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Work-related musculoskeletal disorders and ergonomic risk factors in early intervention educators

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ABSTRACT

Background: Early intervention educators who serve children with special needs often suffer from physical strains. The objectives of this study were to investigate the prevalence of work-related musculoskeletal disorders in this population, and to evaluate the relationship between work-related musculoskeletal disorders and personal/ergonomic risk factors.
Methods: A self-designed questionnaire consisting three domains (demographics/prevalence of work-related musculoskeletal disorders/ergonomic risk factors) was delivered to educators who work in early intervention institutions.
Results: Ninety-four percent of early intervention educators suffered from musculoskeletal disorders. Logistic regression revealed that some work-related ergonomic factors were highly associated with symptoms on lower back, shoulder and neck, with odds ratios ranging from 0.321 to 4.256.
Conclusion: High prevalence of work-related musculoskeletal disorders impacts this occupation negatively. Further regulations to the institutions regarding workplace health promotion and environment modification, as well as training to the employees for body mechanics, should be implemented to prevent injury occurrence.

1. Introduction

Early Intervention (EI) is to enhance the development of children with disabilities by providing early, appropriate, and intensive interventions. It includes multidisciplinary services designed to serve children with special needs under the age of three, and older children up to 18 for broader scope (Allen, 2011). The target populations are children with disabilities in one or more of the following areas in development: physical, cognitive, adaptive, communicative, or social and/or emotional development. A group of professionals offer services including: screening and assessment, home visits and family counseling, physical therapy, occupational therapy, speech therapy, psychological services, audiology services, vision services, social work services, educational programs, etc. The early intervention educators are largest in number among these professionals. They take care of children in classroom within early intervention institutions, and serve as primary care providers for these children during their time in the institution.

The job demands of early intervention educations and childcare workers are similar. They are responsible for meeting the basic needs of children in addition to providing activities that stimulate the children's physical, emotional, intellectual and social growth (Bureau of Labor Statistics BLS, 2002b; Sanders, 2004). The physical demands include but not limited to frequent lifting and carrying children, transferring children from one place to another, sitting on the floor, reaching to various height, kneeling, squatting, bending, prolonged standing, pushing and pulling (Bureau of Labor Statistics BLS, 2002a; King et al., 1996). In addition, the setting and furniture in childcare institution are mainly designed for young children, therefore inappropriate for adults' body mechanics (King et al., 2006). Grant et al. (1995) in a work sampling study noticed that childcare workers spend an additional 26% of their time sitting on child-size furniture when helping children with activities. Another 18% of their work-time involved flexing and bending the trunk for more than 20°. The frequencies were even higher for those working with young children.

Furthermore, different from the childcare workers, early intervention educators serve children with special needs. These children

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are delayed in development thus require much more assistance in daily routine. First, they are more likely to be obese than their typically developing peers before age 3, and this risk gradually increases between 3 and 5 years of age (Emerson, 2009). Second, many of them exhibit abnormal muscle tone. Taking care of children with abnormal muscle tone demands greater physical effort when carrying, diaper changing, feeding, positioning, and stretching. Furthermore, some of them need help donning and doffing of assistive devices such as ankle-foot orthosis or lower extremity brace, and require a lot more assistance in self-mobility. These factors lead early intervention educators to a higher chance of acquiring work-related musculoskeletal disorders.

Work-related musculoskeletal disorders (WMSDs), defined as a subset of musculoskeletal disorders (MSDs) that arise out of occupational exposures, may lead to work restriction, work-time loss, or consequently cause work leave (Forde et al., 2002). They have been reported among other health care professionals (Ando et al., 2000; Darragh et al., 2009; Ju et al., 2011; Owen, 1994; Pompeii et al., 2009). Investigations on WMSDs in nursing staff reported a prevalence rate of 70–90% (Ando et al., 2000; Smith et al., 2004; Trinkoff et al., 2002). Among the listed disorders, prevalence of low back pain was the highest, followed by neck, shoulder and extremity pain. However, there is a paucity of literature on the prevalence of WMSDs in childcare workers, such as early intervention educators. Grant et al. (1995) investigated a small sample ($n = 22$) of childcare workers and reported 78% of musculoskeletal pain or discomfort. On the contrary, Bureau of Labor Statistics (BLS) (2002b) reported an injury rate of only 2.6% among childcare workers. The wide discrepancy might originated from a number of reasons, such as taking different cut point of WMSD severity for data inclusion (Sanders, 2004).

