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Relationship between Individual-level Social Capital Including Social Trust, Traditional Local Events and *Moai*, and Mental Health among Middle-aged Adults in Okinawa

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ABSTRACT

The aim of the present study was to investigate the association between individual-level social capital, including cultural factors such as social trust and traditional local events, *moai* (a type of mutual-financing, private aid, money-lending circuit), and mental health among middle-aged adults in Okinawa, Japan. A total of 869 middle-aged adults (age range, 30-64 years) who underwent a health checkup at a health center in Okinawa between February and June 2009 were invited to participate in the study. Questionnaire responses from the 327(192 males, 135 females, effective response rate, 37.6%) who provided complete data on all variable of interest were used for analyses. No correlations were found between GHQ12 scores and economic factor, and *moai* (Spearson's correlation coefficient). Multiple regression analysis was performed with GHQ12 scores as the dependent variable and individual-level social capital such as social trust, traditional local events and contact with friends outside of work as independent variables. Association were found between GHQ12 scores and both traditional local events ($\beta = -2.339$, $P = 0.005$) and social trust ($\beta = -0.739$, $P < 0.001$). This study suggests that fosters social trust and traditional local events therefore are suitable for promoting regional mental health among middle-age adults. *Ryukyu Med. J.*, 35 (1~4) 7~20, 2016

Key words: mental health, traditional local events, social trust, *moai*, middle age, Okinawa

INTRODUCTION

In Japan, dramatic changes in the structure of the population, a diversification of lifestyles, the spread of non-infectious disease, and a public-health crisis are threatening healthy longevity¹⁾. These changes are accompanied by an aging population, a falling birth rate, and a transitioning disease structure. Therefore, the Japanese government has established "Health Japan 21 (the second term)"²⁾, which involves goal-oriented measures for the

comprehensive implementation of national health promotion aiming to achieve a vibrant society through improvements in lifestyle and the social environment, as well as a sustainable social security system. The second term of Health Japan 21 was launched to promote the achievement of a society in which all citizens, from infants to the elderly, support one another and live happy and healthy lives within the next decade²⁾. In light of this, the Community Health Policy Committee of Japan¹⁾ and the Activity Guidelines for Public Health Nurses³⁾ have presented policies that incorporate the concept

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of community-based social capital in further health-promoting initiatives based on the increasingly diversified and sophisticated needs of community residents. Putnam et al.⁴⁾ defined social capital as “features of social organization, such as trust, norms, and networks, that can improve the efficiency of society by facilitating coordinated actions.”

Associations between social capital and health have been widely reported in a number of recent studies. Studies of other countries by Kawachi et al.⁵⁾ and Ehsan A.M. et al.⁶⁾ have focused on the association between mental health and social capital at both the individual and contextual levels, while research in Japan has been concerned with diagnostic scales for measuring social capital⁷⁾, individual social capital and self-rated health⁸⁾, and large-scale epidemiological studies of elderly populations⁹⁾. Although a substantial amount of previous research has been concerned with the relationship between social capital and self-

rated health^{5,8,9)}, few studies have been performed in relation to the relationship between social capital and mental health^{6,10)}.

Okinawa is an island prefecture located over 1,500km from Tokyo (Fig. 1). Both the history and culture of Okinawa differ from those of other prefectures¹¹⁾. In terms of Okinawa's socioeconomic environment relative to the rest of Japan, income levels have remained stagnant since the pre-war period¹²⁾, and the prefecture currently has the lowest rates of personal income and university enrollment, accompanied by extremely high rates of divorce, unemployment, and (male) suicide. Based on the theory that economic disparities have an impact on health disparities¹³⁾, Okinawa is characterized as an “unhealthy” region; however, Okinawa has the highest mean life expectancy (75 years) in Japan¹⁴⁾.

