Posture and lifting exposures for daycare workers

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ARTICLE INFO

ABSTRACT

Daycare employees, specifically caregivers, are a distinct population that may experience increased risk of injury due to the high exposure to bent postures, lifting conditions and high stress associated with their work. The objectives of the study were to collect up to date data on daycare workers and to compare the data between groups working with children of different ages (Infant, Toddler and Pre-school). The study consisted of two distinct phases: Phase 1 — Questionnaire distribution, Phase 2 — Observation and analysis involving three dimensional postural monitoring and video recording as well as an analysis of the low back forces and moments in lifting. Phase 1: Consisted of the distribution of questionnaires to all employees in each of the participating daycares (n = 73). Of the 73 questionnaires distributed 32 responses were obtained (44%). Of the 32 employees who completed the questionnaires, 19 caregivers volunteered to participate in Phase 2 of the study. An additional 5 caregivers participated in phase 2 of the study, but did not complete any questionnaires. The questionnaires indicated 81% of the workers have experienced low back pain. Phase 2: Observational data were collected on site in five local daycares, throughout the first half of each subject's shift (~3.5 h). Caregivers from each of the three classroom age groups were recruited for participation in the direct observation (Infant: n = 7, Toddler: n = 7, Preschool: n = 8). Posture analysis revealed that on average, workers adopted trunk flexion angles greater than 55°, for 10% of the collection time, and greater than 70°, for 5% of the collection time. These postures correspond to both moderate and severe flexed postures respectively. The lifting analysis (completed using the data recorded in phase 2) revealed that workers lifted with frequencies of 0.25 lifts/minute, lifted a total weight of 501 kg (over 3.3 h) and experienced average compression and shear forces of 3323 N and 371 N, respectively. A between-group comparison showed that when compared to the Preschool group, the Infant (p = 0.008) and Toddler (p = 0.001) groups demonstrated higher relative flexed postures and lifting frequencies, and the Toddler group (p = 0.023) demonstrated higher total weight lifted. Results suggested that these employees experience an elevated risk of low back injury caused by their occupational tasks and thus, further research is required to determine appropriate worker accommodations and safe work practices to help mediate these risks for all daycare caregivers.

Relevance to industry: It is thought that the results from this study could lead to the development of safe working and job sharing guidelines for daycare workers.

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1. Introduction and background

Daycare workers are a specific population that has had little attention in the research community in recent years, with most of the research taking place in the 1990's and early 2000's. In a 2012 statistical supplement published by the Workplace Safety and Insurance Board (WSIB) of Ontario, workers in the daycare/homecare field contributed to 7% of all reported workplace injuries (WSIB, 2012). With this incidence of work-related injury, it is imperative

that interventions are researched to help mitigate this injury risk.

Brown and Gerberich (1993) used statistical information to examine the rate, type and mechanisms of injury experienced by daycare caregivers. The results found the back and upper/lower extremities to be the most common areas of injury; while the most common mechanisms of injury were worker overexertion and falls (Brown and Gerberich, 1993). In another study, some of the ergonomic factors that could cause increased worker injury were identified (Swanson et al., 1994). Some of the factors identified were: lifting, bending, stooping, squatting and carrying loads. Additionally, high-risk tasks including lifting children to change tables, bending to use equipment and carrying children were identified (Swanson et al., 1994). Working posture has also been associated with self-report discomfort in the neck/shoulder, back, and lower limbs. This is dependent both on time spent working, and on sitting versus standing work. On average, discomfort increased over the course of the shift; but self-reported discomfort decreased when the subject was able to sit while working. Surprisingly, this was not the case in the back, as seated work increase back discomfort when compared to standing (Antle et al., 2015).

In the same period, a study was performed in Quebec daycare centres including a full ergonomic assessment and physical demands analysis of the conditions of workers and facilities. The results suggested that injuries were primarily caused by falls and tasks involving excessive effort and movement (Markon and Le Beau, 1993). Owen (1994) performed a 4-hour workplace observation of worker-identified "difficult tasks", and recorded information involving worker performance. Workers were observed based on: lift duration, bending, twisting, and foot position. The employees reported lifting, specifically children, to be the most physically demanding tasks. Recommendations for improvement included: implementing assisted lifting, the use of chairs with increased back support, and improvement of toilets, cribs, and sinks (Owen, 1994). In 1996, King and colleagues observed workers on the job and noted the differences between the child age groups. Results suggested that there are different physical demands placed on the caregivers depending on the child group (King et al., 1996).

