The Ergonomics of Caring for Children: An Exploratory Study

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BACKGROUND. Caring for one's children is among the most ubiquitous of occupations. However, few studies have examined the ergonomic risks involved in parents caring for children at home.

PURPOSE. The purpose of this study was to identify the frequency, type, and severity of musculoskeletal symptoms in parents of children less than 4 years old. The study further examined the factors that contribute to musculoskeletal pain in this sample.

METHODS. A convenience sample of 130 parents with children younger than 4 years old completed a seven-page survey that included questions related to the parents' demographics, their musculoskeletal discomfort, their performance of child-care tasks with high biomechanical risks (such as carrying a child in a car seat), and parents' perceived psychological strain related to caring for their children.

RESULTS. Ninety-two percent (92%) of the providers were mothers. Sixty-six percent (66%) of the sample reported the presence of musculoskeletal pain. The parts of the body most affected were the low back (48%), neck (17%), upper back (16%), and shoulders (11.5%). Factors associated with musculoskeletal pain were performing child-care tasks defined as having high biomechanical risks ($p = .001$), the perception that caring for children is highly demanding ($p = .003$), and performing hobbies less than 1 hour per week ($p = .04$). Parents' working status, age, and participation in other daily activities were not significantly related to musculoskeletal discomfort.

CONCLUSION. This study demonstrates the high prevalence of musculoskeletal pain in parents of children under the age of 4 years. It underscores the association between physical and psychological factors in the development of musculoskeletal discomfort. It suggests the need for occupational therapy wellness programs that focus on preventing musculoskeletal discomfort and providing support for the parenting role.

applications for ergonomics exist in nonwork-related settings (Sanders, 2004), this has not been a central focus of research in the United States, possibly due to the lack of direct monetary incentives for improving ergonomics outside the workplace. However, large Scandinavian studies have found important interactions between leisure activities and work that affect long-term physical functioning (Leino-Arjos, Solovieva, Riihimaki, Kirjonen, & Theilema, 2004). Research suggests that injuries precipitated by nonwork-related tasks (including caring for children) interacts with workplace exposures to contribute to higher use of the workers’ compensation and private health care insurance systems (Bergqvist, Wålgast, Nilsson, & Voss, 1995). Because attribution to specifically work or nonwork causes is difficult for chronic conditions such as MSDs, many workers do not file for worker’s compensation even for work-related MSDs but instead use sick time and traditional health insurance (Azaroff, Levenstein, & Wegman, 2002; Boden, 2000; Morse, Dillon, Warren, Levenstein & Warren, 1998). Overall, given the very large numbers of persons at risk, implications exist for preventing musculoskeletal pain in parents (including mothers, fathers, and other family members acting as the primary caregivers for young children) in order to minimize health care costs and optimize the role of a parent.

Literature Review

Musculoskeletal Symptoms and Psychosocial Strain in Child-Care Workers

This literature review will address the research on the frequency of reported pain in individuals caring for children and the ergonomic risk factors that may contribute to MSDs. Although the term ergonomic risk factors is classically associated with the biomechanical or physical workplace exposures, current definitions of ergonomics address the broader organizational and psychosocial factors that may also contribute to the development of MSDs (Warren, 2004). For the purposes of this paper, the discrete components of ergonomics will be used. The term biomechanical risk factors will refer to physical exposures such as working in awkward postures or lifting heavy objects (or children). The term psychosocial risk factors will refer to such individual and social factors as an individual's perceived stress, control over one’s job, ability to make decisions, and social support, all of which have been associated with work-related MSDs (Karasek & Theorell, 1990; Warren; Warren, Dillon, Morse, Hall, & Warren, 2000).

A paucity of literature exists relative to the biomechanical and psychosocial strains involved in adults caring for children in day-care centers, nursery schools, and home settings. Researchers first addressed child-care work with a focus on improving the general work environment for adults caring for children in day-care settings. Studies primarily addressed the infectious disease, environmental, and stress-related concerns in child-care work (Bright & Calabro, 1999; Manlove, 1993). Results of the Child Care Employee Project Survey indicated that biomechanical issues were also important concerns for child-care providers across the United States. In this survey, 48% of child-care workers had experienced back strains from lifting children, 69% reported moving heavy furniture, and only 25% of the day-care centers in which the respondents worked used adult size furniture for workers (Child Care Employee Project, 1983).

