

The utility of walking assistive devices among people with mobility disabled

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지체장애인의 보행 보조기 사용

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Abstract This study compared the utility of walking aids, and activities of daily life depending on the ability of people with mobility disabilities to use walking aids. Data were extracted from the Korea Welfare Panel Study in 2014. Data of 435,947 individuals were analyzed using chi-square and t-tests. The findings from this study showed that disabled persons who cannot use walking aids independently were more likely to have a severe disability level and a lower level of daily activities than the independent group. The level of social participation and leisure activities were also significantly lower in the dependent than the independent group. Therefore, walking aids should be tailored for individuals depending on their level of independence for using walking aids.

Key Words : Assistive device, Convergence, Disables, Mobility, Satisfaction, Walking

요약 본 연구의 목적은 장애인의 보행 보조 기구의 사용 능력에 따른 보행 보조 기구의 사용과 일상생활 수행정도를 비교하는 것이다. 연구자료는 2014년 한국복지패널 표본에서 추출하였다. 전체 435,947 자료를 교차분석과 t-검정을 이용하여 분석하였다. 연구 결과, 독립적으로 보행 보조 장치를 사용할 수 없는 장애인들이 장애정도가 더 심하고 일상생활 수준도 낮은 것으로 나타났다. 또한 사회참여 수준과 여가활동 수준도 역시 비교그룹에 비해 독립적으로 사용하는 그룹에서 현저히 낮았다. 보행보조기는 장애인의 보행보조기 사용에 있어 장애인의 독립성 수준에 따라 맞춤형으로 해야 한다는 결론이 도출되었다.

주제어 : 보조기구, 융합, 장애인, 활동, 만족도, 보행

1. Introduction

The National Disability Survey reported that there were more than two million disabled people in South Korea, 50% of whom had

mobility impairments [1].

People with mobility impairments have limitations in taking care of their daily lives independently. Various walking aids are designed and recommended for people with mobility

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impairments to help increase their mobility independence. The rehabilitation service team offers effective walking aids and also provides education regarding their management. Despite the beneficial effect on walking in people with mobility disability [2], the utility of walking assistive devices vary depending on the individuals' ability to use them. Gignac et al. reported that the use of assistive devices might have different associations with well-being [3]. The social activities or participation in mobility disability can be affected by the level of walking devices utilization [3]. Several factors are associated with the use of walking assistance devices, such as personal help, age, the severity of disabilities, satisfaction with their devices, and the level of daily activities [4,5].

South Korea's Ministry of Health and Welfare conducts the Korea Welfare Panel Study (KWPS) to assess data on social welfare. The KWPS (2014) analyzed data on the needs of the people throughout their life cycle to enhance policy flexibility and responsiveness. Since 2006, the KWPS has been collecting panel data related to social welfare, including low-income, social security, and disability issues. The survey for the disabled investigates six dimensions: a) causes for disability and current status, b) everyday life, c) survey for pre-schoolers (from year 0-before entering the school), d) survey for students (elementary-high school), e) survey for adults (aged 18-below 65), and f) survey for seniors (aged 65 or above) [7].

Traditionally, white canes and guide dogs have a long history of use for people with visual impairments [8,9]. However, along with the development of advanced assistive technology, various assistive technology is linked to the quality of life of the disabled.

This study aimed 1) to identify the general characteristics and factors associated with the disabled conditions depending on the ability to use the walking assistive devices, 2) to compare

the level of satisfaction with their walking assistive devices and the level of activities of daily living (ADL)/ instrumental ADL (IADL), and 3) to compare the distribution of social activities depending on the ability of people with mobility disabilities to use the walking aids.

2. Methods

2.1 Sample

Participants included those with a mobility disability such as an amputation, paralysis, joint disorder, and/or deformities. The Korea Welfare Panel Study (2014) data were used, and a sample of 435,947 was included. The inclusion criteria were: mobility disabilities with the possession of walking aids such as a cane, crutch, walker, and wheelchair. To compare the main factors, the sample was grouped into an independent ($n=310,416$) and dependent group ($n=125,531$) according to their ability to use the walking aids. That is, during panel questions, if respondents said walking assistance can be possible independently, they were classified into independent groups, and if they say it was dependent, they were classified into dependent groups.

