

Reciprocity as Social Capital and Self-Rated Health in Japanese Community-Dwelling Adults

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Abstract— This study examined the relationship between reciprocity among community dwelling adults and self-rated health by analyzing data from a survey conducted every 5 years between 1991 and 2011 in Japan. The results revealed a downward trend in reciprocity at the group level over the 20-year survey period, but little change in reciprocity at the individual level. A comparison of different surveyed cohorts showed that the younger the generation, the lower the group-level reciprocity. A multi-level analysis controlling for age, gender, educational status and marital status showed that both at the individual and group levels, higher reciprocity was associated with higher self-rated health. However, there was an interaction effect involving reciprocity at two levels: a stronger correlation between individual reciprocity and self-rated health was observed for individuals from a recent cohort with a low level of group reciprocity. This paper concludes by discussing the factors to consider when examining the influence of reciprocity on self-rated health.

Keywords- *Social Capital; Self-Rated Health; Multi-Level Analysis*

I. INTRODUCTION

It is widely known that social relationships can influence an individual's health. For example, the mortality rate for unmarried individuals and those with little social contact is higher than that of individuals who are married or have some degree of regular social contact [1]. Individuals with large social support systems maintain their health even in stressful situations [2]. While research on these micro social relationships has notable implications for the human health sciences, more attention is now being directed toward the influences of an individual's macro social relationships with the community, i.e., social capital [3]. Putnam, one of the pioneers in this field of research, defined social capital as "social networks and the norms of reciprocity and trustworthiness that arise from them," showing the empirical data that the safety net for health risks was more effective and procuring medical services was easier due to the high degree of cohesion present in communities where trust and reciprocity were part of the norm [4]. Actually, it has been reported that people living in an area where many residents agreed that "most people can be trusted" and "most of the time, people try to be helpful" had lower mortality rates and better health than those living in areas where residents did not agree with those

statements [5] [6]. Similarly, it has been shown that as the level of trust in others and sense of belonging to the community decrease, the risk of mental health problems increases [7].

In recent years, Japanese researchers have actively investigated the relationship between social capital and health. For example, one study reported that local residents with a higher level of willingness to participate in community activities as well as trust and reciprocity with other residents had better mental health [8]. Furthermore, older adults living in high-income areas had higher self-rated health and subjective well-being than did those living in lower-income areas [9]. Following a review of a range of these studies, Mamada [10] concluded that social capital could influence health maintenance and promotion, even in Japan.

However, the previous studies contain some problems. First, most studies (e.g., [6] [7] [11]) used trustworthiness as an indicator of social capital but did not address reciprocity. As a result, reciprocity as social capital has not been examined to the same extent as trust in terms of its influence on health. However, the norm of reciprocity has long been considered indispensable for ensuring stability within a social system as the "basis of all systems of morality" [12] [13]. Therefore, the relationship between reciprocity and health requires further investigation.

Second, several previous studies (e.g., [8]) treated social capital as an indicator at the individual rather than group level. However, treating social capital as an individual's awareness and behavior toward their social relationships obscures the difference between the study of social capital and the study of social support. This confounding approach would reduce the merit of studying social capital as a new concept [3]. A multi-level analysis technique has recently been developed to advance the study of social capital [7]. This new statistical methodology enables us to differentiate indicators at the individual and group levels to examine the correlations of each indicator with external criteria [14]. For example, reference [15] applied a multi-level analysis to a large longitudinal dataset from the UK to find that persons with a high level of trust in others tended to report higher self-rated health at the individual level as well as at the group level (i.e., those living in an area where trust in others is high tended to report greater self-rated health). A similar examination using reciprocity as an

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indicator should then be beneficial to confirm the influence of social capital on health.

Third, several previous studies (e.g., [15] [16]) assessing the relationship between social capital and health focused on geographical differences, but did not sufficiently examine generational differences. However, according to reference [4], the most important factor in the recent decline in social capital within the United States is the rise of a new generation that does not consider ties to the community as important as did previous generations. In other words, the decline in the population of a generation rich in trust and reciprocity has led to a decline in social capital in the local community as a whole. Similarly, in Japan, a large longitudinal survey showed that younger males tended to interact less with their neighbors compared with older males [17]. However, the possible impact of these generational changes on the relationship between social capital and health has yet to be studied.

