

## Original Article

# Gender-related Factors Associated with Upper Extremity Function in Workers

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**Objectives:** This study aimed to find gender distinctions in terms of the sociology of the population; to determine work-related factors; to analyze gender differences in daily living, work, sports, and art performances; and to identify gender-related factors that limited performance of daily living and work activities.

**Methods:** A questionnaire was designed that included disabilities of the arm, shoulder, and hand (DASH), accident history, disease history, work duration at current workplace, marital status, job satisfaction, job autonomy, and physical demands of the job. Out of 1,853 workers surveyed, 1,173 questionnaires (63.3%; 987 males, 186 females) included responses to DASH disability and DASH optional work and were judged acceptable for analysis.

**Results:** Upper extremity functional limitation during work and daily living was higher for females than males. The limitations for males increased according to their household work time, accident history, work duration, job satisfaction, physical demand, and job autonomy. Meanwhile, female workers' upper extremity discomfort was influenced by their disease history, job satisfaction, and physical demands. In addition, the size of the company affected male workers' upper extremity function, while marriage and hobbies influenced that of female workers.

**Conclusion:** This study addressed sociodemographic factors and work-related factors that affect each gender's upper extremity function during daily living and working activities. Each factor had a different influence. Further studies are needed to identify the effect that role changes, not being influenced by risks at work, have on musculoskeletal disorders.

**Key Words:** Gender, DASH, Disability, Upper extremity, Work

## Introduction

Work-related musculoskeletal disorders (WMSDs) refer to cases where one or more symptoms of pain, stiffness, burning sensation, or numbness at particular joints persist for at least one week or more than once in a month during the past year [1]. Workload can be concentrated on partial body regions such as

the shoulders, arms, neck, and hands in workers who perform repetitive work, and occupational musculoskeletal disorders mainly developing from increased mental stress load during work lead to chronic fatigue at these and other body regions [2]. In addition, physical work factors, psychosocial factors, environmental factors, and individual characteristics affect work-related upper extremity musculoskeletal disorders [3].

Functional limitation and sports/arts related social activities limitation in daily living as well as in workplace have been reported in workers with musculoskeletal symptoms and workers with upper extremity musculoskeletal disorders among workplace workers [4,5]. The Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire, which was designed to measure the individual subjective limitation in upper extremity

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motion and the disabilities in one or more regions of upper extremity, is widely utilized for investigating related physical functions, and DASH has been utilized in many studies in populations with symptom complaints [6,7], the general population [8], general working population [9], as well as for patients with musculoskeletal disorders (MSDs). In one study, the mean total DASH score and each component score were statistically significantly higher in older workers, female workers, and manual workers in a general working population [9].

Upper extremity discomfort has been reported to be greater in female than male workers [10-12], and gender has been implicated as a potential confounding variable or effect-modifying factor in an epidemiological study [10]. Higher musculoskeletal symptom complaints in females may reflect gender-related differences in body size, muscle strength, motor ability, and hormones; more predominant female involvement with household work and childcare; information bias, with females being more likely to talk about discomfort; gender differences in job and mental support even in the same job category; and a more male-compatible working environment [13]. However, no firm data concerning gender differences has been published [10]. Most of the previous studies on gender differences [10-12] only examined the difference in the region of upper extremity pain in the general population or the general working population [10], or the difference in pain complaint rate between female and male workers by industry category [11,12].

The fact that more females suffer from MSDs than males suggests that there are influential gender differences in personal factors and work-related factors. Appropriately, one of the aims of this study was to identify gender distinctions among male and female employees in small and medium manufacturing enterprises in terms of sociodemographic and work-related factors. A second goal was to identify gender-related differences in the performance in daily living, work, sports, and art using the Korean DASH 2nd edition [14], which was developed to measure upper extremity functional limitation. Finally, this study sought to clarify the factors that limit the performance of each gender in daily living and work.

## Materials and Methods

### Materials

The DASH and structural questionnaires for working environment assessment were distributed to 1,853 workers in 16 companies engaged in the manufacture of machinery ( $n = 8$ ), metal ( $n = 5$ ), electronics ( $n = 1$ ), and other items ( $n = 2$ ). The questionnaires were collected 2-4 weeks later and examined. Of the 1,853 workers, 1,173 (63.3%), fully completed the MSD

questionnaire and the working environment assessment questionnaire, and filled out both the DASH-related items concerning regular daily activities and work ability, enabling conversion to a 100-point scale.

