as advocating for more frequent breaks, especially when working with VDTs, and adjusting requirements that oblige workers to sit or hold the same position for too long, could be addressed for most types of office work. Practitioners might find the information from this study that shows that a significant relationship among job characteristics, psychological morbidity, and MSD symptoms useful in the planning and execution of prevention programs. Policy makers might find that the lack of any significant relationship between the home environment and MSD symptoms is useful in setting policy agendas and priorities.

ABSTRACT

The objectives of this project were to: 1) examine the associations among stressful exposures in the job and home environments and musculoskeletal disorders (MSD) symptoms; 2) test some of the possible pathways that may link stress from these environments to the development of MSD symptoms; and, 3) explore potential demographic (race and age) and mediating factors (psychosomatic symptoms, depression, and anxiety) that may work directly or indirectly with stress to cause or exacerbate MSD symptoms.

Data from a cross-sectional survey of women working in customer service within the telecommunications industry were used. The majority of the women in the sample were married (n=122, 56%), with some college or post-high school training (n=97, 44%). Most were parents (n=166, 77%), with, on average, 2 children. The mean age was approximately 42 years. The sample was made up equally of people identifying themselves as either African-American or white (n=108, 50%; n=102, 47% respectively). The average tenure on the job was 215.8 months (approximately 18 years).

Symptoms from five musculoskeletal systems were analyzed: hands, neck, shoulders, upper back and lower back. From the reported symptoms, cases and non-cases were defined and used in subsequent analyses. Stress from home and the job was conceptualized using the Job Strain Model (Demand/Control model). Both standardized measures and newly developed, job specific measures were used. Standardized measures were also used to measure psychological morbidity.

These data showed that demands from the job was the most important factor related to MSD symptoms. Those with high physical demands appeared to have the highest odds of having MSD symptoms. Demands, control, and social support at home were not directly related to MSD symptoms, nor did they modify the relationship between their parallel measures in the job environment and symptoms.

Psychological morbidity was also related to MSD symptoms. Elevated state anxiety was directly related to symptoms, while depression and psychosomatic symptoms acted as mediators between job and home demands and MSD symptoms, especially symptoms in the lower back. Psychological ill health also acted as a modifier: low job support and depression, together, increased the odds of having neck or upper back symptoms, just as high job demands coupled with either high levels of depression or trait anxiety increased the odds of having low back symptoms.

The effects of race and age on stress from the home and job environment and on MSD symptoms were inconsistent and inconclusive. Differences by race were found in the home environment, but these differences were not maintained when variables from the job environment were taken into consideration. The effects of age were minimal, possibly indicating the 'healthy worker effect' for this population.

In sum, for this study job demands was the most important factor linking job and home strain to MSD symptoms. An additional finding of equal interest, however, was the effect and influence of psychological ill health on job and home strain and, in turn, on some MSD systems, but not others.

OBJECTIVE AND BACKGROUND

Primary Objective

The primary objective of this project was to examine the relationship between work stress and musculoskeletal disorders (MSDs) in a group of female office workers in the telecommunications industry. What made this project unique was that work was defined as both the work performed on the job (paid work) and work done at home (unpaid work), and work at home was conceptualized using the same theoretical constructs from the Job Strain Model: demands, control, and social support. In addition to testing the independent relationships among strain from paid and unpaid work on MSD symptoms, the combined effect of strain from both environments on MSD symptoms was examined. Finally, in order to test some of the possible pathways that may link strain to the development of MSD symptoms, potential demographic (race and age) and mediating factors (psychosomatic symptoms, depression, and state/trait anxiety) were tested.

Background

Researchers have suggested that the nature and organization of office work, especially work that involves the use of computers or video display terminals (VDTs), may be leading to an increasing number of workers with symptoms of MSDs. While much of the research to date linking symptoms of MSDs and VDT work has focused on the biomechanics of computer work, such as the physical effects of repetitive motions, excessive force, and rigid postures (Silverstein et al., 1986; Silverstein et al., 1987), researchers have also begun to explore the effects that job stress has on the development of MSD symptoms among VDT workers.

While many studies have supported a link between job stress and MSD symptoms (Faucett et al., 1994), the results have not shown a clear or consistent relationship (see reviews by (Bongers, 1993; Centers for Disease Control, 1997)). This inconsistency may be due, in part, to the different approaches researchers have taken to: 1) measure MSD and MSD symptoms; 2) job stress; 3) conceptualize the scope of the work environment; 4) include possible confounding and mediating effects. This study considers the last three of these approaches.

In some studies researchers have used measures of job stress that were developed to generalize across a variety of office and VDT-related jobs, while others have used more job-specific measures that have allowed them to distinguish the subtleties of certain exposures unique to a job or industry. Similarly, in relation to the scope of the work environment, in most studies on job stress only the exposures associated with waged work have been considered, neglecting the exposures to stress from unpaid work that may affect the development or exacerbation of MSD symptoms. This may, in part, help explain why women in many studies have been more likely to report and experience MSD symptoms (Bernard et al., 1994; Hales et al., 1994). Some have argued that the physical demands or repetitive motions associated with unpaid work or hobbies, such as tennis, knitting, and use of personal computers at home, may cause or exacerbate symptoms of MSDs, while others have suggested that the “double burden” effect of stress from work on the job and at home may lead to or exacerbate MSD symptoms. Finally, in some studies researchers have not included possible confounding and mediating variables, such as demographic

characteristics or psychological ill health measures that could influence the relationships among stress and MSD symptoms.

This research, therefore, attempted to test whether certain exposures to stress, including the physical, psychological, social, and emotional elements that are associated both with office-based customer service work and from work done at home were associated with MSD symptoms and whether these exposures were directly or indirectly associated with such symptoms.

LITERATURE REVIEW

Overview

Over the past two decades, researchers and practitioners have seen an increase in the incidence of MSDs in the United States. The U.S. Bureau of Labor Statistics (BLS) has reported that MSDs account for approximately 60 percent of all occupational illnesses and have been some of the fastest growing types of workplace illnesses (Bureau of Labor Statistics, 1997), making them a serious public health problem. Among people of working age (18 to 64), MSDs ranked as the leading occupational illness (Bureau of Labor Statistics, 1995), and industry has paid a considerable price for MSDs. In 1992, for example, the financial burden of MSDs was estimated to be \$149.4 billion, approximately 2.5% of the gross national product (Yelin et al., 1995).

Some researchers have suggested that the increase in MSD incidence is simply due to a greater awareness of symptoms which subsequently has resulted in a higher number of MSD reports while other have argued that that relatively recent technological, market, and labor force changes have spurred a whole host of different risk factors at work and created new populations at risk for developing MSDs. For example, manufacturing industries, such as construction and food processing, that require fast-paced, repetitive motions, have consistently and historically reported some of the highest numbers of problems associated with MSDs while data have recently shown that some service industries, especially those involving VDT-based work, now also rank among the leading industries with workers suffering from MSDs (Bureau of Labor Statistics, 1997).

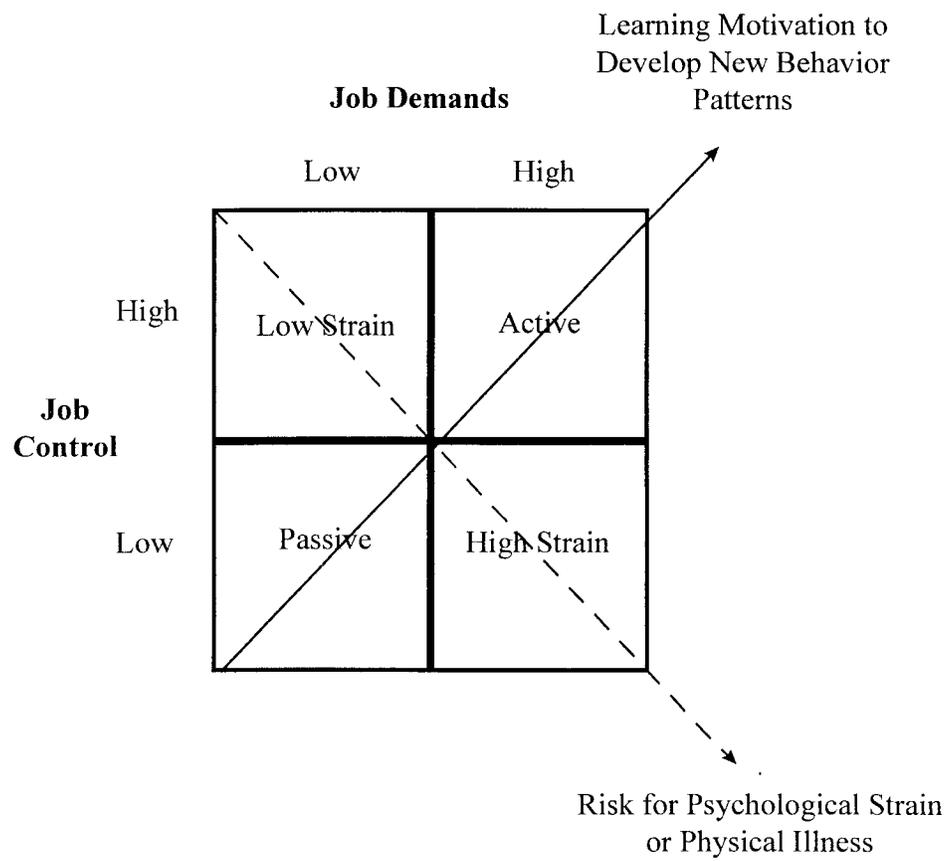
Job Strain and MSDs/Possible Pathways Linking the Two

Research has shown that repetition, mechanical stress, chronic disease, hormonal conditions, and a history of acute trauma are risk factors for developing MSDs and MSD symptoms (Brick et al., 1991; National Institute for Occupational Safety and Health (NIOSH), 1996; Stock, 1991), but strong evidence also has suggested that exposures to certain psychosocial characteristics in the work environment, especially monotonous and repetitive work with little control over the process, also increase the risk (Bongers, 1993). These characteristics, demanding work with little control, are most commonly thought of in the context of the Job Strain Model (Karasek et al., 1990) (see Figure 1). In numerous studies, this model, developed by Karasek (1981), has shown that deleterious strain will occur when excessive psychological demands persist with little individual control over task content, execution, and decision-making. While most research that has employed the Job Strain Model has focused on cardiovascular disease (see Schnall, (1994), for a

review), researchers have recently begun to use this model to examine the relationship between job stress and MSDs (Faucett et al., 1994).

Although the pathophysiological mechanism linking strain and MSDs remains unclear, researchers have suggested a few possible direct and indirect pathways. One possibility is that the chronically elevated levels of catecholamines associated with job strain may affect muscle tension, making the body vulnerable to physical strain and injury (Bongers, 1993; Theorell et al., 1991). Another possibility is that work stress can contribute to the intensification of unhealthy behaviors that may then put workers at risk for developing MSD symptoms. Johansson (1991), for example, showed that workers, when smoking, withstood longer and more intensified stress, possibly leading to a susceptibility for developing a MSD. Supporting this, Nathan et al (1996), found in a cross-sectional study of workers that lifelong non-smokers had significantly less confirmed carpal tunnel syndrome than moderate, heavy, and ex-smokers. Another pathway researchers have suggested is that reactions to stressful environments, such as psychosomatic symptoms (Houtman et al., 1994) and depression, may act as mediators; the exposure to stress could lead to anxiety or depression, which subsequently could trigger the development of MSDs (Leino et al., 1993).

Figure 1. Job Strain Model



Symptoms of MSDs and VDT work

While much of the research to date linking MSDs and VDT work has focused on the biomechanics and physical ergonomics of computer work, notable research also has been done to investigate the effect of stress from the psychosocial work environment on musculoskeletal problems among VDT workers (Faucett et al., 1994; Haynes, 1991). Using conceptual models of job stress such as the Job Strain Model, much of the research to date has characterized jobs dominated by the use of VDTs by the demands, control, and social support associated with the work. For example, in a review of seven studies examining the relationship between VDT work and MSD symptoms, Haynes (1991) found that in four of the seven studies, higher demands and/or low control (low levels of decision making) were reported among the VDT than among the infrequent or non-VDT users.

Women and MSDs

Many industries historically dominated by women, such as sewing, knitting, and telecommunications have some of the highest number of disorders associated with the musculoskeletal system (Bureau of Labor Statistics, 1997). Women's rates of MSDs have been shown to be higher than men's, but it is unclear why this is (Ashbury, 1995). Some have hypothesized that the differences may be that the social definition and acceptance of reporting and diagnosing MSDs has "allowed" women to begin reporting symptoms that they previously had not (Ashbury, 1995), while others have interpreted studies that show physical strength associated to MSD symptoms (Chaffin et al., 1973) to mean that the higher rate among women is a result of physical strength differences between men and women. What is known is that many low-level, unskilled or semi-skilled jobs are filled by women, that these jobs are also often associated with risk factors for job strain and MSDs, and the number of these types of jobs is increasing.

Other explanations on why it seems that women have higher rates of MSDs may be based on scientific methodology. It may be that some risk factors for MSDs are unique to the different work worlds that men and women occupy. For example, within the service sector, women are often employed in "caring" industries, such as in nursing and customer service. A new area of research is currently looking at the effects of "emotional labor," or the commodification of human emotion on work stress (Hochschild, 1983). This added element of having to "act" a certain part or masking emotion as part of the job requirements may add to the stress process, and eventually, to the development of symptoms for MSDs. In addition to the possible strain of emotional labor, women also may be exposed to psychosocial risk factors while doing unpaid work at home. Despite their entry into the workforce, women continue to hold the primary responsibility for home and family and have been shown to perform the majority of the work associated with those responsibilities (South and Spitze). While this relationship has had little exploration in relation to MSD symptoms, others (Frankenhaeuser, 1991; Lundberg et al., 1994; Luecken et al., 1997) have shown by testing catecholamine levels that women often have higher catecholamine levels at home after working at a paid job all day. The exposure to stress from child care, housework, caring for elderly parents, maintaining control over the organization of the household, and the availability and reliability of social support,

therefore, could have an independent effect on the development of MSDs or a synergistic effect with the exposure of stress from work.

Possible mediators and confounders

While no literature has been found that shows racial differences in MSD symptomology, there is a large literature showing differences in the hypothesized exposures that may lead to MSD symptoms; namely, differences in family stress and stress related to unpaid work. Therefore, it was hypothesized that there may be significant differences when comparing race and the home strain variables, but after controlling for unpaid work and looking at job strain, race was not expected to be significant.

With regards to age, evidence from the literature suggested that two groups might possibly have higher rates of MSD symptoms: younger and older women (Guo et al., 1995; Ohlsson et al., 1995). This relationship may be related to younger women maintaining the majority of the family responsibilities and older women facing long-term exposure to strain from both work and family. It was hypothesized, therefore, that age may have different effects in different environments, with younger age associated with strain from home and older age associated with strain from the job.

Other personal, physical, and social characteristics that have been shown to be associated with either job strain, home strain, or MSD symptoms have included marital status, parental status (Hall, 1992; Luecken et al., 1997; Lundberg et al., 1994), and body mass index (Werner et al., 1994). These variables were taken into consideration and controlled for in the multivariate analyses.

The primary goal of this project, therefore, was to determine if, in a population of women workers who used VDTs as an integral part of their job, psychosocial factors from the job and home environment were associated either directly or indirectly with MSD symptoms.

THEORETICAL FRAMEWORK

As previously discussed, the Job Strain Model was used to conceptualize the relationships among exposures to stress at work, strain, and symptoms of MSDs. This model posits that deleterious strain will occur when high physical and psychological demands on the job (the pace, effort, and volume of work) coexist with organizational barriers and policies that inhibit an individual's authority to make decisions concerning the work (called decision latitude) or the use of his or her skills at work (called skill discretion). In other words, when excessive psychological and physical demands persist with little individual control over the content of the task or its execution, or over decision-making, there is a high risk for psychological strain and physical illness, such as symptoms of MSDs. Johnson and Hall (1988) augmented the model to include social support from coworkers or supervisors; they showed that the greatest risk for ill health was for those workers with high demands, low control, and low social support.

In essence, this project was an attempt to test a further augmentation of the Job Strain Model by including constructs specific to unpaid work. This was an attempt to

address some of the limitations of the model that researchers have written about and critiqued (Frankenhaeuser et al., 1989; Lundberg et al., 1994; Hall, 1991). These criticisms have included: 1) Only variables within the job environment are considered. Strain is modeled to be a result of exposure within a single isolated environment, the job environment. Little consideration has been given to the permeable boundaries of the different work environments, including the work environment at home. 2) The model was developed using paid work as its focal point. With notable exceptions (Hall, 1991; Lundberg et al., 1994), unpaid work and the unpaid work environment have not been established as a part of the definition of “work” or the “work” environment. 3) Until recently, the majority of evidence collected on job stress has involved male research subjects. A persistent question is whether current conceptualizations of job strain apply to women and the work environments in which women work. 4) Methodologically, the Job Strain Model cannot sufficiently assess chronic exposures to stress when there are interruptions in the job. This is a salient issue for workers who temporarily leave the labor market to care for children or elderly parents, or who work seasonally or part-time. Possible harmful, yet consistent exposures to stress from unpaid work may help to elucidate the effect of stress from home as well as the effect of unstable work patterns.

