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Original Article

Development of an instrument for community-level health related social capital among Japanese older people: The JAGES Project

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ABSTRACT

Background: We developed and validated an instrument to measure community-level social capital based on data derived from older community dwellers in Japan.
Methods: We used cross-sectional data from the Japan Gerontological Evaluation Study, a nationwide survey involving 123,760 functionally independent older people nested within 702 communities (i.e., school districts). We conducted exploratory and confirmatory factor analyses on survey items to determine the items in a multi-dimensional scale to measure community social capital. Internal consistency was checked with Cronbach's alpha. Convergent construct validity was assessed via correlating the scale with health outcomes.
Results: From 53 candidate variables, 11 community-level variables were extracted: participation in volunteer groups, sports groups, hobby activities, study or cultural groups, and activities for teaching specific skills; trust, norms of reciprocity, and attachment to one's community; received emotional support; provided emotional support; and received instrumental support. Using factor analysis, these variables were determined to belong to three sub-scales: civic participation (eigenvalue = 3.317, $\alpha = 0.797$), social cohesion (eigenvalue = 2.633, $\alpha = 0.853$), and reciprocity (eigenvalue = 1.424, $\alpha = 0.732$). Confirmatory factor analysis indicated the goodness of fit of this model. Multilevel Poisson regression analysis revealed that civic participation score was robustly associated with individual subjective health (Self-Rated Health: prevalence ratio [PR] 0.96; 95% confidence interval [CI], 0.94–0.98; Geriatric Depression Scale [GDS]: PR 0.95; 95% CI, 0.93–0.97). Reciprocity score was also associated with individual GDS (PR 0.98; 95% CI, 0.96–1.00). Social cohesion score was not consistently associated with individual health indicators.
Conclusions: Our scale for measuring social capital at the community level might be useful for future studies of older community dwellers.

Introduction

A growing body of studies suggests that social capital has a significant influence on health and health behaviors.[1–8] The concept of social capital is used in two distinct approaches: the network-based approach and the social cohesion approach.[9] Most public health research adopts the latter social cohesion approach,

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which clarifies the contextual effect of community-level social capital as a group attribute or collective property. Community-level social capital is important for older adults to maintain health and well-being, as they are likely to spend many hours in the community. Japan is a global leader among developed countries that are experiencing rapid population aging. The proportion of older people is currently 26.0% and is predicted to reach 30.3% by 2025. To tackle issues associated with this situation, the Japanese government started a novel public health agenda for the health of older adults called Integrated Community Care for older adults.[10] This agenda aims to build social capital at the community level, improve local healthcare governance, and enrich local resources/environments supporting older residents. Therefore, interest in measuring and monitoring social capital at the community level has increased among central and local governments.

To date, several scales have been developed to measure social capital, including scales that can be used in the workplace,[11] in the school setting,[12,13] and for caregivers of children requiring special care needs,[14] as well as for trainees in clinical and translational science.[15] However, to our knowledge, no community social capital scale is available that is useful for studies of older people in industrialized countries like Japan. The generalizability of existing social capital scales might be limited, as most of them have been developed in only a few or single communities. Information on the validity and reliability of those scales is widely lacking.[2,16] Available scales also fail to capture multiple dimensions of community-level social capital, such as cognitive and structural social capital.[2,16]

In this paper, using large-scale data from a survey of community-dwelling older adults, we developed and validated an instrument to measure community social capital in older community-dwelling populations. Various definitions of community social capital have been offered.[16–21] Of these, influential definitions in the fields of epidemiology and public health include the definition by Coleman[22]: “a variety of different entities having two characteristics in common: they all consist of some aspect of social structure, and they facilitate certain actions of individuals who are within the structure”. Putnam's definition is also well known: “features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit”.[23] In social epidemiology, Kawachi and Berkman introduced a more straightfoward definition that is useful in public health settings: “resources that are accessed by individuals as a result of their membership of a network or a group”.[17]

Referring to these definitions, we have developed a health-related social capital scale at the community level because we assumed that our scale would be used to conduct community diagnosis (i.e., to evaluate the characteristics of the community and individual residents). Evaluating the contextual effects of community characteristics on individual health is a key interest of studies and activities of public health.

