The effect of using welfare IT convergence contents on physical function, depression, and social participation in the elderly

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Abstract. [Purpose] This study investigates the effects of welfare IT convergence contents on physical function, depression, and social participation among the elderly. It also aims to provide material for future activity mediation for the elderly. [Subjects] Two hundred subjects >65 years were selected from six elderly welfare facilities and related institutions in the Busan and Gyeongbuk areas and were evaluated from 2014 to 2015. [Methods] This study assessed physical function, depression, and social participation; 100 subjects who utilized commercialized welfare IT convergence contents were included in an experimental group and 100 subjects who had no experience thereof were included in a control group. [Results] When comparing differences in physical function between the groups, balance maintenance was better in the experimental group. There were also significant differences in depression and social participation. The experimental group displayed higher physical function, lower depression levels, and higher social participation levels compared to the control group. [Conclusion] Welfare IT convergence contents positively influence occupational performance in the elderly. Future research is necessary to provide information to the elderly through various routes, so that they can understand welfare IT convergence contents and actively utilize them.

Key words: Welfare IT convergence contents, Physical function, Social participation

INTRODUCTION

Recent advances in medicine have been associated with health promotion and the prolongation of the average lifespan; subsequently, this has resulted in an increase in the aged population ratio. Therefore, population aging is continuously ongoing across the globe[3]. When one grows old, physical, cognitive, and social functions decline. Due to the decline of physical and cognitive function and the increase in depression, the elderly have increased risk of senile disorders such as cerebrovascular disease, degenerative disease, and dementia[3]. Accordingly, in order to maintain and improve the physical function of the elderly and encourage active social participation, strategies are required to improve performance in various fields.

Recently, a technology that creates new types of goods and services is receiving attention by applying IT technology to existing industries[3]. This concept is called IT convergence. It is a technology that creates new services and jobs in order to realize the benefits of a future life where all individuals are healthy and secure by applying IT technology to service industries that are related to daily life. Of these technologies, welfare IT convergence is a concept that has been newly created for the elderly, infirm, and disabled. Welfare IT convergence realizes the “harmonious growth of welfare and industry” and improves “quality of life” by blending IT and welfare services[3]. It is a concept connected with medicine, engineering, and

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welfare, which collectively links all industries that develop systems for the progress of humanity’s wellbeing. It also includes developing and using software for monitoring. Particularly, welfare IT convergence contents are developed targeting the elderly, infirm, and disabled, i.e., the vulnerable members of society. The effectiveness and relevance of such contents are gradually increasing.

Recently, social support for the elderly has become more widespread; however, in many cases, the contents that provide proper services and information are insufficient compared to the demand. There are many previous studies on the factors that influence each individual area of welfare (e.g., the effect of IT convergence contents on perception or depression, or the effect on education); however, there has been no research on the influence on occupational performance that integrates all these areas. Particularly, there is almost no research targeting the elderly.

This research aims to present the welfare IT convergence contents that can be helpful for the elderly, and to investigate the influence of welfare IT convergence contents on their physical function, cognitive function, and occupational performance.

**SUBJECTS AND METHODS**

This study was conducted from September 1, 2014 to March 30, 2015. In order to carry out the research using survey contents and assessment report measurements, all details of this study’s procedures were submitted to the Science Research Council of Inje University, which approved the study protocol.

The researcher conducted physical function, depression, and social participation assessments, targeting subjects over the age of 65 who were using six elderly welfare facilities and related organizations in Busan and Gyeongbuk. Among these institutions, three institutions were utilizing welfare IT convergence contents on the elderly, while the other three were not. The researcher selected 100 senior citizens who were using commercialized welfare IT convergence contents as the experimental group, and selected 100 senior citizens who had no experience of using such contents as the control group.

In terms of physical health support contents, the experimental group of this study mainly utilized virtual exercise programs such as Wii-Fit; an alarm function that informed patients of times to take medicine or important schedule items; and smartphone applications that could monitor health issues such as diabetes and blood pressure. In respect to cognitive health support contents, these consisted of mainly computer games, mobile phone application games (figure making, puzzles, picture making), and applications that checked for dementia. The contents that supported ADL and leisure were mainly electronic equipment such as robot cleaners that did domestic work, real-time traffic navigation devices that helped while driving, and mobile weather information devices. It was determined that the subjects utilized various kinds of contents, though most welfare IT convergence contents used were those that utilized computer or mobile devices.

