INTRODUCTION

The World Health Organization (WHO) predicted that the share of the population aged 60 year and over will increase due to the rapid aging of the global community and reported that dementia and depression are the major risk factors for mental health problems in the older adults. Consequently, mental health in late-life are becoming more important than at any other time of life [1]. The proportion of those over 65 years of age in Korea has expanded from 15.1% (2019) to 17.5%(2022) [2]. Dementia patients accounted for 10.2% (2021) of the older adults over 65 years in South Korea [3]. In addition, the proportion of depression among the older adults over 65 years reached 13.5%(2020) [4]. These statistical trends indicate that depression and cognitive impairment are major factor that threatens the mental health of the older adults.

According to studies on geriatric depression and cognitive impairment, there was a meaningful relationship between the two and depression increased the incidence of cognitive decline [5]. Geriatric depression occurs frequently in both male and female and is the main risk factor affecting cognitive function and a higher prevalence of depressive disorder is associated with a greater clinical cognitive impairment [6]. In addition, more severe symptoms of depression could raise the risk of dementia [7], leading to an increased risk of all-cause dementia including Alzheimer's disease [8]. In longitudinal studies, the incidence of depression became higher in the pre-clinical phase of dementia [9] and depression increased cognitive impairment and dementia in the long term [7,10]. Contrary to these studies, there was also a study that showed that depression in the older adults was related to cognitive decline but was not related to dementia-related pathology [11]. Considering preceding studies, the pathways linking depression and dementia are unclear, but it seems widely
proven as a major factor affecting cognitive decline.

Since it has been verified in many studies that depression affects cognitive function, it is necessary to identify significant protectors that stave off the cognitive impairment caused by geriatric depression. In previous studies, health status, mobility constraint, and social network were identified as mediating factors between depression and cognitive function [12-14]. However, since these factors are rather difficult to intervene in a short period of time, it is required to search for factors that are more effective in preventing cognitive decline and that can be intervened. With the recent development and commercialization of ICT, the demand for ICT use by the older adults is increasing, and the previous studies have reported that the use of ICT and social activity of the older adults have a positive effect on cognitive function [15,16]. Since the use of ICT and social activity are factors that can be educated or intervened, it can be estimated that they will act as mediators between geriatric depression and cognitive function.

With the recent advancement of ICT and commercialization in mobile devices, the ownership rate of mobile smart devices among the Korean older adults has increased steadily annually, accounting for 91.2% in their 60s and 63.2% in their 70s or older, furthermore, the internet usage rate has increased [17]. The use of ICT devices is an effective alternative not only for acquiring information, but additionally for enabling communication, social relationships, and engagement and solving the problem of social alienation due to physical limitations [18, 19]. In addition, the more ICT used, the higher cognitive function [15]. These preceding researches suggest that ICT use helps to activate the cognitive function of the older adults and can be a positive mediating factor to improve cognitive decline caused by depression.

In addition, the older adults have a desire to continue existing social relationships; and it is necessary to maintain social activities and roles to overcome difficulties such as retirement and bereavement. Social activity in old age was confirmed that has influence on cognitive function, more frequent social activities have been found to reduce overall cognitive decline [6,20]. In addition, those who have more social assets such as community engagement and interaction with neighbors, and more participation in social activities had enhanced cognitive function [16]. These study results support a logical link that the promotion of social activity in the older adults would have affirmative influences on cognitive decline caused by depression.

Meanwhile, contrary to the accumulation of studies that identified relationship between depression and cognitive function [5,7-9], and factors influencing depression and cognitive function [6,12,16], there were very few studies identifying the mediating effect of ICT use and social activity between depression and cognitive function. Accordingly, this study attempted to explore the mediating effects to confirm ICT use and social activity act as mediators for cognitive decline caused by depression in older Koreans, aiming to provide useful information and basic data for the improvement of cognitive enhancement program.

METHODS

1. Study Design

This secondary analysis study used the original data from the 2020 National survey of older Koreans, approved for use by the Korea Institute for Health and Social Affairs (KIHASA).