However, when epidemiologic studies began to address the musculoskeletal health of adult child-care workers, wide discrepancies in the frequency of musculoskeletal discomfort were reported. Brown and Gerberich (1993) examined workplace injuries in 440 child-care workers in Minnesota and found an overall injury incidence rate of 1.94 injuries per 100 workers over a 6-year period. Low-back strain accounted for 34% of all injuries, followed by lower extremity (20%), upper extremity (12%), and injuries to multiple sites (13%). Almost 50% of all injuries were sprains, the majority caused by overexertion (34%); 49% of all back injuries were associated with lifting children.

Studies conducted by Gratz and Claffey (1996) and Calabro et al. (2000) yielded much higher prevalence of musculoskeletal symptoms in child-care workers. Gratz and Claffey found that 18% of 446 early child-care workers in day-care centers and in-home day-care settings noted back pain; 30%–35% noted headaches; and 23%–36% noted fatigue on a weekly basis. In addition, 29% to 35% of this sample rated their jobs as stressful to very stressful. When Calabro et al. (2000) surveyed 240 child-care workers in 34 day-care centers, they found that 11.5% of child-care workers suffered low-back pain and 21.5% suffered falls or trips related to the job.

Although these self-report surveys were conducted on nonrandom samples of child-care workers and thus must be interpreted cautiously, collectively, the outcomes indicate that both musculoskeletal and psychosocial health concerns are legitimate but not yet fully described in those caring for children on a regular basis.

Musculoskeletal Symptoms and Psychosocial Strain in Parents

The studies related to adult health while caring for children in day-care centers were conducted within the context of promoting workplace health, safety, and quality of work.
Without this organizing framework, the concern for parents’ musculoskeletal health relative to caring for children has been compartmentalized into niche perspectives. Medical studies have associated low-back pain and tension headaches with delivering children and lifting children. Mundt et al. (1993) studied nonoccupational lifting in a case-control study of 287 clients with symptoms of a herniated lumbar intervertebral disc. In 177 confirmed cases the relative risk of developing a herniated intervertebral disc was 4 times higher in cases that lifted children greater than 25 lbs from the floor using a back-bent, straight-knees posture than in controls.

Russell, Groves, Taub, O’Dowd, and Reynolds (1993) and Breen, Ransil, Groves, and Oriol (1994) examined low-back pain in new mothers as related to the use of epidural anesthesia use during delivery. Although the two studies’ results differed with respect to the relationship of anesthesia to low-back pain, both suggested that repetitive lifting and poor understanding of proper posture contributed to new mothers’ long-term low-back pain.

Yamada, Yamada, Naito, Kamishima, and Yamaguchi (2003) compared the prevalence of tension headaches in Japanese women who worked part-time outside the home and those who did not work, also comparing “basic” family structure (wife, husband, children) to “complex” family structure (additional relatives or elderly parents living with them). They found a significantly higher prevalence of tension headaches in those women who did not work outside the home and who had a complex family structure ($p < .05$). Researchers suggested that the stress of caring for children and elderly relatives and performing housework triggered frequent tension headaches in this sample.

Given that low-back pain appeared to be the most common musculoskeletal disorder related to caring for children, researchers began to more closely examine parents’ lifting practices and their process of choosing their methods of lifting. Griffin and Price (2000) examined lifting methods in mothers, hypothesizing that choices in lifting methods would be based on a myriad of contextual factors such as the equipment available, number of children, duration and frequency of the task, and ways to conserve energy. In reality, mothers used primarily one lifting method, the “stoop lift” method of lifting (bending at the waist with knees straight), because it was perceived to be the quickest, most efficient, and safest method for the child. Decisions were based on the children’s immediate needs rather than mothers’ regards for their personal health.

The psychosocial strain in caring for children at home while coordinating family and household responsibilities with work demands has been further addressed. Francis-Connolly (2000) uncovered mothers’ feelings of incompetence in caring for their new babies and their feeling overwhelmed by the constant “24-hour” physical and emotional demands of mothering. Dyck (1992) discussed the social constraints and complex social network mothers used to negotiate their child-rearing tasks. Primeau (2000) discussed the unequal division of labor in traditional households. Hochschild (2000) examined the emotional stresses and general fatigue women derive from rearing children and the “double shifts” that women undertake to manage careers and families. Researchers acknowledge the enfolding nature of mothers’ performance of child-care tasks that occur simultaneously with teaching children, nurturing children, and performing household tasks (Francis-Connolly; Primeau, 1998).

Given that high frequencies of musculoskeletal pain have been reported in both child-care workers and parents, particularly mothers, a closer examination of the research on specific risk factors that may be contributing to MSDs is provided.

