

REVIEW

# Full-Time Homemakers: Workers Who Cannot “Go Home and Relax”

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*This paper examined how musculoskeletal disorders (MSDs) of female homemakers were studied in the literature. It also presented preliminary findings from field observations of housework and fulltime homemakers in urban settings. PubMed, Ergonomics Abstracts, Sociofile, and PsycINFO databases were used in the literature search. The review focused on comparing demands of housework and paid work. Also, exposure factors found in studies of various occupations were compared with the results of field observations of housework in 4 homes in Beirut, Lebanon. Few studies systematically examined associations between MSDs and risk factors in housework. Some well-known risk factors for MSDs were identified in the Beirut homes; however, other unique factors were noted. Housework activities expose homemakers to known risk factors for MSDs, which calls for further studies to identify appropriate intervention and prevention strategies.*

homemakers    housework    paid work    musculoskeletal disorders

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## 1. INTRODUCTION

Musculoskeletal disorders (MSDs) have been identified as a major health concern that affects sizeable segments of the general and working populations [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14] worldwide. Work is a major determinant of these disorders, and exposures in paid work have been associated with back, neck [15, 16, 17, 18, 19], shoulder [4], and upper- and lower-limb disorders [20].

Both physical and psychosocial causal factors for MSDs have been found in paid work, although

the pathways leading to MSDs are not always clear [21, 22, 23, 24, 25]. Physical work demands associated with these disorders include heavy physical work in general such as heavy lifting, repetitive work [4, 26], prolonged sitting posture [15, 17], prolonged standing, especially without access to seats [27, 28], neck flexion [16, 17, 29, 30], work with abducted arm (or arm above shoulder level) [30], bending or twisting [9, 15, 30], exposure to whole-body and hand–arm vibration [9, 17], duration of computer work [31], and poor workstation design for VDU work [17, 21, 23, 32]. Associations have been found

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between symptoms and the following workplace psychosocial and organizational factors: high psychological job demands [4, 16, 18], low skill discretion [4, 16, 18], low decision latitude [6, 33], poor social support [6, 16, 18, 34], and low job satisfaction [35].

Gender differences have been found in prevalence of neck, shoulder, and upper- and lower-limb problems, both in the general population [36, 37, 38] and at work [39]. Much of the female excess in MSDs may be due to differential ergonomic exposures such as more repetitive work, awkward postures and less task variety in tasks usually assigned to women [21, 31, 39, 40]. Gender may be a surrogate for workplace exposure variables, at least in some instances [41, 42]. However, even after adjustment for some workplace exposure differences, a residual gender difference in outcome is often found. While unidentified workplace exposure differences or intra-stratum confounding may account for the residual difference [43], household task participation has also been evoked as a possible explanation [21, 39].

This paper seeks to identify potential housework-related risk factors for MSDs in a literature review and in exploratory studies done in Nabaa, Beirut, Lebanon in 2004–2005. Attention has been given to known biomechanical risk factors (heavy physical work, prolonged sitting, prolonged standing, repetitive work, upper-limb abduction, bending, twisting, and neck flexion) as well as psychosocial risk factors (high psychological job demands, low skill discretion, low decision latitude, low social support, and low job satisfaction) associated with MSDs, and likely to be found in housework. Strategies involving a risk factor for outcomes other than MSDs, such as strategies for handling detergents, have already been studied [44].

## 2. METHODS

### 2.1. Search Strategy

The PubMed, Ergonomics Abstracts, Sociofile and PsycINFO databases were examined for the years 1995–2005 for articles in peer-

reviewed journals in English, with abstracts. Where possible, the search was restricted to adults. The search used the following main rule: [(housework or domestic or household) AND musculoskeletal]; or adaptations thereof, e.g., [housework or domestic work or domestic activit\* or homemaker or household activit\*) AND musculoskeletal]. The search was performed either on the Title and Abstract fields, or on All fields. For certain databases, the search was limited to peer-reviewed articles in English.