2. Research Materials and Subjects

The original data not cleaned from the 2020 National survey of older Koreans (National Statistics Office approval No.117071) was used to explore the mediating effects of ICT use and social activity on cognitive decline caused by depression. A 3-year statutory survey conducted by the KIHASA (KIHASA IRB 2020-36) under the Ministry of Health and Welfare. The target population of the original data was 65 or older living in general residential facilities in 17 cities and provinces nationwide as of 2020. According to the description of sampling method for original data, the sample was selected by the stratified cluster extraction method from 969 survey districts across the country, which was used by probability proportional to size systematic sampling. The survey was conducted by the KIHASA as a tablet-PC assisted personal interview by a trained interviewer from September 14 to November 20, 2020. In total, 10,097 subjects (including 177 proxy respondents) responded to that. The 8,980 subjects out of a total of 10,097 subjects from the original data were used for the final analysis, excluding proxy responses (177) and incomplete data per study variable (940).

3. Instruments

1) Characteristics of the subjects

The subject's characteristics that were focused on sex, age, marital status, level of education, residential area, working status, and subjective health status. The level of
education and subjective health status were reclassified by standardizing the frequency. Age was divided into "over 65 and under 75", "over 75 and under 85" and "over 85". Marital status was further divided into "no spouse" and "having a spouse". Education levels were reclassified as "no school", "elementary school graduation", "middle school graduation", and "high school graduation or higher". Residential areas were classified as "urban areas" for dong, and "rural areas" for eup and myeon. Working status was classified as "not working" and "working", and the subjective health status were reclassified as "healthy", "moderate", and "unhealthy".

2) Depression
   The subject's depression was measured using the Short Form Geriatric Depression Scale (SGDS) developed by Sheikh & Yesavage [21] and translated by Cho et al. [22]. In the survey, there were a total of 15 questions including 7 questions on negative recognition regarding the past, present, and future, 4 on degraded affectivity, and 4 on cognitive inactivity and lack of motor function, which were coded again to account for 1 point for "Yes" and 0 for "No". Five (1,5,7,11,13) questions with inverted content were reverse coded. The total score was 0 to 15, in which a higher score meant more severe depressive symptoms. In the study by Cho et al. [22], the reliability was Cronbach's $\alpha = .89$, its reliability in this study was Cronbach's $\alpha = .86$.

3) Cognitive function
   The subject's cognitive function was measured using the Korean version of the Mini-Mental State Examination for Dementia Screening (MMSE-DS) by Kwon & Park [23]. The questionnaire was composed of a total of 19 questions that measured orientation in time and space, memory registration and recall, attention and computation skills, language and visuospatial skills, command implementation, and understanding and judgment skills, which were scored as 1 point for "correct" and 0 for "incorrect". The total score was 0 to 30, in which a higher score meant a better cognitive function. In the study by Um et al.[15], the reliability was Cronbach's $\alpha = .81$, its reliability in this study was Cronbach's $\alpha = .91$.

4) ICT use
   The ICT use of the subjects was measured by the number of activities using information and communication technologies. The activities included the transmission and reception of messages, information search, and inquiry, capturing pictures or video, listening to music, playing games, viewing videos, use of social network services, e-commerce, financial transactions, and application search and installation. For scoring, the number of "Yes" responses in a total of 11 areas by using information and communication technologies and services were summed. The total score was between 0 and 11, in which a higher score was considered an increased level of ICT use.

5) Social activity
   The social activity of the subjects was measured by the number of activities that they participated in the past 1 year. These included club, fraternal, political and social, volunteer, recreational and cultural, educational and learning, and religion-related social activities. For scoring, the number of responses as "Yes" in a total of 7 areas was summed. The total score was between 0 and 7, in which a higher score was considered an increased social activity.

4. Ethical Consideration
   The original data were used after receiving approval for the use of microdata for 2020 National survey of older Koreans via the health and welfare data portal operated by KIHASA. In addition, this study was approved for exemption of the deliberation by the Institutional Review Board of J University (JIRB-2022030701-01220310).