**Biomechanical Risk Factors in Caring for Children**

Owen (1994); King, Gratz, Scheuer, and Claffey (1996); and Grant, Habes, and Tepper (1995) all examined the biomechanical risk factors related to musculoskeletal discomfort (primarily low-back pain) in child-care workers. Owen identified the 10 tasks perceived to be the most physically stressful for 27 child-care workers in five Midwestern day-care centers. These tasks involved lifting (onto a changing table or toilet, into and out of a pushcart or crib), bending (to feed, play, wash hands, or clean the room), and stooping. Observations of these workers demonstrated that they used poor lifting technique throughout the day. King et al. (1996) cited similar biomechanical stressors in a worksite analysis of 125 child-care workers. These workers additionally used inadequately sized furniture, sat unsupported on the floor, and reached repetitively above shoulder height.

Grant et al. (1995) substantiated that child-care workers frequently assume awkward postures during the day. Work sampling studies indicated that 25% of workers’ time was spent in squatting, kneeling, or sitting on the floor. An additional 26% of their time was spent sitting on small, child-size furniture. Eighteen percent (18%) of teachers’ activities involved flexing at the trunk greater than 20°. Frequencies for these awkward postures were higher for those working with younger children.

Although similar child-care tasks are performed by child-care workers and parents, important differences exist. Parents must perform all the child-care tasks mentioned previously in addition to bathing and transporting, putting children to bed and waking them, playing with children, teaching and consoling them. Household tasks of cleaning,
cooking, laundry, and shopping must also be accomplished while organizing the household schedule to meet job and community demands. Parents acting as the primary caregivers (primarily mothers as cited in the literature) report routinely multitasking to take care of children while performing daily chores (Esdale & Olson, 2004; Hochschild, 2000; Pirie & Herman, 1995; Primeau, 2000). However, child-care workers must care for a larger number of children and therefore may experience higher repetition and intensity of exposures than parents during their daily shift. Some researchers argue that workplace exposures are typically more intensive than environmental exposures (Kroemer & Grandjean, 2001).

**Effects of Employment on Women Caring for Children**

Finally, Hall and Gordon (1973) suggested that married women with part-time jobs are more likely to experience role overload in striving to fulfill the tasks of both a mother and worker than women who are employed full-time. Greenhaus and Beutel (1985) suggested that home–work conflicts are exacerbated by having young children and little spousal support. Paden and Buehler (1995) found that role overload and conflict between home and work creates a “spillover effect” that is associated with physical symptomatology in women who work. This role overload predicted spousal support. Extensive research supports that workers in high-strain jobs have a higher incidence of cardiovascular and musculoskeletal disease than occupations without these characteristics (Karasek & Theorell; Warren et al., 2000). Thus, according to this model, caring for children could be considered a high-strain occupation (high demands, low control) although no studies have specifically applied parenting to this theory.

In summary, the research on the musculoskeletal discomfort in parents caring for preschool children suggests that biomechanical exposures such as frequent lifting and bending during the daily tasks of parenting may contribute to their musculoskeletal discomfort. However, no studies have specifically identified which child-care tasks may put parents at risk for developing an MSD. Although qualitative studies have alluded to the emotional demands required in caring for children, no studies have addressed the relationship between psychosocial strain and MSDs in parents. The purpose of this study was to identify the frequency of musculoskeletal pain in parents of children under 4 years of age and delineate the specific biomechanical and psychosocial variables related to these symptoms. For the purposes of this study, parent refers to the mother, father, or guardian acting as the primary caregiver for the child or children in the home. The research questions were:

1. What is the frequency, type, and severity of musculoskeletal symptoms in parents of children 0 to < 4 years of age?
2. What biomechanical and psychosocial factors contribute to musculoskeletal pain in parents?

**Methods**

**Survey Development**

A seven-page survey instrument was developed from field observations of child-care tasks, focus-group feedback from parents of children 0 to < 4 years of age, the literature, and 20 pilot surveys. The survey underwent review by seven experts, including three occupational therapy professors (who specialized either in ergonomics, orthopedics, or pediatrics, all with children under 4 years of age), one social research scientist, one ergonomist, and two day-care providers with combined experience of over 25 years. Experts critiqued the survey relative to clarity, face validity, and the degree to which each survey question was critical in answering the overall research questions.

The survey began with demographic questions related to children’s and parents’ ages and weight, marital status, family income level, and spouses’ level of assistance in child-care tasks. The survey addressed parents’ hours of sleep, hours working outside the home, hours children spent in day care and babysitting, and parents’ participation in...
common daily activities (including exercise, housework, computer use, yard work, and hobbies). Participation in daily activities was categorized according to the frequency parents performed the activity per week (< 1 hr, 1–3 hrs, and > 3 hrs). The survey then addressed the following variables that may impact the development of musculoskeletal discomfort in a parent and location of the musculoskeletal pain.