Recently, concerns have arisen over a so-called “longevity crisis” in conjunction with the reduction

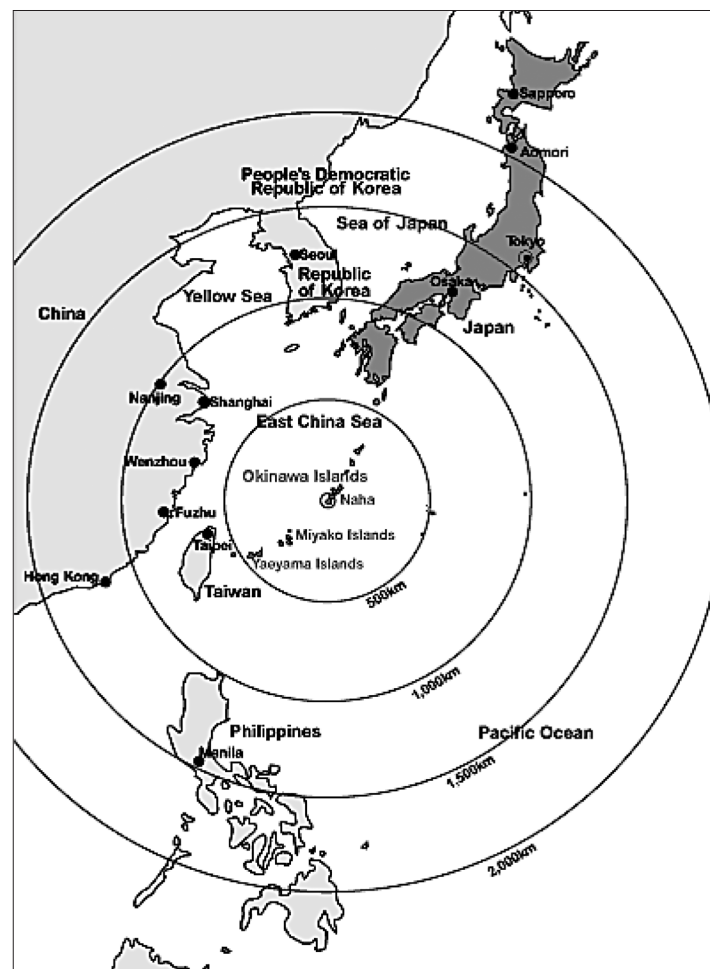


Fig.1 Location of Okinawa Prefecture

http://www.pref.okinawa.jp/summit/a_la/map/index2.htm

Source: Okinawa Prefecture

of the mean life expectancy of Okinawan men as the result of the high suicide rate and the increased prevalence of lifestyle-related disease, such as middle-age obesity and metabolic syndrome^{15,16}. It is said that the elderly in Okinawa enjoy long life expectancies; however, it is also said that middle-age health is worsening. The number of patients with depression in Japan increased about 3.5 fold from 1996 to 2008¹⁷, and more than 30,000 suicides are reported annually¹⁸. Relative to the national mean, the male suicide rate in Okinawa is high, with some indications of links to alcohol consumption and liver disease¹⁶. The proportion of 40s and 50s of suicide rate (2009), is 30% or more¹⁹. Depression is 43.8% of causes and motives of suicide (2009). It also has been an increase in workers' compensation grant decision number by mental disorders¹⁸. Okamoto et al.²⁰ has been described that middle age is turning point in life. That time is frequently unstable element, such as stress and maladjustment in the workplace²¹, and increase of middle age divorce and stress of caregivers of old parents, infants and child abuse in the family life. Middle age adult of health problems is an important issue by the abovementioned.

With the aim of improving physical health, Okinawa has carried out a variety of community activities and nutrition education in longevity research and the Yui Health Project²², a pilot project involving model practices for healthy behavior aimed at reviving healthy longevity in partnership with the Health Japan 21 initiative. However, few active interventions into mental health measures, which have more complex characteristics, including alcohol-related problems and stresses such as work-life balance and interpersonal relations, have been employed.

Kawachi's analysis²³ found Okinawa to be a region particularly well-suited to studying the effect of social capital in relation to health and longevity. One reason for this is that the Okinawan dialect contains the term *yuimāru*, which is considered to signify a type of mutual aid or norm of reciprocity. Another that may be cited is the *moai* system, a traditional form of a rotating savings and credit association (ROSCA). Shirai²⁴ has indicated that there are many areas where regional cohesion has been richly preserved and where the modalities of community and personal ties throughout the prefecture remain rooted in kin-based and territorial

association. In a broader sense, he further contends that the strong cohesion, trust norms, and sense of mutual aid in Okinawa's territorial communities can be reimagined as social capital resources²⁴. Many field studies have been conducted with a focus on the relationship between health and individual activities and methods of association among the elderly in Okinawa^{25,26}, including the relationship between participation in local associations and rates of medical examinations²⁷; however, few have focused on such relationships among middle-aged adults.