The purpose of the current study was to examine relationships between social capital and self-rated health by analyzing large-scale survey data of Japanese community-dwelling adults. In accordance with the preceding discussion, we used reciprocity as an indicator of social capital, applied a multi-level analysis to the data, and investigated the influence of generational changes on the relationship between social capital and self-rated health.

II. METHOD

A. Study Design and Population

This study utilized data from the survey carried out by the Research Institute for Policies on Pension and Aging. This survey is administered every five years to an age- and gender-stratified random sample of pension plan-holders and beneficiaries (and their spouses) living in Japan. A total of 25,333 respondents have taken part in the survey from the first round in 1991 to the fifth in 2011. As the spouses' questionnaire does not contain questions on self-rated health, their data were not included in the current analysis. This reduced the total number of eligible respondents to 15,208. By excluding respondents with missing variables, the final number of subjects for the current analysis was 14,073 (male: 10,691; female: 3,382; average age 54.19 ± 10.95 years).

B. Research Variables

As an indicator of reciprocity at the individual level, participants were asked to rate their satisfaction in terms of "being useful to society." This question was measured on a five-point scale that ranged from "fully satisfied" to "very unsatisfied." Individuals with higher scores are more oriented toward reciprocity. As an indicator of reciprocity at the group level, the proportion of respondents who identified fulfillment in life as "feeling that I am useful to others and society" was calculated for each survey. The survey cohort with a higher proportion was considered to have a higher norm of reciprocity.

Participants were also asked to rate their current health on a five-point scale that ranged from "excellent" to "poor." Higher values represented higher self-rated health. In addition, some demographic indicators (gender, age, educational status, and

marital status) were used as covariates that could influence the relationship between reciprocity and self-rated health. Educational status had four categories: junior high school, high school, junior or vocational college, and university or higher. Marital status had four categories: unmarried, divorced, widowed, and married.

C. Statistical Analysis

First, descriptive statistics for the variables analyzed in this study were obtained, and trends in generational changes in social capital and its related factors were examined by comparing five survey cohorts.

Next, a multi-level analysis with self-rated health as the outcome variable was applied to the following five models, and the results were compared.

Model 0: This was the null model without any explanatory variables that consisted of intercept (overall average) and residual variance. The estimated value of intercepts and variances at the individual and group level were calculated in this model to confirm whether there was any difference in self-rated health between survey cohorts.

Model 1: This model included the moderators (gender, age, educational status, and marital status) as explanatory variables to the null model. It was assumed that intercepts would differ between survey cohorts in this model when examining the influence of each explanatory variable on self-rated health (random intercept model). Furthermore, we identified whether there were any differences in health among survey cohorts that could not be explained by the moderator variables.

Model 2: In addition to the moderator variables in Model 1, reciprocity at the individual level was added as an explanatory variable to Model 2. This enabled us to examine the relationship between reciprocity at the individual level and self-rated health after removing the influence of the moderator variables. The difference between this model and the previous (Model 1) lies in the additional assumption that the strength of the relationship between reciprocity and health differed among survey cohorts (random intercept and random slope model).

Model 3: This model added reciprocity at the group level as an explanatory variable to Model 2. We examined whether reciprocity at both the individual and group levels correlated with self-rated health after controlling for the effects of the moderators.

Model 4: This model added the interaction between reciprocity at the individual and group levels as an explanatory variable to Model 3. Here, we explored whether the relationship between reciprocity at the individual level and self-rated health was influenced by reciprocity at the group level.

Indicators for comparing the fitness of each model to the data included deviance ($-2 \log$ likelihood), AIC (Akaike information criterion), and BIC (Bayesian information criterion) calculations. For Models 0 and 1, we evaluated the explanatory power of reciprocity at the group level when it was possible to calculate interclass correlations (ICC). In the analysis, reciprocity at the individual level was centered before its addition to the model in order to prevent unnecessarily high correlations in the intercepts and slopes [14].