**High-Risk Practices:** Child-care tasks considered to be “high risk” were assumed to be those that result in high biomechanical stresses placed on a particular part of the body. Most practices that involve carrying, lifting, and bending place a strain on the low back that is exacerbated by repetition, prolonged duration, and weight of the child. When the child is held away from the parent’s body (such as when loading a child into a car seat or removing a child from a crib) the torque placed on the upper and lower back and shoulders is greatly increased. Most of these practices can be performed with less risk by maintaining proper alignment of the body, by keeping the child close to the body when lifting, and by using alternate means to carry a child for prolonged durations (e.g., backpack, front pack, stroller) (Kroemer & Grandjean, 2001; Sanders, 2004).

High-risk practices were defined based on the literature (King et al., 1996; Owen, 1994), the focus group, and pilot study feedback. Focus group and pilot study feedback provided additional high-risk practices related to transporting, bathing, feeding children, and performing chores with children that were not identified through prior research on child-care workers. Table 1 lists those high-risk practices as defined in the study.

Parents who completed the survey identified the high-risk child-care practices they performed on a regular basis. The number of high-risk practices that parents reported was summed to form an overall high-risk practice score. The potential number of high-risk practices varied according to the age of the child. For example, parents who cared for infants could potentially perform 12 high-risk practices, whereas those caring for children 2 to <3 years of age could potentially execute only 9 high-risk practices given fewer feeding, holding, and transporting demands. To adjust for these different possibilities, each of these age groups were divided into high-, medium-, and low-risk categories. To illustrate, for parents of children 0 to < 1 year of age, the potential number of high-risk practices was 12. Those who performed 0–4 practices entered the low-risk category, those who performed 5–8 practices entered a medium-risk category, and those who performed 9–12 practices entered a high-risk category.

**Perception of Psychological Strain:** Psychological strain is postulated to arise from high-perceived occupational demands and low control over one’s job or limited use of skills according to the Demand-Control Model of occupational stress (Karasek & Theorell, 1990). The perceived level of psychological strain resulting caring for children was addressed in three questions related to the occupational demands of a parent, adapted from the Job Content Questionnaire (Karasek & Theorell). Questions were “I have enough time to get done what I need to do,” “I have sufficient time during the week to perform hobbies or other activities that are meaningful to me,” and “Caring for my children requires a lot of physical effort.” Perceived demands were scored according to a Likert scale. The values were summed for a perceived demand score that was categorized as either high or low.

**Presence, type, and location of pain:** Participants provided information about the presence, type, and location of musculoskeletal discomfort through completion of a schematic drawing of the entire body. The operational definition was pain or discomfort lasting for either 7 days consecutively or 20 days all together in the last 3 months that “you think may be related to caring for your child or children.” This definition was adapted from that used by the Connecticut Upper-Extremity Surveillance Project (Morse et al., 1998). Severity of the condition was assessed based on positive responses for visiting a medical doctor and receiving a medical diagnosis.

**Procedure**

Surveys were distributed to a convenience sample of providers at malls, playgroups, playgrounds, stores, and day-care centers in Southern New England from October through December 2001. Inclusion criteria for the participants were: (1) being the primary caregiving parent for the

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**Table 1. High-Risk Child-Care Practices (Based on Literature and Expert Opinion)**

<table>
<thead>
<tr>
<th>Practice</th>
</tr>
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<tbody>
<tr>
<td>Carry child in car seat</td>
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<tr>
<td>Carry child on one hip</td>
</tr>
<tr>
<td>Carry child while bending down</td>
</tr>
<tr>
<td>Lift child up to or off a changing table</td>
</tr>
<tr>
<td>Lift child into or out of a crib with high sides</td>
</tr>
<tr>
<td>Lift child up from the floor</td>
</tr>
<tr>
<td>Stand bent over to wash child</td>
</tr>
<tr>
<td>Change child on floor, crib, or playpen</td>
</tr>
<tr>
<td>Open baby food jars and cans</td>
</tr>
<tr>
<td>Push child on a seated toy</td>
</tr>
<tr>
<td>Breast feed in an awkward position</td>
</tr>
<tr>
<td>Bottle feed in an awkward position</td>
</tr>
</tbody>
</table>

*Note: Most high-risk practices entail use of the body, particularly the back or neck, in an awkward posture. An awkward posture is one that deviates from a neutral position (i.e., head upright, maintenance of vertebral curves, shoulders at one’s side, elbows flexed to 90°, forearms not rotated, wrists straight) (Kroemer & Grandjean, 2001; Sanders, 2004).*
child or children, (2) having one or more children under the age of 4, and (3) willingness to complete and return the survey within the requested time period. Surveys were either completed immediately or mailed to the researcher. No attempt was made to follow-up those that were not returned. Approval by a university institution review board was obtained prior to conducting the study.