5. Data analysis
   Data were analyzed by SPSS/WIN 25.0 program and detailed methods are as follows. Since the original data were stratified cluster samples, a complex sample analysis method was utilized, and all statistical values were presented as weighted values except the frequency. Frequency and descriptive statistics were used to analyze the subjects' characteristics and study variables. In addition, t-test, ANOVA with Bonferroni correction for multiple comparisons was used to analyze the difference in variables according to the subject characteristics, and Pearson's correlation was performed to find the relationship among study variables. In addition, a hierarchical multiple regression analysis was applied to identify the mediating effects of ICT use and social activity between depression and cognitive function, and a Sobel test was performed to evaluate the significance of the mediating effect. All statistical significance was verified as a $p$-value less than .05.

RESULTS

1. Differences in Depression and Cognitive Function by Characteristics of Subjects
Table 1. Differences in Depression and Cognitive Function according to Characteristics (N=8,980)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Categories</th>
<th>n (%) †</th>
<th>Depression</th>
<th>Cognitive Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>M±SE</td>
<td>t or F (p) or post hoc †</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>t or F (p) or post hoc †</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>3,703 (44.1)</td>
<td>3.01±0.06</td>
<td>-7.31 (&lt; .001)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>5,277 (55.9)</td>
<td>3.60±0.06</td>
<td>(&lt; .001)</td>
</tr>
<tr>
<td>Age (year)</td>
<td>65~74</td>
<td>5,666 (59.6)</td>
<td>2.93±0.04</td>
<td>71.48 (&lt; .001)</td>
</tr>
<tr>
<td></td>
<td>75~84</td>
<td>2,867 (35.5)</td>
<td>3.87±0.08</td>
<td>(&lt; .001)</td>
</tr>
<tr>
<td></td>
<td>≥ 85</td>
<td>447 (4.9)</td>
<td>4.35±0.22</td>
<td>a &lt; b &lt; c</td>
</tr>
<tr>
<td>Marital status</td>
<td>No spouse</td>
<td>3,585 (31.4)</td>
<td>4.11±0.07</td>
<td>12.62 (&lt; .001)</td>
</tr>
<tr>
<td></td>
<td>Having a spouse</td>
<td>5,395 (68.6)</td>
<td>2.99±0.05</td>
<td>(&lt; .001)</td>
</tr>
<tr>
<td>Education level</td>
<td>No school</td>
<td>861 (8.8)</td>
<td>4.67±0.15</td>
<td>106.56 (&lt; .001)</td>
</tr>
<tr>
<td></td>
<td>Elementary school</td>
<td>2,915 (30.6)</td>
<td>3.82±0.08</td>
<td>(&lt; .001)</td>
</tr>
<tr>
<td></td>
<td>Middle school</td>
<td>2,163 (23.8)</td>
<td>3.50±0.08</td>
<td>a &lt; b &lt; c &lt; d</td>
</tr>
<tr>
<td></td>
<td>≥ High school</td>
<td>3,041 (36.8)</td>
<td>2.53±0.06</td>
<td></td>
</tr>
<tr>
<td>Residential area</td>
<td>Urban area</td>
<td>6,496 (76.2)</td>
<td>3.29±0.05</td>
<td>-2.42 (&lt; .015)</td>
</tr>
<tr>
<td></td>
<td>Rural area</td>
<td>2,484 (23.8)</td>
<td>3.51±0.08</td>
<td></td>
</tr>
<tr>
<td>Working status</td>
<td>Working</td>
<td>3,541 (38.8)</td>
<td>2.74±0.05</td>
<td>-12.84 (&lt; .001)</td>
</tr>
<tr>
<td></td>
<td>Not working</td>
<td>5,439 (61.2)</td>
<td>3.73±0.06</td>
<td></td>
</tr>
<tr>
<td>Subjective health status</td>
<td>Healthy</td>
<td>4,622 (51.0)</td>
<td>2.26±0.04</td>
<td>552.36 (51.0)</td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td>2,814 (30.7)</td>
<td>3.58±0.07</td>
<td>(&lt; .001)</td>
</tr>
<tr>
<td></td>
<td>Unhealthy</td>
<td>1,544 (18.2)</td>
<td>5.99±0.11</td>
<td>a &lt; b &lt; c</td>
</tr>
</tbody>
</table>

† n (%): unweighted frequency (weighted %), † Post hoc Bonferroni correction for multiple comparison test values with superscript letters a, b, c and d are significantly different across rows (p < .05).