Methods

Data

We analyzed cross-sectional data derived from the year 2013 wave of the Japan Gerontological Evaluation Study (JAGES) Project. JAGES investigated people aged 65 years or older who did not have physical or cognitive disabilities, a state which was defined as not receiving public long-term care insurance benefits in 30 municipalities. The municipalities were not randomly selected but covered a wide range of characteristics in terms of regions and population sizes in Japan. In 13 relatively small municipalities, self-administered questionnaires were mailed to all functionally independent older adults, and in 17 municipalities, questionnaires were mailed to randomly selected older adults based on the official residential registers (response rate, 71.1%). The respondents were 129,739 residents nested in 832 communities that were primarily based on school districts, with some municipal exceptions. Communities containing <50 respondents were excluded to avoid non-precise values due to small samples. Ultimately, we derived data from 702 communities comprising 123,760 individuals. The mean number of observations per community was 176 (standard deviation [SD], 226).

We aggregated individual responses into small areas (i.e., school districts) to assess social capital at the community level. Although social capital could be evaluated at various levels of aggregations, such as municipality, prefecture, and country levels,[24] we selected the school district as the unit of community in this paper for the following reasons. First, in most regions, school district could represent a geographical scale in which older adults can travel easily by foot or bicycle, and many local activities by community organizations, such as senior citizens club and sports clubs, are performed within each school district. Second, school district is valuable unit for considering local public health activities. Using school districts as the sampling unit, we could evaluate regional variability in social capital within each municipality, which may help local public health practitioners in conducting their activities. Third, it is the smallest area size in which we could maintain sufficient precision of the aggregated information, in terms of the number of samples within each community.

Selection of candidate variables for social capital scale

Referring to available concepts of social capital,[16–21] we selected 53 indicators that were potentially associated with social capital (See eTable 1 for full lists of variables). For example, selected variables included the proportion of residents in each community who reported participating in community-based activities (e.g., volunteer groups; sports groups or clubs; hobby activity groups; senior citizen clubs; community associations; study or cultural groups; nursing care prevention activities; activities to teach skills or pass on experiences to others; local events, including festivals and dances; activities to support older people requiring protection; activities to support older people requiring nursing care; activities to support parents raising children; and local living arrangement improvement or beautification activities). Items also assessed social integration (e.g., average number of friends and frequency of contact with them, the proportion of people who received or provided social support, and interactions with neighbors), trust, norms of reciprocity, and attachment.

Subjective health indicators

The concurrent validity of our social capital scale was evaluated using the health indicators of self-rated health (SRH) and depressive symptoms. These are valid predictors of mortality regardless of other medical, behavioral, or psychosocial factors.[25,26] We measured SRH using the question “How do you feel about your current health status: excellent, good, fair, or poor?” Depressive symptoms were assessed using the 15-item Geriatric Depression Scale (GDS) that was developed for self-administration in the community using a simple binary (yes/no) format.[27,28] Scores $\geq$5 on the GDS indicate mild to severe depression.[28]

Statistical analysis

Selection of variables for social capital scale

First, we aggregated each selected variable into the community (school district) level because a community social capital scale

Table 1
Correlation between social capital candidate indicators and subjective health at the community level (n = 702).

	Partial correlation[a]	
	SRH (fair/poor)	GDS (≥5)
Volunteer group (≥once a month)	−0.093**	−0.193***
Sports group (≥once a month)	−0.233***	−0.355***
Hobby activity (≥once a month)	−0.256***	−0.332***
Study or cultural group (≥once a month)	−0.144***	−0.205***
Skills teaching (≥once a month)	−0.106**	−0.200***
Frequency of contact with friends (rarely)	0.272***	0.372***
Number of friends (≥10)	−0.140**	−0.255***
Receive emotional support (any one or more)	−0.049	−0.189***
Provide emotional support (any one or more)	−0.154**	−0.265***
Receive instrumental support (any one or more)	−0.186***	−0.292***
Community trust (strongly & moderately trusted)	−0.204***	−0.373***
Norms of reciprocity (agree strongly & agree)	−0.144***	−0.331***
Community attachment (strongly & moderately attached)	−0.136***	−0.315***
Facilities you feel free to drop in	−0.102**	−0.206**

GDS, geriatric depression scale; SRH, self-rated health.
***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.
[a] Population density and elderly proportion at municipality level were controlled.

