Disaster Management and Social Capital in Cases of Shinjuku-ku: Generational Differences Do Matter

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<Abstract> Much attention has been paid on social capital as a concept for understanding of local communities in recent years. This study verifies relations between social capital and local capabilities of disaster management from a standpoint of usual relation of people within neighborhood or a community through the questionnaire survey in Shinjuku-ku, Tokyo conducted in September 2010. Correlations are found between social capital and local capabilities of disaster management by Structural Equation Modeling (SEM) analysis (n=446). The most principal factor closely related to local capabilities for disaster management is a latent factor of "good sense of place". There are significant differences of cognition for disaster preparedness between respondents of less than 60 years and respondents of 60 years or more. In conclusion, this study discusses the implication for public policy making.

Keywords: disaster management, community, social capital, Structural Equation Modeling (SEM)

1 . Introduction

A study showed that local administrations could not correspond to various matters effectively right after the occurrence of a big disaster (Ishibashi, 2009; and Yutaka Tsujinaka, Robert Pekkanen and Hidehiro Yamamoto, 2009). Over 90% of people escaped from their broken houses in the Great Hanshin-Awaji Earthquake (34.9% by themselves, 31.9% helped by families, 28.1% helped by friends or neighbors, 2.6% helped by passers-by). Few people were helped by public rescue teams. As lessons from it, usual relation of people within neighborhood or a community is crucially important. To reduce damages caused by a natural disaster and quickly rebuild a community, disaster preparedness at a community and personal levels played quite

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important roles (Fijimi, Kakimoto, Yamada et al., 2011). Thus, much attention has been paid on social capital as a concept for understanding of local communities in recent years.

Dynes (2005) explained that communities were the locus of the response to disaster and had the social capital necessary to respond to disasters. In previous researches, voluntary organizations for disaster management were evaluated mainly in terms of attributions of organizations and actual conditions of their activities (Okanishi and Sadohara, 2006). However, little attention has been paid on usual relation of people within neighborhood or of a community, though it is a key factor of social capital. This fact indicated researches about social capital and local capabilities of disaster management should be pursued. For these purposes, this study has focused on the relations between social capital and local capabilities of disaster management from a standpoint of usual relation of people within neighborhood or a community through the extensive questionnaire survey in Shinjuku-ku, Tokyo in 2010.

2 . Voluntary organizations for disaster management

Until the early 1990's, there had been a tendency to put emphasis on an engineering aspect in approaches for disaster preparedness (Mimaki and Shaw, 2007). At the event of the Great Hanshin-Awaji Earthquake, however, local administrations could not correspond to various matters effectively right after the occurrence of a big disaster. Therefore, local communities were forced to execute some of emergency measures which administrations should be in low but could not be in charge in reality. A need for greater attention on encouraging disaster preparedness at a community and personal levels was paid in the Hyogo Framework for disaster reduction (ISDR, 2005). Local residents' sense of solidarity formed voluntary organizations for disaster management to protect their local houses and streets by themselves. According to Clause 2, Article 5 of Basic Act on Disaster Control Measures, cities, towns and villages should make efforts to foster activities of voluntary organizations for disaster management. This clause was added by the amendment of the law after the Great Hanshin-Awaji Earthquake. In 2004, when Niigata Prefecture Chuetsu Earthquake occurred, all the safety of residents in Yamakoshi Village were checked promptly within a day after the earthquake (Fire and Disaster Management Agency, 2007). This showed the importance of usual relation of people within neighborhood or of a community.

After the experience of the Great Hanshin-Awaji Earthquake there has been an increasing awareness of the importance of the social aspects of disaster preparedness, in particular community's capacity to respond (Mimaki and Shaw, 2007). One line of inquiry has come to socio-psychological factors, which influence levels of disaster preparedness (Sagara, Okada and Paton, 2009). There was no synthetic research which evaluated the capability of community for disaster management (Kitagawa, Ohgai Murakami et al., 2006). As a capability of community for disaster management is composed of various factors, we have many difficulties in evaluating relation of people within neighborhood or of a community such as individual awareness of disaster preparedness, organizational capabilities of community for disaster management, etc.

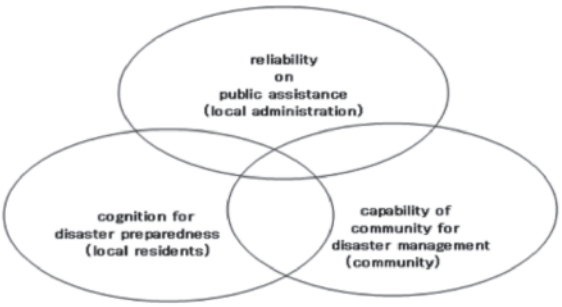
Under these circumstances, analyses of voluntary activities for disaster management,

using the concept of social capital, have flourished in recent years. One of such studies concluded that factors which promote capabilities of community for disaster management were (a) community leader's leadership, (b) social capital in local community, (c) existence of institution to promote social capital (Junko Mimaki and Rajib Shaw, 2007). Yoshimori (2010) analyzed the capability of particular high-rise condominium for disaster management which was related to neighborhood or community within condominium. Izukawa (2008) pointed that capabilities of local disaster management had positive correlation with community activities. However, in a pre-disaster context, little attention has been paid on social capital and its contribution in building community resilience (Bhandari, Okada, Yokomatsu et al., 2010). Accumulation of reliable data and to get a clue for the study on disaster management is expected, because verifiable data is limited.

For that purpose, as a research fellow of Center for Social Capital Studies at Senshu University which established a research project titled "Exploring Social Capital towards Sustainable Development in East Asia" funded by Ministry of Education, Culture, Sports, Science and Technology in 2009, I carried out the questionnaires in Shinjuku-ku, Tokyo in 2010.

Voluntary organizations for disaster management are the core structures of mutual assistance in local areas, and it is desirable for local habitants to share the living environment and support these organizations actively. Figure 1 shows the conceptual framework of local capabilities for disaster management.