To combat Okinawa's health and longevity crises, interventions that target the adult life stage are required². Therefore, Okinawa has been conducting activities for the prevention and intervention into lifestyle-related diseases; however, the effect thus far has been poor². Basic data for carrying out local health promotion activities that make use of social capital will also be necessary. However, studies focusing on the middle-age life stage in Okinawa are basically non-existent, and no studies have been performed on the relationship between social capital and mental health.

For this reason, drawing on reports by Kawachi²³ and Shirai^{24,28}, we investigated the following factors as social participation: traditional local events and *moai* (sometimes referred to as *yoriai*), a well-known type of mutual-financing, private aid, money-lending circuit in Okinawa that can be translated as "meeting for a common purpose"²⁹. In other words, *moai* refers to a group of friends, relatives, or colleagues that regularly get together for the purpose of reciprocal support. It is all at once financial, emotional, and social.

The purpose of this study was to investigate the association between individual-level social capital, including cultural factors such as social trust, traditional local events and *moai*, and mental health among middle-aged adults in Okinawa Prefecture, Japan.

METHODS

The participants in this study comprised residents of Okinawa aged 30 to 64 years who underwent a health checkup. Written requests for cooperation were distributed to all 13 centers that perform health checkups in Okinawa Prefecture;

three centers agreed to cooperate. Requests were then sent to 869 middle-aged adults who underwent a checkup at one of these three centers, 451 of whom provided responses (response rate, 51.9%). Then, questionnaire responses from the 327 (192 males, 135 females, effective response rate, 37.6%) who provided complete data on all variable of interest were used for analyses.

The survey period was from February to June 2009. Before administering questionnaires, a researcher or research collaborator gave a verbal explanation of the purpose and details of the study to individuals undergoing health checkups, and questionnaires were then distributed directly to those who provided consent. Completed surveys were returned to a dedicated collection box set up at the center.

Questionnaire items

The questionnaire was composed of items regarding basic characteristics, including sex, age, household size, number of children, employment status, annual household income, mental health screening, individual-level social capital (including social trust, social participation, traditional local events and *moai* network). Respondents were asked a binary-choice question regarding employment status, with options for “regular” or “part-time.” Annual household income was ranked on a 10-point scale ranging from “2 million yen or less” to “10 million yen or more” in one million yen increments.

Mental health screening was based on items from the 12-item General Health Questionnaire (GHQ12). The GHQ12, which was developed by Goldberg as a general health questionnaire to assess the symptoms of neurosis³⁰⁾, is excellent at identifying individuals with symptoms of neurosis, anxiety, social dysfunction, tension, or depression. We chose this scale to assess mental health because it has been shown to have reliability and validity³¹⁾ and has been used in recent studies both inside^{32,33)} and outside of Japan^{34,35)}. The rating scale is a behaviorally anchored scale consisting of the following four options: “Better than usual”, “Same as usual”, “Worse than usual” and “Much worse than usual”. A Likert-style scoring procedure is applied to this four-point scale, with “Better than usual” receiving a score of 3. The total score on the GHQ12 can range from 0 to 36, with higher scores corresponding to poorer mental health. In terms of reliability, Cronbach’s α

coefficient for the data in this study was 0.846.

Scales used to measure social capital in Japan and overseas had an extensive list of question items for ascertaining social capital⁷⁾. Therefore, we referred to a questionnaire created by the Cabinet Office³⁶⁾ based on the classifications of Putnam et al.⁴⁾ Individual perceptions of community social capital were assessed within cognitive and structural domains. Cognitive social capital indicators included social trust and norms of reciprocity. Social trust was evaluated with the following question: “Are you able to trust people in general?” Responses were scored on a 10-point Likert scale from 1 (“not at all”) to 10 (“always”).

Structural social capital indicators included actual behaviors such as participating in locally based associations. Structural social capital was assessed by enquiring about informal network (contact with friends outside of work, contact with relatives) and social participations of formal network (volunteer activities, resident associations or school Parent-Teacher Association (PTA) board activities, traditional local events, *moai*). Under informal networks, respondents were asked about contact with friends outside of work and contact with relatives, answering either “no (0)” or “yes (1)”, with the frequency of “direct contact” then being reclassified into 10 stages from “every day (1)” to “0 times (10).”