2.2 Data of the KWPS

This survey is conducted regularly every three years by the Ministry of Health and Welfare to assess the overall status of the disabled and reflect them in government policies [7]. Data were collected from January to December 2013. This panel data for the 2014 survey of the disabled was a sample collection frame [7]. Samples were collected using the systematic probability proportional to size (PPS) extraction method, considering the characteristics of surveyors (apartment surveyors, usually called surveyors) [7]. The survey table includes the

household, the discriminative survey table, and the in-depth survey table (individual survey table). The in-depth survey table contains disability characteristics by disability type and disability commonalities (health, daily life support, disability aids, education, employment and vocational life, social, cultural, and leisure activities, marriage/female lovers, life satisfaction, the experience of violence and discrimination, housing, welfare services, and economic conditions).

2.3 Measurements

In this study, all variables were measured using the in-depth survey table [7].

Severity levels of disabilities: The severity levels of disability can be classified into six indices (1-6 index); the lower the index, the higher the severity. In this study, we classified into 3 level (1-2 index, 3-4 index, 5-6 index) according to the level of mobility function.

Satisfaction with walking aids: The satisfaction with walking aids was scored from 1 (not satisfied) to 4 (fully satisfied).

Activities of daily living (ADLs) and Instrumental ADLs: The ADLs and IADLs were used. ADLs and IADLs tools also inquired about the long-term care insurance scheme for older adults. The scores on the ADLs tool ranged from 12 to 36, while the scores on the IADLs tool ranged from 8 to 32. Higher scores indicated a lower level of activities of daily living.

Social activities: Social activities included the presence of social participation and leisure activities (using the internet, watching movies, etc.).

2.3 Data analysis

Descriptive statistics such as mean (\pm SD) and frequency (%) were used. The chi-squared and t-test were performed to compare the main factors between groups using IBM SPSS 26.0 program.

3. Results

3.1 General characteristics

Table 1 presents the demographics of dependent and independent groups.

The mean age of the dependent and independent groups was 69.58 (\pm 15.0) and 67.14 (\pm 13.04) years, respectively. Among the independent group, 27.2% were employed, while only 9.9% were employed in the dependent group. In the dependent group, 74.2% were enrolled in the national health insurance service, while 85.8% in the independent group had a national health insurance. On the other hand, 25% in the dependent group had Medicaid-medicare service from the government, while 13.9% of the independent group used this service.

Table 1. General characteristics

Characteristics	Classification	The ability to use of walking aids	
		Independent n (%) or M \pm SD	Dependent n (%) or M \pm SD
Gender	Man	133285(42.9)	58451(46.6)
	Women	177131(57.1)	67081(53.4)
Age, years	Range: 20-105	67.14 \pm 13.04	69.58 \pm 15.00
Education	Informal education	55941(18.0)	28815(23.0)
	Elementary - high school	212810(68.6)	83544(66.6)
	College \uparrow	41665(13.4)	13173(10.5)
Having job	Yes	84319(27.2)	12419(9.9)
Having spouse	Yes	161021(51.9)	62371(49.7)
Types of insurance	Health insurance	266367(85.8)	93123(74.2)
	Medicaid	43183(13.9)	31363(25.0)
	Others	866(0.3)	1046(0.8)

3.2 Mobility disabled related characteristics

Table 2 presents the comparison of characteristics related to mobility disabilities between the dependent and independent groups. As a result, the severity of disabilities, type of

disabilities, satisfaction with the use of devices, ADLs, and IADLs was statistically different between the two groups ($p < .001$). That is, the proportion of 1-2 index of severity was higher in the dependent group compared to the independent group ($p < .001$).

The proportion of amputation and paralysis type of disabilities was higher in the dependent group than the independent group ($p < .001$). However, satisfaction with the use of the device in the dependent group was greater than in the independent group ($p < .001$). The level of ADLs and IADLs in the dependent group was worse than the independent group ($p < .001$).