The purpose of this literature review was to identify the types of risk factors commonly observed in housework, and to delineate the similarities between housework and certain paid occupations.

### 2.2. Housework, MSDs and Preliminary Field Observations in Lebanon

To further explore the risk factors for MSD among full-time homemakers, a review of previous studies conducted on households in suburban areas of Beirut was conducted. Field observations were also carried out as preliminary ergonomics assessment of actual housework.

#### 2.2.1. Preliminary household ergonomics observations

A household in Nabaa, Beirut, was observed for a period of 2 h while “Samia” was cleaning. Nabaa is an impoverished densely populated area on the outskirts of East Beirut. It is inhabited by families from Mount Lebanon and to a lesser extent by families originally from South Lebanon. This area has poor infrastructure and a high rate of movement both within and in and out of the community.

Samia was 38 years old and had two children, aged 6 and 8. She lived with her husband and his mother, and they were joined from time to time by two brothers-in-law, who might have stayed with them for several weeks at a time. The apartment was on the second floor and had two bedrooms, a large living room, a kitchen, and a bathroom. Floors were tiled and there were several carpets.

All actions were noted with paper and pencil by an experienced ergonomist. Rooms cleaned were mapped and the placement of furniture was indicated. Samia was asked to explain the reasons for some actions. Samia was also asked to describe all her actions for 24 h preceding the observations.

Another set of observations concerned another woman who was cleaning in crowded conditions in spaces ill-adapted to the task. Her movements were so rapid that the observer was challenged to capture all the relevant postures. A third set of observations and conversations were held with a woman who pointed out some of the less visible psychosocial dimensions of her work including a demanding husband and social and family pressures.

**2.3. Comparison Between Housework and Selected Paid Occupations**

The authors observed paid work in several common women’s occupations whose task nomenclature showed some overlap with domestic work [28, 45, 46, 47]. We were able to compare our observations of these occupations with the preliminary observations of the housework in Nabaa.

**3. RESULTS**

**3.1. Number of Articles Identified**

Fifty-six articles potentially dealing with the effects of housework on MSDs were identified in four databases (Table 1). We chose to search widely in the hope of finding a large number of articles, and this resulted in a large proportion (25%) of irrelevant articles. In addition, the largest group of articles (16) dealt with the ability to do housework used as a measure of functional status among patients with musculoskeletal or other health problems, rather than with the effects of housework. Only 12 articles dealt specifically with musculoskeletal problems or pain among those doing housework, while another 7 articles dealt with more diffuse effects of housework, child care, or “the double workday”, such as fatigue or lack of sleep.

Among the articles on the effects of housework on health, most were primarily oriented toward examining the effects of paid work, considering housework as part of a larger picture of exposures.

**TABLE 1. Publications Retrieved From Scientific Journal Databases, November 2005**

Source	Outcome, Musculoskeletal	Outcome, Fatigue or Sleep Problems	Outcome, Physical	Outcome, Psychosocial	Stressor, Physical	Stressor, Psychosocial	Tool for Assessing Functional Status	Other <sup>a</sup>
PubMed <sup>b</sup> (N = 19)	6	1		1	1	1	6	5
Ergonomics Abstracts <sup>c</sup> (N = 21) <sup>d</sup>	6	6	2	3	2		2	2
PsycINFO <sup>e</sup> (N = 21) <sup>d</sup>	4	1	1	2	2	2	10	6
Sociofile <sup>f</sup> (N = 3)			1				1	1
Total (N = 56) <sup>g</sup>	12	7	4	5	5	2	16	14