should be created from the multiple indicators representing community-level characteristics. For example, when perceptions about trust are aggregated to the group level, it is no longer a measure of personal perceptions but a measure of the trustworthiness of people in the group.[9] Second, to extract the variables related to health outcomes, we calculated partial correlations between each candidate variable and the health indicators of SRH and GDS, after controlling for population density and the proportion of older individuals (ecological analysis). Candidate variables with moderate or strong correlations with either SRH or GDS were then extracted ($r > 0.150$). When several variables were conceptually similar, we adopted the variable with the closest relationship to be the health indicators. Third, we conducted exploratory factor analysis and eliminated low-communality variables so that the remaining variables maximized internal consistency, as evaluated based on Cronbach's alpha test. Fourth, we applied the maximum likelihood method with promax rotations for these factor analyses to account for the correlations among the factors identified. The utilization of multiple community indicators rather than a single indicator in creating a community social capital scale increases the reliability of the scale created. We then performed confirmatory factor analysis. We did not attempt to improve the fit index of our confirmatory factor analysis model via basing the analysis on residual covariance matrices.

Evaluating concurrent validity

The concurrent validity of our scale was determined using multilevel Poisson regression predicting individual SRH and GDS. To model contextual effects of community social capital, we used multilevel analysis to account for the variability in health outcomes due to individual compositions (i.e., individual's sociodemographic backgrounds and the responses to the questions used for making our community social capital scale).[9] To model potentially different associations between community social capital and individual health across individual characteristics, we also applied a cross-level interaction term. We used Stata 12.1 (StataCorp, College Station, TX, USA) and MLwiN 2.32 (Centre for Multilevel Modelling, Bristol University, Bristol, UK) for statistical analysis.

Ethical considerations

JAGES participants were informed that participation in the present study was voluntary and that completing and returning the self-administered questionnaire via mail indicated their consent to participate in the study. Ethics approval was obtained from the Ethics Committee at Nihon Fukushi University (13-14).

Table 2
Extraction of social capital candidate indicators based on reliability.

	Communalities (Factor analysis)	
Number of items	14	11
Volunteer group	0.325	0.315
Sports group	0.638	0.640
Hobby activity	0.743	0.752
Study or cultural group	0.500	0.495
Skills teaching	0.295	0.288
Less frequency of contact with friends	0.273	
Number of friends	0.229	
Receive emotional support	0.679	0.687
Provide emotional support	0.538	0.533
Receive instrumental support	0.392	0.394
Community trust	0.795	0.883
Norms of reciprocity	0.720	0.650
Community attachment	0.534	0.529
Facilities you feel free to drop in	0.273	
Cronbach's alphas	0.728	0.752

Results

Based on the results of the correlation analysis, we selected 14 of the 53 candidate variables that were strongly or moderately associated with health indicators (Table 1). We excluded three variables to improve communalities and ultimately adopted 11 for inclusion in our health-related community social capital scale based on internal consistency ($\alpha = 0.752$) (Table 2).

Exploratory factor analysis (Table 3) suggested that three factors (eigenvalues: 3.317, 2.633, and 1.424) composed of the 11 variables, with cumulative contribution of 67.0%. The first factor was mainly associated with the participation in volunteer groups, sports groups, hobby activities, study or cultural groups, and activities for teaching skills ($\alpha = 0.797$). We collectively named this factor “civic participation”. The second factor that was strongly associated with trust, community trust and attachment ($\alpha = 0.853$), was named “social cohesion”. The third factor that was strongly associated with receiving and providing emotional support and receiving instrumental support ($\alpha = 0.732$) was named “reciprocity”. Social cohesion score significantly correlated with reciprocity score ($r = 0.436$, $p < 0.001$). Confirmatory factor analysis showed that the root mean square error of approximation was 0.089, the comparative fit index

Table 3
Factor loadings of community-level social capital scale.

	Exploratory factor analysis[a]			Confirmatory factor analysis[b]		
	Civic participation (F1)	Social cohesion (F2)	Reciprocity (F3)	Civic participation (F1)	Social cohesion (F2)	Reciprocity (F3)
Volunteer group	0.536	0.119	−0.029	0.557	–	–
Sports group	0.791	−0.015	0.100	0.796	–	–
Hobby activity	0.868	−0.020	0.021	0.867	–	–
Study or cultural group	0.706	−0.023	−0.051	0.693	–	–
Skills teaching	0.536	0.003	−0.060	0.532	–	–
Community trust	0.055	0.934	−0.009	–	0.947	–
Norms of reciprocity	−0.058	0.817	−0.015	–	0.790	–
Community attachment	0.055	0.716	0.007	–	0.727	–
Received emotional support	−0.092	−0.005	0.831	–	–	0.828
Provided emotional support	0.104	−0.097	0.750	–	–	0.682
Received instrumental support	−0.061	0.257	0.486	–	–	0.603
Correlation coefficient						
F1 & F2	0.154 ($p = 0.000$)			0.178 ($p = 0.000$)		
F1 & F3	0.065 ($p = 0.087$)			0.031 ($p = 0.495$)		
F2 & F3	0.436 ($p = 0.000$)			0.392 ($p = 0.000$)		