Differences in depression and cognitive function by characteristics of subjects were presented (Table 1). There were more female (55.9%) than male (44.1%), and the mean age of the subjects was 73.24±0.08, with those 65 years or older but less than 75 years old accounted for 59.6% of the population. Of the subjects, 68.6% reported having a spouse, 76.2% were living in urban areas, 61.2% were not working, 36.8% had high school or higher education level, and 51.0% reported good health status.

There were significant differences in depression by subjects’ sex (t=-7.31, p < .001), age (F=71.48, p < .001), marital status (t=12.62, p < .001), education level (F=106.56, p < .001), residential area (t=-2.42, p=0.015), working status (t=-12.84, p < .001) and subjective health status (F=552.36, p < .001). In the post-hoc analysis, depression was significantly higher in the older age, lower education level, and worse subjective health status. Cognitive function differed significantly according to subjects’ sex (t=3.97, p < .001), age (F=44.35, p < .001), marital status (t=-9.65, p < .001), education level (F=96.67, p < .001), residential area (t=9.71, p < .001), working status (t=10.98, p < .001), subjective health status (F=45.54, p < .001). In the post-hoc analysis, the cognitive function was significantly higher in the younger age, the higher education level, and better subjective health status.

2. Correlations among Depression, Cognitive Function, ICT Use, and Social Activity

Correlations among depression, cognitive function, ICT use, and social activity of the subjects were presented (Table 2). Depression was negatively correlated with cognitive function (r=-.21, p < .001), ICT use (r=-.22, p < .001), social activity (r=-.13, p < .001), whereas cognitive function was positively correlated with ICT use (r=.38, p < .001) and social activity (r=.22, p < .001). There was a positive correlation between ICT use and social activity (r=.37, p < .001).

3. Mediating Effects of ICT Use and Social Activity on the Relationship between Depression and Cognitive Function

The suitability of the estimated regression model was verified through residual analysis. The skewness and the kurtosis had an absolute value of less than 4 (Table 2), which met the normal distribution standard, the Durbin-Watson value was 1.73~1.88, close to 2, confirming the independence of the residuals. In multicollinearity verification, the tolerance limit, which was 0.96~0.98, greater than 0.1 and the variance expansion factor, which was 1.02~1.05, all less than 10. Thus, there was no problem of multi-
collinearity, and the model was suitable for regression analysis.

The results of the three-step regression analysis to identify the mediating effect of ICT use between depression and cognitive function was presented (Table 3, Figure 1). As a result of regression analysis of step 1, the independent variable, depression, had a significant effect on ICT use ($\beta=-.22$, $p<.001$). In step 2, the significant effect of independent variable, depression, on the dependent variable, cognitive function, was confirmed ($\beta=-.13$, $p<.001$). In step 3, to verify the effect of ICT use as a parameter, regression analysis was performed with depression and ICT use as independent variables and cognitive function as the dependent variable. Both depression ($\beta=-.15$, $p<.001$) and ICT use ($\beta=.35$, $p<.001$) impacted cognitive function, and the coefficient of depression in step 3 was lesser than in step 2. These confirmed that ICT use, the parameter, would have a partial mediating effect on the relationship between depression and cognitive function. In the Sobel test for the mediating effect of social activity, the absolute value of Z was 1.96 or higher, indicating the significance of the mediating effect ($Z=-9.63$, $p<.001$).

### DISCUSSION

This study examined the mediating effects of ICT use and social activity on the relationship between depression and cognitive function in older Koreans.

Regarding the relation between variables, cognitive function had a negative correlation with depression, while having positive correlations with the ICT use and social activity. These were consistent with the results reported in the previous studies [15,24,25] examining the relationship between these variables for the older adults living in the community. The results show that the lower cognitive function, the higher depression, and that the higher ICT use and social activity, the higher cognitive function. It suggests that interventions that activate ICT use and social activity are needed to improve cognitive function.