Table 2. The comparison of mobility disabled related characteristics between groups

Characteristics	Classification	The ability to use of walking aids		χ^2 or t (p)
		Independent n (%) or M \pm SD	Dependent n (%) or M \pm SD	
Severity of disability	1-2 index	26238(8.9)	47968(43.0)	66743.40 ($<.001$)
	3-4 index	120956(40.9)	37997(34.0)	
	5-6 index	148376(50.2)	25632(23.0)	
Types of disability	Amputation	18483(6.0)	14251(11.4)	28940.35 ($<.001$)
	Paralysis	43985(14.2)	42208(33.6)	
	Joint disorder	231811(74.7)	62231(49.6)	
	Deformation	16137(5.2)	6841(5.4)	
Satisfaction of use of devices	Range:1-4	2.87 \pm 0.67	2.97 \pm 0.64	-45.00 ($<.001$)
ADLs	Range: 12-36	12.76 \pm 1.50	19.05 \pm 6.83	-323.40 ($<.001$)
IADLs	Range: 8-24	10.02 \pm 3.18	18.38 \pm 6.70	-422.97 ($<.001$)

(ADLs: Activities of daily livings, IADLs: Instrumental ADLs)

3.3 Social activities between groups

Table 3 presents the distributions of social activities between the dependent and independent groups.

The independent group was found to be more active in social activities. That is, 63.5% of the independent group engaged in social participation, while 35.2% participated from the dependent group ($p < .001$). In the independent

group, 22.5% used the Internet, while 14.3% could assess the Internet in the dependent group ($p < .001$). In the dependent group, 12.5% answered "alone" in the item "Ability to cope with risk situations," while 66.3% responded "alone" in the independent group ($p < .001$).

Table 3. The comparison of social activities between groups

Characteristics	The ability to use of walking aids		χ^2 (p)
	Independent n (%)	Dependent n (%)	
Social participation, yes	197088 (63.5)	44204 (35.2)	28921.52 ($<.001$)
Watching movie or music at outside	17530 (5.6)	4978 (4.0)	516.30 ($<.001$)
Watching TV	305554 (98.4)	119151 (94.9)	4399.11 ($<.001$)
Using the Internet	69741 (22.5)	17942 (14.3)	3717.03 ($<.001$)
Creative hobby	12467 (4.0)	974 (0.8)	3140.82 ($<.001$)
Sports, yes	23976 (7.7)	4242 (3.4)	2786.91 ($<.001$)
Learning activity	10238 (3.3)	1247 (1.0)	1851.07 ($<.001$)
Volunteering	13065 (4.2)	1591 (1.3)	2380.46 ($<.001$)
Touring	19031 (6.1)	2437 (1.9)	3350.86 ($<.001$)
Eating out with family	102209 (32.9)	18658 (14.9)	14554.53 ($<.001$)
House working	215743 (69.5)	33639 (26.8)	66584.06 ($<.001$)
Resting in public places (e.g Sauna)	93285 (30.1)	18188 (14.5)	11375.27 ($<.001$)
Ability to cope with risk situations, Available alone	205693 (66.3)	15667 (12.5)	103446.17 ($<.001$)

4. Discussion

The findings from this study revealed the characteristics of disabled people who used walking aids independently and dependently.

Some devices such as a wheelchair may help with mobility or movement within a building or where there is a level change. Various walking aids can help people with an impaired ability to walk. Walking aids generally refer to canes,

crutches, and walkers [8]. It should be used to suit the needs of the individual user and is an aid that helps improve stability, reduce loads, and generate all or part of the movement [9,10]. In previous studies on walking aids, the user's ability to integrate walking assistance devices was found to affect the use of their devices [6,9-12].

In this study, the independent use of the assistive device differed depending on the class of disability or severity. However, the satisfaction with the assistive device was low among the disabled who used the assistive device independently. It can be inferred that the walking device was not tailored for independent use. Recently, technological walking advances can be expected to significantly increase the range of these devices, for example, by using sensors and audio or tactile feedback [8].

The development of these devices is expected to have a positive impact on the social activities of the disabled in previous studies [9,13-16]. The results of this study showed that disabled people who could not use the assistive device independently had low social participation and that outdoor leisure activities were also limited. In the future, the development of walking devices suitable for the daily standard of the disabled will increase their social participation, and this positive social participation will be a strategy to improve their quality of life. Previous studies have also reported that the use of these devices increases social participation and improves the social and cognitive functions of people with disabilities [3-5].

Therefore, based on the results of the present study, the use of assistive devices and its related social activities should be monitored. Besides developing technology for it, research should also continue to confirm education and compliance with education on its use.

5. Conclusion

The severity of the disability, the type of disability, the level of satisfaction with devices, and their daily activities were related to the presence of walking assistance devices. Therefore, walking assistive devices support and education programs are needed so that people with disabilities can use assistive devices well and future studies should address how walking aids (i.e., canes, crutches, walkers, and rollators) enable social participation among people with disabilities.

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