Notes. a—retrieved because search terms were very broad. Examples: about professional cleaners only; “domestic” referring to gross domestic product; “activit\*” referring to an analysis of work activity; “housework” or “musculoskeletal” found in bibliography but not text; b—(housework or domestic work or domestic activit\* or homemaker or household activit\*) AND musculoskeletal—items with abstracts in peer-reviewed journals, in English, all fields, adult, human, 1995–2005; c—title or abstract word: housework or “domestic work\*” or “domestic activit\*” or homemak\* or “household activit\*”—items with abstracts in peer-reviewed journals, in English, title or abstract, 1995–2005; d—some items were classed in more than one category; e—[housework or homemaker or (household activit\*) or (domestic work) or (domestic activit\*)] AND musculoskeletal—items with abstracts in peer-reviewed journals, in English, all fields, adult, human, 1995–2005; f—(household or domestic or housework) AND musculoskeletal—items with abstracts in peer-reviewed journals, in English, all fields, 1995–2005; g—some articles appeared in more than one data base. Three from Ergonomics Abstracts and five from PsycINFO were also retrieved from PubMed, and one article was retrieved from all three of these databases.

### 3.2. Risk Factors in Housework

A summary of the published articles is presented in Table 2. Articles that merely considered housework as a confounding factor in studying paid work,

or were descriptive rather than analytical, were excluded from Table 2. However, a few selected articles, from outside the 1995–2005 publication period, which considered housework as a risk factor for MSD were included.

**TABLE 2. Studies of Housework Risk Factors for MSDs Among Women**

Reference	Study Design and Population	Exposure Measure	Outcome Measure	Result
[2, 3, 36]	stratified random sample from a Canadian population health-based survey	chronic health problems long term disability restricted activity consultation with a health professional use of prescription and nonprescription drugs	prevalence of MSD	women were more likely than men to have MSD disability lower income and education, and not being in the labor force increased the risk of disability (MSD and non-MSD) arthritis disability was more likely among women men were at greater risk for back disabilities
[21]	cross-sectional observational study of Swedish men and women working in a manufacturing company	work techniques work in awkward postures leisure activities (household work, exercise, etc.)	self-reported MSD symptoms	women spent more time on household activities than men
[56]	Swedish employed population-based survey	home duties home stress child care demands psychosomatic strain demographics	psychosomatic strain	psychosomatic strain associated with home duties and stress was much higher for women than men for women, increase in paid working hours is associated with an increase in psychosomatic strain
[53]	case-control study of Swedish women aged 20–59	hours of paid work/week time spent on domestic work and childcare energy expenditure physical work and awkward posture in paid work psychosocial factors at work number of and age of children previous symptoms of neck/shoulder and LBP	risk of neck/shoulder and LBDs	over 60 h of paid work/week or at least 40 h/week of unpaid work increased relative risk of seeking care for MSDs, mainly of the neck increased hours of unpaid work at home was correlated with LBDs
[54]	private practice/hospital-based case-control study of 646 persons aged 20–64	occupational activities lifting children/objects carrying, stretching, bending personal and lifestyle factors	pain, numbness, or tingling radiating to lower limbs	frequent lifting of objects or children of over 11 kg was significantly related to lumbar disc herniation
[60]	population-based Italian survey of 1 000 families	housework duties	MSD	upper limb disorders associated with washing dishes, cleaning clothes, and cleaning carpets
[55]	retrospective case-control study of Swedish women aged 38–64	work history, environment, stress general health and cardiovascular risk factors gynecologic disease	LBP	LBP associated with performing some daily living activities
[57, 58, 59]	case-control study of Chinese women aged 44–55	sociopsychological stress index (self-reported): type of housework/work housework/work stress stressful life events in past 12 months sociodemographic characteristics social factors	self-reported back pain	LR-related sociopsychological stress including housework to low back disorder

Notes. MSD—musculoskeletal disorder, LBP—low back pain, LR—logistic regression.

### 3.3. Housework, MSDs, and Preliminary Ergonomics Observations in Lebanon

#### 3.3.1. Review of previous household studies in Lebanon

Data from a recent urban health study demonstrated a heavy household burden among women from 2797 households in three poor Lebanese communities in 2002 [48, 49]. Note that only 23% of the women studied held paid jobs, but those who worked were employed for an average of 45 h/week. As in other parts of the world (e.g., Dahlberg, Karlqvist, Bildt, et al. [21]), women did a much greater proportion of household work than men.