Social participations of formal network were evaluated with volunteer activities, resident associations or school Parent-Teacher Association (PTA) board activities, traditional local events, *moai*. Participation was assessed using a binary-choice question as either “not involved (0)” or “involved (1).” Owing to their status as mutual aid activities, traditional local events and *moai* were also assessed as social participation. Traditional local events data were supplemented with an indication of specific events, such as harvest or *eisa* festivals (*eisa* festivals are traditionally held during the *Obon* holidays, which take place from July 13th to 15th of the lunar calendar, to bid farewell to the ancestors’ spirits).

Data analysis

Descriptive statistics for individual-level social capital, GHQ12, and basic attributes were listed by sex and total number of participants. Next, characteristic sex differences were observed using the chi-square test, complemented by adjusted

residual analysis, and Student's *t*-test. Some questions used nominal scales and a strong distributional bias; therefore, Spearman's rank correlation coefficient was calculated as a non-parametric method for correlations between GHQ12 and other individual variables.

Variables observed to have a relationship with GHQ12 ($P < 0.05$) in univariate analysis, social trust, variables, variables for traditional local events, and contact with friends outside of work were considered as independent variables. Analysis was carried out using dummy variables to replace variables other than continuous variables. Adjustment variables were sex, age, and annual household income.

Statistical analysis was performed using SPSS statistical software (Ver. 20.0; IBM, Tokyo, Japan), with a two-tailed significance level of $< 5\%$.

Ethical considerations

The study protocol was approved by the O Prefectural Nursing University ethics committee (approval no. 08027, December 26, 2008).

RESULTS

An overview of the characteristics of the study participants categorized by sex is shown in Table 1. There were a total of 327 participants (males: 192 [58.7%], females: 135 [41.3%]). Regarding age (range, 30-64 years), 33.9% of the participants were in their 30s, 28.1% were in their 40s, 30.3% were in their 50s, and 7.6% were in their 60s. No significant differences in age were found between the sexes ($p = 0.400$). Significant differences were observed between the sexes in employment status ($p < 0.001$). The rate of regular employment was significantly higher for males (91.1%) than for females (46.7%), showing a sex difference in employment status ($p < 0.001$). The largest annual household income category was "between 2 and 3 million yen", with 36 males (18.8%) and 31 females (23.0%); none of these differences were significant by residual analysis.

Mean (\pm standard deviation) overall GHQ12 scores were 13.31 ± 5.18 (males: 13.01 ± 4.92 , females: 13.73 ± 5.53); none of these differences were significant ($p = 0.25$). Among the social capital items, a significant sex difference was not observed (residual analysis, $z = 3.05$).

Spearman's rank correlation coefficient for the correlations between GHQ12 scores and each of the variables are shown in Table 2. GHQ12 scores was negatively correlated with social trust (Spearman's correlation coefficient, $r_s = -0.290$), traditional local events ($r_s = -0.182$), and was positively correlated contact with friends outside of work ($r_s = 0.115$).

Traditional local events was positively correlated with age ($r_s = 0.123$), social trust ($r_s = 0.125$), volunteer activities ($r_s = 0.125$), and residents' associations or school PTA board activities ($r_s = 0.317$). Investigation of correlations between GHQ12 and other individual variables showed a weak correlation in each case, with Spearman's rank correlation coefficient ranging from 0.003 to 0.326. Accompanied by the fact that independence between variables was relatively well-maintained with no observably consistent correlation pattern, this suggests the absence of any problems due to multicollinearity.

The results of multiple regression analysis with GHQ12 scores as the dependent variable are shown in Table 3. The multiple correlation coefficient (R) was 0.357, coefficient of determination (R^2) was 0.127, adjusted coefficient of determination (R^2) was 0.111, and F value was 7.789 ($p < 0.001$). The contribution ratio of the entire model was about 13%. No correlation was found between sex, age, household income, contact with friends outside of work and GHQ12. Correlations were observed with social trust ($\beta = -0.739$, $p < 0.001$) and traditional local events ($\beta = -2.339$, $p = 0.005$).

