IQOL: Improving Quality of Life

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***Abstract*— Quality of life (QOL) has been recognized as very important in the evaluation of healthcare. WHO describes QOL as a broad ranging concept affected in a complex way by the person's physical health, psychological state, personal beliefs, social relationships, and their relationship to salient features of their environment. In this special track, research on improving the QOL of people with physical disabilities is presented. The focus is on research aimed at making their life more comfortable, not at treating or curing their disability.**

Keywords- quality of life; physical disability; mental disability; walking assistance; powered foot prosthesis; activities of daily living.

I. INTRODUCTION

The constitution of the World Health Organization (WHO) defines health as "A state of complete physical, mental, and social well-being not merely the absence of disease…[1]." It follows that the measurement of health and the effects of health care must include not only an indication of changes in the frequency and severity of diseases but also an estimation of well-being, which can be assessed by measuring the improvement in the quality of life (QOL) related to health care [1].

The WHO defines QOL as "an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns." It is a broad ranging concept affected in a complex way by the person's physical health, psychological state, personal beliefs, social relationships and their relationship to salient features of their environment" [1].

Therefore, research related to QOL has covered a very wide area, not only treating or curing disabilities, but also making the lives of people with disabilities more comfortable. Such research was first undertaken by Karnofsky and Burchenal, who studied QOL for cancer patients in the 1940s [2]. Nowadays, QOL is an important consideration not only in terms of cure but also in terms of care.

In this special track, the improving QOL (IQOL) is defined as research aimed at developing technologies that will help the disabled and/or the late elderly to move freely.

The next section summarizes the contributions made in this special track, and the last section summarizes the importance of these contributions.

II. SUMMARY OF CONTRIBUTIONS

In this special track, four contributions will be presented. Two of them are related to improving the walking ability of the disabled and/or the late elderly. The ability to walk by themselves without a caregiver's assistance or wheelchair is an effective way for them to maintain their health.

Murata et al. devised a novel powered foot prosthesis, the Powered Foot Prosthesis Emulating Motion of Healthy Foot (PEHF) shown in Figure 1, which emulates the motion of a healthy foot with a half cycle delay [3]. When a healthy person is walking, the motions of both feet are basically the same, with a half cycle difference. On the basis of this principle, the angular velocity of the foot part of the PEHF has the same angular velocity as the healthy foot, with a half cycle delay. Since the PEHF uses an industrial cylinder motor to push and pull the foot part of prosthesis, its cost would be dramatically lower than that of existing foot prosthetics. Several million people around the world live with limb loss. Due to its lower price, many amputees would be able to easily afford the PEHF, enabling them to walk like healthy people.

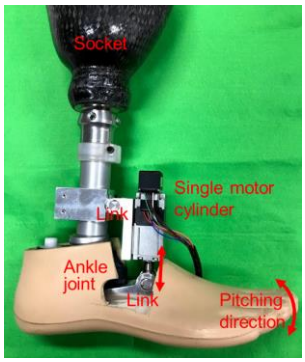

Figure 1. Prototype of PEHF.

Baba et al. developed a spring assist unit, shown in Figure 2, that fits in the heel of a shoe and helps the disabled and/or the late elderly raise their heel when beginning to walk [4]. Experimental results demonstrated that it substantially assists gait walking, that there is a correlation between body weight and optimal spring stiffness, as shown in Figure 3, and that the spring assist unit does not affect the person's walking posture. This means that the wearer can walk with less muscle power and that the fall probability is lower.

Shoes with Nike Air technology have the same effect [5], but since they are designed for athletes, they are not suitable for the disabled and/or the late elderly as their foot muscles are weak.

(a) Spring assist units

(b) Shoes with spring assist unit

Figure 2. Spring assist units and shoes with unit

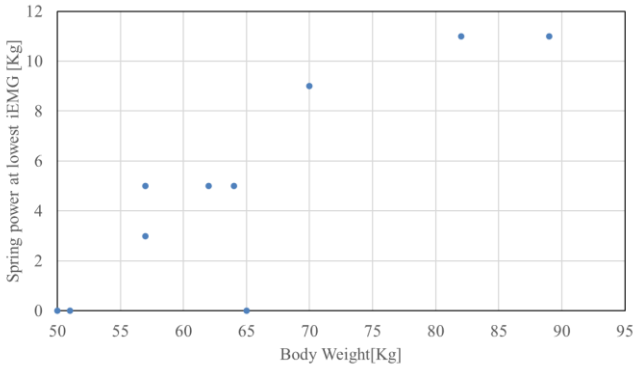

Figure 3. Lowest iEMG vs. participant body weight.

The other two contributions are related to patients in a hospital.

In-patients typically experience a drop in physical activity [6]. However, even short-term rehabilitation treatment should improve their ability to perform activities of daily living (ADL), but the changes in physical activity levels accompanying such treatment are unknown. Nishimura et al. used the Barthel Index (BI) [7] to evaluate changes over one week in the physical activity levels of in-patients undergoing rehabilitation treatment and investigated the correlations between the variabilities in these factors [8]. The BI and physical activity levels were measured at the beginning and end of the week for eight patients undergoing rehabilitation treatment at Iwate Medical University Hospital. The number of steps taken and time spent walking increased significantly between measurements. On the other hand, there was no significant difference in BI scores between the measurements. Four of the eight in-patients exhibited an improved BI, and none of them exhibited a worsened BI. Furthermore, there were no significant correlations between the BI score variabilities and the variability in the number of steps taken or time spent walking. The results suggest that rehabilitation treatment improves ADL ability and increases the physical activity level of in-patients although the variabilities in these factors are not correlated.

Imabuchi et al. developed a novel video monitoring system to automatically detect typical patient behaviors, such as rising from the bed, leaving the bed, falling down, and wandering [9]. Their system utilizes infrared omnidirectional cameras that enable a wide range of monitoring actions both day and night. Skeletal information of multiple patients is captured using a computer vision-based pose detection technology and used to classify each behavior. Evaluation experiments demonstrated the feasibility of detecting typical patient behaviors using the proposed system. A shortage of healthcare workers due to the declining birthrate and aging population is placing a heavy burden on them to address the growing demand for 24-hour medical services. The developed video monitoring system should prove useful in detecting in real time wandering behavior and accidental falling 24 hours a day. By enabling nursing staff to quickly reach a patient who has wandered away and/or fallen, this system should reduce the need to bind dementia patients to their bed to prevent them from wandering and/or falling.

III. CONCLUSION

The contributions in this special track provide useful information to researchers interested in the gait, prosthetics, walking robots, rehabilitation, and monitoring.

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