III. RESULTS

A. Cross-Cohort Differences of the Data

There was a statistically significant difference ($p < 0.001$) in the average age of each survey cohort, but the effect was very small (partial $\eta^2 = 0.004$). The proportion of women increased significantly ($p < 0.001$) and moderately ($w = 0.12$) in subsequent survey cohorts, from the first (18.4 %) to the fifth (31.1 %) survey cohort. In terms of educational status, there was also a significant ($p < 0.001$) and moderate ($w = 0.27$) difference between the cohorts; the more recent the survey, the larger the proportion of subjects with higher educational status. There was also a significant ($p < 0.001$) and moderate ($w = 0.15$) difference between survey cohorts in terms of marital status; the proportion of married subjects continually decreased from the first (91.2 %) to the fifth (80.1 %) survey cohort. These results suggest that the data in the current study reflect recent social changes in Japan such as the rises in women's employment rates, educational status, and singlehood.

There was a significant ($p < 0.001$) difference between cohorts in the average value of reciprocity at the individual level, but the effect was too small (partial $\eta^2 = 0.007$). In contrast, there was a significant ($p < 0.001$) and moderate ($w = 0.16$) difference between cohorts in reciprocity at the group level. The results indicate that while there was little change in reciprocity at the individual level over the past twenty years, reciprocity at the group level exhibited a downward trend. Age cohorts based on age at the time of the first survey were then created at five-year intervals, and the shift in values among surveys was mapped (Figure 1). As results, we found higher reciprocity at the group level in the older generation (represented by a dotted lines), suggesting that the decrease in reciprocity at the group level stemmed at least in part from the effect of age cohort (i.e., generational changes).

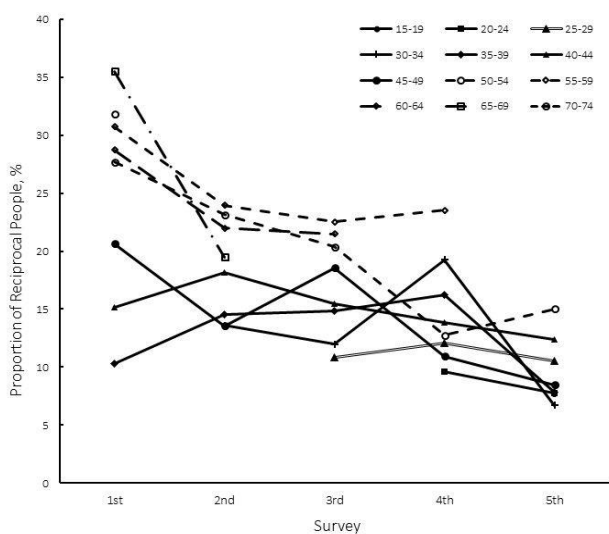


Fig. 1. Reciprocity at the group level according to the age cohort with the first survey (1991) as the baseline.

B. Multi-Level Analysis

Model 0 (null model): The random effects (variance at the individual level) was 0.868 and was larger than the variance of the intercepts at the group level (0.020). This shows that the relationship with self-rated health is stronger for individual- than for cohort-level factors. However, the standard deviation (square root of the variance) of the intercept at the group level was 0.142 (95% confidence interval = 0.076 – 0.267), suggesting its significant relationship with self-rated health. Moreover, the interclass correlation (ICC) was 0.023, which shows that 2.3% of the variance in self-rated health can be attributed to differences in survey cohorts.

Model 1 (random intercept model): In terms of fixed effects, self-rated health was high among older subjects, those with high educational status, and widows/widowers or those married with a living spouse. In terms of the random effect, variance at the individual level was 0.858, which was lower than that in the null model; however, the variance of the intercepts at the group level (0.022) did not show a drastic change. Therefore, it is assumed that differences in self-rated health found between the survey cohorts should be attributed to factors other than the moderator variables. As shown in Table 1, however, each model fit indicator (deviance, AIC, and BIC) of the model showed a decline in value compared with the Model 0, which suggests that Model 1 provided improved model fit.