STUDY AIMS

This project had five specific aims: 1) To examine the relationship between the basic Job Strain model (the demands, control, and social support of paid work), an expanded model (original constructs plus emotional labor and emotional rewards from work) and symptoms of musculoskeletal disorders; 2) to examine the stressful characteristics of unpaid work (categorized by demands, control, and social support of unpaid work), additional constructs related to stressful conditions of unpaid work (emotional management, emotional rewards from unpaid work and responsibilities) and their relationship to symptoms of musculoskeletal disorders; 3) to test the efficacy of expanding the Job Strain model by adding exposures of stress from the unpaid work environment to the traditional model and then examining the relationship of the combined effect (“total strain”) to musculoskeletal disorders; 4) to determine if there is a relationship between total strain, depressive symptoms, psychosomatic disorders, and symptoms of musculoskeletal disorders; 5) to examine variability of stress from the paid and unpaid work environments by race and age and their relationship to musculoskeletal disorders.

METHODOLOGY

The data for this project were collected in a previous project (The Communications Workers and Health Study or CWHS). In this study, the instruments used to measure exposures to stress from unpaid work, stress specific to customer service work, and symptoms of MSDs were developed and tested.

In the CWHS, all members of a telecommunication union local were mailed study surveys. The survey included the new instruments (symptoms of musculoskeletal disorders, exposures to job stress specific to customer service and

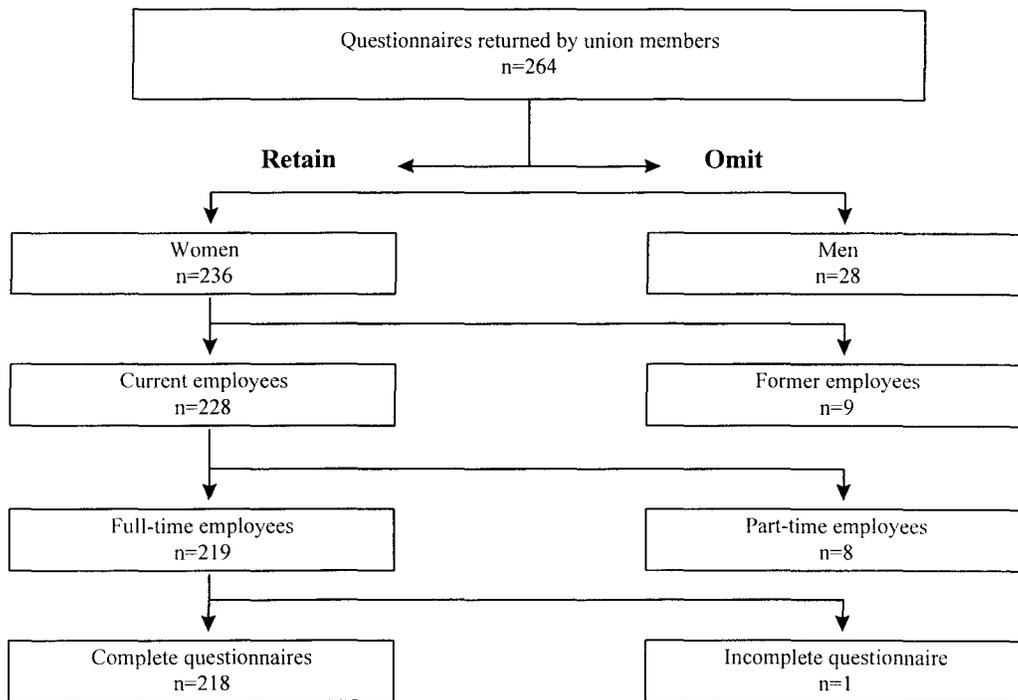
VDT work, and exposures to stress from unpaid work done at home) and standard measures of job strain, depressive symptoms, psychosomatic disorders, anxiety, emotional labor, job satisfaction, and behavioral and demographic factors (see Appendix A for study instrument). Six hundred thirty-two questionnaires were mailed to members. Of those, 43% or 265 were returned. In these analyses, 218 were used (218/265, 82%). All data were entered once and then entered again for verification.

Subjects

The final study sample included all customer service workers who were female and currently working full-time. Although all those sampled had similar job characteristics within the customer service area of the telecommunications company, they held different job titles and specialized in different parts of customer service. These titles included: consultants (n=126, 59%), maintenance administrators (n=47, 22%), service representatives (n=35, 16%), caseworkers/clerks (n=6, 3%).

As shown in Figure 2, the proportion of men and part-time workers who returned questionnaires was small (29 men, 11%; 8 part-time, 3%), making it difficult to show differences between and within gender and full-time/part-time status. In addition, a small part of those returning questionnaires (n=9, 3%) had either left the company or were not currently working due to illness/disability, family leave, making their data very different from the rest of the sample. Therefore, questionnaires from the 29 men, 8 part-time workers, 5 former employees, and 4 workers on disability, family leave or vacation, were not included in the final sample. One questionnaire with over half of the values missing was also excluded. Figure 2 shows how the final sample was derived.

Figure 2. Response rate for CWHS survey



The majority of the women were married (n=122, 56%), with some college or post-high school training (n=97, 44%). Most were parents (n=166, 77%). The mean age was approximately 42 years, with a standard deviation of 7.96. Respondents had, on average, 2 children, with one living at home. The sample was made up equally of people identifying themselves as either African-American or white (n=108, 50%; n=102, 47% respectively). Most did not work a second job (n=210, 97%), and the mean length of employment at their full-time day job was 215.8 months (approximately 18 years) with a standard deviation of 106.43 (approximately 9 years).

Table 1 shows the distribution of gender, full-time status, and employment status for all those returning questionnaires. Tables 2 and 3 show the distribution of the demographic characteristics of the final sample (only women currently working full-time).

Table 1. Frequencies of Demographic Variables for CWHS Survey

Demographic Variable	Category	n (%)
Gender	Female	236 (89)
	Male	28 (11)
Employee Status	Full-time	246 (97)
	Part-time	8 (3)
Current Status	Working for company	256 (97)
	No longer working for company due to disability, FMLA, or vacation	9 (3)

Table 2. Means, Standard Deviations and Ranges for Demographic Variables in Final Sample.

Demographic variable	Mean (sd)	Range
Age	42.02 (7.96)	19-64 years
Number of children	1.99 (1.07)	1-7
Children at home	1.12 (1.01)	0-5
Tenure (months)	215.80 (106.43)	3-522
Hours at second job	17.67 (14.01)	1-35
Hours of caregiving	18.94 (28.51)	2-168

Table 3. Distribution of Demographic Variables in Final Sample.

Demographic variable	Category	n(%)
Race	African-American	108 (50)
	White	102 (47)
	Hispanic	2 (1)
	Other	4 (2)
Education	Some high school	1 (1)
	High school	70 (32)
	Some college	97 (44)
	Two-year degree	14 (6)
	Four-year degree	30 (14)
	Graduate school	6 (3)
Marital status	Single	44 (20)
	Married/Living with partner	122 (56)
	Divorced	41 (19)
	Widowed	11 (5)
Spouse's education	Some high school	11 (9)
	High school	39 (32)
	Some college	42 (34)
	Two-year degree	8 (6)
	Four-year degree	18 (15)
	Graduate school	5 (4)
Spouse employed	Yes	106 (86)
	No	18 (14)
Parent status	Yes	166 (76)
	No	52 (24)
Caregiver status	Yes	43 (20)
	No	175 (80)
Second job	Yes	7 (3)
	No	211 (97)

Measures

The instruments in the CWHS included newly developed scales and standardized scales. The standardized scales included demand, control, and social support scales from the Job Content Questionnaire (JCQ) (Karasek, 1985), the Center for Epidemiologic Studies Depression Scale (CES-D)(Radloff, 1977), the State-Trait Anxiety Inventory (STAI)(Spielberger, 1983), and the NIOSH General Symptoms (Mayes et al., 1984) scales. Spratt's scale for Emotional Labor (1996), which included sub-scales for emotional rewards and emotional burden, was also used. New scales developed for the CWHS included the MSD symptom scales and home strain scales. Additional job-specific demand, control, and social support scale items were also developed and used in conjunction with the JCQ items.

The new scales and scale items were developed from constructs identified from both interviews with workers and a factor analysis of the scale pre-tests. Items

relating specifically to telecommunications customer service training, work, and supervisory monitoring were developed and tested. For the home environment, rewards from work done at home, the responsibilities associated with managing a home, and the emotional management associated with the work at home, along with the demands of, control over, and social support from the work done at home, were all found in interviews to be the important exposures associated with stress. Spratt's instrument for emotional labor (1996) was adapted for work done in the home environment and, consistent with Hochschild's theory about home-related labor (1983), was called emotional management. The remaining scales were developed using data from the qualitative interviews with the workers.

The MSD symptom scales were developed using both the strengths of other instruments, such as the Nordic Symptom Questionnaire (Kuorinka et al., 1987), and from the literature on MSD symptomology. Symptoms were measured for eight musculoskeletal system: hands, fingers, wrists; elbows and arms; neck; shoulders; upper back; lower back; hips and thighs; and, feet and ankles. Basic symptom questions were posed first (pain, numbness, stiffness) and then questions regarding interference with daily activities, previous injury, and medical treatment asked second.

Table 4 lists all the measures used, the number of items in each scale, the alpha coefficient for each scale (if applicable), and the type of variable (dependent, independent, or mediator).

Table 4. Variables Measured, Scale Author, Number of Items, Alpha Coefficient, and Type of Variable in CWS Study

Scale	Number of items	Alpha (α)	Type of Study Variable
<u>Musculoskeletal Disorders</u>			
Symptoms of musculoskeletal disorders-questions for all musculoskeletal systems (Griffin, unpublished)			
Hand symptoms	9	0.72	Dependent
Elbow symptoms	7	0.68	Dependent
Shoulder symptoms	8	0.73	Dependent
Neck symptoms	7	0.58	Dependent
Upper back symptoms	8	0.73	Dependent
Lower back symptoms	8	0.79	Dependent
Hips/thighs	8	0.50	Dependent
Feet/ankles	8	0.70	Dependent
<u>Mental Health Scales</u>			
Center for Epidemiologic Studies Depression Scale (CES-D) (Radloff, 1977)	20	0.94	Mediator
State-Trait Anxiety Inventory (STAI) (Spielberger, 1983)	40	0.97	Independent
NIOSH General Health Scale (Psychosomatic disorders symptoms) (Mayes, 1984)	17	0.92	Mediator
<u>Job Stress Scales</u>			
Work demands (Griffin, unpublished; Karasek, 1985; Spratt, 1996)	32	0.92	Independent
Work control (Griffin, unpublished; Karasek, 1985)	27	0.87	Independent
Work support (Griffin, unpublished; Karasek, 1985; Johnson, unpublished)	26	0.93	Independent
Emotional labor (Spratt, 1996)	12	0.79	Independent
Rewards from work on the job (Spratt, 1996)	7	0.79	Independent
<u>Home Stress Scales</u>			
Home demands (Griffin, unpublished)	10	0.87	Independent
Home control (Griffin, unpublished)	18	0.91	Independent
Home support (Griffin, unpublished)	12	0.80	Independent
Emotional management (Griffin, unpublished)	19	0.92	Independent
Rewards from work at home (Griffin, unpublished)	9	0.88	Independent
Responsibility (Griffin, unpublished)	17	0.91	Independent
<u>Confounders</u>			
Additional health questions	43	na	Independent
Chronic Conditions	27	na	Independent
Hormonal Conditions	7	na	Independent
Ergonomic questions	7	na	Independent
Health behavior questions	4	na	Independent
Smoking	3	na	Independent
Exercise (Schechtman, 1991)	1	na	Independent
Demographic questions	10	na	Independent
General work-related questions	5	na	Independent

Procedures

Missing values.

For the CWHS data, random missing values for the job and home stress scales, the CES-D, and the psychosomatic symptoms scales were replaced with the individual's scale mean if at least 70% of the scale items were present. While few missing values existed for these scales, differences between the imputed and original scales were compared. No significant difference across scales was found.

Missing values were replaced for only one question in the MSD scales ("Have you experienced any limited movement in your ..."). If a respondent answered no to all of the other core symptom questions for a scale, but left the limited movement question blank, the missing value was replaced with a "no" value (0). This procedure was done after verifying that few survey respondents (<1%) answered "no" to the other core questions and then answered "yes" to the movement question.

Case Definition.

To be defined as an MSD case, participants had to meet three criteria from their responses. They had to report: 1) no previous injury to the body region of interest (e.g., hands); 2) having at least one symptom from the core questions (e.g., pain, stiffness, limited movement); and, 3) either having sought medical treatment for their symptoms or having had their symptoms interfere with their work at home or work on the job. Those who were not considered cases either did not have any symptoms or had symptoms but did not either seek medical care or have the symptoms disrupt their work. Because it was difficult to determine the cause and nature of previous injuries, those reporting previous injuries were excluded from the analyses.

Case definitions were developed for MSDs associated with the hands, shoulders, neck, upper back, and lower back. The number of cases for MSDs associated with the elbows, thighs/hips, and feet/ankles was too few to analyze, and therefore, these groups were not included in the bivariate or multivariate analyses.

The number of cases for each musculoskeletal system are shown in Table 5.

Table 5. Number and percentage of cases and non-cases for each musculoskeletal system.

Musculoskeletal system	Case	Non-case	Total
Hands	74 (37%)	125 (63%)	199
Neck	55 (29%)	131 (71%)	186
Shoulders	55 (28%)	142 (72%)	197
Upper back	42 (22%)	151 (78%)	193
Lower back	72 (39%)	113 (61%)	185

Coding strain variables

After examining univariate statistics, the strain variables were dichotomized using the median as the cut-point. These variables were coded in accordance with the job strain theory. For example, the job demands variable was coded so that high demands were equal to one and low demands were coded as zero. In the same way, low social support was coded as one, while high support was coded as zero. Tables 6

and 7 show the number of items, range or scores, and average score for job and home strain variables.

Table 6. Number of items, range or scores, and average score for job strain variables.

	Job demands	Job control	Social support on the job
Number of items*	32 items	27 items	26 items
Possible range of scores	32-160	27-135	26-130
Actual range of scores	49-152	28-107	32-126
Mean	112.26	57.16	79.07
Median	113	55	79

*see Appendix A for list of items

Table 7. Number of items, range or scores, and average score for home strain variables.

	Home demands	Home control	Social support	Emotional management	Emotional rewards	Responsibilities at home
Number of items*	10 items	18 items	12 items	19 items	9 items	17 items
Possible range of scores	10-50	18-90	12-60	19-95	9-45	17-85
Actual range of scores	10-48	27-89	15-59	19-94	14-45	32-85
Mean	26.19	64.45	40.01	37.43	37.43	68.60
Median	25	66	41	35	35	67

*see Appendix A for list of items

Analytic strategy.

Study Aim 1: To examine the relationship between the basic Job Strain model (the demands, control, and social support of paid work) and symptoms of musculoskeletal disorders.

Bivariate associations between the job strain variables, the hypothesized confounding variables (age, marital status, number of school-aged children living at home, body mass index, and trait anxiety) and each of the MSD outcome variables were first examined using Pearson's chi square. The job strain variables then were entered into a series of hierarchical multiple logistic regression model to tests whether the odds of having MSD symptoms increased with high demands, low control, and low social support and whether the addition of emotional labor and rewards improved the model, all while controlling for the possible confounding variables. One regression model was developed for each musculoskeletal system and each model was fit in three steps. In the first step, the possible confounding variables were fit. In the second step, the common job strain variables (demands, control, and social support on the job) were added. In the third step, emotional labor and emotional rewards were fit. Both the odds of having MSD symptoms and the change in the -2 log likelihood ratio were examined to determine if, after taking personal and behavioral characteristics into account, the job strain variables were significantly associated with MSD symptoms.

Study Aim 2: To examine the stressful characteristics of unpaid work (categorized by demands, control, and social support of unpaid work), additional constructs related to stressful conditions of unpaid work (emotional management, emotional rewards from unpaid work and responsibilities) and their relationship to symptoms of musculoskeletal disorders.

The analysis strategy for Specific Aim 2 was nearly identical to that for Specific Aim 1. However, in addition to the demands, control, and social support, associated with unpaid work, responsibilities for work at home, emotional rewards, and emotional management of unpaid work were included in the analyses.

After examining and analyzing bivariate associations, hierarchical logistic regression models, one for each body region, were fit using the same method as for Specific Aim 1, but using three instead of two steps. The hypothesized confounding variables were fit first, then the home strain variables (demands, control, and social support), and finally, the additional home strain variables (responsibilities, emotional rewards, emotional management). The odds ratios and the change in the -2 log likelihood ratio were examined to determine the fit of the model and the significance of home strain variables in relation to MSD symptoms.

Study Aim 3: To test the efficacy of expanding the Job Strain model by adding exposures of stress from the unpaid work environment to the traditional model and, then, examining the relationship of the combined effect (“total strain”) to musculoskeletal disorders.

Building on the analyses from Specific Aims 1 and 2, Specific Aim 3 was tested using two additional steps in the hierarchical logistic regression models. In the first step, the hypothesized confounding variables were fit. In the second step the job strain variables were added to each model, and in the third, the unpaid work variables were added to the model.