To date, most of the literature regarding childcare workers reported the relation between musculoskeletal symptoms and injury biomechanics (Brown and Gerberich, 1993; Gratz et al., 2002; King et al., 2006; Kumagai et al., 1998; Muto et al., 2006; Owen, 1994). Low back pain was the most frequently reported disorders (Gratz et al., 2002; King et al., 2006; Muto et al., 2006), and the main reason was associated with lifting children. However, no specific attention was paid to the prevalence of WMSDs in early intervention educators considering the potential ergonomic risk factors. Therefore, the purposes of this study were to survey the prevalence of WMSDs in early intervention educators, and to investigate the relationships of WMSDs with their personal and institutional data and occupational ergonomics, and to indentify whether these variables served as the contributing or predicting factors to WMSDs. The authors hypothesized that the occurrence of WMSDs would have significant impacts on WMSD-related consequences such as causing sick leaves, considering job change and affecting work performance.

2. Material & methods

2.1. Instrumentation

A questionnaire based on job specifics of early intervention educators was designed. The contents of this self-administered questionnaire were constructed and modified from related literatures investigating WMSDs among health care professionals and childcare workers. For content validity, four professors specialized in the field of early intervention, rehabilitation science, and special education reviewed the list of questions and made necessary modifications. A consensus was reached by these four experts with a CVI (content validity index) of 0.95. Interrater agreement (IRA) was also assessed for each item. The average IRA for the scale was 0.90.

The final questionnaire was composed of three domains – personal and institutional data, information regarding WMSDs, and work-related ergonomic factors (see Appendix). The first part was designed to obtain personal information (gender/age/marital status/child-bearing history/height/weight/highest degree earned/academic major) and work-related information (years of experience in EI/work days per week/work hours per day/break time/nap habit/exercise habit/type of EI service provided/age range of children served/diagnosis of children served/EI coworkers in the same class/personal protective equipment usage while working/feeling of stress). The second part covers the information regarding WMSDs (musculoskeletal injury occurrence/regions/severity/duration since onset/duration of symptoms/frequency of occurrence/causing sick leaves/considering job change/affecting work performance/participating related continue education courses). The design of this domain was in reference to Standardized Nordic Musculoskeletal Questionnaire (NMQ) (Kuorinka et al., 1987). The term "musculoskeletal disorders" here refers to work-related injuries happened at any time during EI educators' work hours, which can last more than a day and affect daily activities. The investigation covered nine body regions including neck, shoulder, upper back, elbow, hand/wrist, lower back, thigh, knee, and ankle/foot. The disorder was rated 0 to 4 from no pain to unbearable pain. Subject responded with score 1 and above was considered suffering from WMSDs. The third domain involved work-related ergonomic factors (diaper changing/feeding/toileting/grooming/transferring/rehabilitation).

Fifty EI educators from two institutions were surveyed to ensure the construct validity of the questionnaire. Cronbach's alpha coefficient, which is based on all possible correlations between each item on the scale and the total score, was used to reveal the internal consistency. The Cronbach's alpha coefficient for the WMSD domain and the ergonomic domain were 0.902 and 0.834 respectively. This value was 0.903 for the entire questionnaire. None of the tested items was eliminated during the factor analysis. The same group completed the questionnaire again after two weeks. The questionnaire had test-retest reliability above 0.75.

2.2. Sample & procedure

This study intended to survey EI educators who fit in the following categories: 1. work in an EI institution for at least 3 months; 2. serve children with special needs directly; 3. no musculoskeletal injuries attributed as source other than the workplace within the past 3 months. According to the 2010's statistics from Child Welfare Bureau, Ministry of the Interior, there were 101 EI institutions and 2,695 special educators working in different regions of Taiwan. Since there is no other reported statistics particularly for EI special educators, we took 2,695 as the sampling pool. A sample size of approximately 350 would be appropriate based on previous research (Bartlett et al., 2001). First we used stratified sampling method to decide the number of EI institutions included in the survey according to their geometrical distribution; then, we selected the target EI institutions with purposive sampling method to deliver the questionnaires. There were 34 EI institutions selected and 417 EI educators participated.

The procedure was approved by the Institutional Review Board of Chang Gung Memorial Hospital. The questionnaire was first mailed to the person in charge at each institution and then delivered to the subjects by that person. Along with the questionnaire, a cover letter was attached to explain the purposes of the study and to assure confidentiality. Seven days after the initial mailing, the author contacted the subjects to ascertain whether they received the mail and encouraged them to respond to the survey. The investigators also answered any remaining questions that the subject had in regard to study participation.