Figure 1. Conceptual framework of local capabilities for disaster management



To minimize the damage caused by a natural disaster, people in Japan have come to widely believe that the cooperation among local residents [*Jijo* in Japanese], communities [*Kyojo* in Japanese] and administration [*Kojo* in Japanese] is quite important as lessons from the Great Hanshin-Awaji Earthquake. Local capabilities of disaster management may consist of (a) cognition for disaster preparedness (b) capability of community for disaster management, (c) reliability on public assistance.

3 . Research objectives

On the basis of the conceptual framework of local capabilities for disaster management shown Figure 1, followings are the objectives for this research:

A. To examine correlations among three factors of conceptual framework of local capabilities for disaster management by use of Structural Equation Modeling (SEM). That is to verify correlations among (a) cognition for disaster preparedness, (b)

capability of community for disaster management, (c) reliability on public assistance in cases of Shinjuku-ku.

B. To find out correlations between social capital and local capabilities of disaster management from a standpoint of usual relation of people within neighborhood or of a community by model construction.

C. To verify differnces by age within social capital factors related to local capabilities of disaster management.

4. Research methodology

To get a clue for the research on local capabilities for disaster management and social capital, Center for Social Capital Studies at Senshu University conducted the survey for local habitants of four areas (Yotuya, Tansucho, Enoki, Wakamatu) in Shinjuku-ku, Tokyo in 2010. It was assured that research data would be only used for academic purpose.

Figure 2. Four target areas located in the eastern part of Shinjuku-ku

As Yotsuya area has grown and flourished as a post town of the Edo era, this area is rich with green space having a modernistic figure based on its long history and culture. Of late, transportation network in this area has changed considerably as subway North-South Line and Oedo Line were opened for traffic accompanied by relocation of the Metropolitan Government Office to West Shinjuku area. In Tansumachi area, Ushigome Ward Office was set up in Meiji period. The then Ushigome-ku consisted of present Tansumachi area, Enoki area and Wakamatsu area. Kagurazaka became the most prosperous amusement center within a hilly residential section of western Tokyo [*Yamanote*]. "People of culture [*Bunkajin*]" assembled there. In recent years, Tansumachi area has become a business zone. The starting of subway service of Oedo Line has accelerated this tendency more. In Enoki area residential zone and small-sized commerce and industry zone have intermingled based on its history and culture. Wakamatsu area is located in almost center of Shinjuku-ku with many national institutes. This area consists of quiet residential zones generally and is convenient to live with shopping quarters. Traffic access has been improved after Oedo Line was opened.

On the whole, these four areas inherited their own long histories and cultures from Edo era. Within these four areas, population of each neighborhood association or residents' association is rather small. As voluntary organizations for disaster management were established in almost all the small towns in Japan, the questionnaires were carried out through 115 neighborhood associations or residents' associations in the eastern part of Shinjuku-ku. On August 31, 2010, the questionnaires were sent from Center for Social Capital Studies at Senshu University, requesting a respondent to send a reply by September 28. Overall 2,300 questionnaires were distributed through neighborhood associations or residents' associations, 635 responses were returned with an overall corresponding rate of 27.6%. We should notice that the questionnaires were carried out before the occurrence of the Great East Japan Earthquake. This research does not intend to compare differences among four areas, as our research focus is on communities within four areas totally. Social capital variables considered in this research are "social capital in general" and "social capital in neighborhood".

4 . 1 Organization of questionnaires

Items on the questionnaire sheet were prepared to match with conceptual framework of local capabilities for disaster management shown at Figure 1. The questionnaires consisted of the following three categories; (a) the local activities for disaster management (Q1-Q14), (b) the cognition of society (Q15-Q20), (c) attribution of the respondent (F1-F10). In many question items like Q4 or Q20, respondents were requested to choose one opinion by its number from among the five Likert scale options from "greatly reliable" to "not reliable at all". The number chosen was rated respectively as positive 5 to negative 1 in the process of statistical transaction.

Table 1. Question items about local activities for disaster management

Q1 existence of experience of natural disasters (SA: single answer, out of 2 choices)
Q2 traditional successions of disaster experiences (SA out of 2 choices)
Q3 cognition for origins of voluntary organization by residents (SA out of 5 choices)
Q4 reliability on a certain person or organization as shown below in the event of a natural disaster (5 point Likert scale)
(a) family
(b) neighbors
(c) relatives
(d) acquaintances or friends
(e) colleagues or coworkers
(f) voluntary organizations for disaster management
(g) self-fire brigade
(h) other volunteer organizations or NPO
(i) police or fire-authorities

(j) hospitals
(k) Shinjuku Ward Office
(l) Tokyo Metropolitan Government
(m) Self-Defense Forces

Q5 frequency of participation in voluntary activities for disaster management (5 point Likert scale)
Q6 how in charge of voluntary organization for disaster management (SA out of 6 choices)
Q7 frequency of voluntary activities for disaster management (5 point Likert scale)
Q8 practice of disaster preparedness by residents (MA: multiple answer)
Q9 self-assessment on organizational capability of voluntary organization for disaster management (5 point Likert scale)
Q10 expectation toward Shinjuku Ward Office about disaster management measures (MA)
Q11 expectation toward Tokyo Metropolitan Government about catastrophic disaster (FA: free answer)
Q12 existence of units of the Self-Defense Forces in nearby area (SA out of 2 choices)
Q13 visit experience of the unit of the Self-Defense Forces (SA out of 2 choices)
Q14 expectation toward the Self-Defense Forces about catastrophic disaster (FA)

Table 2. Question items about the cognition of society

Q15 reliability on society in general (5 point Likert scale)
Q16 reliability on people while traveling (5 point Likert scale)
Q17 association with relatives (5 point Likert scale)
Q18 association with friends or acquaintances outside workplace (5 point Likert scale)
Q19A frequency of association with neighbors (5 point Likert scale)
Q19B ratio of neighbors in association (5 point Likert scale)
Q20 reliance on a certain person or organization as shown below in worries and troubles (5 point Likert scale)
(a) family
(b) neighbors
(c) relatives
(d) acquaintances or friends
(e) colleagues or coworkers
(f) neighborhood associations or residents' associations
(g) volunteer organizations or NPO
(h) religious groups
(i) police or fire-authorities
(j) schools or hospitals