[a] Exploratory factor analysis was applied promax rotation and maximum likelihood method.
[b] Model fit indicators of confirmatory factor analysis were as follows: Chi-square (df) = 271.2(41), $p < 0.001$, RMSEA = 0.089, CFI = 0.925, TLI = 0.899, SRMR = 0.058.

was 0.925, the Tucker–Lewis index was 0.899, and the standardized root mean square residual was 0.058, which were almost comparable to the criterion of the fit index.

Table 4 shows descriptive statistics for the variables in the multilevel Poisson regression model. Individual-level civic participation was calculated via summing the number of civic groups (up to five) in which respondents participated once or more per month. Individual-level social cohesion and reciprocity were dichotomized into those who responded "strongly/moderately agree" and "any one or more" compared with all other responses. Even after controlling for individual socio-demographic status (i.e., age, gender, marital status, education, and annual household income), all community-level social capital scores were significantly associated with depressive symptoms (Table 5). The prevalence ratio (PR) was 0.94 (95% confidence interval [CI], 0.92–0.95) per 1 SD increase in the score for civic participation. The PRs for social cohesion and reciprocity were 0.97 (95% CI, 0.95–0.99) and 0.96 (95% CI, 0.95–0.98), respectively. When the outcome was changed to self-rated health, the PRs of social capital scores were similar to the associations with GDS scores, although statistical significance was marginal for social cohesion and reciprocity.

Additional adjustments for individual-level responses to the questions used to form our scale for evaluating social capital did not affect the PRs for civic participation (PR for poor/fair SRH, 0.96; 95% CI, 0.94–0.98; PR for GDS, 0.95; 95% CI, 0.93–0.97; Model 2). Reciprocity was also associated with individual GDS (PR 0.98; 95% CI, 0.96–1.00). On the other hand, the same adjustment attenuated the association between community-level social cohesion and individual health indicators. Most cross-level (individual and community) interactions were not statistically significant (Model 3). Applying an indicator method using a dummy variable as categorical data, which was done to account for non-normal distribution and missing data, did not alter the major results and trends (eTable 2). In addition, correlation coefficients between each community-level social capital score and individual responses were not high (0.09–0.17).

Table 4
Descriptive statistics of final sample.

Outcome	
Fair/poor health	No (n = 97,324, 78.6%),[a]
	Yes (n = 22,134, 17.9%)
	Unknown (n = 4,302, 3.5%)[b]
Depressive symptoms	No (n = 74,648, 60.3%),[a]
	Yes (n = 26,700, 21.6%)
	Unknown (n = 22,414, 18.1%)[b]
Level 1 (individuals, n = 123,760)	
Age, years	Mean = 74.0, Range = 65–106
Gender	Male (46.3%)[a]
	Female (53.7%)
Marital status	Married (70.0%)[a]
	Divorced (20.9%)
	Separated (3.3%)
	Never married (2.2%)
	Unknown (3.6%)
Education	≥10 years (n = 56.0%)[a]
	<10 years (41.7%)
	Unknown (2.3%)
Annual household income (Equivalent income)	≥\4,000,000 (8.4%)[a]
	\2,000,000–\3999.999 (30.0%)
	<\2,000,000 (41.4%)
	Unknown (20.2%)
Civic participation (number of groups which participated once or more per month in five indicators)	None (45.1%)
	One (15.5%)
	Two (10.3%)
	Over three (6.9%)
	Unknown (22.1%)[b]
Social cohesion (number of "strongly/ moderately agree" in three indicators)	None (12.9%)
	One (17.1%)
	Two (20.6%)
	Three (44.6%)
	Unknown (4.7%)[b]
Reciprocity (number of "any one or more" in three indicators)	None (1.3%)
	One (3.0%)
	Two (6.7%)
	Three (82.8%)
	Unknown (6.2%)[b]
Level 2 (communities, n = 702)	
Civic participation (factor score)	Mean = 0, Range = −2.79 to 3.66
Social cohesion (factor score)	Mean = 0, Range = −3.82 to 2.86
Reciprocity (factor score)	Mean = 0, Range = −4.55 to 2.26

[a] Reference categories used for subsequent regression analyses.
[b] Unknown cases in these major variables were eliminated in subsequent regression analyses.