### Methods

This study centered on individuals' sociodemographic and work-related factors that influenced the function of the upper extremities. Furthermore, this study surveyed sex, age, work duration, marital status, pastimes and hobbies, average household work time, disease history, accident history, and the degree of physical demand. Regarding pastimes and hobbies, this study attempted to determine whether the subjects were involved in activities that can cause MSDs such as computer-related work, playing musical instruments, needlework, calligraphy, tennis, badminton, squash, soccer, foot volleyball, basketball, and skiing. The disease history included illnesses that led to MSDs, for example, rheumatoid arthritis, diabetes, lupus erythematosus, gout, and alcoholism. Regarding accident history, the authors investigated whether the subjects had experienced accidents (e.g., injuries from sports, car accidents, tumbles, or falls) that damaged their hands, fingers, wrists, arms, elbows, shoulders, necks, backs, legs, or feet. Regarding work-related psychosocial factors, the authors conducted a qualitative analysis of job satisfaction, physical demand, job autonomy, with a five-point scale.

The DASH questionnaire used in this study was developed by the Upper Extremity Collaborative Group, American Academy of Orthopaedic Surgeons (UECG, AAOS) to measure the effect of musculoskeletal health status and damage affecting upper extremities on various functions through a conceptual literature review of measurement of quality of life and health status, expert discussions, and reconsideration of the concepts for existing quantity assessment tool since 1990s [15]. UECG concentrated on DASH questionnaire measurement of symptoms and disability particularly focusing on physical function among physical, social, and mental dimensions [16]. The DASH questionnaire is composed of questions for symptoms and ability to perform specific motions. Subjects should answer based on condition in the last week, choosing the closest answer in cases where the particular motion did not occur. Which hand or arm was used does not matter, and answers are given on 5-point scale based on performance, irrespective of the way the motion was performed. The questionnaire had three main parts containing 30 items in total: questions related to the ability to perform specific motions (21 items); questions related to the severity of symptom (4 items); and other questions related to social activities, sleep disorders, and psychologi-

cal influences. Optional questions concerned four items about work ability and four items about sports/arts. The design of all of the questions was such that the scores were converted to a 100-point scale by formulas described for each questionnaire [14]. In this research, the authors assessed 21 questions pertaining to specific motions in daily life and four questions about work ability through DASH disability scores and optional work scores, respectively.

The DASH was found to very highly correlate with visual analog scale (VAS) in pain, function, and work ability ( $r = 0.65-0.80$ ) [6,17], and highly correlate with SF-36, a generic health status measure, in physical function ( $r = 0.68$ ) and pain distribution ( $r = 0.56$ ) [18].

Total DASH score (except for optional items) and each DASH component score were obtained by conversion to a 100-point scale. For physical function, the DASH disability/symptom score is calculated by  $[(\text{sum of } n \text{ responses}) / (n - 1)] \times 25$ , where  $n$  = total number of questions answered. If three or more items are not answered, this score cannot be calculated. Items with a score of 1 (No difficulty) in the 5-point scale will give a total DASH score of 0, and all items with a score of 5 (Unable) will give total DASH score of 100. Optional modules are scored by converting to a 100-point scale, by adding up assigned values for each response, dividing by 4, subtracting 1, and multiplying by 25. An optional module score may not be calculated if there are any missing items [14].

### Statistical analyses

Age, household work time, pastimes/hobbies, accident history, disease history, and marital status were set as variables of the individual factors. Industry category, sizes of companies, work duration at current workplace, physical demand, job satisfaction, and job autonomy were set as work-related factors by subject gender. Chi-square test was used for comparison of the factors between genders. The t-test was used for comparing the scores in daily activity disability/symptom, work, and sports/arts components of DASH between genders. Multiple linear regression was carried out with the daily activity disability score and the work score as dependent variables, and with personal sociodemographic factors and work-related factors as independent variables. Dummy variables included pastimes/hobbies, disease history, accident history, marital status, job satisfaction, physical demand, job autonomy, industry category, and sizes of companies. There were two job categories in this study. The first was the machinery and metal manufacturing industries and the second was the electronics manufacturing industry. The size of the workplace was divided into two categories: "300 people or more" and "fewer than 300 people." The work-

related sociopsychological factors of job satisfaction, physical demand, and job autonomy were divided into high and low risk categories. For job satisfaction, "very satisfied," "fairly satisfied," and "so-so" belonged to the low risk category, while "slightly unsatisfied" and "very unsatisfied" were a part of the high risk category. Concerning physical demand, the low risk group consisted of "not difficult at all," "durable," and "so-so", while the high risk group was composed of "mildly difficult" and "very difficult." For job autonomy, "I can control it when necessary" and "I can control it a little bit" were in the low risk category while "I cannot control it at all" was in the high risk category. Statistical software used in the analyses was SPSS ver 13.0.