(k) political party or politician
(l) Shinjuku Ward Office
(m) Tokyo Metropolitan Government
(n) central government

Table 3. Question items about attribution of the respondent

F1 gender (SA out of 2 choices)
F2 age (SA out of 8 choices)
F3 occupation (SA out of 13 choices)
F4 type of dwelling (SA out of 9 choices)
F5 number of people living together (FA)
F6 habitation years in Shinjuku-ku (SA out of 7 choices)
F7 hope of continuous habitation in Shinjuku-ku (SA out of 4 choices)
F8 degree of satisfaction of living in Shinjuku-ku (5 point Likert scale)
F9 prediction of living standard in 5 years (5 point Likert scale)
F10 living standard compared with 5 years before (5 point Likert scale)

5 . Findings and Analysis

5 . 1 Sample

Respondents are living in four areas (Yotsuya, Tansumachi, Enoki, Wakamatsu) in Shinjuku-ku, Tokyo. These four areas inherited their own long histories and cultures from Edo era (Figure 3,4,5,6,7and 8).

Figure 3. Gender

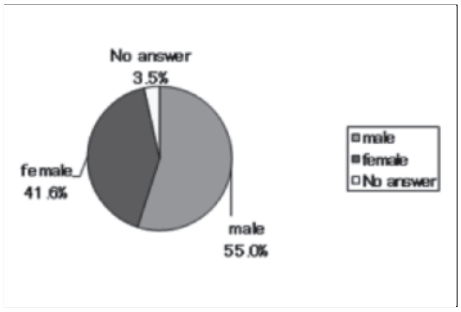


Figure 4. Age

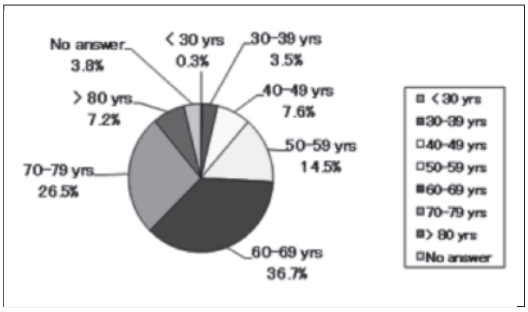


Figure 5. Number of people living together

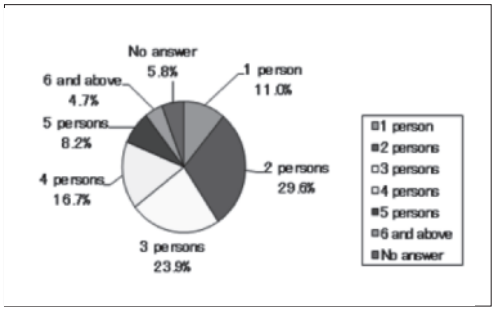


Figure 6. Habitation years in Shinjuku-ku

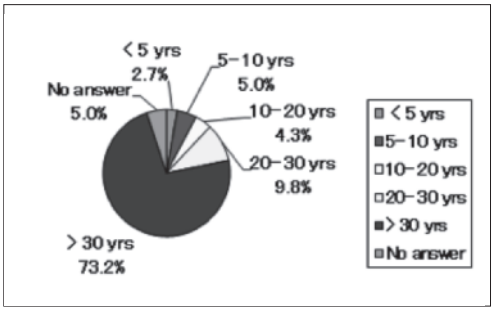


Figure 7. Hope of continuous habitation

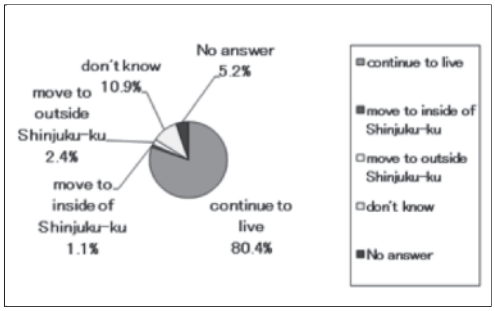
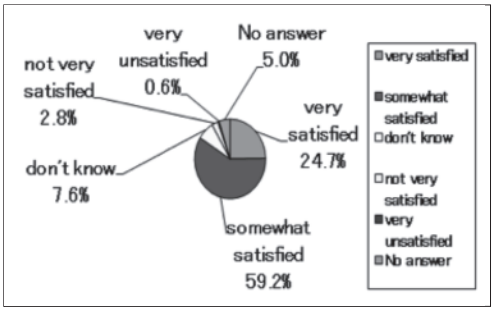


Figure 8. Degree of satisfaction of living



Attributions of the respondent were as follows: gender (male = 55.0%, female = 41.6%, no answer = 3.5%); age (< 30 yrs = 0.3%, 30-39 yrs = 3.5%, 40-49 yrs = 7.6%, 50-59 yrs = 14.5%, 60-69 yrs = 36.7%, 70-79 yrs = 26.5%, > 80 yrs = 7.2%, no answer = 3.8%); number of people living together (1 person = 11.0%, 2 persons = 29.6%, 3 persons = 23.9%, 4 persons = 16.7%, 5 persons = 8.2%, 6 persons and above = 4.7%, no answer = 5.8%); habitation years in Shinjuku-ku (< 5 yrs = 2.7%, 5- 10 yrs = 5.0%, 10- 20 yrs = 4.3%, 20- 30 yrs = 9.8%, > 30 yrs 73.2%, no answer = 5.0%); hope of continuous habitation (continue to live = 80.4%, move to inside of Shinjuku-ku = 1.1%, move to outside Shinjuku-ku = 2.4%, don't know = 10.9%, no answer = 5.2%); degree of satisfaction of living (very satisfied = 24.7%, somewhat satisfied = 59.2%, don't know = 7.6%, not very satisfied = 2.8%, very unsatisfied = 0.6%, no answer = 5.0%).