In terms of measurement, other studies have instrumented the worker to record quantifiable injury risk data and have related this data to self-report postural data obtained from questionnaires. Self-report data from questionnaires targeting worker mobility and control over posture were found to be useful additions to studies with observational components, particularly when relating working conditions to musculoskeletal outcomes (Laperrière et al., 2005). Inclinometers, capable of recording forward trunk inclination posture, showed a forward flexed posture of 20°, on average, and substantial percentage of worker time spent in postures in higher flexed postures (Kumagai et al., 1995). In addition to measuring trunk inclination, Shimaoka et al. (1998) also measured worker heart rate, step count, sit/stand time and lifting parameters. These researchers also examined caregivers with different child age groups and found workers in the younger groups experienced higher musculoskeletal and lifting/carrying demands (Shimaoka et al., 1998).

The previous research has led to the development of safe-lifting guidelines and ergonomic recommendations to help limit the exposure to these injury risks among this working population. This information has been presented in the form of brochures (OHCOW, 2012; Everest Re Group Ltd., 2010; UTexas.edu, (n.d.)), training programs (UTexas.edu, 2013), and information booklets (California Childcare Health Program, 2006). Despite this, it is unclear whether these resources are being used in employee training programs, and if the recommendations have been implemented in the workplace.

Based on the review of literature presented, there has been little quantitative field research conducted in the past decade. With advances in technology and more knowledge on worker injury exposure and safety, daycare data were collected to determine if any changes had been implemented since the early observations and to see if workers in this field are still exposed to these work risk factors. Therefore, the objectives of the current study were to evaluate postural and lifting demands in a sample of daycare workers, and compare these demands between the caregivers in three child age groups.

2. Methods

The protocols employed in the current study, as well as all recruitment and dissemination strategies have been approved by Queen's University's General Research Ethics Board.

2.1. Phase 1 – questionnaires

2.1.1. Subjects
Caregivers were recruited from five daycares in the Kingston, Ontario area. Within each of the daycares a set of questionnaires, one dealing with history of worker injury and the other with demographics and work, were distributed for all workers to complete (73 sets of questionnaires total).

2.1.2. Data collection
Two questionnaires were distributed to all employees. The first served to determine worker demographics and work experience (called the Demographics & Job Survey (DJS)). This survey included questions related to experience working in a daycare, educational background, health and safety training, and history of occupational injury. Finally, the questionnaire ended with a brief survey aimed to examine the employee's knowledge of safe lifting practices and determine whether they had ever received lifting training on the job. The second questionnaire (Pain Survey (PS)) identified areas of pain using an Extended Nordic Questionnaire (Dawson et al., 2009) and a modified Borg Scale (Borg, 1990) with a pain map. Additionally, the Oswestry Disability Index examined the effects of back pain on worker function (Fairbank and Pynsent, 2000).

2.1.3. Data processing
Questionnaire responses were summarized and general trends were recorded. Of particular interest were the areas of pain or discomfort, outlined in the Extended Nordic Questionnaire as well the areas and pain scores identified by the Borg Scale.

2.2. Phase 2 – field data collection

2.2.1. Subjects
Of those caregivers who completed and returned the questionnaires from Phase 1, 19 volunteered to continue on with the study. These 19 individuals, as well as an additional 5 caregivers (who did not complete any questionnaires) participated in phase 2 of the study (N = 24 volunteers: n = 23 females, 1 male; height = 163.9 ± 7.9 cm, weight = 72.0 ± 15.7 kg). Phase 2 involved an observation and measurement component, lasting approximately four hours. The daycares divide the children in three age groups: Infant (0–1.5 years), Toddler (1.5–~2.5 years) and Preschool (~2.5–~4 years). Preference was given to individuals with a minimum of 1 year experience working in a daycare, however provided the participants had completed the required education program for an Early Childhood Educator diploma, complete with mandatory placements, this experience threshold was not enforced. The average years of experience for all workers were 8.11 ± 9.6 years.