It was attempted to validate the mediating effect of ICT use between depression and cognitive function, from which partial mediating effects were identified. The result of this study, which identified the mediating effect of ICT use between depression and cognitive function, can be interpreted as a similar viewpoint as the preceding research that ICT use had a positive effect on cognitive function and healthy aging [15]. It is in the same context as the results of previous studies that reported that increased use of ICT alleviated cognitive decline due to aging [18,26], and online activities and the use of digital technology had positive mediating effects on life satisfaction and on cognition and healthy aging [19]. Therefore, it can be seen that the previous studies support the results of this study by confirming that ICT use is a significant factor that help improve

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**Table 2. Levels and Correlations among Study Variables**

(N=8,980)

<table>
<thead>
<tr>
<th>Variables</th>
<th>M±SE</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>Depression</th>
<th>Cognitive function</th>
<th>ICT use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>3.34±0.04</td>
<td>1.18</td>
<td>1.00</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive function</td>
<td>24.80±0.06</td>
<td>-1.62</td>
<td>3.68</td>
<td>-21 (.001)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>ICT use</td>
<td>3.81±0.04</td>
<td>0.65</td>
<td>-0.60</td>
<td>-22 (.001)</td>
<td>.38 (.001)</td>
<td>1</td>
</tr>
<tr>
<td>Social activity</td>
<td>2.05±0.01</td>
<td>-0.04</td>
<td>-0.27</td>
<td>-13 (.001)</td>
<td>.22 (.001)</td>
<td>.37 (.001)</td>
</tr>
</tbody>
</table>

ICT=information and communication technology use.
In addition, the mediating effect of social activity between depression and cognitive function identified was partially consistent with that of previous studies. The previous study [14] reported the mediating effect of social networks as a concept including social activities and relations with relatives and neighbors between depression and cognitive function. And the mediating effect of social activity between the residential place and cognitive function was confirmed [27]. It was confirmed that participation in social activities has the effect of delaying cognitive decline in the older adults 65 or older [28], and that the social activity indirectly affects cognitive function [29]. Furthermore, it has been found that consistent social engagement leads to cognitive improvement and the role in social networks and social activity moderates the relationship between depression and memory [30]. Therefore, it can be seen that the previous studies support these results by confirming that social activity is a significant factor that can prevent cognitive decline.

These results confirmed that ICT use and social activity of the older adults could positively influence their cognitive decline due to depression, helping to maintain and promote their cognitive function, and confirmed that such activities could be protective factors that could mitigate cognitive decline caused by depression. This study provides fundamental data for the development of a program to improve cognitive function by confirming the mediating effect of ICT use and social activity on geriatric depression and cognitive function. In addition, these results have significant meaning that ICT use and social activity can play a positive role in delaying cognitive decline due to depression and further helping to maintain and improve cognitive functions. It is expected that play a part in strengthening the cognitive function by promoting the program through education and intervention to enhance the level of ICT use and social activity, which identified as mediating factors in this study.

### Table 3. Mediating Effect of ICT Use on the Relationship between Depression and Cognitive Function \( (N=8,980) \)

<table>
<thead>
<tr>
<th>Step</th>
<th>Variables</th>
<th>B</th>
<th>SE</th>
<th>( \beta )</th>
<th>( t (p) )</th>
<th>( R^2 )</th>
<th>F (( p ))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Depression → ICT use</td>
<td>-.21</td>
<td>.01</td>
<td>-.22</td>
<td>-20.25 (&lt; .001)</td>
<td>.05</td>
<td>409.98 (&lt; .001)</td>
</tr>
<tr>
<td>2</td>
<td>Depression → Cognitive function</td>
<td>-.34</td>
<td>.02</td>
<td>-.21</td>
<td>-17.62 (&lt; .001)</td>
<td>.04</td>
<td>310.59 (&lt; .001)</td>
</tr>
<tr>
<td>3</td>
<td>Depression → Cognitive function</td>
<td>.57</td>
<td>.02</td>
<td>.35</td>
<td>33.74 (&lt; .001)</td>
<td>.17</td>
<td>754.06 (&lt; .001)</td>
</tr>
</tbody>
</table>

Sobel \( Z = -16.92 (p < .001) \)

ICT=information and communication technology use.

