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Relationship between Social Capital and Cognitive Functions among Community-Based Elderly

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Abstract

The concept of social capital encompasses all relationships and networks among people in a local community or society as a whole. It has been found to be associated with the health and daily living status of people. Furthermore, an association between social capital and cognitive functions among the elderly has been suggested in recent years. However, the number of such reports is very few. Hence, the present study aims to evaluate the relationship between social capital and cognitive functions among the elderly living in a local community in Japan. A questionnaire survey was administered to 192 elderly individuals belonging to 10 neighborhood elderly groups. A regression analysis was conducted to determine the relationship between cognitive functions and the level of engagement with the local community, after adjusting for age, gender, and symptoms of depression. Valid responses were collected from 145 participants (mean age: 75.3 years). An analysis of the data concerning the level of engagement with the local community revealed a significant difference in the cognitive function scores between the group of people who indicated that they had someone they could consult (n = 69) and the group that indicated they had no one to consult (n = 76) (regression coefficient: −0.61, p = 0.0038, 95% confidence interval: −1.02 to −0.20). This result indicates the existence of a significant correlation between social capital and cognitive functions of the elderly living in a local community. In future studies, we need to investigate the same with a larger number of participants from a wider geographical area, and by incorporating more indicators for a comprehensive evaluation of social capital.

Keywords

Social Capital, Cognitive Functions, Elderly, Community

1. Introduction

The concept of social capital encompasses all relationships and networks among people in a local community or society as a whole. The definition of social capital varies among researchers. However, the following definition proposed by Putnam is used most frequently: "Social capital refers to the features of a social organization, such as trusts, norms, and networks, that can improve the efficacy of the society by facilitating coordinated actions" [1].

Social capital has been shown to be associated with health status and life expectancy. Kawachi *et al.* conducted a large-scale survey of the individuals who live in 39 US states and revealed that the risk of perceived poor health increased in individuals living in states with a lower level of social capital [2]. Berkman reported that, with an increasing level of social capital, both the suicide rate and number of individuals committing suicide decrease, and the life expectancy increases [3]. Moreover, in a nationwide survey conducted in Japan, the unemployment rate was lower and the birth rate was higher in communities with a high level of social capital [4]. In a survey of Tokyo Metropolitan area residents, the percentage of individuals who felt that they were in good health was higher among those having closer interactions with other people in the community [5].

Previous studies have demonstrated that social capital is correlated not only with physical health, but also with mental health. In a nationwide survey of adults in Russia, social capital was found to be correlated with both physical health and mental health, and the correlation with the latter was found to be even stronger [6]. According to the data from a nationwide panel survey conducted in the United Kingdom, a comparison of individuals in the groups with the highest and lowest levels of social capital revealed that the odds ratio for the presence of mental disease was approximately 2.0 in both males and females in the group with the lowest level of social capital. This suggests that the risk of onset of mental disease is higher for individuals with a lower social capital level [7]. A systematic review of studies that focused on the elderly also suggested the existence of a positive correlation between social capital and mental health [8].

Furthermore, in recent years, social capital has been reported to be associated with cognitive functions among the elderly. For instance, Sakamoto *et al.* conducted a study on the elderly living in a local community who did not need long-term care in their daily life. Their findings revealed that cognitive functions were superior in individuals who were more frequently involved in social activities [9]. Similarly, Wang *et al.* compared social capital between individuals with mild cognitive impairment (MCI) and those with normal cognitive functions, and reported that individuals with MCI had a significantly lower level of social capital than did those with normal cognitive functions [10]. A three-year cohort study conducted by Fragtiglioni *et al.* revealed that the risk of impaired cognitive functions was higher in individuals with insufficient links to the society (e.g., individuals living alone) than it was in individuals with satisfactory social networks [11]. To the best of our knowledge, however, only few previous studies have suggested that social capital is associated with cognitive functions among

the elderly. Thus, the present study aims to analyze the relationship between social capital and cognitive functions among the elderly living in a local community.