5 . 2 Factor analysis about the conceptual framework

We can find out a few latent background factors from a large number of manifest factors. First we conducted exploratory factor analysis about the conceptual framework of local capabilities for disaster management shown in Figure 1. This framework was supposed to be made up of three elements; (a) cognition for disaster preparedness, (b) capability of community for disaster management, (c) reliability on public assistance. Judging from correlation matrix, we picked up nine items from these questionnaires.

Table 4. Factor analysis about the conceptual framework of local capability for disaster management

		maximum likelihood method, promax rotation		
naming	question items	factor1	factor2	factor3
reliability on public assistance	(a) reliability on hospitals (Q4 (j))	0.842	-0.037	0.013
	(b) reliability on police or fire-authorities (Q4 (i))	0.820	-0.079	-0.017
	(c) reliability on Shinjuku Ward Office (Q4 (k))	0.782	0.094	0.003
cognition for disaster preparedness	(d) frequency of participation in voluntary activities for disaster management (Q5)	-0.009	0.876	-0.032
	(e) how in charge of voluntary organization for disaster management (Q6)	-0.012	0.517	0.029
	(f) cognition for origin of voluntary organization by residents (Q3)	0.006	0.468	0.082
capability of community for disaster management	(g) self-assessment on organizational capability for disaster management (Q9)	-0.042	-0.070	0.837
	(h) frequency of voluntary activities for disaster management (Q7)	-0.014	0.186	0.654
	(i) reliability on voluntary organization by residents (Q4 (f))	0.278	0.113	0.408
correlation			0.019	0.322
				0.503

Nine items were (a) reliability on hospitals, (b) reliability on police or fire-authorities, (c) reliability on Shinjuku Ward Office, (d) frequency of participation in voluntary activities for disaster management, (e) how in charge of voluntary organization for disaster management, (f) cognition for origin of voluntary organization by residents, (g) self-assessment on organizational capability for disaster management, (h) frequency of voluntary activities for disaster management, (i) reliability on voluntary organization by residents. Respondents were requested to choose one opinion by its number from among five point Likert scale, however single answer out of 6 choices on item (e) and out of 5 choices on item (f).

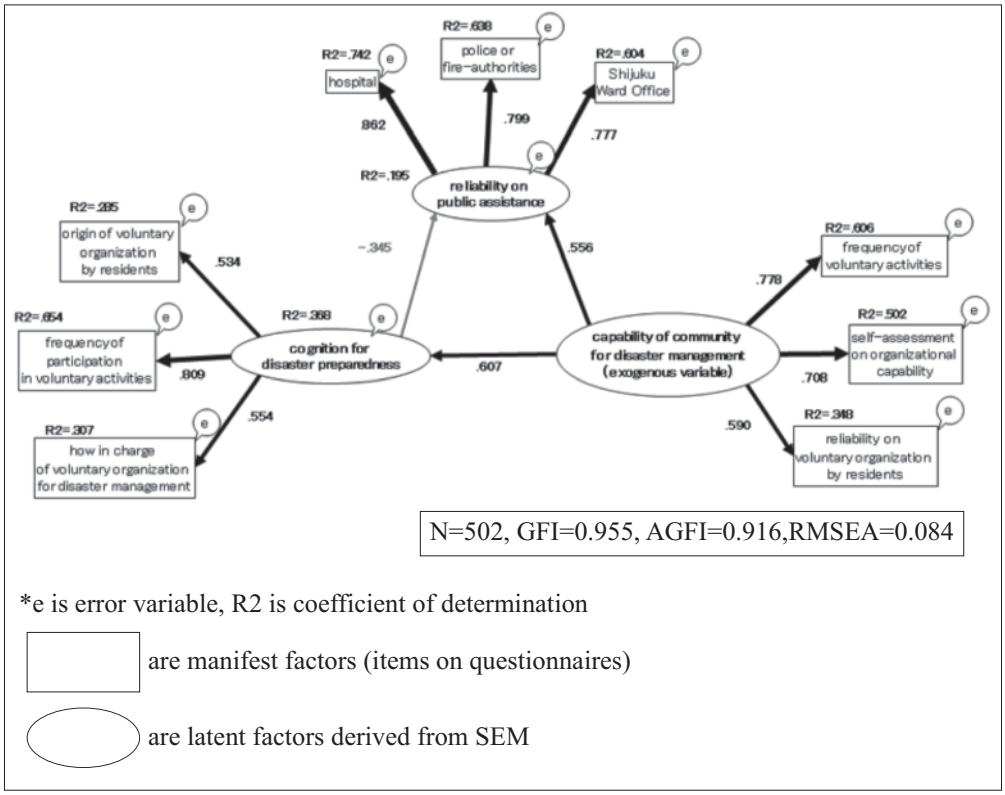
The result of exploratory factor analysis (n=502) is shown Table 4. All the items listed above showed a considerably high internal consistency (Cronback α=0.715). Items with a value of less than 0.4 were excluded.

Concluding from correlation matrix after promax rotation, this model was suitable for 3-factor structure. We named factor 1 as “reliability on public assistance”, factor 2 as “cognition for disaster preparedness”, and factor 3 as “capability of community for disaster management”. Through this analysis, statistics software named Excel Statistics 2010 was used which was produced by Social Survey Research Information Co. ltd, Tokyo, Japan.

5 . 3 Covariance structure analysis about the conceptual framework

Structural Equation Modeling (SEM) was applied to predict the correlation of manifest factors or latent factors that might existed behind the framework of disaster management. The result of SEM with nine manifest factors and three latent factors based on Table 4 is as follows.