After fitting the confounding, job strain and unpaid work variables into the model, nine interaction terms were created, one for each job strain variable (demands, control, and social support) by each unpaid work variables (demands, control, social support). Each interaction term was then entered into a main effects models as a final step. Using this procedure, nine models with interaction terms for each musculoskeletal system were evaluated.

Models with significant interaction terms were analyzed in greater detail to determine at what level the interaction term is significant. Dummy variables were then created for each level of the interaction and fit into the model.

Study Aim 4: To determine if there is a relationship among job strain, home strain, depressive symptoms, psychosomatic disorders, state and trait anxiety, and symptoms of musculoskeletal disorders.

This analysis was performed using three methods to determine the main, mediating, and interactive effects of psychological ill health on MSD symptoms. The first method was to analyze a hierarchical logistic regression model that included the effect of job strain, home strain, and each psychological disorder while controlling for demographic and physical health indicators.

For the second method, models were built to examine whether psychological disorders acted as mediators between job strain and MSD symptoms. Recommended by Baron and Kenny (1986) and described by Breckler (1995), this method included three regression equations to determine if there was a mediating effect. The first model was a simple linear regression equation to test for a significant relationship between the independent variable (job strain) and the mediating variable (psychological disorder, such as depressive symptoms). The second model also was a

simple linear regression model to test for a significant relationship between the independent variable (job strain) and the dependent variable (MSD symptoms). The third model included both the independent variable (job strain) and the mediating variable (psychological disorder) to determine if the correlation between the independent and dependent variable was diminished when the mediating variable was considered, thus showing that the independent variable worked through the mediating variable.

The third part of these analyses was to determine if psychological disorders moderated the effect of job strain on MSD symptoms. For these analyses, logistic regression models that included an interaction term of a job or home strain variable and a psychological disorder variable were fit. Models with significant interaction terms were then analyzed in greater detail by creating dummy variables for each level of the interaction was present. The models were then re-fit using the dummy variables.

Study Aim 5: To examine variability of stress from the paid and unpaid work environments by race and age and their relationship to musculoskeletal disorders.

To test this hypothesis, differences in stress from the paid and unpaid work environment and race (white and African American) were examined in two ways. First, bivariate comparisons were reviewed to look at differences within the different paid and unpaid work strain constructs. Second, using three hierarchical logistic regression models similar to those in the previous analyses, race was fit in a model with job strain variables, home strain variables, and both job and home strain variables. The odds ratios for the MSD symptoms and the change in the -2 log likelihood ratio were examined in each model to determine if any evidence existed that showed differences in MSD symptoms between African Americans and whites.

In a similar fashion, differences across age were explored: bivariate comparisons were reviewed to look at differences within the different constructs and then the three hierarchical logistic regression model were fit. While in the previous logistic regression models (Aims 1-3) age was included as a control variable; however, for this analysis, age was entered on the last step of the model.

RESULTS

Study Aim 1

To examine the relationship between the basic Job Strain model (the demands, control, and social support of paid work), an expanded model that includes emotional labor and emotional rewards, and symptoms of musculoskeletal disorders.

The first step in this analysis was to test the relationships among the hypothesized confounding variables and MSD caseness for each musculoskeletal system. In the analysis, age, marital status, number of children, body mass index, and trait anxiety were compared to caseness for the five MSD groups. Of the 30 comparisons made, only four significant differences were found. With a significance level of 0.05, possibly one to two of these could be significant due to chance.

A significantly greater proportion of those with high trait anxiety reported neck ($p=0.03$) and upper back symptoms ($p=0.01$). Similarly, a greater percentage of the youngest participants reported neck symptoms ($p=0.02$) and more single than married participants reported upper back symptoms ($p<0.01$).

The second step was to test for bivariate relationships among the job strain variables and MSD caseness. In this analysis, a significantly higher proportion of those with high job demands were MSD cases. This was true for each musculoskeletal system (see Table 8). While other job-related stress variables were not associated with MSD symptoms, there were some differences among those with high and low job control, but the differences were not as consistent as with job demands. A significantly greater proportion of those with low job control were more likely to have hand, neck, and upper back symptoms, but not shoulder or lower back symptoms. With a significance level of 0.05, two of the relationships could possibly be significant due to chance.

Table 8. Percentage of those with hypothesized risk factor for job strain by MSD caseness

		% with high job demands	% with low job control	% with low social support at work	% with high emotional labor	% with low rewards from work
Hand	case	54%	68%	58%	51%	60%
	non-case	46%	45%	49%	48%	55%
	p-value	p<0.01	p<0.01	p=0.21	p=0.71	p=0.43
Neck	case	71	66	56	51	56
	non-case	40	46	48	49	54
	p-value	p<0.01	p=0.01	p=0.33	p=0.83	p=0.76
Shoulder	case	75	62	51	53	58
	non-case	36	48	51	48	56
	p-value	p<0.01	p=0.08	p=0.95	p=0.57	p=0.80
Upper back	case	79	67	55	50	52
	non-case	38	48	50	49	57
	p-value	p<0.01	p=0.04	p=0.56	p=0.88	p=0.61
Lower back	case	60	58	60	45	53
	non-case	39	49	47	50	53
	p-value	p<0.01	p=0.20	p=0.09	p=0.56	p=0.96

After testing for bivariate relationships, the variables were entered into a hierarchical logistic regression model, one model for each MSD system. In each model except for low back symptoms, job demands remained significant after controlling for age, marital status, number of children, BMI, trait anxiety, job control and job support. With high job demands, the odds of having MSD symptoms ranged from 2.42 to 10.81, depending on the musculoskeletal system. However, contrary to what the Job Strain Model purports, neither job control nor social support was significant in any of the models (see Tables 9-13).

Subsequent analyses, which included an additional step with emotional labor and emotional rewards in the model, were also evaluated. Neither of the variables was significant in any of the models; their addition did not significantly improve any of the models.

Table 9. Multiple Logistic Regression for Job Strain Main Effects Model on MSDs Associated with the Hands

Variable	B	s.e.	Wald	p-value	Odds ratio	95% CI
Age	-0.01	0.18	0.01	0.93	0.99	0.70-1.39
Marital status	-0.03	0.39	0.01	0.94	0.97	0.45-2.10
Number of children	-0.00	0.27	0.00	0.99	0.99	0.59-1.68
Body Mass Index	0.32	0.43	0.56	0.45	1.38	0.59-3.20
Trait anxiety	-0.00	0.41	0.00	0.99	0.99	0.45-2.22
Job demands*	1.02	0.43	5.72	0.02	2.79	1.20-6.45
Job control	0.67	0.45	2.21	0.14	1.96	0.81-4.76
Job social support	-0.04	0.42	0.01	0.92	0.96	0.42-2.19
Constant	-1.53	0.60	6.46	0.01		

*p-value is ≤ 0.05

Table 10. Multiple Logistic Regression for Job Strain Main Effects Model on MSDs Associated with the Neck

Variable	B	s.e.	Wald	p-value	Odds ratio	95% CI
Age	0.15	0.20	0.57	0.45	1.16	0.79-1.70
Marital status	-0.52	0.42	1.50	0.22	0.60	0.26-1.37
Number of children	0.13	0.30	0.18	0.67	1.14	0.63-2.04
Body Mass Index	0.06	0.47	0.02	0.90	1.06	0.42-2.67
Trait anxiety	0.63	0.46	1.85	0.17	1.87	0.76-4.60
Job demands*	0.88	0.45	3.85	0.05	2.42	1.00-5.86
Job control	0.68	0.47	2.05	0.15	1.97	0.79-4.96
Job social support	-0.18	0.46	0.16	0.69	0.83	0.33-2.06
Constant	-2.13	0.68	9.75	0.00		

*p-value is ≤ 0.05

Table 11. Multiple Logistic Regression for Job Strain Main Effects Model on MSDs Associated with the Shoulders

Variable	B	s.e.	Wald	p-value	Odds ratio	95% CI
Age	-0.08	0.19	0.19	0.67	0.92	0.63-1.34
Marital status	-0.30	0.43	0.47	0.49	0.74	0.32-1.73
Number of children	0.19	0.28	0.43	0.51	1.21	0.69-2.11
Body Mass Index	0.64	0.46	1.89	0.17	1.89	0.76-4.70
Trait anxiety	0.13	0.46	0.08	0.77	1.14	0.46-2.82
Job demands**	1.35	0.46	8.51	0.00	3.87	1.56-9.61
Job control	0.13	0.47	0.08	0.78	1.14	0.45-2.87
Job social support	-0.20	0.45	0.19	0.66	0.82	0.34-1.97
Constant	-1.95	0.67	8.41	0.00		

**p-value is ≤ 0.01

Table 12. Multiple Logistic Regression for Job Strain Main Effects Model on MSDs Associated with the Upper Back

Variable	B	s.e.	Wald	p-value	Odds ratio	95% CI
Age	-0.29	0.22	1.67	0.20	0.75	0.48-1.16
Marital status**	-1.22	0.49	6.16	0.01	0.29	0.11-0.77
Number of children	0.54	0.35	2.41	0.12	1.71	0.87-3.37
Body Mass Index	0.33	0.55	0.35	0.55	1.39	0.47-4.06
Trait anxiety	0.59	0.54	1.16	0.28	1.80	0.62-5.22
Job demands**	1.68	0.56	9.07	0.00	5.36	1.80-15.99
Job control	0.01	0.54	0.00	0.99	1.01	0.35-2.90
Job social support	-0.03	0.52	0.00	0.95	0.97	0.35-2.71
Constant	-2.22	0.81	7.58	0.01		

**p-value is ≤ 0.01

Table 13. Multiple Logistic Regression for Job Strain Main Effects Model on MSDs Associated with the Lower Back

Variable	B	s.e.	Wald	p-value	Odds ratio	95% CI
Age	-0.08	0.17	0.24	0.62	0.92	0.66-1.29
Marital status	0.10	0.38	0.06	0.80	1.10	0.52-2.31
Number of children	0.12	0.25	0.21	0.64	1.12	0.68-1.85
Body Mass Index	-0.16	0.41	0.16	0.69	0.85	0.38-1.90
Trait anxiety	0.13	0.39	0.11	0.74	1.14	0.53-2.46
Job demands	0.63	0.40	2.46	0.12	1.88	0.85-4.15
Job control	-0.42	0.41	1.07	0.30	0.65	0.29-1.46
Job social support	0.68	0.40	2.95	0.09	1.98	0.91-4.33
Constant	-0.92	0.57	2.57	0.11		

In an attempt to understand if subscales within the job demands construct could better elucidate the relationship between demands and symptoms of MSDs, a factor analysis of the job demands scale was performed and the subscales from that analysis were examined. Because of the theoretical similarity of the job demands scale and the emotional demands items included in the emotional labor scale, emotional demand items were included in the factor analysis with the other job demands scale items. In the rotated factor analysis, six factors with eigenvalues greater than one were found. Scales related to the pace, emotional labor requirements, time constraints, demands due to electronic and managerial monitoring, technical demands, and the physical demands of the job. Further analyses showed that the scales had adequate internal consistency, with alpha coefficients ranging from 0.67-0.86 (see Appendix B for scale items and alpha coefficients). Replacing the general demands variable with these six subscales, the hierarchical logistic regression models were re-examined. Of the six subscales, only physical demands was consistently associated with MSD symptoms. As shown in Tables 14-18, physical demands were significantly associated with hand, shoulder, upper back, and lower back symptoms and neared significance with neck symptoms, with odds ratios ranging from 1.39 to 1.51.

Table 14. Multiple Logistic Regression Model with Sub-scales of Job Demands for MSDs Associated with the Hands⁺

Variable	B	S.E.	Wald	Sig	Exp (B)	95% CI
Job control	0.70	0.49	2.06	0.15	2.02	0.77-5.28
Job support	-0.40	0.46	0.76	0.38	0.67	0.27-1.65
Pace	-0.04	0.04	0.87	0.35	0.96	0.89-1.04
Emotional demands	-0.02	0.05	0.13	0.72	0.98	0.89-1.08
Time constraints	0.06	0.06	1.00	0.32	1.07	0.94-1.21
Technical demands	0.03	0.09	0.07	0.79	1.03	0.85-1.23
Monitoring demands	-0.01	0.06	0.05	0.82	0.99	0.87-1.12
Physical demands**	0.33	0.11	8.96	0.00	1.40	1.12-1.74
Constant	-4.62	1.49	9.61	0.00		

+Controlling for age, marital status, number of children, bmi, and trait anxiety

**p-value is ≤ 0.01

Table 15. Multiple Logistic Regression Model with Sub-scales of Job Demands for MSDs Associated with the Shoulders⁺

Variable	B	S.E.	Wald	Sig	Exp (B)	95% CI
Job control	0.29	0.51	0.33	0.56	1.34	0.50-3.62
Job support	-0.52	0.49	1.11	0.29	0.59	0.23-1.57
Pace	-0.02	0.04	0.34	0.56	0.98	0.90-1.06
Emotional demands	0.01	0.05	0.03	0.87	1.01	0.91-1.12
Time constraints	-0.02	0.07	0.05	0.82	0.98	0.86-1.12
Technical demands	-0.03	0.10	0.09	0.76	0.97	0.79-1.18
Monitoring demands	0.02	0.07	0.06	0.80	1.02	0.89-1.17
Physical demands**	0.41	0.13	9.79	0.00	1.51	1.17-1.95
Constant	-5.36	1.66	10.36	0.00		

+Controlling for age, marital status, number of children, bmi, and trait anxiety

**p-value is ≤ 0.01

Table 16. Multiple Logistic Regression Model with Sub-scales of Job Demands for MSDs Associated with the Neck[†]

Variable	B	S.E.	Wald	Sig	Exp (B)	95% CI
Job control	0.78	0.50	2.43	0.12	2.19	0.82-5.87
Job support	-0.35	0.49	0.49	0.48	0.71	0.27-1.86
Pace	0.00	0.04	0.01	0.92	1.00	0.93-1.09
Emotional demands	0.01	0.05	0.02	0.88	1.01	0.91-1.12
Time constraints	-0.02	0.07	0.06	0.80	0.98	0.86-1.12
Technical demands	0.12	0.10	1.46	0.23	1.12	0.93-1.35
Monitoring demands	-0.05	0.07	0.58	0.45	0.95	0.82-1.09
Physical demands	0.21	0.12	3.06	0.08	1.23	0.98-1.55
Constant	-4.25	1.49	8.16	0.00		

[†]Controlling for age, marital status, number of children, bmi, and trait anxiety

Table 17. Multiple Logistic Regression Model with Sub-scales of Job Demands for MSDs Associated with Upper Back[†]

Variable	B	S.E.	Wald	Sig	Exp (B)	95% CI
Job control	-0.01	0.60	0.00	0.99	0.99	0.31-3.20
Job support	-0.62	0.62	1.02	0.31	0.54	0.16-1.80
Pace	-0.04	0.05	0.51	0.47	0.97	0.88-1.06
Emotional demands	0.09	0.06	1.80	0.18	1.09	0.96-1.24
Time constraints	0.07	0.09	0.60	0.44	1.07	0.90-1.26
Technical demands	0.11	0.12	0.94	0.33	1.12	0.89-1.40
Monitoring demands	0.03	0.10	0.09	0.76	1.03	0.85-1.25
Physical demands*	0.39	0.16	5.73	0.02	1.47	1.07-2.02
Constant	-9.05	2.52	12.93	0.00		

[†]Controlling for age, marital status, number of children, bmi, and trait anxiety

*p-value is ≤ 0.05

Table 18. Multiple Logistic Regression Model with Sub-scales of Job Demands for MSDs Associated with the Lower Back[†]

Variable	B	S.E.	Wald	Sig	Exp (B)	95% CI
Job control	-0.39	0.46	0.73	0.39	0.68	0.28-1.66
Job support	0.56	0.44	1.63	0.20	1.75	0.74-4.13
Pace	-0.03	0.04	0.63	0.43	0.97	0.90-1.05
Emotional demands	-0.04	0.05	0.57	0.45	0.96	0.88-1.06
Time constraints	-0.01	0.06	0.01	0.93	0.99	0.88-1.13
Technical demands	0.09	0.09	1.08	0.30	1.10	0.92-1.30
Monitoring demands	-0.04	0.06	0.34	0.56	0.96	0.85-1.09
Physical demands**	0.33	0.10	10.03	0.00	1.39	1.13-1.70
Constant	-3.06	1.33	5.25	0.02		

[†]Controlling for age, marital status, number of children, bmi, and trait anxiety

**p-value is ≤ 0.01

In sum, the job demands variable was significantly and consistently associated with MSD symptom caseness in the bivariate and multivariate analyses. Emotional labor and emotional rewards, however, were not. Upon further analyses of the job demands variable, it appears that the physical demands required for the job increased the risk for caseness in each musculoskeletal system, even when controlling for possible confounding variables, job control, and job support.

Study Aim 2

To examine the stressful characteristics of unpaid work (categorized by demands, control, and social support of unpaid work), additional constructs related to stressful conditions of unpaid work (emotional management, emotional rewards from unpaid work and responsibilities) and their relationship to symptoms of musculoskeletal disorders.