2. Method

2.1. Participants

In all the administrative districts (n = 13) of Fujisawa City (population: 423,435; percentage of residents aged 65 years or over: 23.0%, as of April 1, 2015) in the Kanagawa prefecture, we conducted research briefing sessions in the city's businesses and related organizations in the city (e.g., sessions were conducted in about 150 senior citizens clubs, which were visited by approximately 7800 at that time). Ten organizations for the elderly agreed to participate in this study, and 192 elderly (aged 60 years or more) belonging to these 10 organizations provided consent for participation in this study (62 males and 130 females; mean age: 75.2 years; standard deviation: 6.3 years). A questionnaire survey was then carried out with these participants, from July 2015 to March 2016.

This study was approved by the Ethics Committee of Graduate School of Health Management, Keio University (#2015-16), and it was conducted in compliance with the recommendations of the Declaration of Helsinki and the Ethical Guidelines for Medical and Health Research Involving Human Subjects. Additionally, it was registered as a clinical study with the University hospital Medical Information Network Clinical Trials Registry (UMIN-CTR, UMIN000018401).

2.2. Investigation/Evaluation

The investigation covered the participants' cognitive functions, the degree of relationship with the local community (an element of social capital), and symptoms of depression, which may be associated with cognitive dysfunction).

Cognitive functions were evaluated using the Cognitive Assessment for Dementia, iPad version 2 (CADi2), developed by Yamaguchi *et al.* (available for free at the Apple Store: https://itunes.apple.com/us/app/cadi/id586052447). The CADi2 is a cognitive function test used as a primary screening tool during health checkups in local communities, and its reliability and validity have been verified [12]. This scale comprises 10 questions, and the subject is asked to answer each question with 0 or 1. The total score is 10, and higher scores are indicative of a higher level of cognitive functions. The CADi2 was found to have a significant high correlation with the Mini-Mental State Examination (MMSE), which is used to assess cognitive status (correlation coefficient: 0.79) [12].

The degree of relationship between individuals within the community was evaluated using the method employed in a previous study [5]. For this, in response to the question, "What kind of relationship do you have with the individuals in your community?", each subject was asked to select an answer from the following four options: "1: I have someone that I can consult", "2: I have someone that I can chat with", "3: I have someone to exchange greetings with", and "4: I am not sociable at all".

Symptoms of depression were investigated using the Japanese version of Zung's Self-Rating Depression Scale (SDS) [13]. This scale comprises 20 questions, with the total score ranging from 20 to 80. Higher scores indicate more severe symptoms. The cutoff point for identifying depression has been determined to be 40 [14]. In Japan, Fukuda and Kobayashi reported that the mean score was 60 in a depressive group, 49 in a neurosis group, and 35 in a normal control group.

Age and gender were evaluated as demographic variables.

2.3. Analysis

The data were subjected to a multivariate analysis after the exclusion of missing values (n = 47). A regression analysis was conducted to determine the relationship between cognitive functions and the level of engagement with the local community. The cognitive function level was regarded as the response variable and the social capital level was regarded as the explanatory variable. The depression score (SDS), age, and gender were adjusted as covariates related to cognitive functions. The participants were divided into 2 groups based on having or not having someone to consult, because of the substantial difference of the level of engagement with the local community between the two categories. Statistical analyses were conducted using R version 3.3.3 (R Foundation for Statistical Computing, Vienna, Austria); the level of significance was set at $p < 0.05$.

3. Result

Of the elderly who were enrolled in this study (N = 192), 157 participated in the onsite survey that included the administration of the CADi. Valid responses were collected from 145 participants (mean age ± standard deviation [SD]: 75.3 ± 6.3 years). The demographic variables of the participants have been shown in Table 1. The mean scores on both cognitive function and depression were within the normal range, indicating that the percentage of healthy individuals was high in the population studied. However, the SDS scores were higher than the cutoff level in 29.1% (n = 50) of the participants.

An analysis of the data regarding the degree of relationship with the local community revealed a significant difference in the cognitive function scores between the group of people who indicated that they had someone they could consult (Category 1, n = 69) and the group that indicated they had no one to consult (Category 2 - 4, n = 76; regression coefficient: −0.61, p = 0.0038, 95% confidence interval: −1.02 to −0.20; Table 2).