## Results

### Gender difference in individual socio-demographic factors

Among the 987 males (84.1%) and 186 females (15.9%), age distribution was even across the third-to-fifth decade in male,

**Table 1.** Characteristics of individual sociodemographic factors of study subjects by gender

Variable	Class	Male	Female	p-value
Age (years)	≤ 29	377 (38.2%)	97 (52.2%)	0.00
	30-39	341 (34.9%)	27 (14.5%)	
	40-49	201 (20.4%)	43 (23.1%)	
	50-59	68 (6.9%)	19 (10.2%)	
Marital status	Single	415 (42.0%)	92 (49.5%)	0.06
	Married	572 (58.0%)	94 (50.5%)	
Pastime/hobby	No	461 (46.7%)	113 (60.8%)	0.00
	Yes	526 (53.3%)	73 (39.2%)	
Household work (hours)	No	498 (50.5%)	32 (17.2%)	0.00
	< 1	357 (36.2%)	49 (26.3%)	
	1-2	100 (10.1%)	63 (33.9%)	
	2-3	20 (2.0%)	32 (17.2%)	
	≥ 3	12 (1.2%)	10 (5.4%)	
Disease history	No	943 (95.5%)	176 (94.6%)	0.57
	Yes	44 (4.5%)	10 (5.4%)	
Past accident	No	582 (59.0%)	130 (69.9%)	0.01
	Yes	405 (41.0%)	56 (30.1%)	

and third decade prevailed in female. Disease history was not statistically different between genders, but proportionally more males (405, 41.0%) reported past accidents than females (56, 30.1%). Most workers were married (572 males, 58.0%; 94 females, 50.5%). In terms of pastimes or hobbies, the gender difference was significant with 526 males (53.3%) and 73 females (39.2%) enjoying pastimes or hobbies. Of the male workers,

357 (36.2%) performed less than 1 hour of household work each day and 498 workers (50.5%) doing no household work at all. Thirty-two of the female workers (17.2%) did not do household work at all, 49 workers (26.3%) did household work for less than 1 hour, 63 workers (33.9%) for 1-2 hours, and 42 workers (22.6%) for more than 2 hours. The results from females were statistically different from males (Table 1).

**Table 2.** Characteristics of work-related factors of study subjects by gender

Variable	Class	Male	Female	p-value
Industry category	Metal	340 (34.4%)	40 (21.5%)	0.00
	Machinery	386 (39.1%)	42 (22.6%)	
	Electronics	234 (23.7%)	95 (51.1%)	
	Other	27 (2.7%)	9 (4.8%)	
Size of company	< 300	481 (48.7%)	66 (35.5%)	0.00
	≥ 300	506 (51.3%)	120 (64.5%)	
Work duration (years)	≤ 5	528 (53.5%)	133 (71.5%)	0.00
	5-10	187 (18.9%)	33 (17.7%)	
	10-15	113 (11.4%)	15 (8.1%)	
	15-20	81 (8.2%)	4 (2.2%)	
	≥ 20	78 (7.9%)	1 (0.5%)	
Job satisfaction	Very satisfied	68 (6.9%)	4 (2.2%)	0.04
	Fairly satisfied	298 (30.2%)	53 (28.5%)	
	So-so	513 (52.0%)	98 (52.7%)	
	Slightly unsatisfied	77 (7.8%)	23 (12.4%)	
	Very unsatisfied	31 (3.1%)	8 (4.3%)	
Physical demand	Not difficult at all	42 (4.3%)	6 (3.2%)	0.01
	Durable	336 (34.0%)	53 (28.5%)	
	So-so	291 (29.5%)	41 (22.0%)	
	Mildly difficult	263 (26.6%)	73 (39.2%)	
	Very difficult	55 (5.6%)	13 (7.0%)	
Job autonomy	Low*	314 (31.8%)	83 (44.6%)	0.00
	Medium <sup>†</sup>	432 (43.8%)	73 (39.2%)	
	High <sup>‡</sup>	241 (24.4%)	30 (16.1%)	

\*Low: I cannot control it at all.

<sup>†</sup>Medium: I can control it a little bit.