Discussion

We developed and validated an 11-item scale, which was comprised of sub-dimensions of civic participation, social cohesion,

Table 5
Estimated prevalence ratios from multilevel Poisson regression analysis.

	Self-rated health (fair/poor)			Depressive symptoms (GDS ≥5)		
	Model 1 *PR* (95% CI)	Model 2 *PR* (95% CI)	Model 3 *PR* (95% CI)	Model 1 *PR* (95% CI)	Model 2 *PR* (95% CI)	Model 3 *PR* (95% CI)
Fixed parameters						
Community level variables						
Civic participation (factor score)	0.94*** (0.92–0.96)	0.96*** (0.94–0.98)	0.97** (0.95–0.99)	0.94*** (0.92–0.95)	0.95*** (0.93–0.97)	0.95*** (0.93–0.97)
Social cohesion (factor score)	0.99 (0.97–1.01)	1.03* (1.01–1.05)	1.03 (0.99–1.07)	0.97** (0.95–0.99)	1.02* (1.00–1.04)	1.03 (1.00–1.06)
Reciprocity (factor score)	0.98 (0.97–1.01)	1.00 (0.98–1.03)	1.02 (0.95–1.09)	0.96*** (0.95–0.98)	0.98* (0.96–1.00)	1.03 (0.98–1.09)
Individual-level variables						
Civic participation (0–3)		0.74*** (0.72–0.76)	0.74*** (0.72–0.76)		0.76*** (0.75–0.78)	0.76*** (0.75–0.78)
Social cohesion (0–3)		0.84*** (0.83–0.85)	0.84*** (0.83–0.85)		0.77*** (0.76–0.77)	0.77*** (0.76–0.77)
Reciprocity (0–3)		0.86*** (0.84–0.88)	0.86*** (0.84–0.88)		0.82*** (0.80–0.83)	0.82*** (0.80–0.83)
Cross-level interactions						
Community level civic participation × Individual level civic participation			0.98 (0.95–1.00)			1.01 (0.98–1.03)
Community level social cohesion × Individual level social cohesion			1.00 (0.98–1.02)			0.99 (0.98–1.01)
Community level reciprocity × Individual level reciprocity			0.99 (0.97–1.02)			0.98* (0.96–1.00)
Random parameters						
Community level intercept variance (standard error)	0.004 (0.002)	0.004 (0.002)	0.003 (0.002)	0.001 (0.001)	<0.001	<0.001
Community level civic participation slope variance (standard error)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Community level social cohesion slope variance (standard error)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Community level reciprocity slope variance (standard error)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

CI, confidence interval; GDS, geriatric depression scale; PR, prevalence ratio.
***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.
All models are also adjusted for individual-level age, gender, marital status, education, and annual house income. Unknown cases in social capital variables and dependent variables were eliminated in this analysis. Sample size of model 1 was as follows: SRH; individual = 119,458, community = 702, GDS; individual = 101,348, community = 702. Sample size of model 2 and model 3 were as follows: SRH; individual = 88,436, community = 702, GDS; individual = 79,081, community = 702.

and reciprocity, to measure social capital at the community level. Evaluations of communalities of factors and internal consistency, as well as confirmatory factor analysis, demonstrated that these 11 indicators formed a reliable scale. We also found evidence to support convergent validity: the indicators were correlated with health outcomes in expected directions. Our instrument might be useful for gerontological studies and activities in Japan, and, although further studies are needed, the scale may be useful in other countries with a similar context to that of Japan.

The distinction among civic participation, social cohesion, and reciprocity dimensions are fundamental in social capital theory.[3,16,17,29] Our factor analysis statistically identified these three components. According to Islam et al, the structural dimension of social capital includes externally observable aspects of social organization and is characterized by behavioral manifestations of network connections or civic engagement.[29] This concept was reflected in the variables included in our civic participation and reciprocity variables. That the factors reflecting subjective attitudes, such as trust, norms of reciprocity, and attachment within the community, were collectively named "social cohesion" was also theoretically reasonable. The "reciprocity" component of our social capital scale may capture the dimension of community social capital that promotes the exchange of individual social supports within the community. Our results, which showed strong correlation between "reciprocity" and "social cohesion", are also consistent with the theoretical framework. We did not find remarkable inflations of confidence intervals or strong correlation between community-level social capital scores and individual responses after adjusting for individual measures. These findings suggest that the potential for multicollinearity was not large.