4. Discussion

The results of this study indicated that individuals with a deep relationship with the local community had higher cognitive function levels than did individuals without such a relationship. Regarding this relationship, previous studies have demonstrated that an abundance of networks and commitment to social activities were associated with better levels of cognitive functioning [9] [10]. The re-

Table 1. Data on the age, gender, social capital, and CADi and SDS scores of the sample.

	N (%)	Median (25^{th} - 75^{th} percentile)
Age (in years)	145	75 (71 - 80)
Gender		
Male	50 (34.5)	-
Female	95 (65.5)	-
Social capital (networks)[a]		
1	69 (47.6)	-
2	49 (33.8)	-
3	24 (16.6)	-
4	3 (2.1)	-
CADi score	145	9 (8 - 10)
SDS score	145	34 (30 - 40)

[a]1: I have someone that I can consult; 2: I have someone that I can chat with; 3: I have someone to exchange greetings with; 4: I am not sociable at all. CADi: Cognitive Assessment for Dementia, iPad Version. SDS: Self-Rating Depression Scale.

Table 2. The relationship between cognitive functions and social capital.

	Estimate	95%CI
Social capital (networks)		
The kind of relationship with individuals in their community		
Having someone to consult (n = 69)	Ref.	-
Having no one to consult (n = 76)	−0.61	−1.02 - 0.20

A regression analysis was conducted to determine the relationship between cognitive functions and the degree of relationship with the local community after adjusting for age, gender, and SDS score. CI: Confidence Interval, Ref.: Reference, SDS: Self-Rating Depression Scale.

sults of the present study suggest that the depth of an individual's relationships with others in a given community is also associated with his/her cognitive functions. This association is consistent with the report of Dodge *et al.*, who stated that daily conversations with others could improve the cognitive functions of the elderly [15]. An attempt to interpret the findings of the present study reveals the possibility that closer communication with other people serves as an intellectual stimulus for any individual, which, in turn, may exert a positive influence on their cognitive functions. On the contrary, we cannot rule out the possibility that the differences in the individual's level of communicational skills and abilities might have attributed to the differences in the cognitive function levels. Given that this was cross-sectional study, no definite causal relationships can be concluded and the results described above are only speculative (this is one of the limitations of this study).

This study had several other limitations. First, it has been reported previously that the degree of relationship with the local community is also associated with health indicators, in addition to cognitive functions [5] [16]. It is therefore diffi-

cult to rule out the possibility that such factors, which were not measured in the present study, could have confounded the present findings. Second, of the 192 participants enrolled this study, 47 were excluded because of absence from the onsite survey or due to missing values. However, there were no significant differences in age ($p = 0.35$) and gender ($p = 0.46$) distribution between the analyzed sample and these 47 people. Therefore, their exclusion may not have affected the present findings.

Third, although the present study used the depth of the relationship with the local community as an indicator of social capital, the latter is actually known to be composed of trust, norms, and networks [1]. Thus, the present study measured only one (networks) component of social capital. In this regard, Nyqvist *et al.* also pointed out the lack of a gold standard for the measurement of social capital in past researches [8]. In the future, it would be desirable to measure social capital more comprehensively, by encompassing all the components described above. Fourth, the number of participants enrolled in this study was not sufficiently large, and the sample was selected from a single district. Further investigations are needed to improve the generalizability of these findings. Finally, the participants of this study were members of local organizations, and therefore, they already had some level of relationship with the local community. However, of these participants, those having a deeper relationship were shown to have better cognitive functions. This result suggests that not only the presence/absence of community networks, but also the depth of the relationship with such networks is an important factor influencing cognitive functions.

5. Conclusion

The results of the present study indicate the existence of a significant correlation between social capital and cognitive functions of the elderly living in a local community. However, the data available are not sufficient to permit generalization of the findings. Future studies need to replicate this study with a larger number of participants from a wider geographical area, and by incorporating other indicators for a comprehensive evaluation of social capital. If the relationship between social capital and cognitive function levels can be further clarified, it will be possible to utilize the findings for helping the elderly lead better and longer lives in the local community, and for devising measures to prevent the onset of dementia.

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