DISCUSSION

No significant sex differences were observed among the participants with regard to mean age, household size, or number of children. The fact that the total mean number of children was 1.81 ± 1.31 , and that household size was 3.31 ± 1.48 , suggests a preponderance of nuclear families. In terms of employment status, more males (91.1%) had regular employment than females (46.7%), with the former outnumbering the latter by a factor of approximately 1.8. A large number of household were thought to be dual-income based on the fact that 185 males (96.3%) and 121 females (89.7%) were employed. Judging from its distribution, annual household income was

Table 1 Characteristics of the study participant characteristics by sex

	Total		Male		Female		P value
	n	%	n	%	n	%	
	327	100.0	192	58.7	135	41.3	
Age (Mean \pm SD)	45.31 \pm 9.14		45.59 \pm 8.86		44.93 \pm 9.54		.07
Age group							
30-39	111	33.9	61	31.8	50	37.0	.400
40-49	92	28.1	60	31.3	32	23.7	
50-59	99	30.3	55	28.6	44	32.6	
60-64	25	7.6	16	8.3	9	6.7	
Household size (Mean \pm SD)	3.31 \pm 1.48		3.36 \pm 1.41		3.24 \pm 1.60		.22
Number of children (Mean \pm SD)	1.81 \pm 1.31		1.83 \pm 1.31		1.79 \pm 1.32		.64
Employment status							
Regular employee	238	72.8	175	91.1	63	46.7	<.001
Part-time work	68	20.8	10	5.2	58	43.0	
Other	21	6.4	7	3.6	14	10.4	
Annual household income							
Lower than 2 million yen	33	10.1	7	3.6	26	19.3	<.001
Between 2 and 3 million yen	67	20.5	36	18.8	31	23.0	
Between 3 and 4 million yen	65	19.9	38	19.8	27	20.0	
Between 4 and 5 million yen	50	15.3	35	18.2	15	11.1	
Between 5 and 6 million yen	35	10.7	25	13.0	10	7.4	
Between 6 and 7 million yen	20	6.1	13	6.8	7	5.2	
Between 7 and 8 million yen	18	5.5	11	5.7	7	5.2	
Between 8 and 9 million yen	13	4.0	11	5.7	2	1.5	
Between 9 and 10 million yen	5	1.5	4	2.1	1	0.7	
10million yen or higher	21	6.4	12	6.3	9	6.7	
Mental health							
GHQ12 (Mean \pm SD)	13.31 \pm 5.18		13.01 \pm 4.92		13.73 \pm 5.53		.25
Social trust							
Trust people in general (Mean \pm SD)	6.51 \pm 1.92		6.54 \pm 1.93		6.47 \pm 1.92		.80
Social participation							
Traditional local events							
Involved	42	12.8	25	13.0	17	12.6	.52
Not involved	285	87.2	167	87.0	118	87.4	
Moai							
Involved	166	50.8	100	52.1	61	45.2	.13
Not involved	161	49.2	92	47.9	74	54.8	
Residents' association or PTA board activities							
Involved	64	19.6	40	20.8	24	17.8	.30
Not involved	263	80.4	152	79.2	111	82.2	
Volunteer activities							
Involved	31	9.5	16	8.3	15	11.1	.26
Not involved	296	90.5	176	91.7	120	88.9	
Networks							
Contact with relatives							
Every day	11	3.4	4	2.1	7	5.2	.026
Week to more than 5 times	15	4.6	10	5.2	5	3.7	
3 or 4 times a week	29	8.9	11	5.7	18	13.3	
1 or 2 times a week	115	35.2	59	30.7	56	41.5	
2 or 3 times a month	40	12.2	28	14.6	12	8.9	
Once a month	60	18.3	41	21.4	19	14.1	
Year to more than 6 times	6	1.8	4	2.1	2	1.5	
5 times from 2 a year	28	8.6	18	9.4	10	7.4	
Once a year	13	4.0	8	4.2	5	3.7	
0 times	3	0.9	2	1.0	1	0.7	
No see	7	2.1	7	3.6	0	0.0	
Contact with friends outside of work							
Every day	4	1.2	2	1.0	2	1.5	.231
Week to more than 5 times	3	0.9	2	1.0	1	0.7	
3 or 4 times a week	16	4.9	7	3.6	9	6.7	
1 or 2 times a week	67	20.5	43	22.4	24	17.8	
2 or 3 times a month	43	13.1	29	15.1	14	10.4	
Once a month	116	35.5	73	38.0	43	31.9	
Year to more than 6 times	4	1.2	2	1.0	2	1.5	
5 times from 2 a year	36	11.0	19	9.9	17	12.6	
Once a year	21	6.4	7	3.6	14	10.4	
0 times	1	0.3	0	0.0	1	0.7	
No see	16	4.9	8	4.2	8	5.9	

Note. n=327. Quantitative data uses t - t est, qualitative data uses Chi-squared t est. Employment status, annual household income, contact with relatives, and contact with friends outside of work uses residual analysis.

