An Assessment of Workload on Upper Limbs when Caregiver Change the Nursing Trousers

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Abstract

In this research, movements of the upper limbs of caregivers when putting on/removing the dummy's nursing care clothes with different designs were measured using electromyography (EMG) and video filming. Caregivers' sensory assessments of the burden caused by their services were also investigated to determine how the physiological burden in the upper limbs and sensation of burden relate to each other. Subjects were 10 healthy women aged 23 ± 3 years, with a height of 159.7 ± 8.7 cm and weight of 50.5 ± 8 kg. None of the women had ever provided nursing care to anyone. For this experiment, four kinds of samples were used. By combining EMG and questionnaires, it was made possible to quantify the burden on the upper limbs, which cannot be assessed solely according to work time. Differences in the workload associated with trousers having different designs were also studied. Also, the possibility was suggested that by taking such an approach, nursing care clothes may be developed that would further reduce the burden on caregivers while providing nursing care.

Keywords: Nursing Care; Trousers; Workload; EMG

1   Introduction

In Japan 2007, the percentage of elderly people aged 65 or older exceeded 21% of the total population [1]. With Japan's ageing population situation, nursing care has become a significant social issue. When preparing for the national exams to gain a license, nursing care workers are required to posses basic job techniques, ergonomic knowledge, and an understanding to body mechanics that will help them to ease the burden of nursing care [2]. It is, however too much to ask the general public, who often provide home-based care for their family members, to acquire such basic techniques and expert knowledge [3]. Such being the case, there has been a growing demand for the development of nursing care goods that ordinary people can use effectively in their homes without a great deal of expert techniques or knowledge.

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According to the guidelines set by the Ministry of Health, Labour and Welfare of Japan, daily nursing services for Level 3 – Level 5 recipients of nursing care ("bedridden persons") include meals [4], excretion, and changing clothes. Of these services, the caregiver must change the position of the recipient for excretion and changing clothes, and this is feared to cause strain in their lower back. Since such actions also involve procedures that use one's hands, a burden is placed on the upper limbs and shoulders of the caregiver as well.

In many of the studies on nursing care movements and their associated burden, the strain on the lower back and the degree of burden on the entire body are assessed [5, 6], only a few takes into the consideration of the measurement and assessment of the burden associated with the upper limb movements. This area of study should not be taken lightly as it is impossible for caregivers to carry out their jobs without using their upper limbs [7]. If the relationship between movements of the upper limbs and the resultant burden can be made clear, it may be possible to gain knowledge that would be useful for designing nursing care clothes and diapers that can be easily put on and removed.

In this research, the upper limb movements of caregivers when putting on/removing the dummy's nursing care clothes with different designs were measured using electromyography (EMG) and video filming. Caregivers' sensory assessments of the burden caused by their services were also investigated to determine how the physiological burden in the upper limbs and the sensation of burden relate to each other. In other words, the caregivers' burden was not only assessed using motion and EMG analysis, but also their sensation of burden was taken into account in order to gain a full insight of the knowledge that maybe useful for designing caregiver-friendly nursing care goods.

2 Methodology

2.1 Subjects and Experiment Samples

Subjects were 10 healthy women aged 23 ± 3 years, with a height of 159.7 ± 8.7 cm and weight of 50.5 ± 8 kg. None of the women had any nursing care experience. For this experiment, four kinds of samples were used: Sample 1 consisted of ordinary pajama-type trousers (Fig. 1), Sample 2 was a pair of trousers with a fastener on the side of each leg (Fig. 2), Sample 3 had an opening under the crotch secured by Velcro for ease of changing diapers, strings on both sides that could be tied at the center, and narrow cuffs (Fig. 3), and Sample 4 was identical to Sample 3 except that its cuffs were wider (Fig. 4).

Fig. 1: Sample 1

Fig. 2: Sample 2