In order to measure physical function, muscular strength, muscle endurance, flexibility, and balance response were measured for this study. Muscular strength testing was performed in both hands using a Jamar dynamometer twice, indicating maximum grasping power in kilograms. Muscle endurance was measured using sit-ups that tested the dynamic endurance of abdominal muscles. Subjects were also asked to reach their elbow to their thigh, and success was indicated by maintaining the pose for 30 seconds. Flexibility of the waist and leg was measured with sit-and-reach maneuvers, using a regular pushing speed and maintaining two fingertips in parallel position; the maximum value was obtained after measuring twice. Balance response was measured by standing on one leg, which is a measurement of static balance that stably maintains a body in space.

For the elderly depression scale, the Korean Depression Scale (KDS) was utilized. This scale is composed of six sub-areas (negative thinking about the future, negative thinking about self, worry and nervousness, depressed mood, physical symptoms, and lack of enthusiasm). It is composed of 30 total questions, 5 per each sub-area. The total score range is 0–120, with a higher score indicating more severe depression.

The Craig Handicap Assessment and Reporting Technique was developed to assess patients’ social participation limitations. This tool assesses patients’ social participation limitations in 6 areas and 19 questions. The sub-items include physical independence, cognitive independence, movement, occupation, social integration, and economic independence. The total score is measured from 0–100 points, with 0 points meaning participation limitation appears in all areas, and 100 points meaning that no participation limitation exists.

Research data was analyzed using the SPSS ver. 19.0 program. To compare the differences in details between the two groups (the experimental group and the control group), a t-test was conducted. The statistical significance level in this study is $p<0.05$.

**RESULTS**

Concerning the age and gender distribution of the subjects, the average age of the experimental group was 71.20, and the group consisted of 47 males (47.0%) and 53 females (53.0%). The average age of the control group was 69.82, and the group consisted of 41 males (41.0%) and 59 females (59.0%). Gender and age characteristics of the subjects are summarized in Table 1. After conducting equivalence checks regarding the gender and age composition of the experimental group and the control group, no statistically significant difference was found ($p>0.05$).

When comparing differences in physical function between the experimental group and the control group, balance response
showed a statistically significant difference (p<0.05). In the experimental group, balance maintenance time on one foot was 2 seconds longer (24.3±9.64) than in the control group (21.09±8.26) (Table 2).

When comparing differences in depression between the experimental group and the control group, statistically significant differences were found in all items of the Korean Depression Scale (negative thinking about the future, negative thinking about self, worry and nervousness, depressed mood, physical symptoms, loss of enthusiasm) and in the total scores of both groups (p<0.05, p<0.01) (Table 3).

When comparing differences between the experimental group and the control group with respect to social participation, there was no statistically significant difference between the two groups in terms of physical independence, movement, or

Table 1. Age and gender of the subjects (n=200)

| Categories       | Control group (n=100) | Experimental group (n=100) |
|------------------|-----------------------|----------------------------|
| Age (years) M±SD | 71.2±4.9              | 69.8±3.3                   |
| Male             | 47 (47.0%)            | 41 (41.0%)                 |
| Female           | 53 (53.0%)            | 59 (59.0%)                 |
| Total            | 100 (100.0%)          | 100 (100.0%)               |

Table 2. Comparison of differences in physical function (n=200)

| Categories       | Control group (n=100) | Experimental group (n=100) |
|------------------|-----------------------|----------------------------|
| Strength M±SD    | 36.0±7.2              | 36.3±6.9                   |
| Endurance M±SD   | 7.4±2.7               | 7.3±2.2                    |
| Flexibility M±SD | 12.9±8.2              | 13.1±8.5                   |
| Balance M±SD     | 21.1±8.3*             | 24.3±9.6*                  |

*Values are mean±SD, *Significant difference (p<0.05)