Table 2 Correlation matrix between GHQ12 scores and each of the variables

Variable	1	2	3	4	5	6	7	8	9	10	11
1 GHQ12 (0:good mental health → 36:bad mental health;symptoms of neurosis)	1.00										
2 Sex (1:Male 2:Female)	.066	1.00									
3 Age	-.058	-.039	1.00								
4 Annual household income (1:Less than 2 million yen → 10:More than 10 million yen)	-.050	-.221 ***	.326 ***	1.00							
5 Social trust (1:not at all → 10:always)	-.290 ***	-.010	.051	.076	1.00						
6 Traditional local events (0:No 1:Yes)	-.182 **	.006	.123 *	.004	.125 *	1.00					
7 Moai (0:No 1:Yes)	-.084	-.068	.089	.076	.076	.097	1.00				
8 Volunteer activities (0:No 1:Yes)	-.082	.047	.156 **	.091	-.067	.125 *	.015	1.00			
9 Residents' association or PTA board activities (0:No 1:Yes) "	-.092	-.038	.021	.083	.188 **	.317 **	.131 *	.156 **	1.00		
10 Contact with relatives (1: Every day → 10:Zero time a year)	.090	-.181 **	.076	.063	-.111 *	-.045	-.167 **	-.081	-.020	1.00	
11 Contact with friends outside of work (1: Every day → 10:Zero time a year)	.115 *	.080	.085	.130 *	-.153 **	-.059	-.206 ***	-.052	.003	.123 *	1.000

Note: n=327 *:P < .05, **:P < .01, ***:P < .001
Spearson's correlation coefficient.

Table 3 Results of multiple regression analyses of GHQ12 scores,traditional local events, and social trust

Independent variable	β	t	p
Sex (0:Male 1:Female)	.590	1.052	.293
Age	-.010	-.328	.743
Annual household income (1:Lower than 2 million yen → 10:10million yen or higher)	.017	.139	.890
Social trust (1 :not at all → 10:always)	-.739	- 5.118	p < 0.001
Social participation (0:No 1: Yes)			
Traditional local events	-2.339	- 2.845	.005
Networks			
(1: Every day → 10:Zero time a year)			
Contact with friends outside of work	0.185	1.282	.201
R		.357	
R ²		.127	
adjusted R ²		.111	
F		7.789	p < 0.001

Note: n=327

lower than the 2013 national mean annual income of 6.16 million yen³⁷⁾.

Furthermore, in the present study, no associations were found between mental health and economic factor; this result differed from previous findings^{5,9)}. Cockerham et al.³⁸⁾, Kawachi²³⁾, and all reported that Okinawa is a unique community in which social determinants of health cannot be explained by social stratification theory³⁹⁾. In the present study, the frequency of interaction with friends, and acquaintances, and the inherent friendliness of the prefecture's residents, may be

said to increase levels of trust in the general public, thereby realizing a more significant impact on mental health than any effect of annual household income.

The mean GHQ12 score for all participants was 13.31 ± 5.18 (males, 13.01 ± 4.92 ; females, 13.73 ± 5.53 ; these differences were not statistically significant, $P=0.25$). This was considered to be a mental health state equivalent to that reported by Kawada³³⁾ for workers (35-59 years old) in 2010. Additionally, this was a different result than the tendency for females to be more susceptible to mental health problems

than males, as often reported in labor research³²⁾.