Figure 9. Path diagram with 3 latent variables



Sample size is 502. P values of all paths in this figure are below 0.01 ($p<0.01$). To describe the subordinate items of each factor, first latent factor “capability of community for disaster management” included “frequency of voluntary activities (0.778)”, “self-assessment on organizational capability (0.708)” and “reliability on voluntary organization by residents (0.590)”. Second latent factor “cognition for disaster preparedness” included “frequency of participation in voluntary activities (0.809)”, “how in charge of voluntary organization for

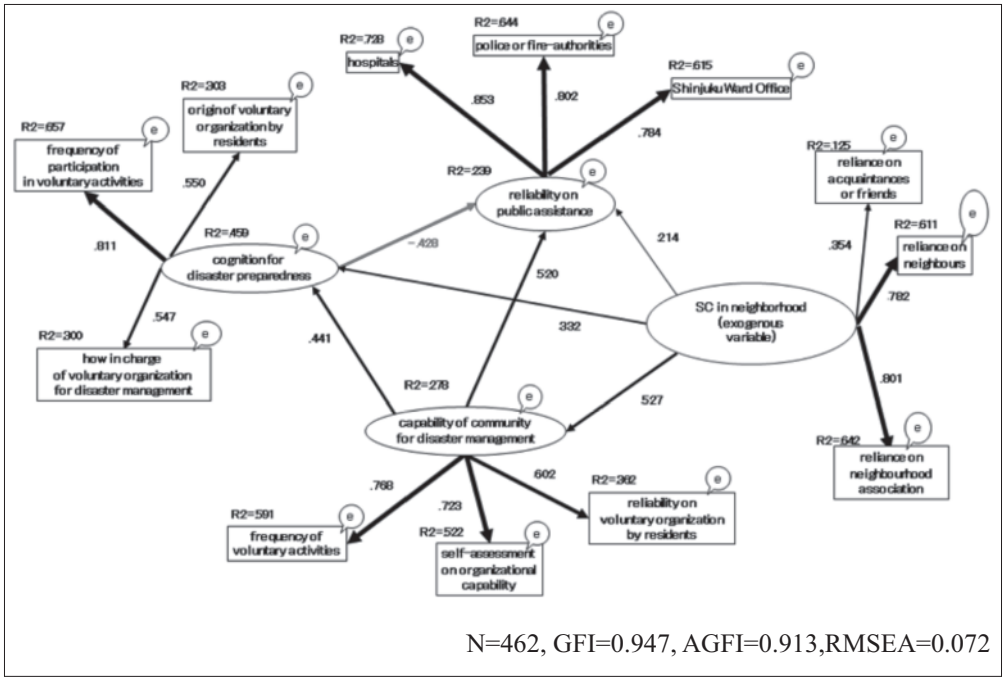
disaster management (0.554)" and "origin of voluntary organization by residents (0.534)". Third latent factor "reliability on public assistance" was broken down into "hospital (0.862)", "police or fire-authorities (0.799)" and "Shijuku Ward Office (0.777)".

The model showed a cause-and-effect relation of "capability of community for disaster management" with "cognition for disaster preparedness (0.607)" and "reliability on public assistance (0.556)". In this model, "capability of community for disaster management" became an exogenous variable. On the other hand, "cognition for disaster preparedness" had a negative correlation with "reliability on public assistance (− 0.345)". In sum, the higher cognition for disaster preparedness by residents exists, the lower needs of public assistance appear. By this SEM analysis, validity of conceptual framework of local capabilities for disaster management shown at Figure 1 was mostly proved. Takaya Kojima wrote a book "Covariance Structure Analysis and Graphical Modeling by Excel" in 2003 published by Ohm Inc. Tokyo Japan. Attached software of this book was used through this analysis.

5 . 4 Social capital and local capabilities for disaster management

In a SEM model with three latent factors, a latent factor of "capability of community for disaster management" became an exogenous factor. In this context, "capability of community for disaster management" is more principal than "cognition for disaster preparedness" or "reliability on public assistance".

Figure 10. Path diagram with 4 latent variables



(note) SC: social capital

If we add another latent factor to this SEM model, a latent factor of "capability of community for disaster management" may not become an exogenous factor. To make a SEM model with four latent factors, we used some question items on Q20 as of social capital factors. As for Q20, respondents were requested to choose one opinion by its number from among five point Likert scale about reliability on a certain person or organization as shown in worries and troubles.

In order to find out correlations between social capital and local capabilities of disaster management from a standpoint of usual relation of people within neighborhood or of a community, a latent factor of "social capital in neighborhood" was included to a SEM model with three latent factors. A latent factor of "social capital in neighborhood" was composed of "reliance on neighbors (Q20 (b))", "reliance on acquaintances or friends (Q20 (d))" and , "reliance on neighborhood associations (Q20 (f)) ". In this model with four latent factors, "social capital in neighborhood" became an exogenous factor. This exogenous factor included "reliance on neighborhood association (0.801)", "reliance on neighbors (0.782)" and "reliance on acquaintances or friends (0.354)". Sample size is 462. P values of all paths in this figure are below 0.01 ($p< 0.01$).

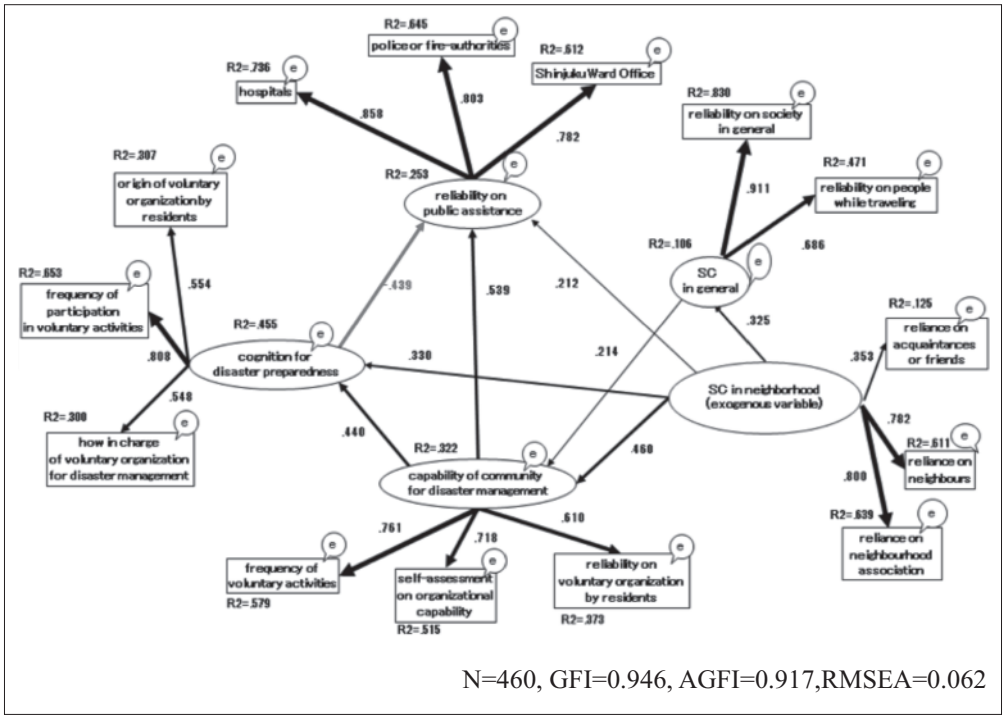
This model showed a cause-and-effect relation of an exogenous factor of "social capital in neighborhood" with "capability of community for disaster management (0.527)", "cognition for disaster preparedness (0.332)" and "reliability on public assistance (0.214)". Furthermore, "capability of community for disaster management" had a cause-and-effect relation with "reliability on public assistance (0.520)" and "cognition for disaster preparedness (0.441)". An exogenous factor of "social capital in neighborhood" had an indirect relation with "cognition for disaster preparedness" via "capability of community for disaster management" in addition to a direct relation. This indirect relation was estimated to be 0.232 (0.527×0.441). Also in this model, "cognition for disaster preparedness" had a negative correlation with "reliability on public assistance (-0.428)".