The first step in this analysis was to examine the bivariate relationships among the home strain variables and the different MSD symptom variables. As shown in Table 19, a significantly greater proportion of those with low control at home reported having shoulder, neck and upper back symptoms, while those with low social support at home were more likely to have hand and upper back symptoms. A greater proportion of those with high home demands reported having lower back symptoms. Interestingly, those with neck symptoms reported more rewards from unpaid work, but this could be due to the fact that with a significance level of 0.05, two of the 36 comparisons could possibly be significant due to chance.

Table 19. Percentage of those with hypothesized risk factor for home strain by MSD caseness

		% with high home demands	% with low home control	% with low social support at home	% with high emotional management	% with low rewards from home
Hand	case	51%	50%	60%	57%	53%
	non-case	42%	45%	43%	43%	50%
	p-value	p=0.20	p=0.47	p=0.02	p=0.07	p=0.67
Neck	case	53%	58%	56%	59%	37%
	non-case	41%	42%	47%	46%	53%
	p-value	p=0.16	p=0.05	p=0.26	p=0.10	p=0.05
Shoulder	case	44%	60%	53%	57%	43%
	non-case	47%	42%	47%	46%	53%
	p-value	p=0.62	p=0.03	p=0.48	p=0.14	p=0.18
Upper back	case	48%	64%	67%	61%	41%
	non-case	47%	42%	47%	47%	54%
	p-value	p=0.97	p=0.01	p=0.02	p=0.11	p=0.14
Lower back	case	56%	48%	56%	51%	54%
	non-case	40%	46%	47%	48%	51%
	p-value	p=0.04	p=0.85	p=0.21	p=0.67	p=0.66

As with Specific Aim 1, after testing for bivariate relationships the variables were entered into a hierarchical logistic regression model, one for each MSD system. (see Tables 20-24). None of the home strain variables were consistently associated with MSD symptoms. While high home control was significant in 3 of the 5 MSD symptoms in the bivariate analysis, in the multivariate analysis it was only significantly associated with increased odds for neck symptoms ($p < 0.05$), but neared significance for shoulder symptoms ($p < 0.06$). Neither social support at home nor home demands increased the odds of having symptoms for any MSD system, although, contrary to what was expected, low demands neared significance for shoulder symptoms ($p < 0.07$).

Table 20. Multiple Logistic Regression for Home Strain Main Effects Model on MSDs Associated with the Hands

Variable	B	s.e.	Wald	p-value	Odds ratio	95% CI
Age	-0.05	0.17	0.08	0.77	0.95	0.68-1.33
Marital Status	0.44	0.48	0.86	0.35	1.56	0.61-3.95
Body Mass Index	0.08	0.40	0.04	0.84	1.09	0.49-2.39
Number of children	0.06	0.25	0.05	0.82	1.06	0.64-1.74
Trait anxiety	0.06	0.43	0.02	0.89	1.06	0.46-2.47
Home demands	-0.00	0.39	0.00	0.99	1.00	0.46-2.15
Home control	0.63	0.47	1.83	0.18	1.88	0.75-4.69
Home support	0.49	0.42	1.37	0.24	1.64	0.72-3.75
Constant	-1.51	0.70	4.68	0.03		

Table 21. Multiple Logistic Regression for Home Strain Main Effects Model on MSDs Associated with the Shoulders

Variable	B	s.e.	Wald	p-value	Odds ratio	95% CI
Age	-0.13	0.20	0.41	0.52	0.88	0.60-1.30
Marital Status	0.34	0.49	0.48	0.49	1.41	0.54-3.69
Body Mass Index	0.51	0.44	1.32	0.25	1.67	0.70-3.98
Number of children	0.40	0.30	1.84	0.17	1.49	0.84-2.67
Trait anxiety	0.58	0.49	1.37	0.24	1.78	0.68-4.68
Home demands	-0.83	0.45	3.32	0.07	0.44	0.18-1.06
Home control	0.91	0.49	3.49	0.06	2.49	0.96-6.51
Home support	0.35	0.47	0.55	0.46	1.42	0.57-3.55
Constant**	-2.19	0.76	8.44	0.00		

Table 22. Multiple Logistic Regression for Home Strain Main Effects Model on MSDs Associated with the Neck

Variable	B	s.e.	Wald	p-value	Odds ratio	95% CI
Age	0.21	0.20	1.13	0.29	1.23	0.84-1.81
Marital Status	0.10	0.50	0.04	0.84	1.11	0.42-2.94
Body Mass Index	-0.06	0.44	0.02	0.89	0.94	0.40-2.23
Number of children	0.08	0.29	0.07	0.79	1.08	0.61-1.91
Trait anxiety	0.87	0.49	3.12	0.08	2.39	0.91-6.26
Home demands	0.47	0.45	1.09	0.30	1.60	0.66-3.84
Home control*	0.98	0.50	3.79	0.05	2.65	0.99-7.08
Home support	-0.14	0.46	0.10	0.76	0.87	0.35-2.12
Constant	-2.53	0.79	10.35	0.00		

*p-value is ≤ 0.05

Table 23. Multiple Logistic Regression for Home Strain Main Effects Model on MSDs Associated with the Upper Back

Variable	B	s.e.	Wald	p-value	Odds ratio	95% CI
Age*	-0.46	0.24	3.74	0.05	0.63	0.40-1.01
Marital Status	-0.85	0.55	2.35	0.13	0.43	0.15-1.27
Body Mass Index	0.07	0.50	0.02	0.89	1.07	0.40-2.84
Number of children*	0.87	0.37	5.64	0.02	2.38	1.16-4.88
Trait anxiety	0.90	0.59	2.37	0.12	2.47	0.78-7.77
Home demands	-0.66	0.54	1.50	0.22	0.52	0.18-1.48
Home control	0.29	0.56	0.27	0.60	1.34	0.45-4.04
Home support	0.86	0.56	2.36	0.12	2.37	0.79-7.14
Constant	-1.93	0.84	5.25	0.02		

*p-value is ≤ 0.05

Table 24. Multiple Logistic Regression for Home Strain Main Effects Model on MSDs Associated with the Lower Back.

Variable	B	s.e.	Wald	p-value	Odds ratio	95% CI
Age	-0.02	0.17	0.02	0.89	0.98	0.70-1.37
Marital Status	0.07	0.46	0.02	0.88	1.07	0.44-2.63
Body Mass Index	-0.30	0.40	0.56	0.45	0.74	0.34-1.62
Number of children	0.15	0.25	0.37	0.54	1.17	0.71-1.92
Trait anxiety	0.22	0.43	0.25	0.62	1.24	0.53-2.91
Home demands	0.19	0.40	0.22	0.64	1.20	0.55-2.63
Home control	0.15	0.45	0.10	0.75	1.16	0.48-2.79
Home support	0.07	0.42	0.03	0.87	1.07	0.47-2.45
Constant	-0.82	0.65	1.61	0.20		

In sum, the bivariate analyses showed that control at home was associated with upper extremity MSD symptoms (neck, shoulders, and upper back). In the multivariate analysis, however, low control at home increased the odds of having symptoms only in the neck, although it neared significance in the shoulders ($p=0.06$). High home demands and low social support at home did not increase the odds of having MSD symptoms in any of the systems measured.

Study Aim 3

To test the efficacy of expanding the Job Strain model by adding exposures of stress from the unpaid work environment to the traditional model and, then, examining the relationship of the combined effect (“total strain”) to musculoskeletal disorders.

Building on the analyses from the previous two study aims, job and home strain variables were examined together in hierarchical logistic regression models. The home strain variables were fit in the last step of the model, after fitting the confounders and job strain variables. This step did not significantly change the -2 log likelihood in any of the five MSD models. Overall, however, the shoulder, neck, and upper back models were significant.

When controlling for the confounding variables and the home strain variables, high job demands increased the odds of having hand, neck and upper back MSD symptoms (Tables 25, 27-28). Odds ratios ranged from 2.51 to 6.52. In the model for shoulder symptoms, home demands, unexpectedly, decreased the odds of being a case (Table 26). None of the variables in the model for lower back symptoms was significant, although job demands and job support neared significance ($p=0.09$) (Table 29).

The second part of the analysis for this specific aim was to investigate the possible interaction between the elements of job and home strain. Nine interaction terms were created (job demands by home demand, control, and support; job control by home demands, control and support; job support by home demands, control, and support). Each interaction term was entered as a last step in the hierarchical models for the 5 MSD systems (hands, neck, shoulder, upper back and lower back). None of the interaction terms, however, was significant.

Table 25. Multiple Logistic Regression with Job and Home Strain Main Effects on MSDs Associated with Hands.

Variable	B	s.e.	Wald	p-value	Odds ratio	95% CI
Age	-0.03	0.18	0.03	0.86	0.97	0.68-1.38
Marital Status	0.32	0.50	0.40	0.53	1.37	0.52-3.63
Body Mass Index	0.31	0.44	0.49	0.48	1.36	0.57-3.21
Number of children	0.01	0.27	0.00	0.96	1.01	0.59-1.73
Trait anxiety	-0.13	0.47	0.07	0.79	0.88	0.35-2.19
Job demands*	0.93	0.44	4.43	0.04	2.52	1.07-5.98
Job control	0.66	0.46	2.03	0.15	1.93	0.78-4.77
Job support	0.05	0.44	0.01	0.92	1.05	0.45-2.46
Home demands	-0.01	0.43	0.00	0.99	0.99	0.43-2.28
Home control	0.52	0.49	1.11	0.29	1.68	0.64-4.38
Home support	0.43	0.44	0.95	0.33	1.54	0.65-3.66
Constant	-2.15	0.79	7.42	0.01		

*p-value is ≤ 0.05

Table 26. Multiple Logistic Regression with Job and Home Strain Main Effects on MSDs Associated with Shoulders.

Variable	B	s.e.	Wald	p-value	Odds ratio	95% CI
Age	-0.16	0.21	0.56	0.45	0.85	0.57-1.29
Marital Status	0.22	0.52	0.17	0.68	1.24	0.45-3.46
Body Mass Index	0.72	0.49	2.19	0.14	2.05	0.79-5.31
Number of children	0.45	0.32	1.98	0.16	1.57	0.84-2.95
Trait anxiety	0.52	0.53	0.98	0.32	1.68	0.60-4.72
Job demands**	1.46	0.50	8.68	0.00	4.31	1.63-11.39
Job control	0.01	0.50	0.00	0.99	1.01	0.38-2.66
Job support	0.14	0.48	0.09	0.76	1.15	0.45-2.93
Home demands*	-1.03	0.50	4.15	0.04	0.36	0.13-0.96
Home control	0.84	0.52	2.62	0.11	2.32	0.84-6.44
Home support	0.26	0.49	0.29	0.59	1.31	0.50-3.42
Constant	-2.84	0.89	10.15	0.00		

**p-value is ≤ 0.01

*p-value is ≤ 0.05

Table 27. Multiple Logistic Regression with Job and Home Strain Main Effects on MSDs Associated with Neck.

Variable	B	s.e.	Wald	p-value	Odds ratio	95% CI
Age	0.18	0.20	0.76	0.38	1.19	0.80-1.78
Marital Status	-0.11	0.53	0.04	0.83	0.89	0.32-2.51
Body Mass Index	0.07	0.48	0.02	0.89	1.07	0.41-2.76
Number of children	0.20	0.32	0.37	0.54	1.22	0.65-2.27
Trait anxiety	0.71	0.52	1.83	0.18	2.03	0.73-5.68
Job demands*	0.92	0.47	3.82	0.05	2.51	1.00-6.32
Job control	0.71	0.48	2.17	0.14	2.04	0.79-5.24
Job support	-0.01	0.48	0.00	0.98	0.99	0.38-2.53
Home demands	0.46	0.48	0.93	0.33	1.59	0.62-4.04
Home control	1.01	0.53	3.58	0.06	2.74	0.96-7.79
Home support	-0.33	0.48	0.47	0.49	0.72	0.28-1.85
Constant**	-3.22	0.93	12.00	0.00		

*p-value is ≤ 0.05

Table 28. Multiple Logistic Regression with Job and Home Strain Main Effects on MSDs Associated with Upper Back.

Variable	B	s.e.	Wald	p-value	Odds ratio	95% CI
Age*	-0.51	0.26	3.92	0.05	0.60	0.36-1.00
Marital Status	-1.04	0.61	2.98	0.08	0.35	0.11-1.15
Body Mass Index	0.27	0.57	0.23	0.63	1.31	0.43-3.99
Number of children*	1.00	0.42	5.60	0.02	2.71	1.19-6.18
Trait anxiety	0.95	0.66	2.11	0.15	2.59	0.72-9.37
Job demands*	1.88	0.60	9.91	0.00	6.52	2.03-20.95
Job control	-0.11	0.58	0.04	0.85	0.90	0.29-2.77
Job support	0.22	0.57	0.15	0.69	1.25	0.41-3.83
Home demands	-1.08	0.63	2.93	0.09	0.34	0.10-1.17
Home control	0.21	0.62	0.12	0.73	1.24	0.37-4.17
Home support	0.90	0.61	2.21	0.14	2.46	0.75-8.04
Constant	-2.88	1.10	6.80	0.01		

*p-value is ≤ 0.05

Table 29. Multiple Logistic Regression with Job and Home Strain Main Effects on MSDs Associated with Lower Back.

Variable	B	s.e.	Wald	p-value	Odds ratio	95% CI
Age	-0.08	0.18	0.21	0.64	0.92	0.65-1.31
Marital Status	0.11	0.47	0.06	0.81	1.12	0.44-2.81
Body Mass Index	-0.19	0.42	0.21	0.65	0.83	0.36-1.88
Number of children	0.16	0.27	0.35	0.55	1.17	0.70-1.98
Trait anxiety	0.10	0.45	0.05	0.82	1.11	0.46-2.69
Job demands	0.71	0.41	2.92	0.09	2.03	0.90-4.56
Job control	-0.44	0.42	1.11	0.29	0.64	0.28-1.46
Job support	0.69	0.41	2.79	0.09	1.99	0.89-4.45
Home demands	0.07	0.42	0.03	0.87	1.07	0.47-2.43
Home control	0.14	0.47	0.09	0.77	1.14	0.46-2.87
Home support	0.09	0.43	0.04	0.84	1.09	0.47-2.55
Constant	-1.11	0.72	2.37	0.12		

In sum, unlike any of the home strain variables, high job demands significantly increased the odds of having MSD symptoms in the hands, shoulders, neck, and upper back. Likewise, no significant interactions between work on the job and at home were found in these analyses.

Study Aim 4

To determine if there is any relationship between total strain (job strain and home strain), depressive symptoms, psychosomatic disorders, anxiety, and symptoms of musculoskeletal disorders.

As was discussed previously, the analysis for this aim was done in three steps to determine possible direct, mediating, and moderating (interactive) effects.

Step 1:

For the first step, hierarchical logistic regression models were created to examine the direct effect of each psychological ill health variable on MSD symptoms while taking job strain, home strain, and possible confounders into account.

Psychosomatic symptoms: Those with high psychosomatic symptoms did not have significantly greater odds of having MSD symptoms in the hands or shoulders, but their odds did increase for neck, upper back and lower back symptoms after controlling for job and home strain and the confounders. In the upper back symptoms model, age, marital status, number of children, and job demands were significant also.

Depressive symptoms: Similar to the analysis with psychosomatic symptoms, depressive symptoms were not related to increased odds of MSD symptoms in the hands. Depression was, however, associated with significantly increased odds of having lower back, shoulder, neck and upper back symptoms. In the model

examining shoulder symptoms, home demands and job demands were also significant, just as in the model for neck symptoms, home control, and job control were significant. Depression, marital status, number of children and job demands all were significantly associated with upper back symptoms.

State Anxiety: State anxiety was associated with hand, shoulder, and upper back symptoms, but was not related to neck and lower back symptoms when the confounding and strain variables were held constant. In addition to state anxiety being significant in the model for shoulder symptoms, job demands and home demands were also significant. Similarly, age, marital status, number of children, job demands, home demands, as well as state anxiety, were all associated with upper back symptoms.

Trait Anxiety: Trait anxiety was not significantly associated with any of the MSD systems after controlling for job and home strain, and the confounding variables.

Overall, in hierarchical logistic regression models with job and home strain, body mass index, and demographic variables controlled for, several musculoskeletal systems were associated with psychological disorders. While those with upper back symptoms reported higher rates of psychosomatic symptoms, depression and state anxiety, those with neck and lower back symptoms reported only more depressive and psychosomatic symptoms. Those with shoulder symptoms reported significantly more depression and higher levels of state anxiety and those with hand symptoms reported more state anxiety. A summary of the odds ratios for MSD symptoms associated with psychological ill health variables is found in Table 30.