Model 2 (random intercept and random slope model): A significant positive effect of reciprocity at the individual level (estimated value = 0.188, $p < .01$) emerged, indicating that the higher an individual's reciprocity, the higher his/her self-rated health. Furthermore, variance at the group level (0.825) was largely reduced from Model 1. The estimated variance values of the intercept (0.023) and the slope (0.001) in the random effect were both positive; their 95% confidence intervals were 0.078 – 0.0290 and 0.012 – 0.062, respectively. This suggests that the average value of self-rated health varied between survey cohorts, and the relationship between reciprocity at the individual level and self-rated health differed between the cohorts. Although a negative value (-0.004) was obtained as the estimate value of covariance of the intercept and slope, the 95% confidence interval of the correlation coefficient between the intercept and slope was -1.000–0.990, suggesting a non-significant relationship. However, all fit indicators were further reduced (improved).

Model 3: A significant positive effect of reciprocity at the group level emerged (estimated value = 2.478, $p < .05$). This indicates that an individual who belonged to a survey cohort with a higher average value of reciprocity tended to show higher self-rated health. Turning to the random effect, adding this variable reduced the variance of the intercept at the group level from 0.023 (in Model 2) to 0.004. This suggests that differences in self-rated health between cohorts can be in part attributed to differences in reciprocity at the group level. In terms of the relationship between the intercept and slope in the random effect, the estimated value of covariance was negative (-0.001). However, the 95% confidence interval of the correlation coefficient was between -0.282 and 0.148, showing a non-significant relationship. In terms of the three fit indicators, while deviance and AIC were reduced in

comparison to Model 2, increase of the value of BIC was observed.

Model 4: In this model, interaction between reciprocity at the individual and group levels had a significant negative impact (-0.535 , $p < .01$). This means that in a survey cohort with low reciprocity, the correlation between reciprocity at the individual level and self-rated health was strong; however, in a survey cohort with high reciprocity, the correlation was weak. Figure 2 shows the effect of this interaction. The examination of fit for Model 4 showed that this model had the lowest values for deviance and AIC among the five models, although the value of BIC was higher than that in other models (Models 2 and 3). A comparative analysis of models was carried out with chi-square tests based on differences in deviance and degrees of freedom. The analysis confirmed statistically that Model 3 was a better fit to the data than Model 2, and Model 4 was a better fit than Model 3 ($p < 0.10$ and $p < 0.01$, respectively). This suggests that Model 4 was the best one for explaining self-rated health in the current sample.

TABLE I. FIT INDICATORS OF EACH MODEL

| | Model 0 | Model 1 | Model 2 | Model 3 | Model 4 |
|----------|---------|---------|---------|---------|---------|
| Deviance | 37972.4 | 37809.9 | 37260.3 | 37257.6 | 37249.7 |
| AIC | 37978.4 | 37831.9 | 37288.3 | 37287.6 | 37281.7 |
| BIC | 38001.1 | 37914.9 | 37394.1 | 37400.8 | 37402.5 |

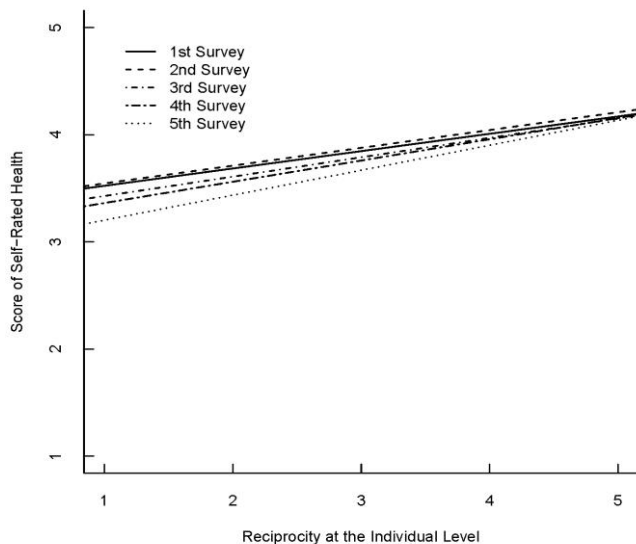


Fig. 2. Regression of reciprocity at the individual level by each survey cohort in relation to self-rated health.