Data Analysis

Microsoft Excel 2000 and SPSS for Windows statistical package version 11.0 were used to tabulate and analyze data. Descriptive statistics were used to describe the sample demographics and frequency of musculoskeletal symptoms. Pearson chi-square analysis was used to compare activity, practices, and perceived demand variables between those parents with and without musculoskeletal pain. Logistic regression was used to examine the interrelationship between independent variables and the presence of musculoskeletal pain.

Demographics

One hundred and thirty surveys were completed and returned for a response rate of 82%. Table 2 summarizes the sample characteristics. The great majority of participants were married (95%) women (92%). The ages of the sample ranged from 17 years to 56 years with a mean age of 33 years. Eighty-six (66%) participants were in the 30–40-year-old age category. The weight of the providers ranged from 95 pounds to 210 pounds with a mean weight of 137 lbs ($SD = 27.8$ lbs). The majority of participants (81%) had family incomes over $60,000 (the median family income for the same geographic region was $65,000 annually). Less than half of the sample (42%) indicated that their spouses equally assisted in caring for the children (defined as 50% of the time or greater). There were 153 children 0 to < 4 years of age reported by the sample. Twenty-one parents (16%) had more than one child under 4 years of age. The mean weight of all children was 25.7 lbs (range 8.0 lb–45.0 lb; $SD = 8.0$ lbs).

Parents’ working status was as follows: 41 participants (31%) did not work outside the home, 43 (34%) worked part-time (less than 30 hours), and 46 (35%) worked full-time (30 hours or more). The mean number of working hours for pay was 29.6 hours (range 0–62 hours; $SD = 13.5$ hours). Hours that children spent in day care were as follows: 22 (17%) of the parents’ children were not in day care; 70 (54%) were in day care part-time (less than 30 hours) and 38 (29%) were in day care full-time (30 hours or greater). The mean number of hours children spent in day care was 21 hours per week (range 0–60 hrs; $SD = 15.6$ hrs.). The differences between the mean hours parents worked for pay and the mean number of hours children were in day care could be explained by the fact that some parents worked for pay at home. Parents in the sample received an average of 6.4 hours of sleep per night (range from < 4 to > 9 hours).

Results

What is the frequency, type, and severity of musculoskeletal symptoms in parents of children 0 to < 4 years of age?

Eighty-eight parents (66%) indicated that they had experienced musculoskeletal discomfort related to caring for their children. Table 3 indicates the frequency according to body part. Almost half of all parents, 62 (48%), indicated the presence of low-back pain. Over 44% of the parents indicated the presence of neck, upper-back, or shoulder pain. Complaints of knee, finger or wrist, and hip pain were each indicated in 10% or less of the parents. Thirty-three (25%) of all participants had visited a medical doctor due to painful symptoms. Twenty-seven parents (21%) had received a diagnosis. Diagnoses included low-back strain, sciatica, shoulder tendinitis, knee pain, neck pain, wrist tendinitis, deQuervain’s tendonitis, carpal tunnel syndrome, and hip tendinitis.

What factors contribute to musculoskeletal pain in parents?

Parents’ Working Status: Table 4 provides the frequencies of reported pain according to the parents’ number of hours working, number of hours the children were in day care, age of the parent, age of the child, and child’s percentage of the parent’s body weight. No clear association existed between reports of musculoskeletal pain and the number of

<table>
<thead>
<tr>
<th>Table 2. Sample Demographics</th>
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</thead>
<tbody>
<tr>
<td>Demographic Variable</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Marital status</td>
</tr>
<tr>
<td>Married</td>
</tr>
<tr>
<td>Single</td>
</tr>
<tr>
<td>Percent of time spouse assists with child care</td>
</tr>
<tr>
<td>Never (0%)</td>
</tr>
<tr>
<td>Occasionally (1–24%)</td>
</tr>
<tr>
<td>Frequently (24–49%)</td>
</tr>
<tr>
<td>Always (50% or &gt;)</td>
</tr>
<tr>
<td>Age categories of children</td>
</tr>
<tr>
<td>0 to &lt; 1</td>
</tr>
<tr>
<td>1 to &lt; 2</td>
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<tr>
<td>2 to &lt; 3</td>
</tr>
<tr>
<td>3 to &lt; 4</td>
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</tbody>
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hours that a parent worked or the number of hours that children were in day care. The greatest frequency of painful symptoms (77%) occurred in the category of parents who worked part-time, between 10 and 30 hours per week.