Table 30. Summary of odds ratios and 95% confidence intervals for MSD symptoms associated with psychological ill health⁺

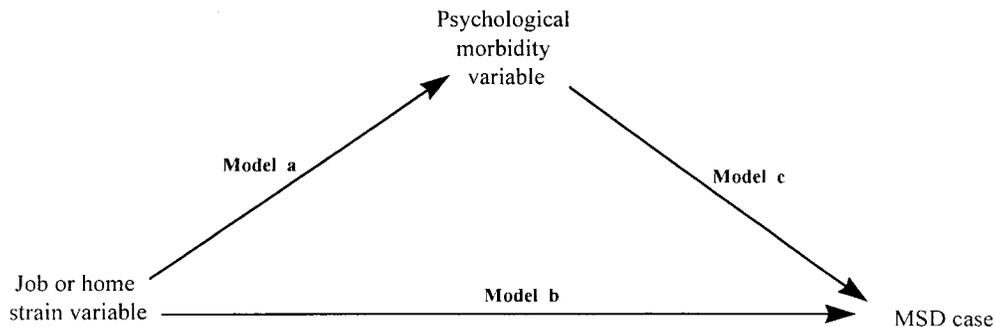
	<u>Psychosomatic symptoms</u>	<u>Depression</u>	<u>State anxiety</u>	<u>Trait anxiety</u>
Hand symptoms	1.72 (0.76-3.90)	1.55 (0.60-3.99)	2.29 (0.96-5.44)	0.88 (0.35-2.19)
Neck symptoms	7.42 (2.62-21.00)	7.07 (2.18-22.94)	2.53 (0.99-6.50)	2.03 (0.73-5.68)
Shoulder symptoms	2.66 (1.04-6.79)	4.56 (1.50-13.84)	4.48 (1.60-12.56)	1.68 (0.60-4.72)
Upper back symptoms	4.82 (1.46-15.90)	5.15 (1.44-18.44)	13.23 (3.05-57.42)	2.59 (0.72-9.37)
Lower back symptoms	2.43 (1.08-5.47)	3.66 (1.41-9.47)	1.95 (0.85-4.47)	1.11 (0.46-2.69)

+ In models controlling for all job strain, home strain variables, and hypothesized confounders.

Step 2:

In this second step of analysis, three models were built to examine whether psychological ill health acted as a mediator between strain variables and MSD symptoms: the first model tested for a significant relationship between strain and the psychological symptoms scale; the second model tested the relationship between strain and MSD symptoms; the third model took into account both strain and psychological symptoms to test whether the relationship of strain to MSD symptoms changed in the presence of psychological ill health variable. Each of the job and home strain variables were examined in relation to the psychological ill health variables. Figure 3 depicts the three models tested.

Figure 3. Models for testing mediating effects of psychological health.



While none of the psychological symptom scales acted as mediators between the job or home strain variables and hand, neck, or upper back symptoms, psychosomatic symptoms and depression did mediate the relationship between job demands and lower back symptoms and between home demands and low back symptoms. Psychosomatic symptoms also appeared to mediate the relationship between home control and shoulder symptoms.

Step 3:

For step 3, logistic regression models that included an interaction term of a job or home strain variable (job demands, control and social support; home demands, control, and social support) and a psychological disorder (depression, psychosomatic symptoms, state and trait anxiety) were examined for each musculoskeletal system. Overall, 24 interaction terms were tested for each MSD system. Models with significant interaction terms were then analyzed in greater detail to determine at what level the interaction was present.

None of the interaction terms were significantly related to hand or shoulder symptoms. For lower back symptoms, two interaction terms were significant (job demands by depression and job demands by trait anxiety). For neck and upper back symptoms, one term was significant (neck: job support by depression; upper back: job support by depression). With a 5% significance level, there is the possibility that for each system, one of these associations was significant by chance.

Dummy variables for each level of the interaction were created and then re-fit into the significant models. Using this method, each interaction term was found to be in the expected direction: for those who reported the combination of low job support and high levels of depression, the odds for neck symptoms and upper back was significantly higher, although the confidence intervals were wide (neck: OR=5.38, CI=1.19-24.43; upper back: OR=7.98, CI=1.11-57.28). Similar to the effects of low social support, those reporting both high job demands and high levels of depression were at greater odds of having low back symptoms (OR=11.89, CI=2.84-49.74). The same increase in odds for low back symptoms was true for those having high job demands and high levels of trait anxiety (OR=5.04, CI=1.68-15.13).

In Step 3, therefore, the combination of either a lack of job support or high job demands and psychological morbidity, in particular depression and trait anxiety, increases the risk of some MSDs symptoms. This is especially true for MSD symptoms in the neck, upper back and lower back.

Study Aim 5

To examine variability of stress from the paid and unpaid work environments by race and age and their relationship to musculoskeletal disorders.

A number of significant differences were found in the bivariate analysis of race and age by job and home strain variables. Age tended to vary by job control while race varied by a number of home strain variables (home demands, home control, emotional management at home, and rewards at home) (see Table 31).

Table 31. Percentage and p-value of respondents reporting job and home strain variables by age and race.

	Age					Race		
	18-36	37-42	43-46	47-65	p=	Black	White	p=
High job demands	24.8	20.0	24.8	30.5	0.84	47.5	52.5	0.22
Low job control*	31.6	19.3	24.6	24.6	0.02	47.3	52.7	0.21
Low job support	22.0	22.0	24.8	31.2	0.84	47.6	52.4	0.26
High emotional labor on the job	23.4	21.5	28.0	27.1	0.85	37.3	42.7	0.11
Low rewards from the job	29.1	20.5	22.2	28.2	0.15	49.1	50.9	0.42
High home demands#	27.9	23.1	20.2	28.8	0.29	37.6	62.4	0.00
Low home control#	25.0	23.1	28.8	23.1	0.33	61.0	39.0	0.01
Low home support	25.7	17.4	29.4	27.5	0.22	50.0	50.0	0.62
High emotional management#	23.3	23.3	24.3	29.1	0.98	44.6	55.4	0.04
High responsibilities at home	26.7	20.0	27.6	25.7	0.39	55.4	44.6	0.23
Low rewards at home#	28.3	18.9	24.5	28.3	0.32	37.5	62.5	0.00

*significantly different across age.

#significantly different by race.

In the multivariate analyses for race, race was significantly related only to neck symptoms, with white women at greater odds of having symptoms than African American women. This relationship was consistent in all three models (job strain, home strain, total strain). When race was added to the model with job strain variables, marital status and race were both significant. With only home strain variables in the model, control at home and race were significant. This relationship held in the total strain model (job and home strain), with both home control and race significantly associated with neck symptoms; marital status was not significant.

In the multivariate analyses for age, being younger was significantly related to having upper back symptoms. It was not, however, related to the other MSD symptoms. In the models for upper back symptoms, age, when added to the model with only job strain variables, was not related to symptoms. However, in the models with only home strain variables, younger workers and workers with more than one child were more likely than older workers and those with few children to report upper back symptoms. In the complete model, high job demands, number of children, and age were related to increased odds for symptoms.

In sum, race and control at home were associated with increased odds for neck symptoms. Similarly, age, number of children, and high job demands increased the odds for upper back symptoms when taking all the job and home strain variables into account.

DISCUSSION

Study Aim 1

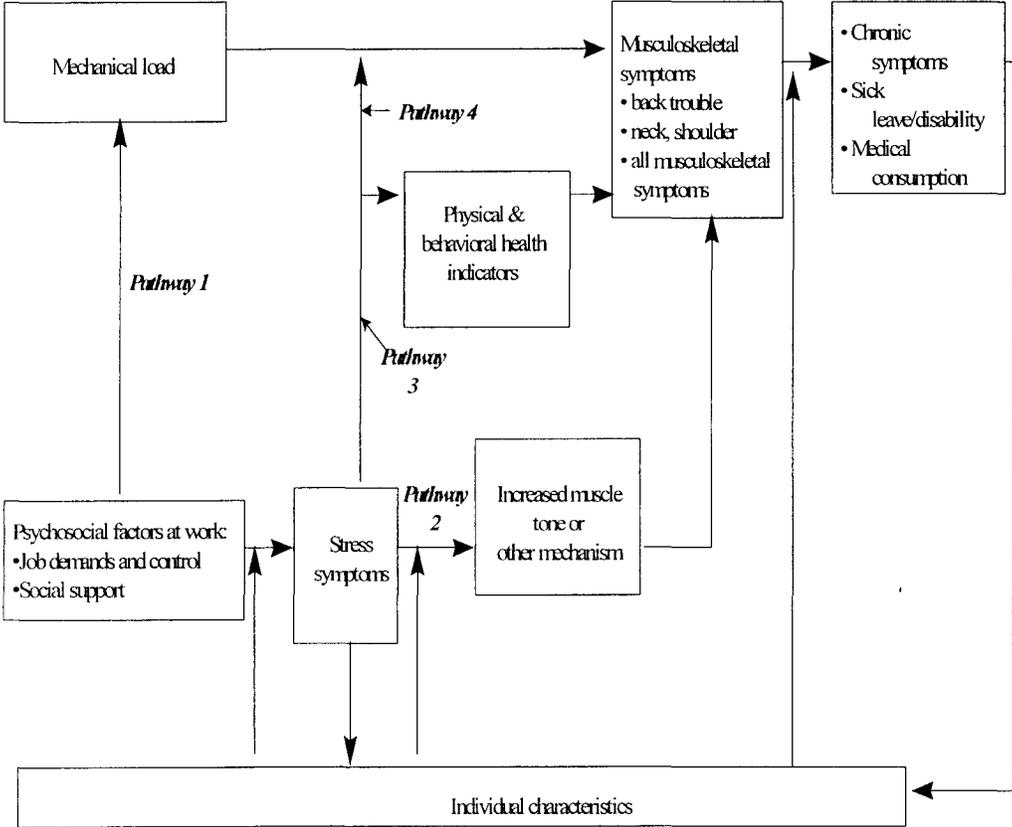
For the first study aim, which used the Job Strain Model to evaluate the relationships among demands, control, and social support with MSD symptoms, two significant results were found. First, only job demands were significantly related to MSD symptoms. Second, upon closer examination, those job demands that were characterized as being ‘physical demands’ were most consistently associated with increased odds of having symptoms.

The first finding contradicted the hypothesis that both high job demands and low job control would be associated with MSD symptoms. The importance of job demands and the absence of job control as a significant factor associated with stress-related outcomes in groups of women workers is consistent with other studies (e.g., Stansfeld, S.A., Fuhrer, R., Shipley, M.J., Marmot, M.G., 1999). The absence of control in this study may, in part, be related to a lack of variability in control at work since similar jobs were investigated. However, it may also be due to more general issues related to the Job Strain Model. Job control may not have the same contextual meaning or play the same role in the stress process for women as it does with men. In studies by Haynes (1991) and Stansfeld, et al, (1999), skill discretion was found to be a better predictor of ill health for women, while men’s health was more closely associated with decision authority. This distinction was not found in this study, but this may be due, again, to the lack of variability in control at work or a lack of statistical power.

From the first finding, the overall importance of job demands for this group of workers was clear: high demands were related to higher odds of having MSD symptoms. In other words, workers with a higher burden of psychosocial demands are at greater risk for MSD symptoms. From the second finding, however, the relationship between the psychosocial nature of job demands and MSD symptoms seems to be questioned since physical demands were the most consistent sub-scale related to symptoms. Several interpretations of this

Using Bongers’ model (1991) (see Figure 4), several possible interpretations could be made from these results. First, physical demands may be significantly associated with MSD symptoms while psychosocial demands are not. Second, the perception of physical demands are significantly associated with MSD symptoms, but the perception of psychosocial demands are not. Third, there is a possible moderating or mediating relationship between the psychosocial and physical demands that is difficult to untangle. For example, the stress from demanding work requirements may cause workers to use excessive force on keyboards or to remain in uncomfortable or static postures. Fourth, workers may be more attune to or more comfortable with reporting physical demands than psychosocial demands. Fifth, because this is a cross-sectional study, the direction of causality is not clear. It could be that those with pre-existing symptoms reported having difficulty with physical job demands just as it possible that the physical job demands caused or exacerbated symptoms. These five possible interpretations suggest that while the physical demands of work are related to having MSD symptoms, disentangling these demands from the psychosocial environment in which they occur is difficult, but may be the important link to understanding the relationship between demands and MSD symptoms.

Figure 4. Bongers' model of possible pathways linking risk factors to MSDs.



Study Aim 2

Contrary to my hypothesis, of all of the home-related exposure variables, control at home was the only variable associated with upper extremity MSD symptoms (symptoms in the neck, shoulders, and upper back). Demands and social support at home were not associated with an increase in odds for symptoms.

There are several possible reasons for the poor association between the home environment variables and MSD symptoms. First, the results may be accurate and there is little association between stress in the home environment and MSD symptoms. Second, home variables may act as mediators between job demands and MSD symptoms, but not as direct effects linked to MSD symptoms. Third, there may not have been enough variability within the home environment to distinguish significant differences across groups. Fourth, the population was older than expected, with a mean age of 42 years. Only 10% had children under 6 years old; only 2% had children under 2 years. An older population without young children may not yield the same results as a younger population with young children. This study population may not currently have the overwhelming demands and responsibilities from the home environment that are associated with having young children, characteristics that may have a direct effect on MSD symptoms. Fifth, the measurements may not have been sensitive enough to distinguish differences between groups. Being a very complex environment to measure, these instruments may need to be refined to sharpen their precision and emphasize the subtleties of the environment.

Study Aim 3

The goal of Study Aim 3 was to examine an expanded Job Strain Model that included both job and home strain variables. Both direct and interactive effects were examined. In these models, high job demands significantly increased the odds of having MSD symptoms in the hands, shoulders, neck, and upper back when home strain variables were included in the models, but none of the home strain variables were significant. Likewise, no significant interaction between work on the job and at home was found in these analyses.

These results provide evidence that in this study the demands of the job, even when taking variables from the home environment into account, is the key factor that increased the odds of having MSD symptoms. Demands and control at home or the interaction of home and work may be associated with other health outcomes, but for MSD symptoms, job demands was the overwhelming factor associated with symptoms.

Study Aim 4

For Study Aim 4, I intended to address the possible contribution that psychological ill health has on MSD symptomology and to investigate the possible pathway in which such morbidity may affect MSD symptoms. I first attempted to determine if psychological ill health was directly related to MSD symptoms and then examined if psychological morbidity mediated or moderated the relationship among job strain, home strain, and MSD symptoms workers' symptoms.

In the first set of analyses, either psychosomatic symptoms, depression, or state anxiety was associated with at least one of the MSD systems. While state anxiety, which was significantly associated with symptoms in the hands, shoulders, and upper back, could have been related to temporary factors or short-term situations

at the time of the survey, depression and psychosomatic disorders may have been more closely linked to the chronically stressful conditions of the work environment. These relationships were tested in the second and third parts of the analyses.

In the second set of analyses, both psychosomatic symptoms and depression were mediators in the relationship between job demand, home demands, and low back symptoms. These results suggest that high demands at home and on the job may cause depression and/or psychosomatic symptoms and in return, such psychological ill health may lead to MSD symptoms, especially those in the lower back. In other words, high job demands may be the earliest indicator and psychological morbidity the second phase in the development of MSD symptoms.

In the third set of analyses, low job support coupled with high levels of depression increased the odds exponentially of having neck or upper back symptoms. Similarly, high job demands coupled with either high levels of depression or trait anxiety increased the odds of having low back symptoms. Again, while with the cross-sectional design of this study it is difficult if there is something unique about those who are depressed and have low job support (do they have low support because they are depressed or are they depressed because of low job support?), it does appear that this combination is a risk factor for neck and upper back MSD symptoms, just as the combination of high job demands and depression or high levels of trait anxiety increase the odds for low back symptoms.

Study Aim 5

For Study Aim 5, race and age were examined as possible variables that may confound the relationship between job or home strain and MSD symptoms. Race is often used as a proxy for discrimination at work, and since some discussion about preferential treatment and cronyism based on race came through in the original interviews with workers, the relationship between job strain and race was of interest. It was also of interest because of hypothesized variations in what is perceived as stressful in the home environment that some researchers have suggested exists. In this study race was not significantly related to any of the job strain variables. It was, however, related to home variables, with whites reporting higher demands and African Americans reporting lower control at home. However, in the multivariate models, after taking into account all of the job and home strain variables, racial differences disappeared, except in one model. Being white and having low control at home were significantly associated with higher odds for neck symptoms. Since it is unlikely that one's race increases the odds for symptoms, it seems that race here is a proxy for something else. This result may suggest that the differences in the home environment vary by subtle social and structural elements that are associated with race and those elements, possibly associated with the stress process, are related to MSD symptoms in the neck.

The effect of age is often examined as a confounding variable in studies on MSD symptoms in order to take into account conditions associated with age and aging, such as arthritis. In this study, however, the youngest age group had the highest odds for upper back symptoms. For the other MSD systems, there was no relationship between age and symptoms. These relationships between age and MSD symptoms, could in fact, be a reflection of the healthy worker effect. The lack of an age effect could mean that healthiest workers have 'survived' the years of chronic job

and home strain and have continued to persevere without or cope with symptoms. Those who have suffered more serious symptoms or strain may have quit.

Limitations

Three concerns about this study's results are issues regarding the study sample: (1) power; (2) bias of respondents; and, (3) bias based on survey administration. A fourth concern is based on the measurements employed in the study.

Power. With a final sample size of 218 women, one possible limitation was the lack of sufficient power to estimate differences between groups. With a larger sample size, some of the study results, especially those that were near statistical significance, could change. A larger sample size could help to decipher inconsistent or unclear results.