<sup>‡</sup>High: I can control it when necessary.

### Gender difference in work-related factors

The industry categories were evenly distributed in male workers, and more (95, 51.1%) were employed in electronics manufacturer in females. Regarding the sizes of the companies, the male distribution was evenly balanced, whereas the female distribution was biased toward companies of 300 people or more (120 workers, 64.5%). In most cases, the work duration at current workplace was less than 5 years for both males (528, 53.5%) and females (133, 71.5%). Concerning job satisfaction, most workers answered "So-so" (513 males, 52.0%; 98 females, 52.7%). Concerning physical demands, most male and female workers answered between "Mildly difficult" and "Durable". Concerning job autonomy, females scored significantly lower than males, with 314 male workers (31.8%) and 83 female workers (44.6%) answering "I cannot control it." (Table 2).

### Gender difference in converted DASH scores factors

Mean DASH score was not significantly different between genders for the sports/arts component. However, upper extremity functional disabilities in daily living and working were significantly different between genders, with higher scores in female workers (Table 3).

### Comparison of effects of factors on converted DASH

**Table 3.** DASH components score by gender

DASH	Gender	N	Mean ± S.D.	p-value
DASH D/S score	Male	987	5.14 ± 7.47	0.00
	Female	186	10.56 ± 11.29	
Disability score	Male	987	3.54 ± 6.66	0.00
	Female	186	7.75 ± 10.55	
Work score (option)	Male	987	7.31 ± 12.65	0.00
	Female	186	13.77 ± 16.73	
Sport/art score (option)	Male	602	6.02 ± 13.90	0.94
	Female	66	6.16 ± 11.83	

DASH: disabilities of the arm, shoulder and hand.

**Table 4.** Factors affecting male worker's DASH disability and work score by multiple linear regression

	Disability score			p-value	Work score			p-value
	B	S.E	$\beta$		B	S.E	$\beta$	
Constant	-0.38	1.06		0.72	0.01	1.95		0.99
Age (years)	0.02	0.04	0.02	0.65	-0.03	0.07	-0.02	0.72
Marital status (0: single, 1: married)	-0.92	0.53	-0.07	0.08	-1.26	0.98	-0.05	0.20
Pastime/Hobby (0: yes, 1: no)	0.05	0.45	0.00	0.92	0.32	0.82	0.01	0.70
Household work (hours)	0.99	0.26	0.12	0.00	1.24	0.48	0.08	0.01
Disease history (0: no, 1: yes)	0.43	1.01	0.01	0.67	1.60	1.86	0.03	0.39
Past accident (0: no, 1: yes)	1.28	0.43	0.10	0.00	2.19	0.78	0.09	0.01
Industry category (0: electronics, 1: metal-machinery)	0.47	0.67	0.03	0.48	1.14	1.23	0.04	0.36
Size of company (0: $\geq 300$ , 1: $< 300$ )	0.74	0.50	0.06	0.14	2.96	0.91	0.12	0.00
Work duration (years)	0.15	0.04	0.16	0.00	0.19	0.08	0.10	0.01
Job satisfaction (0: high, 0: low)	1.45	0.71	0.07	0.04	4.04	1.30	0.10	0.00
Physical demand (0: low, 1: high)	0.98	0.48	0.07	0.04	5.47	0.89	0.20	0.00
Job autonomy (0: high, 1: low)	1.10	0.46	0.08	0.02	3.35	0.85	0.12	0.00
F-value		6.13				12.15		
Adjusted R <sup>2</sup>		0.06				0.12		
p-value		0.00				0.00		

DASH: disabilities of the arm, shoulder and hand.

### scores by gender

#### *Difference in upper extremity functional limitations during daily living and working in male workers*

Workers with past accident experience, which is an individual sociodemographic factor, and a long household work time presented significant limitations during their daily living and working activities. Age, marital status, pastimes/hobbies, and past disease experience did not show significant differences. For work-related factors, work duration, job satisfaction, physical demand, and job autonomy all increased the limitations during daily living and working activities. As the work duration grew longer, the physical demand grew greater, job satisfaction and autonomy lessened, and the functional limitation increased during both daily living and working activities. Moreover, limitations increased in inverse proportion to the sizes of the companies (Table 4).