**Ages of the Child and Parent:** There were no statistically significant relationships in regard to the age of the baby or the age of the parent and developing an MSD. Parents with children 0 to < 1 year of age and 1 to < 2 years of age had more musculoskeletal complaints than did parents with children 2 years of age and older. Older parents reported fewer musculoskeletal complaints. Parents 40 years of age and older had the lowest frequency of musculoskeletal complaints of all age categories. This category of parents also performed high-risk practices with less frequency (44%) than did parents 30 to < 40 years of age (60%) and parents 20 to < 30 years of age (66%).

**Daily Activities.** Chi-square analyses found no significant associations between reports of musculoskeletal pain and the performance of relaxation techniques, yard work, or exercise (see Table 5). A small but significant negative association was found between musculoskeletal pain and hobbies (p < .05). Participants who engaged in hobbies for just 1 hour per week or greater had fewer complaints of musculoskeletal pain.

**Performance of High-Risk Child-Care Practices:** Significant and strong associations were found between the performance of high-risk child-care practices and presence of musculoskeletal pain (p = .001; CI = 59%–95% had musculoskeletal discomfort who reported a high numbers of such tasks, compared to 1–33% for low numbers and 41–71% for medium numbers). Those who performed more high-risk practices more frequently indicated the presence of pain (see Table 6).
involved with caring for children this age.

to the significant physical and psychological stresses

were identified in parents with children 1 < 2 years of age

between high-perceived demands and musculoskeletal pain

variables were controlled. The strongest associations

with the development of musculoskeletal pain when other

4.59,


cance in the logistic regression (OR= 2.1, 95% CI = .96 –

of parents' weights or number of hours children were in day

ages, parents' ages, children's weight, children's percentage

of parents' weights or number of hours children were in day

Discussion

mothers with children over 2 years of age with a nonphysi-

ical basis.

Performing high-risk practices while caring for children

(including carrying a child on one hip, lifting a child from

the floor, bending to wash a child, changing a child on the

floor, pushing a child on a seated toy, and feeding in awk-

ward positions) was associated with musculoskeletal pain in

parents, as was the perception that caring for children was

highly demanding. This supported the Demand-Control

Model of occupational stress suggesting that psychosocial

factors are equally as important concerns as biomechanical

factors in the development of musculoskeletal symptoms

(Karasek & Theorell, 1990; Warren, 2004; Warren et al.,

2000). The psychological strain was reflected in parents' per-

ceptions that they did not have enough time to complete

what they needed to do, did not have enough time for them-

selves, and the belief that caring for children was physically

demanding. In fact, the performance of hobbies greater than

just 1 hour per week was associated with fewer muscu-

loskeletal symptoms, which supports the importance of per-

forming personally meaningful activities, controlling one's
time, and/or participating in an outside physical activity.

The greatest impact of biomechanical and psychosocial

stressesors appeared to be in parents of children < 2 years old

and particularly in parents with children 1 to < 2 years old.

In this category, high-perceived demand and high-risk

child-care practices were the most highly correlated with

musculoskeletal pain. In very young children, high biome-

chanical exposures presumably exist as parents frequently

lift, carry, and hold the children. As children grow older,

the frequency of lifting is less, but children's weights are higher.

From 1 to < 2 years of age, both high frequencies in lifting

or holding and higher children's weight (mean 26.1 lbs in

this study) are experienced by parents. Further, young chil-

dren are very dependent and cannot be left unattended at

Parents was much higher than that previously reported in

study, 66% of the sample noted the presence of muscu-

loskeletal pain (chi-square value 14.08, p = .001). The percep-
tion that caring for children was highly demanding was significantly associat-

ed with musculoskeletal pain (chi-square value 8.97, p = .003).