Women in the three communities reported many symptoms that were classified as musculoskeletal problems [50, 51]. Of the 1869 married women aged 15–59 ( $M = 38$ ) studied in 2002–2003, 954 reported experiencing a health problem in the previous 2 months, of whom 32% (305) identified MSDs as the most important health problem. Other most important health problems reported by this group were much less common: the second was respiratory disease, reported by 10.6%, and the third was cardiovascular disease, among 10.4%. Over two thirds of those reporting an MSD as their most important health problem felt that it was serious or very serious and 66% considered it to be chronic [50]; 44% (135 women) attributed their MSD to housework or to fatigue from housework.

In a subsequent analysis of data on full-time homemakers, 1266 women not participating in the labor force were identified from the original sample of 1869 married women. Results of this study showed that self-reported MSDs were significantly associated with age, weight, number of children, and distress among these full-time homemakers [51].

The prevalence of MSDs in this study resembles or slightly exceeds the prevalence found among women in population-based studies in other countries [38, 52]. Several of the women attributed their pain to household activities.

#### 3.3.2. Preliminary household observations

Some of the most physically demanding tasks identified in the housework observations included taking physical care of a non-autonomous elderly mother-in-law, cleaning rugs, moving furniture so as to accommodate cleaning, making beds in awkward too-small spaces, and carrying her two sons' 15–20 kg book bags to school every day. During the observations, a number of awkward/extreme postures were noted, including sustained trunk flexion (stooped posture) of more than 30° during rug cleaning, dusting, and floor cleaning. Repeated extreme trunk flexion was also associated with rug cleaning, floor cleaning, and especially picking up dust. Forceful and repeated movements in awkward positions were observed during bed making and rug cleaning. Samia reported that she had chronic knee and low back pain.

Other important aspects related to housework that were obtained through an interview included a prolonged work day (6:00–22:30), few rest pauses, and low consumption of food. Lastly, anxiety and tension stemming from disagreement between the spouses about the nature and extent of housework and the presence of uninvited long-term guests (husband's relatives) were also identified as some of the difficulties faced in this household.

### 3.4. Comparison Between Housework and Selected Paid Occupations

Activities in selected paid occupations were compared to tasks identified in the preliminary observations held in the Nabaa households, as well as to previous observations related to detergent handling strategies in the same neighborhood [44] (Table 3). Both similarities and differences between housework and paid work were identified. It should be noted that cleaning tasks performed by Lebanese homemakers are at a much higher frequency than in Western societies. Floors, e.g., were cleaned more than once a day, on average [44].



**TABLE 3. Similarities and Differences Between Common Women’s Professions and Housework With Respect to Biomechanical and Psychosocial Stressors Associated With Musculoskeletal Disorders**