In a SEM model with four latent factors, a latent factor of "social capital in neighborhood" became an exogenous factor. To make a SEM model with five latent factors, we added some question items (Q15 and Q16) as of "social capital in general". In this model with five latent factors, a new latent factor of "social capital in general" did not become an exogenous factor. This latent factor included "reliability on society in general (0.911)" and "reliability on people while traveling (0.686)". In this case "social capital in neighborhood" became an exogenous factor similar to Figure 10. This exogenous factor included "reliance on neighborhood association (0.800)", "reliance on neighbors (0.782)" and "reliance on acquaintances or friends (0.353)". Sample size is 460. P values of all paths in this figure are below 0.01 ($p< 0.01$).

The model showed a cause-and-effect relation of an exogenous factor of "social capital in neighborhood" with "capability of community for disaster management (0.460)", "cognition for disaster preparedness(0.330)", "reliability on public assistance (0.212)" and "social capital in general (0.325)". A latent factor of "social capital in general" had a cause-and-effect relation with "capability of community for disaster management (0.214)". Furthermore, "capability of

community for disaster management" had a cause-and-effect relation with "reliability on public assistance (0.539)" and "cognition for disaster preparedness (0.440)". An exogenous factor of "social capital in neighborhood" had an indirect relation with "capability of community for disaster management" via "social capital in general" in addition to a direct relation. This indirect relation was estimated to be 0.069 (0.325×0.214). Also in this model, "cognition for disaster preparedness" had a negative correlation with "reliability on public assistance (− 0.439)".

Figure 11. Path diagram with 5 latent variables



N=460, GFI=0.946, AGFI=0.917,RMSEA=0.062

By SEM models with four latent factors and five latent factors, a latent factor of "social capital in neighborhood" became an exogenous factor. Thus a factor of "social capital in neighborhood" is more principal than "social capital in general" from a standpoint of usual relation of people within neighborhood or of a community.

As Shinya Ueno (2011) indicated the effect between trust and attachment to the community which strongly related to the accumulation of social capital with multilevel model analysis, we added some question items (F7 and F8) as of good sense of place to make a SEM model with six latent factors. A new latent factor of "good sense of place" became an exogenous factor. This latent factor included "degree of satisfaction of living in Shinjuku-ku (0.830)" and "hope of continuous habitation in Shinjuku-ku (0.665)".

Sample size is 446. P values of all paths in this figure are below 0.01 ($p<0.01$) except two paths. A P value of a path from "good sense of place" to "social capital in general" is 0.023.

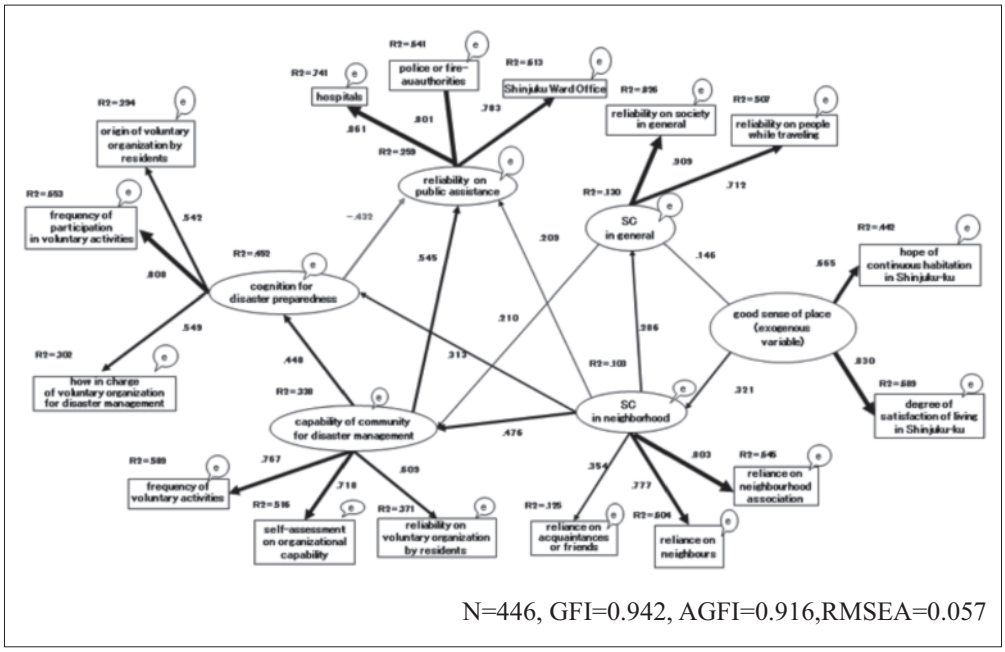
Another P value of a path from “social capital in neighborhood” to “reliability on public assistance” is 0.012. The Goodness-of-statistics for this model are GFI = 0.942, AGFI = 0.916, RMSEA = 0.057. This shows that our SEM model with six latent variables fits the data reasonably well.