Table 5. Percent and Frequency of Musculoskeletal Pain as Related to Daily Activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>&lt; 1 hr percent (n)</th>
<th>1–3 hrs percent (n)</th>
<th>&gt; 3 hrs percent (n)</th>
<th>χ²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td>63% (36)</td>
<td>75% (34)</td>
<td>54% (14)</td>
<td>3.7</td>
</tr>
<tr>
<td>Relaxation</td>
<td>64% (66)</td>
<td>70% (14)</td>
<td>80% (4)</td>
<td>.737</td>
</tr>
<tr>
<td>Hobbies</td>
<td>74% (59)</td>
<td>52% (17)</td>
<td>53% (8)</td>
<td>6.25*</td>
</tr>
<tr>
<td>Computer</td>
<td>59% (35)</td>
<td>69% (29)</td>
<td>74% (20)</td>
<td>2.11</td>
</tr>
<tr>
<td>Housework</td>
<td>33% (1)</td>
<td>60% (21)</td>
<td>68% (62)</td>
<td>2.3</td>
</tr>
<tr>
<td>Yard Work</td>
<td>62% (26)</td>
<td>74% (40)</td>
<td>56% (18)</td>
<td>3.2</td>
</tr>
</tbody>
</table>

Note. Only engagement in hobbies more than 1 hour per week approached significance as protective of musculoskeletal pain (*p < .05).

Perceived Demands in Caring for Children: Similarly, a strong association was found between parents' perceived demands in caring for children and presence of musculoskeletal pain (p = .003; CI = 65%–83% for high demand, compared to 33–64% for low demand). Those who indicated that caring for children was a highly demanding occupation more frequently indicated the presence of pain (see Table 6).

Logistic regression demonstrated no clear relationship between complaints of musculoskeletal pain and children's ages, parents' ages, children's weight, children's percentage of parents' weights or number of hours children were in day care, and parents' work hours. The performance of high-risk child-care practices dropped below statistical significance in the logistic regression (OR= 2.1, 95% CI = .96 – 4.59, p = .065), but high-perceived demands (OR = 2.75, CI = 1.104 – 6.857, p = .030) was significantly associated with the development of musculoskeletal pain when other variables were controlled. The strongest associations between high-perceived demands and musculoskeletal pain were identified in parents with children 1 < 2 years of age (OR 20.32 , CI 2.16–190.79, p = .008). This data speaks to the significant physical and psychological stresses involved with caring for children this age.

Table 6. Child-Care Practices, Perceived Demand and Musculoskeletal Pain

<table>
<thead>
<tr>
<th>Variables and Categories of Risk</th>
<th>Number of Parents (n)</th>
<th>Percentage of Parents With Pain</th>
<th>95% Confidence Intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of high-risk child-care tasks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>1</td>
<td>17%</td>
<td>1%–33%</td>
</tr>
<tr>
<td>Medium</td>
<td>26</td>
<td>56%</td>
<td>41%–71%</td>
</tr>
<tr>
<td>High</td>
<td>59</td>
<td>77%</td>
<td>59%–95%</td>
</tr>
<tr>
<td>Perceived demand in caring for children</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low demand</td>
<td>19</td>
<td>49%</td>
<td>33%–64%</td>
</tr>
<tr>
<td>High demand</td>
<td>67</td>
<td>74%</td>
<td>65%–83%</td>
</tr>
</tbody>
</table>

Note. Performance of high-risk child-care activities was significantly associated with musculoskeletal pain (chi-square value 8.97, p = .003).
this age. In fact, many parents commented anecdotally that physical stresses were exacerbated by children’s crying, struggling, and arguing so that daily tasks became monumental.

Overall, the findings from this study are consistent with the notion that caring for children is a highly demanding occupation as presented by Francis-Connolly (2000), Primeau (1992, 1998, 2000), and Esaide and Olson (2004). Although the results of the study have implications for all parents and guardians acting as the primary caregiver for children, this study allows us to consider these ergonomic risks within the context of motherhood and women’s health given that 92% of the parents were mothers and that less than half of all spouses assisted with caring for children > 50% of the time. (Although it is possible that spouses performed key biomechanical tasks that may have required higher physical forces, data was not available in our study to address this point.) Francis-Connolly discussed that mothers of young children felt culturally compelled to discuss the virtues of mothering; however, in reality they felt overwhelmed by the physical exhaustion and mental stresses of the constant attention demanded by children. Griffin and Price (2000) further described mothers’ feelings of helplessness and lack of control when not knowing what was wrong with their babies. This lack of control, as indicated in psychological strain, bore out to be an important factor in the development of MSDs in this sample.