IV. DISCUSSION

While there has been little change in reciprocity at the individual level over the past twenty years, reciprocity at the group level has followed a downward trend. Data from the Survey on Time Use and Leisure Activities [18] would be useful for comparison with the results of the present study, because the timing of the administration of the former has coincided with the latter (every five years). According to the survey, the proportion of individuals involved in some sort of volunteer activity (e.g., blood donation, assisting local schools, cleaning local parks) changed little between 1991 (27.7%) and 2011 (26.3%). As reference [19] indicated, participation in volunteer activities is an indicator of social capital at the individual level. Our findings then suggest that reciprocity in current-day Japan simply represents an individual's preference for prosociality, rather than a general norm that obliges people to be useful to others and society.

Reference [4] pointed out that the decline in general reciprocity (reciprocity at the group level) in the contemporary United States is reflected in the rise in the rate of refusal of public opinion surveys and the decline in the return rate for census questionnaires. As a decline in census response rates has also been observed in Japan [20], the results of the present study might be influenced by some background factors common to Japan and the US. In fact, the results of our analysis by age cohort found that reciprocity at the group level is lower among younger generations, suggesting that the decline in reciprocity at the group level could be induced by generational changes. Our study has also confirmed trends that reflect recent social change such as increases in women's employment rates, higher educational status, and the rise in singlehood in the past twenty years. Further exploration is then required to examine the relationship between these social changes and the decline in reciprocity at the group level in Japan, or the divergence between reciprocity at the individual and group levels.

The multi-level analysis showed that higher reciprocity was accompanied by higher self-rated health both at the individual and group levels. This is congruent with the previous findings on the relationship between social capital and health outcomes [6] [7] [8] [9]. However, the current results also revealed a significant interaction between reciprocity at the individual and group levels, suggesting that the health-promoting effect of reciprocity at the individual level was greater when reciprocity at the group level was lower. This supports an indication that community social capital is not uniformly healthy [11]. In fact, findings in recent Japanese research on children [21] and adolescents [22] suggests that the relationships between social capital at the individual level and health are contextualized by social capital at the group level. Consequently, our study extended previous findings of younger generations to those of middle-aged and older adults.

Why does the health-promoting effect of reciprocity at the individual level become larger in recent Japan, compared with the past when reciprocity at the group level was higher? Reference [23] identified excessive demand from group members brings about adverse effects on the individual, because in a society with a strong, shared norm of reciprocity, a problem arises in which those who act selfishly can gain the maximum benefit. This is consistent with the argument that

traditional Japanese workplaces have obliged junior employees to go to extra length to serve their seniors [24]. In this old "apprenticeship" culture, while senior workers (who have already paid their dues when they were entry-level workers) benefit, they impose a burden on younger workers in terms of excessive work hours and strained loyalties. Therefore, the results of our study might indicate that in contemporary Japan in which such a norm of reciprocity at the group-level is gradually diminishing, reciprocity at the individual level helps individuals promote their own health more effectively, safe from exploitations of "free-riders."

Previous discussions have tended to emphasize the notion that higher levels of community social capital are health enhancing for everyone, regardless of their individual characteristics [11]. However, this argument is often criticized for overemphasizing the function of social capital as a public good [25]. In fact, research has revealed more negative effects of social capital such as the exclusion of others, imposition of norms, and expansion of inequality [26] [27]. Thus, our results might shed additional light on the "dark side of social capital [28]" by suggesting the incompatibility of reciprocity at the individual and group levels in terms of their effects on self-rated health.

V. FUTURE DIRECTIONS AND CONCLUSION

De Silvia [19] identified 11 methodological problems based on a review of previous studies that assessed the relationship between social capital and health. Some of these problems were improved in the present study: distinguishing individual- and group-level social capital to assess their influences on health, controlling for the influence of moderator variables, and using an appropriate indicator (reciprocity) based on the definition of social capital. However, some issues remain unresolved. For example, the current study did not examine the effect of other forms of cognitive social capital, such as trustworthiness, and structural social capital such as interactions with neighbors and voter turnout. In addition, because the outcome variable was a single-item assessment of self-rated health, the reliability and validity of the index was unconfirmed. It is also insufficient to examine generational changes in social capital by conducting only cross-sectional assessments. Improving upon these problems and accumulating insights that are more accurate will greatly improve future examination of the influence of social capital on health.

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