This model showed a cause-and-effect relation of an exogenous factor of “good sense of place” with “social capital in neighborhood (0.321)” and “social capital in general (0.146)”. That is the most principal factor of path diagram with social capital factors closely related to local capabilities for disaster management is a latent factor of “good sense of place”.

By SEM analysis with 6 latent variables, we found out correlations between social capital and local capabilities of disaster management from a standpoint of usual relation of people within neighborhood or of a community. In other words, we have achieved research object B.

A latent factor of “social capital in neighborhood” had a cause-and-effect relation with “capability of community for disaster management (0.476)”, “cognition for disaster preparedness (0.313)”, “reliability on public assistance (0.209)” and “social capital in general (0.286)”. A latent factor of “social capital in general” had a cause-and-effect relation with “capability of community for disaster management (0.210)”. Moreover, “capability of community for disaster management” had a cause-and-effect relation with “reliability on public assistance (0.545)” and “cognition for disaster preparedness (0.448)”. Also in this model, “cognition for disaster preparedness” had a negative correlation with “reliability on public assistance (− 0.432)”.

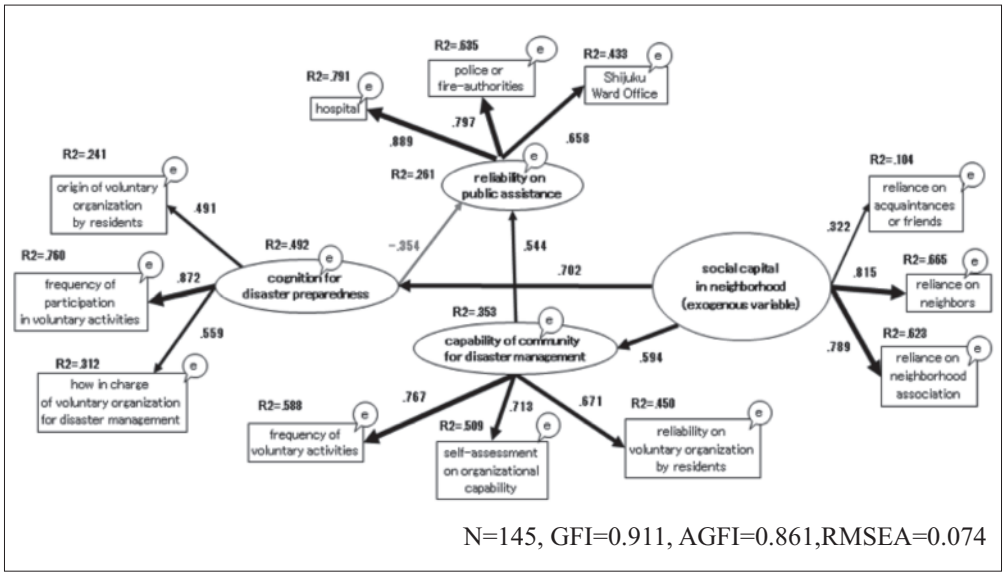
Figure 12. Path diagram with 6 latent variables



5 . 5 Generational differences

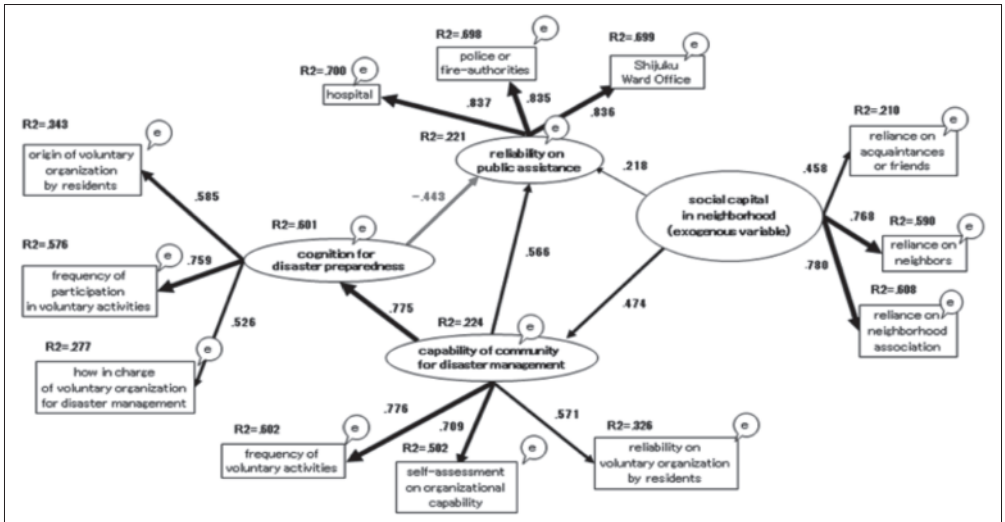
From cross tables of various items in questionnaires, we found some differences by age of respondents. The Chi-square test showed significant differences between those of less than 60 years and those of 60 years or more.

Figure 13. Path diagram with social capital factors (30's-50's)



N=145, GFI=0.911, AGFI=0.861,RMSEA=0.074

Figure 14. Path diagram with social capital factors (60's-70's)



N=292, GFI=0.934, AGFI=0.895,RMSEA=0.074

Figure 13 showed path diagram with social capital factors (30's-50's). Sample size is 145. P values of all paths in this figure are below 0.01 ($p<0.01$). This model showed a cause-and-effect relation of an exogenous factor of "social capital in neighborhood" with "cognition for disaster preparedness (0.702)" and "capability of community for disaster management (0.594)". A latent factor of "capability of community for disaster management" had a cause-and-effect relation with "reliability on public assistance (0.544)", however, it did not have a cause-and-effect relation with "cognition for disaster preparedness". An exogenous factor of "social capital in neighborhood" did not have a direct relation with "reliability on public assistance". Also in Figure 13, "cognition for disaster preparedness" had a negative correlation with "reliability on public assistance (− 0.354)".