Finally, the role of part-time work in mothers’ development of musculoskeletal pain is not clear. Although it would be logical that those mothers who worked fewer hours per week would have more pain secondary to increased exposures related to caring for children (i.e., would have more hours of caring for children at home given fewer hours away at work), this was not the case. In this study those mothers who worked for pay between 10 and 30 hours per week had the highest frequency of musculoskeletal pain (77%). This is consistent with the role and task overload theories relating to “dual employment” of women (Greenhaus & Beutel, 1985; Hall & Gordon, 1973; Hyde, Essex, Clark, & Klein, 2001; Paden & Buehler, 1995). We did not have data concerning work exposures for this sample, so we cannot report on possible cumulative effects of work exposures and parental child-care tasks. Clearly, more research is needed to better understand the complex relationships and stressors among work, child rearing, and the development of musculoskeletal discomfort.

Limitations

Many limitations exist in this study. This exploratory study was a small convenience sample that was not necessarily representative of the overall population ages and socioeconomic status. The low power from the relatively small sample raises the possibility of Type II error (not finding associations where they actually exist). The self-report and cross-sectional nature of the instrument may lend towards a possible response bias such that those with pain may have been more likely to complete the survey and may have rated their activities systematically differently than those without pain. Common instrument bias may have also affected the responses to questions, with respondents giving higher risk scores if they had higher levels of symptoms. The questionnaire was for the most part a nonstandardized tool due to a lack of prior research in the area, and had only limited psychometric testing.

Due to the cross-sectional nature of this survey, it is unclear whether the problems may be self-limiting or chronic. However, the fact that musculoskeletal pain in parents lasts at least through their children’s preschool years lends some evidence as to the long-lasting nature of the problem. Possibly the greatest limiting factor is the survey’s inability to directly record the biomechanical practices of the respondents such as the actual postures used for lifting and carrying, the frequency of performing such tasks, and the duration of time holding children.

Future studies should examine parents’ biomechanical and psychosocial strains in greater depth appreciating the integrated nature of these variables. Research methods related to biomechanical exposures should include direct observation of child-care practices in the home addressing the frequency, duration, and postures used to perform child-care tasks. The nature of the psychological strain including parents’ perceptions of control, personal efficacy, and means of establishing personal support while caring for children can be further explored using interviews and standardized tests to clarify the survey information. The nature of parents’ workplace exposures should also be documented. Finally, the sociological and biomechanical implications for fathers as the primary caregivers for children should not be ignored.

Implications for Practice

This study supports the need for both wellness and interventions programs that focus on preventing and managing MSDs related to caring for children and providing support for the role of a parent. Occupational therapists can assist parents through educational programs regarding body mechanics, child-care equipment, environmental modifications, and managing parents’ daily routines.

Body-mechanics education involves teaching parents the biomechanical principles that promote proper alignment
of the body and training them to identify tasks that may increase their risk of developing an MSD. Occupational therapists and parents together can problem solve strategies that minimize biomechanical stresses while parents perform such tasks as transporting, bathing, and feeding children. For example, when transporting an infant in a car seat, instead of carrying the car seat with one arm extended to the side of the body, a parent may hold the car seat sideways centered in front of the body using the arms to support the head and foot of the car seat. This alternative strategy promotes better alignment of the body and more equal distribution of forces across the body (Pirie & Herman, 1995; Sanders, 2004).

Occupational therapists can assist parents in choosing child-care equipment that has design features that encourage proper body alignment. For example, long handles placed on push toys or a bathtub kneel chair both allow the parent to interact with the child while minimizing biomechanical stresses to the low back. Occupational therapists can also assist parents in arranging their home environment so as to optimize good body mechanics during tasks (e.g., adjusting the heights of changing surfaces to correspond to the parent’s height). These educational components have been incorporated into a group educational format for new mothers called ErgoMOMics (Maynard & Blain, 2002). In this program members analyze as a group the components of child-care tasks and demonstrate the best options for minimizing biomechanical risks. This program also addresses the restorative needs of new mothers.

Finally, occupational therapists can help parents organize their daily and weekly schedules in order to develop a sense of control over their lives and find ways of engaging in activities that are personally meaningful to them. They can help parents examine the emotional stressors and psychological demands in their lives with the hope of finding ways to bolster their social supports and sense of efficacy in the parenting role.

Educational programs for parents can be integrated into preventive and rehabilitative models of care. They can be offered as part of wellness programs for young children attending well-child clinics; they can be provided by occupational therapists treating children with special needs; or offered through postpartum support groups such as ErgoMOMics. Intervention programs can integrate this information into existing activities of daily living retraining programs for individuals learning to manage MSDs. Overall, this study supports the need for occupational therapists to expand their roles in promoting optimal parenting experiences by addressing the biomechanical and psychosocial risk factors in caring for young children.

References