Table 3. Comparison of differences in depression (n=200)

| Categories                      | Control group (n=100) | Experimental group (n=100) |
|---------------------------------|-----------------------|----------------------------|
| Negative thinking about the future M±SD | 7.9±3.9**           | 4.6±3.2**                  |
| Negative thinking about self M±SD | 4.8±2.9**            | 4.7±2.8**                  |
| Worry/nervousness M±SD          | 5.5±3.9*             | 4.2±3.0*                   |
| Depressed mood M±SD             | 7.7±4.4**            | 5.5±3.1**                  |
| Physical symptoms M±SD          | 8.4±4.6**            | 5.3±3.4**                  |
| Loss of enthusiasm M±SD         | 6.6±4.3*             | 4.6±3.4*                   |
| Total score M±SD                | 46.7±20.1**          | 29.4±16.4**                |

*Values are mean±SD, *Significant difference (p<0.05), **Significant difference (p<0.01)

Table 4. Comparison of differences in social participation (n=200)

| Categories       | Control group (n=100) | Experimental group (n=100) |
|------------------|-----------------------|----------------------------|
| Physical independence M±SD | 98.6±4.4             | 99.7±1.9                   |
| Cognitive independence M±SD | 85.6±10.2**          | 98.1±5.5**                 |
| Movement M±SD    | 86.2±13.0             | 89.5±11.5                  |
| Work M±SD        | 54.5±27.0**           | 72.6±27.1**                |
| Social integration M±SD | 45.9±34.5**         | 74.6±22.3**                |
| Economic independence M±SD | 89.3±18.2           | 90.1±15.4                  |
| Total score M±SD | 456.6±61.9**          | 524.8±47.5**               |

*Values are mean±SD, **Significant difference (p<0.01)
DISCUSSION

The purpose of this study is to investigate the effects of welfare IT convergence contents on the physical function, depression, and social participation of the elderly. Based on the research results, the study intended to provide basic data in order for welfare IT convergence contents to be properly utilized as useful tools for health promotion in the elderly. The study conducted assessments in 3 areas targeting both the elderly who utilize welfare IT convergence contents and those who do not.

This research compared the differences in each function between an experimental group and a control group. When comparing differences in physical function between the two groups, balance maintenance was better in the experimental group. Recently, many studies have been conducted that show virtual reality exercise programs improve balance, muscle activity, and flexibility in the elderly\(^{10, 11}\). These programs are intended for patients with stroke, Parkinsonism, or nervous system diseases; they encourage interest and participation by conducting different types of projects in a virtual environment while simultaneously inducing improvement in physical function\(^{10}\).

In terms of depression, the scores in all subcategories as well as the total KDS scores in the experimental group were lower than in the control group, and a statistically significant difference was found between the two groups. Recently, Korea has been frequently mentioned as having the highest elderly suicide rate among OECD countries. As a result, efforts are being taken to investigate the cause of elderly suicide and find solutions, and various support policies and information are being offered in order to prevent elderly depression and enhance communication and exchange\(^{12}\).

Recently, advanced research from overseas has determined that computer/Internet/IT use among the elderly has positive effects on psychological stability, raising self-efficacy and decreasing loneliness. These studies also reported that individuals need a role to relieve social isolation, and that being in a role raises confidence among the elderly and helps them to resume community activity\(^{13, 14}\).

When comparing differences in social participation between the experimental group and the control group, statistically significant differences were found in cognitive independence, occupation, social integration, and the total scores for participation. Studies are concluding that information equipment utilization among the elderly in an information-oriented society can more successfully contribute to solving the problems that the elderly experience, and can help them perform positive roles in social participation activities with improved self-respect\(^{15}\).

Social participation that was directly connected with quality of life among the elderly was generally high in the experimental group that utilized welfare IT convergence contents, particularly in the areas of occupation and social integration. The fact that the experimental group displayed higher scores in these areas is a result that implies a significant need to consider the characteristics of the elderly.

A limitation of this research is that it did not represent the entire elderly population, since it only targeted subjects in the Busan and Gyeongbuk areas. Also, it drew conclusions based only on certain kinds of welfare IT convergence contents that the subjects utilized, so it was limited in the types of welfare IT convergence contents it could suggest. In research henceforth, it will be necessary to investigate how the elderly currently use welfare IT convergence contents and prepare a plan to collect data and provide information to senior citizens nationwide. Furthermore, continuous follow-up studies on IT convergence contents should be conducted, with the aim to help the older generation based on in-depth understanding and sympathy for them.

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