Social capital studies in public health have so far yielded mixed findings, potentially as a result of inconsistencies in the manner in which investigators have operationalized and measured the concept of "social capital", often by resorting to proxy variables available through secondary data sets. Previous studies have used indicators, such as community voting rates in elections or the local crime rate, as proxies for social capital. Although these variables could be viewed as either antecedents or consequences of social capital, they do not directly capture its core concepts. In addition, differences between study findings might relate to variations in culture, region, units of analysis, and age cohorts.

Although communities in Japan might have closer social ties than those in the United States, generalized trust, which is the central concept of social cohesion or cognitive social capital, is low in cohesive societies because human relations in such a society are based on mutual "assurance" rather than "trust".[30] This has resulted in an unfavorable effect of trust on health in some Japanese studies.[31,32] Nonetheless, studies to date are difficult to compare due to their use of conventionally created alternative scales based on an assortment of concepts. Hence, we believe that our novel scale for measuring community social capital could provide a useful option for such studies. Using a common scale would contribute to the discussion about between-study differences of the "true" interests of investigators.

Our findings suggest that community-level civic participation is more closely correlated with health outcomes than social cohesion. This might be because the indicators of civic participation applied in our study were more objective than those used to determine social cohesion. Our analysis also showed a reverse predictive value of community-level social cohesion for health indicators. Further studies should be conducted to identify the possible reasons for those results. Portes's concepts of the dark side of social capital may help understanding the reasons.[33] Portes has pointed out four potentially harmful characteristics of group-level social capital: the

exclusion of outsiders, excess claims on group members, restrictions on individual freedoms, and downward-leveling norms. A Japanese empirical study demonstrated that stronger social cohesion was associated with depressive symptoms in residents whose hometown of origin differed from the communities where they currently resided.[34] Alternatively, the weaker predictive value of community-level social cohesion might be explained via measurement bias due to the potential non-participation of those who trust others less. Information bias when asking about personal perceptions might be another explanation. Compared with information about individual memberships in community groups, individual perceptions regarding trust or reciprocity could be more easily influenced by various temporary conditions. This might also reflect some degree of reverse causation, in which healthier people are more likely to participate. Although individual-level perceptions of social capital were more strongly associated with individual health compared with community-level social capital,[35] this is not unexpected, since more proximal exposure to the individual is likely to correlate with individual-level health outcomes.

Strengths and limitations

This study has several important and inherent strengths. The survey was originally designed to measure social capital, which allowed the use of various conceptually appropriate candidate variables. The large sample size in terms of numbers of individual participants and communities in particular is an important strength, as our analysis has sufficient power to create a community-level scale. We created a social capital scale specifically for the elderly population, which is the first of its kind. Nevertheless, the study also had some key limitations. The cross-sectional design might have included reverse causality that potentially biased the results of our evaluation of concurrent validity. Moreover, it would be better to conduct further validations. For example, criterion validity could be evaluated using more objectively measured community-level variables, such as the proportion of participation in each organization and the voting rate. Validation studies using hard outcomes, such as mortality, are also required. Although the response rate to our survey was relatively high (71.1%), selection bias cannot be fully excluded. Generalizability might be limited because our dataset was not a nationally representative sample and was created for older adults. Caution is needed when applying our community social capital scale to data obtained from alternative contexts, such as younger populations or using data created via alternative survey methods. However, the geographic and cultural variations of the municipalities included in our sample were high, and the municipalities included metropolitan and rural areas. Moreover, we used school districts as community units, but we do not know whether our scale would be similarly valid when evaluating a community defined using an alternative area unit. Ideally, a social capital index that can be applicable at any level of aggregation should be created. However, we found that the three factors based on our alternative factor analyses using individual-level data also showed the same items in each factor, suggesting the potential generalizability of our social capital scores to alternative units of aggregation.

Conclusion

We developed a health-related community social capital scale, which was composed of 11 items assessing civic participation, social cohesion, and reciprocity. The scale was designed to allow calculations based on data derived from older populations. This new standard social capital measure could shed light on public health and gerontological issues, as well as other matters associated with community social capital.

Author's contributions

Conceived and designed the analysis: MS, NK, JA. Performed the survey: KK, the JAGES Group. Analyzed the data: MS, SK, JA. Contributed to the writing of the manuscript: MS, NK, JA, IK, KK, TO. All authors read and approved the final version of the manuscript.

Conflicts of interest

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Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.je.2016.06.005.

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