#### *Difference in upper extremity functional limitations during daily living and working in female workers*

Workers with disease history, one of the individual sociodemographic factors, showed increased functional limitation during

daily living and working. Concerning marital status, married workers presented with decreased functional limitation only during work. Functional limitations increased when workers did not enjoy pastimes or hobbies. No differences by age, accident experience, and household work time were observed during daily living and working. Regarding work-related factors, functional limitation increased together with job dissatisfaction and physical demands both in daily living and work. Job autonomy, the industry category, work duration, and the size of the company did not have significant effects (Table 5).

## Discussion and Conclusion

A previous study conducted in a general working population reported statistically significantly higher DASH scores in females [9]. The present study also revealed scores that were about twice as high in female workers, with scores related to the ability to perform specific motions in daily living of  $5.14 \pm 7.47$  and  $10.56 \pm 11.29$ , and optional work scores of  $7.31 \pm 12.65$  and  $13.77 \pm 16.73$  in males and females, respectively. The DASH scores in this study were low, as this study was per-



**Table 5.** Factors affecting female worker's DASH disability and work score by multiple linear regression

	Disability score				p-value	Work score				
	B	S.E	$\beta$			B	S.E	$\beta$	p-value	
Constant	-1.82	3.96			0.65	4.63	5.70			0.42
Age (years)	0.20	0.16	0.21		0.23	0.01	0.24	0.01		0.97
Marital status (0: single, 1: married)	-3.31	2.88	-0.16		0.25	-11.04	4.15	-0.33		0.01
Pastime/Hobby (0: yes, 1: no)	-0.79	1.61	-0.04		0.63	5.59	2.31	0.16		0.02
Household work (hours)	0.14	0.80	0.02		0.86	0.03	1.15	0.00		0.98
Disease history (0: no, 1: yes)	9.45	3.23	0.20		0.00	11.18	4.65	0.15		0.02
Past accident (0: no, 1: yes)	0.29	1.61	0.01		0.86	-2.35	2.32	-0.06		0.31
Industry category (0: electronics, 1: metal-machinery)	0.57	3.96	0.03		0.89	7.71	5.70	0.23		0.18
Size of company (0: $\geq 300$ , 1: $< 300$ )	-2.16	2.44	-0.10		0.38	-4.07	3.51	-0.12		0.25
Work duration (years)	0.47	0.25	0.18		0.06	0.41	0.36	0.10		0.26
Job satisfaction (0: high, 0: low)	5.84	2.16	0.21		0.01	10.99	3.11	0.25		0.00
Physical demand (0: low, 1: high)	3.31	1.68	0.16		0.05	10.14	2.42	0.30		0.00
Job autonomy (0: high, 1: low)	0.56	1.56	0.03		0.72	1.29	2.25	0.04		0.57
F-value		3.67					7.54			
Adjusted R <sup>2</sup>		0.15					0.30			
p-value		0.00					0.00			

DASH: disabilities of the arm, shoulder and hand.

formed in the general working population and not in clinical cases group. In a study in general adult working population in Germany, the daily living disability/symptom score (30 items) was  $13 \pm 15$ , and work score was  $13 \pm 20^9$ . In a study in general population in the United States [8], the respective scores were  $10.1 \pm 14.7$  and  $8.8 \pm 18.4$ , being lower than the present scores of female workers but higher than the present scores of male workers.

Concerning general personal sociodemographic factors, male workers with accident history and female workers with disease history presented with increased upper extremity functional limitation. This may have reflected a gender difference in social activities and severity of accident and disease. In addition, disease history, particularly diabetes, gout, and rheumatism, and past accident cannot be discounted, as they are musculoskeletal risk factors [19]. In a study of social workers in a community senior service center, workers with a disease diagnosis showed a higher musculoskeletal symptom complaint rate compared with workers without disease diagnosis [20]. Furthermore, musculoskeletal symptom complaint rate was higher in workers with an injury likely to be associated

with MSDs, rheumatic arthritis, diabetes mellitus, or making a hobby of computer-related activity, football, or badminton [21].

From the point of view of gender, household work has been considered as a uniquely female role, with workplace responsibility predominantly the domain of males and household responsibility primarily that of females. But, male participation in household work is increasing with the increase of double-income families. Increased work time in non-unique areas may be a stress factor. Role change is the process in which an individual changes 'into role' or 'out of role' in the social system. Although a female worker from a double-income family who returns to the workplace from home should play a working role as an employee not as a mother or a spouse, the change from a home-based to a workplace-based role can be difficult when she experiences psychological and physical pressures due to household work. Consequently, she can experience home-related stress at the workplace [22]. This study revealed that increased household work time induced upper extremity functional limitation both at home and in the workplace for male workers, while household work and increased household work time did not influence female workers, indicating that difference in

unique role by gender may affect the upper extremity function at home and workplace as well as stress. The observation of a lack of an effect of household work time on female workers is consistent with studies in golf caddies [23], workers in electronics manufacturer, textile and sewing, and food manufacturer [24], and housewives [25]. Suggested reasons have included role difference [22], and decreased tendency of female to acknowledge pain, even with the demands of long household work time with infants [25].