Sample bias. The second concern was the potential bias in the study sample; that is, whether the interview and survey respondents truly represented the larger study population. In order to address this issue, the non-respondents were contacted approximately ten months after the original survey was mailed. With a 43% response rate to the survey, the study team was concerned that the other 57% of the population could have differed in some way from the respondents. A short, anonymous survey and a \$1 bill were mailed to all of the non-respondents (Appendix C). This survey included questions regarding demographics; job demands; satisfaction with one's relationships, job, health, family, and overall well-being; and physician-diagnosed musculoskeletal disorders and depression. Of the 346 surveys sent, 9 (3%) were returned with incorrect or invalid addresses. Of the remaining 337, 84 people (25%) responded. All of the surveys were entered and re-entered in the same fashion as the original data.

When the responses of the non-respondents were compared to the original respondents, no statistically significant differences across any of the basic demographic variables (e.g., age, marital status, education) or medical diagnoses (MSDs or depression) were found. In fact, there were only three significant differences between the two groups: non-respondents were less likely to be caregivers ($p < 0.02$), less satisfied with the way they feel about themselves ($p = 0.05$), and more likely to report having "never having enough time to get the job done" ($p < 0.01$). One additional difference neared significance: non-respondents were more likely to report having "to sit in the same position for several hours during the day" ($p < 0.09$), one of the questions in the physical demands sub-scale.

These data provide some evidence that the original respondents to the CWHS survey may not have been under the same degree of stress on the job as the non-respondents and that our results may be underestimating the actual level of stress in this population.

Survey bias. The third issue of concern was the potential bias of the study participants with this particular survey instrument. Because the study sample was recruited from the union local, participants may have perceived that questions pertaining to their job were more important than questions about their home environment, and they may have answered the job stress questions with more care. Participants may have also be more reserved or private about their home environment, and may not have been as willing or comfortable reporting genuine answers. While

there was no way to test for these perceptions, it is important to keep it in mind when reviewing the results.

Issues Concerning Study Instruments. With regard to the musculoskeletal disorder symptoms questionnaire, the strong psychometric qualities of the scale suggest that the instrument could be used as an instrument in epidemiologic studies to screen for MSD symptoms. It was not, however, developed to be a diagnostic tool. Ideally, the instrument would be tested for additional types of validity and reliability. Administering the questionnaire to establish the test-retest reliability and using a “gold standard” test, such as a medical examination, in conjunction with the questionnaire would be logical steps to further test the instrument for validity and reliability.

Generalizability of Study Results

While the validity and reliability of these measures were excellent, the generalizability of the results may be of concern. These findings may be unique to this group or to this study design. A study using larger populations of working women, both in and out of the telecommunications industry, or employing a different study design, may produce different results.

With regard to job stress, these results may be specific to those working in the telecommunications industry or limited to those working in customer service jobs or other types of interactive service work. For non-paid work, however, these results may be comparable to women in a similar life course stage, but dissimilar to those in different stages. Populations with greater variability in age, income, jobs, and number of children may have very different non-paid work experiences, and therefore, may have different outcomes from those in this study. The lack of variability in this sample may not have presented as clear a picture as it would if there were greater representation in all these groups.

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APPENDICES

Appendix A. CWHS survey

A. GENERAL INFORMATION

In this set of questions we would like **general information** about you and your family.

(1) How old are you right now? _____

(2) What is your sex? Female Male

(3) Do you consider yourself to be
 African American White Asian American Hispanic Other

(4) What is the highest level of schooling you have completed?
 Some high school High school/ equivalent Some college or trade school Junior college/ trade school graduate University or college graduate Graduate school

(5) Are you now
 Single Married/Living with a partner Divorced/separated Widowed

(5a) If **you are married or living with a partner**, what is the highest level of schooling your spouse completed?

Some high school High school/ equivalent Some college or trade school Junior college/ trade school graduate University or college graduate Graduate school

(5b) If **you are married or living with a partner**, is your spouse employed? Yes No

(5c) If **your spouse is employed**, what is your spouse's job? _____

(6) Do you have children? Yes No

(6a) If **YES, how many** children do you have.

_____ Under age 2 _____ Ages 2 through 5 _____ Ages 6 through 12
_____ Ages 13 through 18 _____ Ages 19 and older

(6b) How many children live with you the majority of the time? (more than 6 months/year) _____

(7) Are you currently providing any personal care or help to an aged or disabled relative(s)? Yes No

(7a) If **YES, how many** hours a week do you spend providing care? _____

(8) How tall are you without shoes? (please write in both feet and inches) _____

(9) How much do you weigh without shoes? (please write in number of pounds) _____

(10) What are your hobbies? (please list) _____

(11) Are you currently working for Bell Atlantic? Yes No

(11a) If **NO**, what is the reason you are currently not working at Bell Atlantic? Vacation Termination Quit FMLA Off on disability

(11b) If **NOT WORKING DUE TO A DISABILITY**, please list the type of disability. _____

IF YOU CURRENTLY WORK FOR BELL ATLANTIC, INCLUDING IF YOU ARE ON VACATION OR FMLA, PLEASE CONTINUE. IF YOU ARE NOT WORKING AT BELL ATLANTIC DUE TO TERMINATION, QUITTING, OR DISABILITY, PLEASE GO TO THE LAST PAGE.

(12) How long have you worked for Bell Atlantic? Years _____ Months _____

(13) What is your current job title? _____

(14) What department or product line do you work in? _____

(15) Are you. Full-time permanent employee Full-time non-permanent employee Part-time permanent employee Part-time non-permanent employee

(16) Do you have a second paid job? Yes No

(16a) If **Yes**, what is your job title for you second job? _____

(16b) How many hours a week do you work in this second job? _____

B. FEELINGS ABOUT YOUR WORK ON THE JOB.

PART 1.

In this part of the survey, we would like to find out what the demands of your job are.

Please tell us HOW OFTEN the following things happen on the job. Please write in...				
1	2	3	4	5
Rarely/Never	Sometimes	Often	Usually	Always/Most of the time

- (1) I have enough time to do my job properly _____
- (2) My job requires working very fast. _____
- (3) There is enough time off the phone to finish my work for each customer _____
- (4) As soon as I finish with one caller, there is another caller on the line _____
- (5) I have enough time to give quality customer service _____
- (6) I rush my work to meet deadlines. _____
- (7) I have enough time on the phone with my customers to solve their problems _____
- (8) I have enough time after I finish talking to customers to solve their problems _____
- (9) I have enough time during the day to follow up on the previous caller's problems or questions. _____
- (10) My work must be finished within a specific amount of time _____
- (11) Sitting throughout the day is physically uncomfortable. _____
- (12) My job requires working very hard. _____
- (13) It is difficult to juggle all the requirements of my job. _____
- (14) The number of calls I receive is overwhelming _____
- (15) For my job, I need to concentrate on many things at once _____
- (16) I have to concentrate on one customer's problem while finishing the work from the previous customer _____
- (17) I am asked to do an excessive amount of work. _____
- (18) I sit in the same position for several hours during the day. _____
- (19) My work is monitored to make sure I use the company's name properly (branding) _____
- (20) I have to remember a great deal of information for my job _____
- (21) I hold my arms in one position for long periods of time during the day. _____
- (22) I have enough time to get the job done. _____

Please tell us **HOW OFTEN** the following things happen on the job. Please write in...

1	2	3	4	5
Rarely/Never	Sometimes	Often	Usually	Always/Most of the time

- (23) To see if I am treating customers fairly, my work is monitored. _____
- (24) My work is monitored to make sure I complete my calls in the allotted amount of time. _____
- (25) I can't do my work because the computer system is down. _____
- (26) I am free from conflicting demands that others make. _____
- (27) The computer system runs slowly. _____
- (28) The computer system checks the speed of my work.. . . . _____
- (29) My work is monitored to make sure I follow the scripts the company provides _____
- (30) The computer system checks the accuracy of my work. _____
- (31) The computer system breaks down or stops. _____
- (32) When the computer is down, it takes a lot of time to get it up and running again _____
- (33) Getting to work on time is a challenge for me. _____

PART 2.

In this part of the survey, we want to find out what kinds of things make your job challenging and how much influence you have over certain aspects of your job .

Please tell us **HOW OFTEN** the following things happen on the job. Please write in...

1	2	3	4	5
Rarely/Never	Sometimes	Often	Usually	Always/Most of the time

- (1) My company gives me the proper training I need to give good customer service. _____
- (2) My job requires me to be creative. _____
- (3) When I want to go to lunch, I can just go _____
- (4) I am able to improve my job skills with the training the company provides. _____
- (5) When I need a break from work, I can just take one _____
- (6) My job allows me to make a lot of decisions on my own. _____

Please tell us **HOW OFTEN** the following things happen on the job. Please write in...

1	2	3	4	5
Rarely/Never	Sometimes	Often	Usually	Always/Most of the time

- (7) I decide if I want to work overtime _____
- (8) I can choose my own working hours _____
- (9) I have a lot of say about what happens on my job. _____
- (10) In our training classes, I learn what I need to know to perform my job adequately _____
- (11) I can get vacation time whenever I want it _____
- (12) I get to do a variety of different things on my job. _____
- (13) I am required to solve a customer's problem within a certain amount of time. _____
- (14) I can follow up on the previous caller's problems or questions whenever I want _____
- (15) I have an opportunity to develop my own special abilities. _____
- (16) The training I receive prepares me for changes in the job. _____
- (17) My job requires that I learn new things. _____
- (18) I set my own schedule of when I am on the phone with customers _____
- (19) My job requires a high level of skill. _____
- (20) On my job, I have a lot freedom to decide how I do my work. _____
- (21) I control the pace of incoming phone calls. _____
- (22) My job involves a lot of repetitive work. _____
- (23) I can conduct personal business at work _____
- (24) I am able to **take** personal phone calls at work _____
- (25) I am able to **make** personal phone calls at work _____
- (26) I have a lot of input on how I am evaluated for my job _____
- (27) I choose when to have my work monitored _____
- (28) I have a lot of say in setting the goals for my job _____
- (29) At work, I feel I have control over what happens in most situations. _____

PART 3.

In this part of the survey, we are interested in how you feel about your work on the job.

Please tell us how often you **ACT OR FEEL** this way about the work you do on the job. Please write in...

1	2	3	4	5
Rarely/Never	Sometimes	Often	Usually	Always/Most of the time

- (1) Helping customers makes me feel good about myself. _____
- (2) When I'm stressed, I try not to take it out on customers. _____
- (3) I make an effort to answer customers' questions in a polite way. _____
- (4) I'm responsible for my customers' feelings about the company _____
- (5) When customers say "thank you," it makes the job worthwhile _____
- (6) I make an effort to be interested in the customer's concerns or problems. _____
- (7) If customers treat me like I'm sub-human, I act like it doesn't bother me _____
- (8) Coworkers respect my feelings _____
- (9) My ability to care is all used up at the end of the workday _____
- (10) Coworkers treat me like an equal _____
- (11) I am comfortable sharing my feelings or opinions with the customers _____
- (12) I act like nothing bothers me, even when a customer makes me mad _____
- (13) I act like nothing bothers me, even when a customer makes me upset _____
- (14) Customers are grateful when I give attention to their problems _____
- (15) I want customers to think I'm able to handle their problem _____
- (16) I work hard to keep myself in a positive mood at work _____
- (17) I have to sound concerned about my customer's problems, even when I don't feel like it. _____
- (18) Helping customers is satisfying _____
- (19) I am physically exhausted at the end of the day. _____
- (20) I want customers to think I'm always calm. _____
- (21) I have to keep customers happy as part of my job. _____

Please tell us how often you **ACT OR FEEL** this way about the work you do on the job. Please write in...

1	2	3	4	5
Rarely/Never	Sometimes	Often	Usually	Always/Most of the time

- (22) It's hard to be nice to customers for so many hours every day. _____
- (23) In this job, I give it my all and there's nothing left at the end of the workday. _____
- (24) Customers understand that when I get really busy, I don't have time to be nice. _____
- (25) When something goes wrong at work, I feel like I should try to make my
coworkers feel better _____
- (26) The training for this job requires learning how to deal with people _____
- (27) I feel pleased if customers share their personal problems with me. _____
- (28) I have to calm down angry or frustrated customers in my job. _____
- (29) Customers respect my feelings _____
- (30) Customers judge me by how caring I am when I help them _____
- (31) Supervisors evaluate me on how caring I am to customers. _____
- (32) I am mentally exhausted at the end of the day. _____
- (33) I have to remind myself that angry customers are not angry with me, but with the situation
they are in _____

PART 4.

*In this part of the survey, we would like to find out about **the help and support you get on the job.***

Please tell us **HOW OFTEN** the following things happen on the job. Please write in...

1	2	3	4	5
Rarely/Never	Sometimes	Often	Usually	Always/Most of the time

- (1) I have coworkers who will listen to me when I have a problem _____
- (2) My coworkers help me when there are changes in the job _____
- (3) I can trust telling my coworkers things about my home life _____
- (4) People I work with are competent in doing their job _____
- (5) I am exposed to hostility or conflict from the people I work with. _____
- (6) I can talk to my coworkers when I have a problem at home _____

Please tell us **HOW OFTEN** the following things happen on the job. Please write in...

1	2	3	4	5
Rarely/Never	Sometimes	Often	Usually	Always/Most of the time

- (7) I talk to coworkers outside of work. _____
- (8) People I work with take a personal interest in me _____
- (9) I get together with coworkers outside of work _____
- (10) No one cares for you around here – it’s really just every person for her/himself. _____
- (11) Experienced people will take a new person under his/her wing until the new person gets the hang of it. _____
- (12) We all pitch in and help if anyone needs a hand. _____
- (13) People I work with are helpful in getting the job done. _____
- (14) In my work group, when problems arise we work together as a group to solve them. _____
- (15) In my work group, we try to share equally in the hardships of the job. _____
- (16) There is a feeling of unity among those I work with. _____
- (17) People I work with encourage each other to work together. _____
- (18) There is a really no one I can trust to help me at work _____
- (19) If I was in trouble at work, I could easily turn to others to help me _____
- (20) People I work with are friendly _____
- (21) I can trust telling my supervisor about a problem with my work _____
- (22) My supervisor is there for me when I have a problem with work _____
- (23) I can talk to my supervisor about problems at home. _____
- (24) My supervisor will listen to me when I have a problem _____
- (25) My supervisor will help me to provide good customer service _____
- (26) My supervisor distributes the work to my team in a fair way. _____
- (27) I can depend on my supervisor to help me learn new job responsibilities. _____
- (28) Supervisors are willing to work with me so I have a schedule that is suitable for me _____

C. FEELINGS ABOUT WORK AT HOME.

PART 1.

*In this part of the survey, we would like to find out **what the demands of your work at home are**. For this research, we are considering “work at home” any work that you do at home for which you are not paid. This includes anything you do to manage, maintain or support your home, family and friends.*

Please tell us HOW OFTEN the following things happen at home. Please write in...				
1	2	3	4	5
Rarely/Never	Sometimes	Often	Usually	Always/Most of the time

- (1) In my routine work at home, I do the same things over and over again. _____
- (2) I find my routine work at home to be boring _____
- (3) I find my routine work at home to be monotonous _____
- (4) At home, it’s a struggle for me to finish all I have to do in a short amount of time. _____
- (5) The routine work at home just seems to go on endlessly. _____
- (6) At home I have to work very fast to keep up with the chores and household tasks. _____
- (7) I find time to spend by myself. _____
- (8) Finding time to spend with family and friends is difficult _____
- (9) My daily routine is tightly scheduled. _____
- (10) My daily routine is rigid and inflexible. _____
- (11) Others put demands on my time _____
- (12) My work on the job is easier to manage than the work at home _____

PART 2.

In this part of the survey, we would like to find out what skills are required for your work at home and how much influence you have over your work at home. Again, for this research, we are considering "work at home" any work that you do at home for which you are not paid. This includes anything you do to manage, maintain or support your home, family and friends.

Please tell us HOW OFTEN the following things happen at home. Please write in...				
1	2	3	4	5
Rarely/Never	Sometimes	Often	Usually	Always/Most of the time

- (1) My work at home requires me to learn new things. _____
- (2) I make many of the decisions for family members. _____
- (3) My work at home requires me to be creative. _____
- (4) My work at home requires a high level of skill. _____
- (5) My work at home requires me to do a variety of different things. _____
- (6) I am able to develop my own special abilities or talents at home. _____
- (7) I make a lot of the decisions about what work is done at home. _____
- (8) I am in charge of making the decisions concerning the work done at home. _____
- (9) I have a lot of say about how the house is run _____
- (10) At home, I make decisions for important things that concern my family. _____
- (11) At home, I'm the boss _____
- (12) I am able to make a lot of the decisions about when the work is done at home. _____
- (13) I control how the household (or family's) finances are managed _____
- (14) I make the decisions about how the household money is spent _____
- (15) At home, I make many of the decisions about family members. _____
- (16) I control the order in which the household work is done _____
- (17) I find it impossible to plan for more than a few days in advance _____
- (18) At home, I make a lot of the decisions about who does the work _____
- (19) At home, I feel I have control over what happens in most situations. _____

PART 3.