Figure 14 showed path diagram with social capital factors (60's-70's). Sample size is 292. P values of all paths in this figure are 0.01 or less ($p \leqq 0.01$). This model had a considerably different shape compared with Figure 13. Thus an exogenous factor of "social capital in neighborhood" had a cause-and-effect relation with "capability of community for disaster management (0.474)" and "reliability on public assistance (0.218)". A latent factor of "capability of community for disaster management" had a cause-and-effect relation with "cognition for disaster preparedness (0.775)" and "reliability on public assistance (0.566)". Also in this model, "cognition for disaster preparedness" had a negative correlation with "reliability on public assistance (− 0.443).

Compared with Figure 13 and Figure 14, we found out the following significant differences. First, "cognition for disaster preparedness" of respondents aged from 30's to 50's was directly derived from their "social capital in neighborhood". This relation was strong (0.702). On the other hand, "cognition for disaster preparedness" of respondents aged from 60's to 70's was not directly derived from their "social capital in neighborhood". Their "social capital in neighborhood" had a mere indirect relation with "cognition for disaster preparedness" via "capability of community for disaster management". This indirect relation was estimated to be 0.367 (0.474×0.775).

Second, "social capital in neighborhood" of respondents aged from 60's to 70's had a direct relation with "reliability on public assistance (0.218)". On the other hand, "social capital in neighborhood" of respondents aged from 30's to 50's did not have a direct relation with "reliability on public assistance". Furthermore, an indirect relation with "reliability on public assistance" via "cognition for disaster preparedness" and "capability of community for disaster management" was almost neutral because of offset between a positive relation via "capability of community for disaster management" and a negative relation via "cognition for disaster preparedness".

Third, "capability of community for disaster management" of respondents aged from 60's to 70's had a strong cause-and-effect relation with "cognition for disaster preparedness (0.775)", while "cognition for disaster preparedness" of respondents aged from 30's to 50's was directly derived from their "social capital in neighborhood (0.702)".

As mentioned above, we found out significant differences within social capital factors

related to local capabilities of disaster management between those of less than 60 years and those of 60 years or more. Thus we have achieved research object C.

6 . Conclusion

This study attempted to verify the relation between social capital and local capabilities of disaster management from a standpoint of usual relation of people within neighborhood or of a community by extensive questionnaire survey in Shinjuku-ku, Tokyo.

To minimize the damage caused by a natural disaster, as a result of the Great Hanshin-Awaji Earthquake, people in Japan have come to widely believe that the cooperation among local residents, communities and administration is quite important. In this context, local capabilities of disaster management might consist of (a) cognition for disaster preparedness (b) capability of community for disaster management, (c) reliability on public assistance. Through factor analysis about the conceptual framework of local capabilities for disaster management, we named factor 1 as "reliability on public assistance", factor 2 as "cognition for disaster preparedness", and factor 3 as "capability of community for disaster management". Validity of the conceptual framework was mostly proved by SEM analysis with three factors of "capability of community for disaster management," "cognition for disaster preparedness," and "reliability on public assistance".

By SEM analysis with 6 latent variables, we found out correlations between social capital and local capabilities of disaster management from a standpoint of usual relation of people within neighborhood or of a community. A latent factor of "good sense of place" became an exogenous factor. This latent factor included "degree of satisfaction of living in Shinjuku-ku" and "hope of continuous habitation in Shinjuku-ku". This model showed a cause-and-effect relation of an exogenous factor of "good sense of place" with "social capital in neighborhood" and "social capital in general". In sum, the most principal factor of path diagram with social capital factors, which were closely related to local capabilities for disaster management, was a latent factor of "good sense of place". This latent factor included "degree of satisfaction of living in Shinjuku-ku" and "hope of continuous habitation in Shinjuku-ku". In other words, we could say that "good sense of place" was a key factor for residents' "attachment to Shinjuku-ku".

The Chi-square test showed significant differences between respondents of less than 60 years and respondents of 60 years or more. By path diagram with social capital factors, "cognition for disaster preparedness" of respondents aged from 30's to 50's was directly derived from their "social capital in neighborhood". On the other hand, "cognition for disaster preparedness" of respondents aged from 60's to 70's was derived from "capability of community for disaster management".

The future questionnaire survey should be expected in the rest of Shinjuku-ku. Getting together with two questionnaires, we can survey social capital factors about all communities of Shinjuku-ku. Then, first in history, we can access complete survey data related to social capital and local capabilities of disaster management at urban areas in Japan.

In conclusion, our study will contribute to accumulation of reliable data and to verify the

relation between social capital and local capabilities of disaster management by use of SEM model at urban areas in Japan.

7 . Implication for policy making

Through the survey and the above analysis, several implications could be available for policy making of Shinjuku Ward Office. “Good sense of place” is clearly enhancing the people’s “attachment to Shinjuku-ku” and this “attachment” may relate to the future local communities and hopefully strengthen the local capabilities for disaster management. Shinjuku Ward Office should make continuous efforts to improve “good sense of place”. In addition, this study showed the considerable differences by age with social capital factors. In case of the age from 60’s and 70’s, their “cognition for disaster preparedness” was derived from “capability of community for disaster management”, while that of the age from 30’s and 50’s was directly derived from their “social capital in neighborhood”. Shinjuku Ward Office had better take both direct and indirect approaches on disaster management, as those through local communities may contribute to the elderly people, while the direct approaches are effective to the latter people.

8 . Limitation of the study

We distributed questionnaires through neighborhood associations or residents’ associations. By this reason, the majority of respondents of questionnaires were sixties and seventies who consisted of neighborhood associations or residents’ associations. This bias might be related to the aging of activities of neighborhood associations or residents’ associations. As this survey was owed habitants’ self-assessments, this study has limitation regarding the estimation of voluntary organization for disaster management.

Questionnaire survey was conducted at four areas inherited their own long histories and cultures from Edo era. There would be possibilities that tendency of self-reliance of community people affect their social capital or usual relation of people within neighborhood or of a community. We can verify this hypothesis by means of comparison with different questionnaire survey data conducted in the rest of Shinjuku-ku.

9 . Acknowledgments

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