In multiple regression analysis carried out to determine the association between GHQ12 scores and each variable, associations were found between mental health and, social trust and traditional local events. In a cohort study carried out in the UK by Giordano et al.³⁵⁾ to examine the relationship between social capital and mental health, and in a study by Fujita et al.⁴⁰⁾ that identified five questions in relation to individual cognitive social capital (mutual aid and trust, sense of social responsibility, regional attachment, interpersonal ties, and local kindness) and then looked at associations with mental health, high levels of cognitive social capital were shown to have the potential to prevent the deterioration of mental health. In a similar manner, in this study, social trust was considered an influential factor in the maintenance and improvement of mental health. And, social trust was positively correlated with structural SC (traditional local events, residents' associations or school PTA board activities, contact with relatives, contact with friends outside of work). Middle-aged adults of working age have no time to spare for take care of their children and elderly parents. During that time, they share and understand persons who are without family and co-worker. It deduced that they could be well known other persons and their community and also cognition SC of social trust is higher. Bridging social capital refers to activities that create intermediate-level links within neighborhoods and communities and between social classes. Those links may be more tenuous, but they are also more open and capable of expanding. Bonding social capital refers to activities that involve micro-level links with friends and acquaintances and prioritize personal human relationships with an element of exclusion⁴¹⁾. Person with a job are affected by the effect of bonding SC (work place SC) in the workplace. Housewife affected by the neighborhood SC of the community such as through her childcare and housework. Kawachi et al. suggested that the key to improving health therefore appears to lie in resident ability to access resources outside their immediate social milieu, i.e. access to bridging social capital⁵⁾. Middle-aged adults of working age have been having a lot of stress, bridging SC deduced to be able to reduce it.

Furthermore, Okinawa's unique geography³⁷⁾ and the cumulative experience of recovering from

the historic and tragic poverty that followed its invasion^{38,42)} led to the continued existence of terms such as *yuimāru*⁴³⁾ and *ichariba chōde* ("to meet once is to be sibling for life")⁴⁴⁾, and the fact, as noted by Kawachi et al.¹²⁾, that *yuimāru*⁴³⁾ can be understood to reflect norms of reciprocity and mutual aid. Therefore, it seems that the inhabitants of Okinawa place an emphasis on mutual aid and that social trust relations can be established relatively easily. But, studies in middle-age adults is less concluded is difficult.

In addition, while mental health was found to be associated with traditional local events, no such association was observed with *moai*. Although the difference between the two is unclear, one factor may be differences in the pattern of social capital ties, which are classified into bridging and bonding social capital⁴⁵⁾.

Kawachi et al.⁴⁶⁾ stated that the key to improving the health of residents in poor areas is the power of the people and bridging social capital, which provides access to resources outside the immediate social environment. Furthermore, the Cabinet Office³⁶⁾ reported that community activities (include: events with friends, artistic culture activity, hobby, political activity) are useful experiences not only for participating in events, but also for enabling people to "create bonds with various other people in the community" (58%), "establish friends with common values" (40.8%), "achieve a sense of accomplishment or fulfillment" (39.1%) and "contribute to the local community and society" (34.9%). Traditional local events, similar to the definition of bridging social capital, are presumed to deepen local understanding and mutual comprehension, to present opportunities for strangers to become acquaintances through interactions with neighbors, and to foster both local understanding and knowledge of local residents. Accordingly, traditional local events as defined in this study are thought to be informed by bridging social capital. A bridging form of traditional local events might therefore be considered as a starting point for building safe and secure communities by anyone seeking to prevent suicide and depression¹⁸⁾.

Next, the total rate of participation in *moai* was 50.8% (52.1% for males and 45.2% for females), which was more than 2.5 as high as rates of participation in other events considered as variables for norms of reciprocity, namely residents' association or school PTA board activities (19.6%),

volunteer activities (9.5%), and traditional local events (12.8%). This suggests that many people participate in *moai*. It has been speculated that *moai* became a custom by virtue of Okinawa's strong sense of camaraderie, as well as the fact that kin-based and territorial associations can still be found in many communities, and that there are many areas where regional cohesion has been richly preserved^{24,28)}. The participation rate in *moai* observed in this study is a result identical to that reported by Shirai's study of elderly residents (n=885)²⁸⁾.