In this part of the survey, we want to find out what kinds of things make managing your work at home challenging. Again, for this research, we are considering “work at home” any work that you do at home for which you are not paid. This includes anything you do to manage, maintain or support your home, family and friends

Please tell us HOW OFTEN the following things happen at home. Please write in...				
1	2	3	4	5
Rarely/Never	Sometimes	Often	Usually	Always/Most of the time

- (1) I get angry at myself for not getting all the work done at home that I should get done. . . . _____
- (2) When my family says “thank you” it makes all the work I do at home worthwhile _____
- (3) I resent that the work I do at home goes unnoticed by others. _____
- (4) Knowing that the work I do at home makes my family happy, makes it rewarding. _____
- (5) I feel guilty when I come home tired and don’t want to do the work at home. _____
- (6) I resent that I have to do the majority of the work at home _____
- (7) I get angry that I am responsible for most of the work at home. _____
- (8) I resent that I am still responsible for the majority of work at home, even though I work a full-time job. _____
- (9) When I finish my work at home, I know that I’ve done something especially well. _____
- (10) I feel that it is my family’s fault when the work at home doesn’t get done. _____
- (11) I get angry that I am never thanked for the work I do at home. _____
- (12) The sense of accomplishment when the house is finally clean is a reward for me. _____
- (13) I get angry that I am never thanked for the work I do for my family. _____
- (14) I blame myself for letting the housework build up _____
- (15) I feel that it is my fault when the work at home doesn’t get done. _____
- (16) I enjoy the creativity and skill that go into my work at home. _____
- (17) I get angry at myself for not doing a fair share of the housework _____
- (18) I feel guilty when I come home so tired that I can’t do the work at home. _____
- (19) I blame myself for not managing my time wisely enough to get all my work at home done _____
- (20) My work at home makes me feel good about myself. _____

Please tell us **HOW OFTEN** the following things happen at home. Please write in...

1	2	3	4	5
Rarely/Never	Sometimes	Often	Usually	Always/Most of the time

- (21) I feel that if nobody acknowledges my work at home, I haven't done a good enough job. . . . _____
- (22) I get angry at myself for not doing my housework the way I think it should be done. _____
- (23) My family tells me that I do a good job with the work at home. _____
- (24) I blame my family for not doing any of the work around the house. _____
- (25) I get angry when I have to do the majority of the work at home. _____
- (26) I feel that my family shouldn't let the housework build up. _____
- (27) When friends or visitors compliment the way my house looks, it makes the work I do at home worthwhile _____
- (28) Knowing my family feels comfortable and safe in our home makes the household work I do seem valuable _____

PART 4.

*If you are **married or living with a partner**, please answer the following questions. If not, please go to PART 5.*

Please tell us **HOW OFTEN** the following things happen at home. Please write in...

1	2	3	4	5
Rarely/Never	Sometimes	Often	Usually	Always/Most of the time

- (1) I have enough time to spend with my spouse or partner _____
- (2) I get angry at my spouse or partner for not doing a fair share of the housework. _____
- (3) I feel like I'm living up to my ideal of the "good spouse" or "good partner." _____
- (4) My spouse or partner doesn't manage his/her time wisely enough to get all the work at home done. _____
- (5) I feel like my spouse or partner is the "ideal spouse." _____
- (6) I have friends or family that I go to for advice about my relationship with my spouse or partner _____

PART 5.

In this part of the survey, we are interested in what kind of support you get with your work at home. Again, for this research, we are considering “work at home” any work that you do at home for which you are not paid. This includes anything you do to manage, maintain or support your home, family and friends.

Please tell us HOW OFTEN the following things happen at home. Please write in...				
1	2	3	4	5
Rarely/Never	Sometimes	Often	Usually	Always/Most of the time

- (1) If I have to work late or work overtime, I know that I can depend on my family to cover my responsibilities _____
- (2) My family or friends are there to take over some of my responsibilities at home when I’m too tired _____
- (3) I have someone to “stand in for me” if I have to be in two places at once. _____
- (4) I am expected to be the strong one in my relationships with family and friends _____
- (5) I give more of myself than I receive from others. _____
- (6) I feel guilty when I feel I need some help with work at home. _____
- (7) I feel uncomfortable asking for help around the house. _____
- (8) I feel incompetent when I need to ask for help. _____
- (9) I find that the support I get from family or friends comes with a price tag. _____
- (10) The people I get support from make me feel like I am burdening them. _____
- (11) I have friends or family that are available to give me advice about my life _____
- (12) I have friends or family that are available if I had to ask for a loan _____
- (13) I have friends or family that are available to ask advice for about money. _____
- (14) I feel incompetent when I need to ask for help with money matters. _____
- (15) I feel uncomfortable asking for help with money matters. _____

PART 6.

*In this section, we are interested in **what your responsibilities at home are.***

When ***PUSH COMES TO SHOVE***, how responsible are you, in relation to other family members, for the following tasks? Please write in.....

1	2	3	4	5
Not at all responsible	Somewhat responsible	Equally responsible with others	Very responsible	Totally responsible

- (1) Making sure there is food in the house. _____
- (2) Making sure there are supplies in the house. _____
- (3) Decorating and arranging the house. _____
- (4) Setting down the rules of the house. _____
- (5) Insuring the quality of the work done at home. _____
- (6) Making sure the bills get paid. _____
- (7) Planning social events (for example: vacations, getting together with friends, parties, special occasions) _____
- (8) Remembering important dates (for example: birthdays, holidays, anniversaries) _____
- (9) Doing the daily cleaning around the house _____
- (10) Doing the major cleaning in the house. _____
- (11) Cooking. _____
- (12) Acknowledging important dates (for example: birthdays, holidays, anniversaries) _____
- (13) Maintaining the yard or garden. _____
- (14) Maintaining the car (for example: bringing the car in for repairs, oil changes) _____
- (15) Managing family or personal investments. _____
- (16) Managing household/family budget. _____
- (17) Managing monthly expenses. _____

PART 7.

In this part of the survey, we would like to find out what getting to and from work is like for you.

Please tell us HOW OFTEN the following things happen on the commute. Please write in...				
1	2	3	4	5
Rarely/Never	Sometimes	Often	Usually	Always/Most of the time

- (1) I use my commute time to think through my problems. _____
- (2) I try to use my commute time to plan my day. _____
- (3) I drive aggressively during my commute. _____
- (4) While I'm commuting, I take out my frustrations from behind the wheel of my car _____
- (5) During my commute, I yell or gesture at other drivers. _____

PART 8.

If you are a parent or step-parent, please answer the following questions. If not, please go to PART 9.

Please tell us how often you ACT OR FEEL this way. Please write in...				
1	2	3	4	5
Rarely/Never	Sometimes	Often	Usually	Always/Most of the time

- (1) I have enough time to spend caring for my children. _____
- (2) I have enough time to spend supervising my children. _____
- (3) I feel uncomfortable asking for help with the children _____
- (4) I find it rewarding when my child (or children) learns something new or accomplishes something difficult. _____
- (5) I find it rewarding when friends or family compliment the way my children act or behave _____
- (6) I enjoy the creativity and skill that go into my work raising the children. _____
- (7) I am responsible for making sure that the children are adequately cared for. _____
- (8) I get angry at myself for not taking care of the children the way I think I should. _____
- (9) I feel like I'm living up to my ideal of the "good parent." _____
- (10) I feel like my spouse or partner is the "ideal parent." _____

PART 9.

If you are **a caregiver** to an aged or disabled relative, please answer the following questions. If not, please go to the **PART 10.**

Please tell us how often you ACT OR FEEL this way. Please write in...				
1	2	3	4	5
Rarely/Never	Sometimes	Often	Usually	Always/Most of the time

- (1) I have enough time to spend caring for my relative(s) _____
- (2) I resent having to take care of my relative(s) _____
- (3) I feel uncomfortable finding help for my relative(s) _____
- (4) I am responsible for making sure that my relative(s) is/are adequately cared for. _____
- (5) I feel guilty for not taking good enough care of my relative(s) _____
- (6) I feel uncomfortable taking care of my relative(s) _____
- (7) I find it rewarding when my relative(s) acknowledges my help. _____

PART 10.

In this part of the survey, we are interested in **how satisfied you are** with your life.

All things considered, HOW SATISFIED are you with the following areas of your life? Please write in...				
1	2	3	4	5
Very dissatisfied	Somewhat dissatisfied	No feelings either way	Somewhat satisfied	Very satisfied

- (1) Your marital or love relationship _____
- (2) Your job _____
- (3) Your health. _____
- (4) Your family life _____
- (5) Your standard of living _____
- (6) The way you feel about yourself. _____
- (7) Your life overall _____

D. YOUR HEALTH

In this part of the survey we are interested in learning about different aspects of your physical, mental and emotional health.

PART 1.

In this section, we are interested in learning if you have experienced any problems with your hands, wrists, fingers, or forearms during the last year.

DURING THE LAST 12 MONTHS.....

- (1) Have you experienced any pain or aching in your **hands, wrists, fingers, or forearms**? Yes N
- (2) Have you experienced any stiffness in your **hands, wrists, fingers, or forearms**? Yes N
- (3) Have you experienced any weakness in your **hands, wrists, fingers, or forearms**? Yes N
- (4) Have you experienced any numbness, tingling, or burning in your **hands, wrists, fingers, or forearms**? Yes N
- (5) Have you experienced any limited movement in your **hands, wrists, fingers, or forearms**? (Difficulty moving your **hands, wrists, fingers, or forearms** in all directions and to the extent that you think you should be able to) Yes N

If you answered **NO** to all of the previous questions about your *hands, wrists, fingers, or forearms*, please go to **PART 2** on the next page.

- (6) Did you seek medical care for the problem with your **hands, wrists, fingers, or forearms**? Yes N
- (7) Have you ever had an accident or sudden injury to your **hands, wrists, fingers, or forearms**, such as a sports injury or fracture, that was not related to your work? Yes N
- (8) Did this problem with your **hands, wrists, fingers, or forearms** interfere with your work at home?. Yes N
- (9) Did this problem with your **hands, wrists, fingers, or forearms** interfere with your work on the job?. Yes N
- (10) Did this problem with your **hands, wrists, fingers, or forearms** interrupt your sleep? Yes N
- (11) On a scale from 1 to 5, how bothersome was the problem with your **hands, wrists, fingers, or forearms**? Circle one. (1=not bothersome, 5=very bothersome) 1 2 3 4 5
- (12) Is this problem more bothersome at home or on the job? Home Work No difference

PHOTOCOPIED SKETCH OF RIGHT AND LEFT HANDS

(13) In the hand diagram above, please shade in the area or areas that have bothered you over the last 12 months.

PART 2.

In this section, we are interested in learning if you have experienced any problems with your elbows during the last year.

DURING THE LAST 12 MONTHS.....

- (1) Have you experienced any pain or aching in your **elbows**? Yes N
- (2) Have you experienced any stiffness in your **elbows**? Yes N
- (3) Have you experienced any limited movement in your **elbows**? (Difficulty moving your **elbows** in all directions and to the extent that you think you should be able to) Yes N

If you answered NO to all of the previous questions about your *elbows*, please go to PART 3 on the next page.

- (4) Did you seek medical care for the problem with your **elbows**? Yes N
- (5) Have you ever had an accident or sudden injury to **elbows**, such as a sports injury or fracture, that was not related to your work? Yes N
- (6) Did this problem with your **elbows** interfere with your work at home?. Yes N
- (7) Did this problem with your **elbows** interfere with your work on the job?. Yes N
- (8) Did this problem with your **elbows** interrupt your sleep?. Yes N
- (9) On a scale from 1 to 5, how bothersome was the problem with your **elbows**?
Circle one. (1=not bothersome, 5=very bothersome) 1 2 3 4 5
- (10) Is this problem more bothersome at home or on the job? Home Work No difference

PART 3.

In this section, we are interested in learning if you have experienced any problems with your shoulder or upper arms during the last year.

DURING THE LAST 12 MONTHS.....

- (1) Have you experienced any pain or aching in your **shoulder or upper arms**? Yes N
- (2) Have you experienced any stiffness in your **shoulder or upper arms**? Yes N
- (3) Have you experienced any weakness in your **shoulder or upper arms**? Yes N
- (4) Have you experienced any limited movement in your **shoulder or upper arms**?
(Difficulty moving your **shoulder or upper arms** in all directions and to the extent that
you think you should be able to) Yes N

If you answered NO to all of the previous questions about your *shoulder or upper arms*, please go to PART 4 on the next page.

- (5) Did you seek medical care for the problem with your **shoulder or upper arms**? Yes N
- (6) Have you ever had an accident or sudden injury to your **shoulder or upper arms**, such as a sports injury or fracture, that was not related to your work? Yes N
- (7) Did this problem with your **shoulder or upper arms** interfere with your work at home? Yes N
- (8) Did this problem with your **shoulder or upper arms** interfere with your work on the job? Yes N
- (9) Did this problem with your **shoulder or upper arms** interrupt your sleep? Yes N
- (10) On a scale from 1 to 5, how bothersome was the problem with your **shoulder or upper arms**? Circle one. (1=not bothersome, 5=very bothersome) 1 2 3 4 5
- (11) Is this problem more bothersome at home or on the job? Home Work No difference

PART 4.

*In this section, we are interested in learning if you have experienced any problems with your **neck** during the last year.*

DURING THE LAST 12 MONTHS.....

- (1) Have you experienced any pain or aching in your **neck**? Yes N
- (2) Have you experienced any stiffness in your **neck**? Yes N
- (3) Have you experienced any limited movement in your **neck**? (Difficulty moving your **neck** in all directions and to the extent that you think you should be able to) Yes N

If you answered NO to all of the previous questions about your *neck*, please go to PART 5 on the next page.

- (4) Did you seek medical care for the problem with your **neck**? Yes N
- (5) Have you ever had an accident or sudden injury to your **neck**, such as a sports injury or fracture, that was not related to your work? Yes N
- (6) Did this problem with your **neck** interfere with your work at home? Yes N
- (7) Did this problem with your **neck** interfere with your work on the job? Yes N
- (8) Did this problem with your **neck** interrupt your sleep? Yes N
- (9) On a scale from 1 to 5, how bothersome was the problem with your **neck**?
Circle one. (1 =not bothersome, 5=very bothersome) 1 2 3 4 5
- (10) Is this problem more bothersome at home or on the job? Home Work No difference

PART 5.

In this section, we are interested in learning if you have experienced any problems with your upper back during the last year.

DURING THE LAST 12 MONTHS.....

- (1) Have you experienced any pain or aching in your **upper back**? Yes N
- (2) Have you experienced any stiffness in your **upper back**? Yes N
- (3) Have you experienced any cramping in your **upper back**? Yes N
- (4) Have you experienced any limited movement in your **upper back**? (Difficulty moving your **upper back** in all directions and to the extent that you think you should be able to) . Yes N

If you answered NO to all of the previous questions about your *upper back*, please go to PART 6 on the next page.

- (5) Did you seek medical care for the problem with your **upper back**? Yes N
- (6) Have you ever had an accident or sudden injury to your **upper back**, such as a sports injury or fracture, that was not related to your work? Yes N
- (7) Did this problem with your **upper back** interfere with your work at home? Yes N
- (8) Did this problem with your **upper back** interfere with your work on the job? Yes N
- (9) Did this problem with your **upper back** interrupt your sleep? Yes N
- (10) On a scale from 1 to 5, how bothersome was the problem with your **upper back**? Circle one. (1 =not bothersome, 5=very bothersome) 1 2 3 4 5
- (11) Is this problem more bothersome at home or on the job? Home Work No difference

PART 6.

*In this section, we are interested in learning if you have experienced any problems with your **lower back** during the last year.*

DURING THE LAST 12 MONTHS.....

- (1) Have you experienced any pain or aching in your **lower back**? Yes N
- (2) Have you experienced any stiffness in your **lower back**? Yes N
- (3) Have you experienced any cramping in your **lower back**? Yes N
- (4) Have you experienced any limited movement in your **lower back**? (Difficulty moving your **lower back** in all directions and to the extent that you think you should be able to) . Yes N

If you answered NO to all of the previous questions about your *lower back*, please go to PART 7 on the next page.

- (5) Did you seek medical care for the problem with your **lower back**?..... Yes N
- (6) Have you ever had an accident or sudden injury to your **lower back**, such as a sports injury or fracture, that was not related to your work?..... Yes N
- (7) Did this problem with your **lower back** interfere with your work at home?..... Yes N
- (8) Did this problem with your **lower back** interfere with your work on the job?..... Yes N
- (9) Did this problem with your **lower back** interrupt your sleep?..... Yes N
- (10) On a scale from 1 to 5, how bothersome was the problem with your **lower back**? Circle one. (1=not bothersome, 5=very bothersome) 1 2 3 4 5
- (11) Is this problem more bothersome at home or on the job? Home Work No difference

PART 7.

In this section, we are interested in learning if you have experienced any problems with your hips or thighs during the last year.

DURING THE LAST 12 MONTHS.....

- (1) Have you experienced any pain or aching in your **hips or thighs**? Yes N
- (2) Have you experienced any stiffness in your **hips or thighs**? Yes N
- (3) Have you experienced any weakness in your **hips or thighs**? Yes N
- (4) Have you experienced any limited movement in your **hips or thighs**? (Difficulty moving your **hips or thighs** in all directions and to the extent that you think you should be able to) Yes N

If you answered NO to all of the previous questions about your *hips or thighs*, please go to PART 8 on the next page.