Occupation (Paid Work)	Similarities to Housework	Differences From Housework
Cleaning		
Tasks in common: cleaning, sweeping, mopping, dusting, etc. References: [41, 45, 46, 88, 89]	prolonged standing/walking trunk extension, flexion, other awkward and extreme postures rapid movements of upper limbs repetitive tasks, repetitive movements depending on tools and equipment, may be prolonged awkward postures, prolonged time kneeling	biomechanical tasks in household more varied, less repetitive workday in household is longer so possibly more exposure, less possibility for recovery in household, worker more likely to choose tools, organize workspace (in consultation with other family members, building owner, etc.) so exposures may be fewer
		psychosocial: job demands in household, more multitasking in paid workplace, more possibilities for training and exchange about work methods, health and safety so job demands may be lower in household, “work is never finished”, worker can never “take off and go home” in some cases, household worker may fear violence from spouse or other household member if job is not done to their satisfaction.
	access to spaces to be cleaned may be blocked by occupants and worker must remember to go back worker must remember preferences of each occupant (what can’t be touched, moved)	
		psychosocial: decision latitude household worker has somewhat more control over time and spatial organization (even though schedules and needs of other family members impinge on their organization, household workers have potentially more influence on occupants of the spaces than do family members) paid commercial worker can leave job more readily in case of difficulties with co- workers or supervisors. paid worker has remuneration, paid vacations
	worker decides which spaces to do first often, worker controls timing of rest breaks little direct supervision	
		psychosocial: job satisfaction generally, household worker has strong emotional ties with occupants of the spaces being cleaned generally, paid cleaners have emotional support from colleagues in same workplace whereas household workers work alone cleaners receive financial rewards, paid vacations cleaners may have access to support from a union
Teaching, day care		
Tasks in common: caring, discipline, teaching (day care), feeding, bathing, changing References: [47, 76, 77, 78, 90, 91, 92, 93, 94, 95, 96]	prolonged standing/walking lifting children (who may resist) prolonged bent trunk (when children are small)	biomechanical mothers’ tasks may include more physical multi-tasking; cleaning while holding a baby, bathing, feeding very young children while supervising or playing with older children layout in a day care center or nursery school may be better adapted to the size of young children, but possibly less well adapted to the size of the mother

TABLE 3. (continued)

Occupation (Paid Work)	Similarities to Housework	Differences From Housework
		psychosocial: job demands
	multitasking	mothers are potentially more exposed to interruptions from various sources: door, telephone, children of different ages
	interruptions	teachers have more control over interruptions from outside the classroom
	no distinct boundary to task of primary school teacher (but day care is usually over when the shift is finished)	very long workday, work week, may include night shifts, no vacations
		work is "never done"
		psychosocial: decision latitude
	very long workday, work week	very long workday, work week
	work is "never done"	work is "never done"
	both receive comments from multiple sources about their work	both receive comments from multiple sources about their work; teacher is usually supervised directly by a school director or principal; household worker may be directed by husband or relative or she may control her sphere
		paid commercial worker can leave job more readily in case of difficulties with co-workers or supervisors
		psychosocial: job satisfaction
	emotional bond with young children	teachers' relations with children are loving but are usually more distant, time-limited than mothers'
		love is part of the teaching process for teachers, while mothers' love is more diffuse
		teachers receive support from colleagues, while mothers are often alone
		teachers in some countries have support from union
		teachers receive financial rewards, paid vacations
Food preparation and service		biomechanical
Tasks in common	prolonged standing/walking	household tasks more varied
cutting, chopping, cooking, carrying food, washing dishes	repetitive movements with upper limbs and shoulder/wrist/fingers	commercial workplace spaces may be better organized for tasks, leading to more comfortable postures
	carrying heavy objects (pots)	weights handled in commercial food service are often heavier
	few, short rest breaks	time pressure usually greater in commercial situation
References : [28, 40, 71, 97, 98, 99, 100, 101]		work day in household is longer and can involve three meals; this is much less common in commercial food service
		temperatures may be held very low in commercial food preparation spaces (meat and fish processing and packing)

TABLE 3. (continued)