### Table 4. Mediating Effect of Social Activity on the Relationship between Depression and Cognitive Function \( (N=8,980) \)

<table>
<thead>
<tr>
<th>Step</th>
<th>Variables</th>
<th>B</th>
<th>SE</th>
<th>( \beta )</th>
<th>( t (p) )</th>
<th>( R^2 )</th>
<th>F (( p ))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Depression → Social activity</td>
<td>-.05</td>
<td>.01</td>
<td>-.13</td>
<td>-10.69 (&lt; .001)</td>
<td>.02</td>
<td>114.43 (&lt; .001)</td>
</tr>
<tr>
<td>2</td>
<td>Depression → Cognitive function</td>
<td>-.34</td>
<td>.02</td>
<td>-.21</td>
<td>-17.62 (&lt; .001)</td>
<td>.04</td>
<td>310.59 (&lt; .001)</td>
</tr>
<tr>
<td>3</td>
<td>Depression → Cognitive function</td>
<td>.29</td>
<td>.02</td>
<td>-.19</td>
<td>-15.64 (&lt; .001)</td>
<td>.09</td>
<td>310.26 (&lt; .001)</td>
</tr>
</tbody>
</table>

Sobel \( Z = -9.63 (p < .001) \)

Figure 1. Statistical relationships for mediation model of ICT use and social activity on the relationship between depression and cognitive function.

**cognitive function.**

In addition, the mediating effect of social activity between depression and cognitive function identified was partially consistent with that of previous studies. The previous study [14] reported the mediating effect of social networks as a concept including social activities and relations with relatives and neighbors between depression and cognitive function. And the mediating effect of social activity between the residential place and cognitive function was confirmed [27]. It was confirmed that participation in social activities has the effect of delaying cognitive decline in the older adults 65 or older [28], and that the social activity indirectly affects cognitive function [29]. Furthermore, it has been found that consistent social engagement leads to cognitive improvement and the role in social networks and social activity moderates the relationship between depression and memory [30]. Therefore, it can be seen that the previous studies support these results by confirming that social activity is a significant factor that can prevent cognitive decline.

These results confirmed that ICT use and social activity of the older adults could positively influence their cognitive decline due to depression, helping to maintain and promote their cognitive function, and confirmed that such activities could be protective factors that could mitigate cognitive decline caused by depression. This study provides fundamental data for the development of a program to improve cognitive function by confirming the mediating effect of ICT use and social activity on geriatric depression and cognitive function. In addition, these results have significant meaning that ICT use and social activity can play a positive role in delaying cognitive decline due to depression and further helping to maintain and improve cognitive functions. It is expected that play a part in strengthening the cognitive function by promoting the program through education and intervention to enhance the level of ICT use and social activity, which identified as mediating factors in this study.
However, despite its significance, this study has the following limitations: First, since it is a cross-sectional study using secondary data, the longitudinal changes in research variables could not be reflected. Second, the level of ICT use was measured based on the number of activities using ICT devices, and the frequency and proficiency cannot be considered. Third, it could not reflect the frequency and quality of participation in each field of social activities. Since this was a secondary analysis study using original data, it is necessary to consider the validity of the study variables as it is a limitation that occurs.

CONCLUSION

This study provided meaningful results using large-scale survey data on the older adults in Korea to identify the mediating effects of ICT use and social activity on the relationship between geriatric depression and cognitive function. The findings disclosed that ICT use and social activity could act as significant protective factors in the effects of depression in old age on the cognitive decline; providing a basis for proactive prevention and intervention against cognitive decline in the future and could be used as a basis for program development and research. Based on the research results, the following suggestions are proposed. First, it is necessary to quickly select the older adults vulnerable to cognitive impairment to carry out intervention programs to promote more active cognitive function. Second, it is necessary to improve the content and quality of the program by combining ICT utilization education and social activities with traditional programs to prevent cognitive decline and strengthen cognitive functions, and to develop and apply various ICT-based intervention programs. Third, it is also necessary to develop standardized tools that can measure the level of ICT utilization and social activity of the older adults.

CONFLICTS OF INTEREST

Lee, Jee Young has been an editorial board member since January, 2016, but has no role in the decision to publish this article. Except for that, no potential conflict of interest relevant to this article was reported.

AUTHOR CONTRIBUTIONS

Conceptualization or/and Methodology: Lee JY
Data curation or/and Analysis: Lee JY
Funding acquisition: Lee JY
Investigation: Lee JY
Project administration or/and Supervision: Lee JY
Resources or/and Software: Lee JY
Validation: Lee JY
Visualization: Lee JY
Writing: original draft or/and review & editing: Lee JY

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