No difference by marital status was observed in male workers in this study. In females, upper extremity functional limitation during work was decreased in married workers, in contrast to a study in insurance inspectors reporting no difference by marital status [26], or studies reporting more pain in married workers [27,28]. This discrepancy may reflect the greater number of unmarried female workers in the electronics manufacturing industry. Furthermore, unmarried female workers tended more to take more difficult jobs and to complain about their inconveniences more.

Industry category, a work-related factor, is a risk factor for musculoskeletal symptom complaints [29]. In addition, in this study the upper extremity function did not show any gender difference regardless of the industry category (metal-machinery manufacturers or electronics manufacturers). The scores differed depending on the industry, but this appeared to be due to the job and the task, rather than due to the industry classification. More precise studies are necessary to clarify this point.

The total DASH score and each component score are statistically significantly different in different age groups [9]. However, the upper extremity function was increasingly limited as the work duration at the current workplace became longer. In addition, age did not have a significant influence. The DASH questionnaire may have more highly correlated with work duration at the current workplace, as it examined upper extremity functional disabilities during the past week.

Among work-related factors, a study reported significant decreases in symptoms and functional limitation through job stress management and ergonomic intervention in workers complaining of work-related upper extremity symptoms using DASH [30]. The result may indicate that personal sociodemographic factors, occupation- and work-related factors, and psychosocial factors as well as disease symptoms affect functional disability. Also in this study, upper extremity functional limitation in male workers increased together with physical demands during both daily living and working, and in female workers physical demands increased functional limitation only during work, but not in daily living. This study also showed that upper extremity functional limitation of both genders increased as job

dissatisfaction and physical demands increased.

Studies have consistently reported that high job demands are highly associated with upper extremity musculoskeletal disorders [31]. As a related mechanism, it has been reported that heightened psychological burden increases muscle strain, increases recognition for symptoms or decreases the ability to deal with symptoms, resulting in symptom development or worsening [32].

In another study of manufacturing workers like this study, Tsai et al reported that persons in more physically demanding jobs had an increased relative risk (RR = 1.57) for MSDs [33]. In another MSD-related study, the relative risk of cervical pain was 2.1 in the high-physical-demand groups and 2.4 in the low-social-support groups [34]. Likewise, the high-physical-demand groups indicated 2.1 and 1.9 points of RR for neck/shoulder and arm/wrist/hand pain, respectively, while the low-social-support groups showed 2.2 for arm/wrist/hand pain [35]. According to one cohort study surveying computer-related workers in Northern Europe, the range of odds ratio for upper extremity functional limitation was 1.6-1.9 in high-physical-demand, low-job-autonomy, and high-job-stress groups [36,37]. Some Korean studies have shown that musculoskeletal symptoms are more severe when the physical demand is high and the job autonomy is low [28,38,39].

This study had some limitations. First, the ratio of female workers was low due to the investigated small and medium enterprises' characteristics. Second, although the questionnaire prompted each worker to enter his/her work and job category, the questionnaire response rate was very low and the responses were too diverse to be used as variables, so each job category and work could not be compared separately. Third, the definition of household work time, an important variable in male workers, was somewhat ambiguous because it was not separated from childcare. Another study that used a DASH questionnaire reported that upper extremity functions were affected by ergonomic factors and job stress factors [30], but this study lacked the analytical power to address this issue.

Despite these limitations, a gender difference was confirmed in the effects of personal sociodemographic factors and work-related factors on the upper extremity function during daily living and work activities. In males, a marginal difference was noted for personal sociodemographic factors during daily living and working activities. However, in females, some factors were different. Especially for male workers, upper extremity functional limitation at home and in the workplace, as well as stress, were observed involvement in household work to which they were not accustomed was increased.

However, each sociodemographic factor and work-related

factor, which affected the upper extremity function of each gender during their daily living and working activities showed varying degrees of influence. Moreover, only some particular factors had a meaningful effect. Further studies are needed to identify the effect of role-changes in response to factors such as marriage or housework, and which are not influenced by risks at work, on MSDs.

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