Occupation (Paid Work)	Similarities to Housework	Differences From Housework
	knowledge of cooking and food preparation required (cooks and housewives)	psychosocial: job demands in household, there is more multitasking in household, work is "never done"; worker does not "go home" in commercial food service, server and cook must remember orders, not get them mixed up; time may be very short servers must create good relationships with kitchen workers to ensure their orders come quickly usually less noise in homes, easier to concentrate in household, usually lower requirement for quality, but more requirement to adapt to individual whims, schedules, health conditions in some cases, household worker may fear violence from spouse or other household member if job is not done to their satisfaction; commercial food server may be confronted by unpleasant or complaining customers
		psychosocial: decision latitude in household, usually more choice about what to cook, how and when to serve it paid commercial worker can leave job more readily in case of difficulties with co-workers or supervisors in household, usually more choice about what to cook, how and when to serve it paid commercial worker can leave job more readily in case of difficulties with co-workers or supervisors
	risk of cuts and burns pleasure from serving food if it is appreciated those fed comment on food, may refuse it	psychosocial: job satisfaction food refusal probably more common in home situation commercial food preparers, servers and cooks may receive support from colleagues, while household workers are usually alone while doing their tasks commercial workers may have support from union, standardized breaks commercial workers receive financial rewards, paid vacations
Home health aide		
Tasks in common:	heavy lifting prolonged static postures in awkward positions (bathing, feeding, changing) work in home where equipment may not be properly engineered or arranged so as to protect the worker's health; commercial workplace spaces may be better organized for tasks, leading to more comfortable postures	biomechanical household tasks more varied time pressure usually greater in paid situation work day in household is longer
References: [93, 102, 103, 104]		
	dealing with people who are aged or unwell, uncomfortable and in pain possibility of violence	psychosocial: job demands in household, there is more multitasking in household, work is "never done"; worker does not "go home"



TABLE 3. (continued)

Occupation (Paid Work)	Similarities to Housework	Differences From Housework
		psychosocial: decision latitude in household, usually more choice about order and timing of tasks paid commercial worker can leave or change job more readily in case of difficulties with clients or supervisors
	very high risk of injury pleasure from helping if it is appreciated usually work alone	psychosocial: job satisfaction housewives usually have an emotional bond with the person they care for. commercial workers may have support from a union or other colleagues commercial workers receive financial rewards, paid vacations

4. DISCUSSION

4.1. Risk Factors in Housework

Several relevant findings emerged from reviewing the MSD literature. Firstly, increased hours of unpaid work at home and performing certain daily activities, such as frequent lifting of objects or children over 11 kg, were correlated with low back disorders (LBDs), a subclass of MSDs [53, 54, 55, 56]. Secondly, sociopsychological stress at home and at work was found to be associated with LBDs as well as psychosomatic strain [56, 57, 58 59]. Thirdly, upper-limb MSDs were associated with certain household tasks such as washing dishes and clothes or cleaning carpets [60]. Finally, women were consistently found to spend more time on household activities than did men, and women were more likely than men to have MSDs that resulted in disability [2, 21].

Although these recent studies revealed some of the general links between MSDs and risk factors in the household, the literature still lacks the level of detail that would facilitate effective intervention strategies. More specifically, no studies yielded a desirable level of detail with respect to the frequency, duration, and magnitude of exposures to known MSD risk factors during common household activities. Furthermore, almost no reviewed studies related to MSDs in the household context included a comprehensive evaluation of activities that went beyond commonly performed tasks, such as cleaning and washing, to include such activities as care-giving,

leisure activities, and household maintenance. The literature also lacks specificity with regard to MSD symptoms and fatigue experienced in various body regions among homemakers. Tools to assess many psychosocial factors that have been associated with work-related MSDs, such as decision latitude and job satisfaction, have not been adapted to the household context. Furthermore, the division of domestic labor among household members, which has been shown to be associated with psychosocial health [61, 62, 63], has received little attention in MSD research.

There is also a void in addressing issues that may affect the reporting of MSDs among homemakers, such as the built environment, use of durable goods and appliances, social/family support, lifestyle factors (e.g., smoking history), self-care, and access and utilization of medical care.

Lastly, several studies that assessed, in depth, the physical demands of household tasks focused on the physiological costs (e.g., energy expenditure) of these tasks [64, 65, 66, 67, 68, 69], rather than on their musculoskeletal load (e.g., postures adopted or forces exerted). These energy costs are relevant since they contribute to fatigue and may amplify the effects of housework on health. However, to obtain a thorough understanding of MSD physical risk factors, there is a need to evaluate the musculoskeletal (or biomechanical) demands that household tasks impose on homemakers.