Kondo and Shirai⁴⁷⁾ characterize *moai* as a type of ROSCA. Before the development of formal banking systems, ROSCAs existed ubiquitously, and they are still prevalent in many developing countries. More recently, microcredit has spread dramatically around the globe, offering poor people a more formal financial option. ROSCAs are systems that contribute to the maintenance of community solidarity and the improvement of life for disadvantaged citizens and migrants. However, *moai* are at risk due to the development of public financial institutions and the weakening of trust resulting from *moai* bankruptcies, and it is generally believed that *moai* no longer have a significant financial role to play. In addition, in an exploratory factor analysis of associational patterns in local activities by 20- to 60-year-olds, Shirai et al.²⁸⁾ classified *moai* as "class-based friendship associations." Furthermore, *moai* membership information was checked by compiling articles on *moai* and their membership structures published over a 5-year period (September 2010 to September 2015) in two local newspapers. In Paper A, in 377 of 508 cases (a sample of 235 individuals between 35 and 64 years of age), classmates accounted for 50.2% of members, while residents from the same village accounted for 8.1%. Similar proportions were found in articles from Paper B. This suggests that *moai* participation among middle-aged adults, which is aimed at mutual financial aid as well as opportunities for drinking and fellowship, can be presumed to largely involve bonding social capital. While a relationship between *moai* and health was observed in the study by Shirai et al.⁴⁸⁾, no relationship was found between *moai* and mental health in the present study. This may be due to the fact that the social capital ties found among middle-aged adults in *moai* are based in bonding social capital. In addition, it may also conceivably derive from a

difference in the scale used by Shirai et al.⁴⁸⁾ The significant association was between self-rated health and the elderly men group which was regarded as a bonding SC as *moai* by Shirai et al.⁴⁷⁾. However, this study was not associated with mental health and *moai* (not involved or involved). The reason is considered three. The one is due to the research without distinction as either *moai* of bonding SC or bridging SC in the present study. The second, middle-age adults are a busy day at work (bonding SC). Therefore there is no mental elbowroom; *moai* supposed fun is likely to feel the distress. This is a different daily rhythm of the elderly men with a lot of leisure time. The third, it seems that *moai* of bonding SC provides useful information for elderly men, and makes someone's life worth living.

The Ministry of Health, Labour and Welfare has proposed to "carry out activities based on community social capital and promote initiatives that meet the increasingly diverse and sophisticated needs of residents" from regional healthcare measures in existing public services¹⁾. The results of the present study indicate that traditional local events might be an activity based on local social capital that contributes to improved mental health among middle-aged adults in Okinawa, and may therefore help promote community healthcare measures. Mental health among Okinawan middle-aged adults is affected more by social capital created with friends and relatives or community groups than by personal economic factors, suggesting that activities utilizing social capital may help promote better mental health in the future. Conversely, it is also possible that the fact the region is characterized by kin-based and territorial associations and strong community cohesion^{24,28)}, could steer matters in the wrong direction, toward activities that are detrimental to health, such as the way in which high school youth association are associated with dangerous activities⁴⁹⁾. It is therefore also important to support and foster leaders in community health promotion. Maintenance and improvement of health in middle-aged adults will be crucial going forward. In order to restore longevity in Okinawa, it is important to aim for measures that utilize the present findings for the maintenance of mental health among middle-aged adults, and to provide activities that increase the number of opportunities to experience social trust through traditional local

events. These measures can be expected to lead to a restoration of longevity in Okinawa.

It is expected that providing activities that increase the number of opportunities to gain social trust through traditional local events will also be important social capital for mental health among middle-age adults in Okinawa.

LIMITATIONS

This study had a number of research limitations. First, it was a cross-sectional study. Second, the study participants were limited to health center visitors, the number of effective responses (327) was small, and individuals who had not had a health checkup were not included. Third, a bias was evident in favor of individual-level results in questions related to social capital, in that questions centered around individual cognitive social capital and were not related to environmental social capital. Fourth, questions relating to Okinawan culture were exclusively limited to those relating to traditional local events and *moai*. Based on these considerations, we cannot generalize the characteristics of the middle-age life stage for Okinawans. In the future, the promotion of mental health among middle-aged adults in Okinawa will require further clarification of the association between social capital and other specific activities. For that reason, it will be necessary to find more participants and to continue carrying out regional comparisons and cohort studies.

CONCLUSION

In this study, we aimed to clarify the association between individual-level social capital, including cultural factors such as social trust and traditional local events, *moai*, and mental health among middle-aged adults in Okinawa. Results from a survey of 327 middle-aged adults who underwent a checkup at a health center showed that social trust and traditional local events were factors that influenced mental health in middle-age life. However, associations with economic factor identified in previous studies were not observed. This study suggests that fosters social trust and traditional local events may therefore be suitable for promoting

regional mental health among middle-age adults.

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