- (5) Did you seek medical care for the problem with your **hips or thighs**? Yes N
- (6) Have you ever had an accident or sudden injury to your **hips or thighs**, such as a sports injury or fracture, that was not related to your work? Yes N
- (7) Did this problem with your **hips or thighs** interfere with your work at home? Yes N
- (8) Did this problem with your **hips or thighs** interfere with your work on the job? Yes N
- (9) Did this problem with your **hips or thighs** interrupt your sleep? Yes N
- (10) On a scale from 1 to 5, how bothersome was the problem with your **hips or thighs**? Circle one. (1=not bothersome, 5=very bothersome) 1 2 3 4 5
- (11) Is this problem more bothersome at home or on the job? Home Work No difference

PART 8.

In this section, we are interested in learning if you have experienced any problems with your feet or ankles during the last year.

DURING THE LAST 12 MONTHS.....

- (1) Have you experienced any pain or aching in your **feet or ankles**? Yes N
- (2) Have you experienced any stiffness in your **feet or ankles**? Yes N
- (3) Have you experienced any numbness, tingling, or burning in your **feet or ankles**? Yes N
- (4) Have you experienced any limited movement in your **feet or ankles**? (Difficulty moving your **feet or ankles** in all directions and to the extent that you think you should be able to) Yes N

If you answered NO to all of the previous questions about your *feet or ankles*, please go to PART 9 on the next page.

- (5) Did you seek medical care for the problem with your **feet or ankles**? Yes N
- (6) Have you ever had an accident or sudden injury to your **feet or ankles**, such as a sports injury or fracture, that was not related to your work? Yes N
- (7) Did this problem with your **feet or ankles** interfere with your work at home? Yes N
- (8) Did this problem with your **feet or ankles** interfere with your work on the job? Yes N
- (9) Did this problem with your **feet or ankles** interrupt your sleep? Yes N
- (10) On a scale from 1 to 5, how bothersome was the problem with your **feet or ankles**? Circle one. (1=not bothersome, 5=very bothersome) 1 2 3 4 5
- (11) Is this problem more bothersome at home or on the job? Home Work No difference

PART 9.

The next three sections (Parts 9-11) are questions about **how you have been feeling lately**. Please answer the following questions about how you have felt **DURING THE PAST WEEK**.

	Rarely or none of the time (less than 1 day)	Some or a little of the time (1-2 days)	Occasionally or a moderate amount of the time (3-4 days)	Most or all the time (5-7 day)
(1) I was bothered by things that usually don't bother me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(2) I did not feel like eating; my appetite was poor.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(3) I felt that I could not shake off the blues even with help from my family or friends	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(4) I felt that I was just as good as other people	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(5) I had trouble keeping my mind on what I was doing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(6) I felt depressed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(7) I felt that everything I did was an effort	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(8) I felt hopeful about the future	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(9) I thought my life had been a failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(10) I felt fearful.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(11) My sleep was restless.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(12) I was happy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(13) I talked less than usual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(14) I felt lonely.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(15) People were unfriendly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(16) I enjoyed life.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(17) I had crying spells	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(18) I felt sad.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(19) I felt that people disliked me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(20) I could not get going.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PART 10.

The following questions are **about your general health**. These items are not necessarily related to severe physical illness but are things that people experience in their day to day lives.

Please answer how often have you experienced any of the following **DURING THE PAST MONTH**.

	Never	Occasionally	Sometimes	Fairly often	Very Often
(1) Your face became hot when you were not in a hot room or exercising.	<input type="checkbox"/>				
(2) You perspired excessively when you were not in a hot room or exercising	<input type="checkbox"/>				
(3) Your mouth became dry.	<input type="checkbox"/>				
(4) Your muscles felt tight and tense.	<input type="checkbox"/>				
(5) You were bothered by a headache.	<input type="checkbox"/>				
(6) You felt as if the blood were rushing to your head	<input type="checkbox"/>				
(7) You felt a lump in your throat or a choked-up feeling.	<input type="checkbox"/>				
(8) Your hands trembled enough to bother you.	<input type="checkbox"/>				
(9) You were bothered by shortness of breath when you were not working hard or exercising.	<input type="checkbox"/>				
(10) You were bothered by your heart beating hard.	<input type="checkbox"/>				
(11) Your hands sweat so that you felt damp and clammy	<input type="checkbox"/>				
(12) You had spells of dizziness	<input type="checkbox"/>				
(13) You were bothered by having an upset stomach or stomach ache.	<input type="checkbox"/>				
(14) You were bothered by your heart beating.	<input type="checkbox"/>				
(15) You were in ill health which affected your work.	<input type="checkbox"/>				
(16) You had a loss of appetite.	<input type="checkbox"/>				
(17) You had trouble sleeping at night.	<input type="checkbox"/>				

PART 11a.

*A number of statements which people have used to describe themselves are given below. Read each statement and then put an X in the appropriate box to the right of the statement to indicate **how you feel right now, that is, AT THIS MOMENT**. There are no right or wrong answers. Do not spend too much time on any one statement, but give the answer which seems to describe your feelings best.*

	Not at all	Somewhat	Moderately so	Very much so
(1) I feel calm.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(2) I feel secure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(3) I am tense	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(4) I feel strained.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(5) I feel at ease.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(6) I feel upset.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(7) I am presently worrying over possible misfortunes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(8) I feel satisfied	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(9) I feel frightened	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(10) I feel comfortable.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(11) I feel self-confident.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(12) I feel nervous.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(13) I am jittery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(14) I feel indecisive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(15) I am relaxed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(16) I feel content.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(17) I am worried	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(18) I feel confused	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(19) I feel steady	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(20) I feel pleasant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PART 11b.

*A number of statements which people have used to describe themselves are given below. Read each statement and then put an X in the appropriate box to the right of the statement to indicate **how you generally feel**. There are no right or wrong answers. Do not spend too much time on any one statement, but give the answer which seems to describe how you generally feel.*

	Almost never	Sometimes	Often	Almost always
(1) I feel pleasant.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(2) I feel nervous and restless.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(3) I feel satisfied with myself	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(4) I wish I could be as happy as others seem to be	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(5) I feel like a failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(6) I feel rested.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(7) I am "calm, cool, collected"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(8) I feel that difficulties are piling up so that I cannot overcome them.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(9) I worry too much over something that really doesn't matter.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(10) I am happy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(11) I have disturbing thoughts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(12) I lack self-confidence.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(13) I feel secure.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(14) I make decisions easily	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(15) I feel inadequate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(16) I am content	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(17) Some unimportant thought runs through my mind and bothers me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(18) I take disappointments so keenly that I can't put them out of my mind	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(19) I am a steady person.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(20) I get into a state of tension or turmoil as I think over my recent concerns and interests.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PART 12.

This section has questions about conditions you may have. Have you been told BY A DOCTOR that you have any of the following conditions?

	Yes, only within the last 12 months	Yes, but more than 12 months ago	No
(1) Diabetes mellitus (“sugar”)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(2) Thyroid problems.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(3) Kidney disease.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(4) Tuberculosis (TB)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(5) Sarcoidosis.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(6) Cancer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(7) Spastic bowel (irritable bowel syndrome)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(8) Rheumatoid arthritis.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(9) Osteoarthritis.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(10) Arthritis - don’t know type.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(11) Gout.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(12) Hypertension (“high blood pressure”)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(13) Lupus.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(14) Back disorder of the muscles, nerves, or discs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(15) Carpal tunnel syndrome.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(16) Tendonitis.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(17) Tenosynovitis (“Trigger finger”)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(18) Tennis elbow.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(19) Golfer’s elbow.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(20) Bursitis.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(21) Rotator cuff tear or shoulder.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(22) Depression.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(23) Anxiety disorder.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(24) Thoracic outlet syndrome.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(25) Ganglionic cyst (“Ganglion”)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(26) Ruptured disc or pinched nerve in the neck.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(27) Raynaud’s disease (“White finger”)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PART 13.

In the next section we would like to know about your computer use and your work station.

- (1) At your job, do you work on a computer or computer terminal? Yes No
- (1a) If **YES**, on average, how many hours a day do you work on the computer? _____
- (2) Has your work station at Bell Atlantic been adjusted to fit you better? Yes No
- (2a) If **YES**, when was it adjusted? Date _____
- (2b) If **YES**, what was adjusted? _____
- (2c) Has this adjustment made your work station more comfortable? Yes No
- (2d) How has this adjustment changed your pace of work? . Increase No Decrease
Change
- (3) Do you use a personal computer at home? Yes No
- (3a) If **YES**, how many hours a week do you use the computer? _____

PART 14.

The next few questions are for WOMEN ONLY. Men should skip this section and go to Part 15 .

- (1) Are you pregnant now? Yes No
- (2) Are you going through menopause (“change of life”) now? Yes No
- (3) Have you passed menopause? Yes No
- (4) Have you had surgery to remove either ovary? Yes No
- (5) Are you taking birth control pills now? Yes No
- (6) Are you taking hormone replacement pills now? Yes No
- (7) How many pregnancies have you had? _____

PART 15.

Have you ever ***broken or fractured any of the bones*** in your...

	Yes & have no problems with it now	Yes & still have problems with it	No
(1) Hands, wrists, fingers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(2) Neck.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(3) Shoulder.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(4) Back.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(5) Arm.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(6) Hip.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(7) Leg or legs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(8) Knee(s)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(9) Feet or ankles.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PART 16.

The next few questions are about your ***general health***.

- (1) What medicines/pills do you take regularly? Please list: _____
- (2) Do you currently smoke cigarettes? Yes No
- (2a) IF **YES**, how many cigarettes a day do you smoke (1 pack=20 cigarettes)? _____
- (2b) IF **NO**, are you an ex-smoker? Yes No
- (3) Do you currently participate in any regular activity or program (either on your own or in a formal class) designed to improve or maintain your physical fitness? Yes No

LASTLY

- (1) What do you find most stressful about your work on the job? _____
- _____
- (2) What signs of stress in yourself and coworkers do you see at work? _____
- _____
- (3) What do you find most rewarding about your work on the job? _____
- _____
- (4) What do you find most stressful about your work at home? _____
- _____
- (5) What do you find most rewarding about your work at home? _____
- _____

PLEASE TURN THE PAGE.

THANK YOU VERY MUCH FOR COMPLETING THIS SURVEY!

In order to process your reimbursement check, we need your name and address. After your check is sent, we will remove this page and discard it, so that the questionnaire does not have your name attached to it.

Please write in...

Your name: _____

Your mailing address: _____

Appendix B. Sub-scale items

Appendix B. Job demands sub-scale items and alpha coefficients.

Job demands sub-scale	Scale items	Cronbach's alpha
Pace	<ol style="list-style-type: none"> 1. My job requires working very fast 2. I rush my work to meet deadlines 3. My job requires working very hard 4. It is difficult to juggle all the requirements of my job. 5. The number of calls I receive is overwhelming. 6. For my job, I need to concentrate on many things at once. 7. I have to concentrate on one customer's problem while finishing the work from the previous customer 8. I am asked to do an excessive amount of work 	0.86
Emotional labor	<ol style="list-style-type: none"> 1. My ability to care is all used up at the end of the workday 2. I am physically exhausted at the end of the day 3. It's hard to be nice to customers for so many hours every day 4. In this job, I give it my all and there's nothing left at the end of the workday 5. I am mentally exhausted at the end of the day 	0.84
Time constraints	<ol style="list-style-type: none"> 1. There is enough time off the phone to finish my work for each customer. 2. I have enough time to give quality customer service. 3. I have enough time on the phone with my customers to solve their problems. 4. I have enough time during the day to follow up on the previous caller's problems or questions. 5. I have enough time to get the job done. 	0.82
Monitoring demands	<ol style="list-style-type: none"> 1. I have to calm down angry or frustrated customers in my job 2. As soon as I finish with one caller, there is another caller on the line. 3. To see if I am treating customers fairly, my work is monitored. 4. My work is monitored to make sure I follow the scripts the company provides. 	0.82
Technical demands	<ol style="list-style-type: none"> 1. I can't do my work because the computer system is down. 2. The computer system runs slowly. 3. The computer system breaks down or stops. 4. When the computer is down, it takes a lot of time to get it up and running again. 	0.78
Physical demands	<ol style="list-style-type: none"> 1. Sitting throughout the day is physically uncomfortable 2. I sit in the same position for several hours during the day 3. I hold my arms in one position for long periods of time during the day 	0.67

Appendix C. Non-respondents survey

A. GENERAL INFORMATION

*In this set of questions we would like **general information** about you and your family.*

(1) How old are you right now? _____

(2) What is your sex? Female Male

(3) Do you consider yourself to be
 African American White Asian American Hispanic Other _____

(4) What is the highest level of schooling you have completed?
 Some high school High school/ high school equivalent Some college or trade school Junior college/ trade school graduate University or college graduate Graduate school

(5) Are you now
 Single Married/Living with a partner Divorced/separated Widowed

(5a) If **you are married or living with a partner**, what is the highest level of schooling your spouse completed?
 Some high school High school/ high school equivalent Some college or trade school Junior college/ trade school graduate University or college graduate Graduate school

(5b) If **you are married or living with a partner**, is your spouse employed? Yes No

(5c) If **your spouse is employed**, what is your spouse's job? _____

(6) Do you have children? Yes No

(6a) If **YES, how many** children do you have. _____ (total)
_____ Under age 2 _____ Ages 2 through 5 _____ Ages 6 through 12
_____ Ages 13 through 18 _____ Ages 19 and older

(6b) How many children live with you the majority of the time? (more than 6 months/year) _____

(7) Are you currently providing any personal care or help to an aged or disabled relative(s)? Yes No

(7a) If **YES, how many** hours a week do you spend providing care? _____

(8) How tall are you without shoes? (please write in both feet and inches) _____

(9) How much do you weigh without shoes? (please write in number of pounds) _____

(10) What are your hobbies? (please list) _____

(11) Are you currently working for Bell Atlantic? Yes No

(11a) If **NO**, what is the reason you are currently not working at Bell Atlantic? Vacation Termination Quit FMLA Off on disability

(11b) If **NOT WORKING DUE TO A DISABILITY**, please list the type of disability. _____

(12) How long have you worked for Bell Atlantic? Years _____ Months _____

(13) What is your current job title? _____

(14) What department or product line do you work in? _____

(15) Are you. Full-time permanent employee Full-time non-permanent employee Part-time permanent employee Part-time non-permanent employee

(16) Do you have a second paid job? Yes No

(16a) If **Yes**, what is your job title for you second job? _____

(16b) How many hours a week do you work in this second job? _____

B. INFORMATION ABOUT YOUR JOB.

In this part of the survey, we would like to find out what the demands of your job are.

Please tell us HOW OFTEN the following things happen on the job. Please write in...				
1	2	3	4	5
Rarely/Never	Sometimes	Often	Usually	Always/Most of the time

- (1) My job requires working very fast. _____
- (2) My job requires working very hard. _____
- (3) It is difficult to juggle all the requirements of my job. _____
- (4) I am asked to do an excessive amount of work. _____
- (5) I sit in the same position for several hours during the day. _____
- (6) I hold my arms in one position for long periods of time during the day. _____
- (7) I have enough time to get the job done. _____
- (8) I am free from conflicting demands that others make. _____

C. SATISFACTION QUESTIONS

In this part of the survey, we are interested in how satisfied you are with your life.

All things considered, HOW SATISFIED are you with the following areas of your life? Please write in...				
1	2	3	4	5
Very dissatisfied	Somewhat dissatisfied	No feelings either way	Somewhat satisfied	Very satisfied

- (1) Your marital or love relationship _____
- (2) Your job _____
- (3) Your health. _____
- (4) Your family life _____
- (5) Your standard of living _____
- (6) The way you feel about yourself. _____
- (7) Your life overall _____

D. HEALTH CONDITIONS

*This section has questions about **conditions you may have**. Have you been told **BY A DOCTOR** that you have any of the following conditions?*

	Yes, only within the last 12 months	Yes, but more than 12 months ago	No
(1) Diabetes mellitus (“sugar”)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(2) Spastic bowel (irritable bowel syndrome)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(3) Rheumatoid arthritis.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(4) Osteoarthritis.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(5) Arthritis - don’t know type.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(6) Hypertension (“high blood pressure”)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(7) Back disorder of the muscles, nerves, or discs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(8) Carpal tunnel syndrome.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(9) Tendonitis.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(10) Tenosynovitis (“Trigger finger”)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(11) Bursitis.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(12) Rotator cuff tear or shoulder.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(13) Depression.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(14) Anxiety disorder.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(15) Thoracic outlet syndrome.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(16) Ganglionic cyst (“Ganglion”)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(17) Ruptured disc or pinched nerve in the neck.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(18) Raynaud’s disease (“White finger”)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

LIST OF POSSIBLE PUBLICATIONS

Although I have not, to date, published any papers from this study, several manuscripts are in progress. The first is a paper based on Study Aims 1, 2, and 3, which examines the stressful exposures in both the job and home environments and their effects on MSD symptoms. The second paper focuses on the relationships among job strain, home strain, depression and MSDs and is based on Study Aim 4. Finally, I am interested in writing a paper based on different theoretical approaches to women, work and stress and plan to use these data to illustrate possible issues and gaps in the field that could be addressed in the future. Included in this paper will be a discussion on changes in health that may be affected by changes in work throughout the life course.