Domestic labor (including housework and care activities) and the home environment have been generally ignored when addressing MSDs. A limited number of studies have particularly explored the prevalence and causes of MSDs among full-time, part-time, or unemployed homemakers who routinely perform housework [58, 59, 60]. However, the types of exposures of homemakers have not been differentiated according to the time spent at paid work. For example, we do not know the biomechanical requirements of those household activities (cooking, laundry, cleaning) that are more often done by full-time homemakers than by those who do part- or full-time paid work.

One consequence of these lacunae in the information base on housework and MSDs is that the prevalence of MSDs in the general population is referred to without considering that such a population is diverse with regard to exposures. That is, the general population is composed of those exposed to risk factors in paid work, housework, and leisure activities. This confusion can result in full-time homemakers or the general population being treated as a control group in the study of workplace risk factors, rather than as populations with specific exposures.

Therefore, studying the association between housework and MSDs is an important issue, especially in countries like Lebanon whose division of domestic labor is extremely traditional and where most women are full-time homemakers as well as in other cultures where women combine household and paid work to a greater extent [21, 53, 56].

#### **4.2. Comparison Between Housework and Selected Paid Occupations**

Biomechanical aspects of housework tasks resemble those found in many tasks performed by paid workers in cleaning, child care, health care for disabled adults, and food preparation. Note that some of these occupational populations have been identified to have some of the highest MSD incidence and lost workday rates for lower back, neck, and upper- and lower-limb disorders [32, 70, 71, 72, 73, 74, 75]. Psychosocial constraints found in home caring tasks are similar to those

found in primary school teaching and day care, which are associated with very high risks for stress [47, 76, 77, 78]. However, it is possible, even probable, that tasks called by the same name, such as laundry, differ in biomechanical and psychosocial content according to whether they are performed by a mother of five, a childless married woman who lives with a disabled relative, an elderly woman living alone, a paid household worker, or a worker in a commercial laundry. For this reason, it is necessary to examine in detail the tasks performed by women in a variety of situations.

The preliminary household observations revealed that there seemed to be some overlap in tasks and constraints; however, household work could present many important differences with paid work. In general, there may be much more multitasking in households. Child care and cooking can combine in rapid succession with other tasks, for example.

Breaks are an important determinant of musculoskeletal health [79, 80]. We did not observe rest breaks in the household, but our observations were much too limited for us to be able to evaluate this factor. It appeared that household workers had more latitude in determining the order of work tasks, but our observations were usually done when she was alone; it is very possible that constraints on the household situation may be quite variable according to the time of day and the needs and personalities of family members. For example, mothers of newborns may have very little latitude in the timing of their activities.

Household tasks performed by homemakers are generally more variable than professional tasks that may share some basic similarities, such as janitorial tasks. The effect of task rotation on biomechanical effects is complex and depends on peak requirements of each job as well as cumulative tissue loading [81, 82]. It cannot be taken for granted that mixing tasks helps to prevent musculoskeletal problems.

We have not yet been able to observe biomechanical aspects of work in other areas of Beirut. We would expect to find differences in household work tasks according to the region.

In Nabaa, the built environment is characterized by cramped spaces, as it is in some other urban environments [83, 84], which may affect women's working space, probably influencing the biomechanical constraints of their work.

It is clear from the literature review and the preliminary findings presented in this article that physically demanding housework activities expose female homemakers to several known risk factors for MSDs of the lower back, neck/shoulder, and upper and lower limbs. This line of work should, therefore, be studied from an ergonomic point of view, so as to indicate opportunities for prevention. At present, biomechanical constraints in housework are often invoked as potential alternative causes when compensation for MSDs among paid workers are being considered, particularly when workers are women [85]. Such arguments have not been research-based, but have led to denial of compensation. In appropriate populations, the relative contributions but also the interactions between paid and unpaid work as potential causes of MSDs should be examined.

We would expect that documenting the problem elements in women's household work would also have an empowering effect, as it has in other women's workplaces [86, 87].

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