



Leisure-time activities and psychological distress in a suburban community in Japan

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ABSTRACT

Objective. There is a wide range of leisure-time activities and previous research indicates that some of these are associated with lower psychological distress. The aim of this study was to assess whether leisure-time activities were associated with psychological distress.

Methods. A population-based questionnaire survey was conducted in 2009 in a suburban area of northern Japan using complete enumeration. Of 16,996 residents aged 30–79 years who received the questionnaire, 14,261 (83.9%) responded and 9908 (58.3%) responses were eligible for analysis. The relationship between psychological distress and physical, artistic, outdoor, and volunteer leisure-time activities was assessed separately and simultaneously by sex.

Results. The percentage of reported psychological distress was 2.8% for men and 3.9% for women. Each category of leisure-time activity was related to psychological distress separately. The simultaneous analyses revealed that engaging in regular outdoor leisure activity was associated with less psychological distress in both men (odds ratio [OR] = 0.38; 95% confidence intervals [CI]: 0.23, 0.63, $p < 0.001$) and women (OR = 0.39; 95% CI: 0.25, 0.59, $p < 0.001$). Engaging in regular physical activity was associated with less psychological distress in women (OR = 0.09; 95% CI: 0.01, 0.68, $p = 0.019$). Volunteer work and art activities were not associated with psychological distress in either men or women.

Conclusion. Greater engagement in outdoor leisure activity and physical activity was significantly associated with a lower likelihood of psychological distress. The results from the present study indicate that engaging in leisure-time activities, especially in outdoor leisure and physical activities, may be an effective means of promoting public health.

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1. Introduction

How people spend their leisure time is an important factor in maintaining psychological health. Leisure-time physical activity is associated with decreased mortality from many physical disorders and decreased risk of mental disorders (Jonsdottir et al., 2010; Lahti et al., 2014; Rovio et al., 2005; Schnohr et al., 2006; Teychenne et al., 2008) and associated with an increase in life expectancy (Janssen et al., 2013; Moore et al., 2012). Psychological distress, however, may decrease the likelihood of engaging in leisure-time physical activities (Gigantesco et al., 2015).

A number of studies have examined the association between leisure-time activity and psychological health, and several have suggested that physical activity is associated with lower psychological distress (Goldfield et al., 2011; Hamer et al., 2009; Hurwitz et al., 2005; Velten et al., 2014; Wada et al., 2006). Some studies also suggest that lack of

participation in community activity is associated with psychological distress (Honda et al., 2010; Kuriyama et al., 2009). Most of these studies focus on the association of psychological health with physical activity and community involvement. However, an individual's choice of leisure-time activity may depend on personal interests and preferences or the environment. Nevertheless, few studies have examined type of leisure-time activity performed by individuals in a community in addition to physical activity and community involvement, or assessed which types of leisure activity might be strongly associated with psychological health.

The objective of the present study was to examine types of leisure-time activity performed by a community population, and to assess whether such activities were associated with psychological distress.

2. Methods

2.1. Participants

A population-based questionnaire survey using complete enumeration was conducted between June and August 2009 in a municipality in

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Akita Prefecture, which is located in a suburban area close to fields and mountains in northern Japan. The average income level in Akita Prefecture, including the study area, was lower than the national average and the overall unemployment rate (for those aged ≥ 15 years) in Akita as of 2009 (5.4%) was slightly higher than the national rate (5.1%) (Statistics Bureau, 2010). The total areas of Akita Prefecture and the survey area were 11,638 and 318 km², respectively. About half of the land in the survey area was covered by forest. The survey area, which had 10 parks and 21 sports facilities as of 2009, was relatively well suited to physical activities. The population of the survey area as of 2004 was 27,209. The target population, aged 30–79 years old, was 16,996 residents, and excluded inpatients and institutional residents, such as individuals in nursing homes or welfare facilities. Community volunteers or municipal employees delivered questionnaires, received informed consent from each household, and later collected the questionnaires.

2.2. Questionnaire

The variables measured were age, sex, living arrangements (living alone vs. not alone), marital status, employment status, educational background, psychological distress, and leisure-time activities. Employment status was defined as employee, self-employed, or unemployed (unemployed persons among those eligible for the labor force or persons not in the labor force). Educational background was classified into four levels: compulsory education (9 years of schooling), high school education (12 years), junior college graduate (14 years), and university graduate or higher (16 years and over). Severity of psychological distress was assessed using a Japanese version of the Kessler Psychological Distress Scale (K6) (Furukawa et al., 2003). Cronbach's alpha coefficient for each item on the Japanese K6 was 0.849 and its equivalence to the original English version was confirmed (Furukawa et al., 2008). K6 is a six-item survey for assessing psychological distress. Using a five-point scale (0 = “None of the time” to 4 = “All of the time”), respondents were asked questions such as how often they experienced symptoms of non-specific psychological distress (nervousness, hopelessness, restlessness or fidgetiness; so depressed that nothing can cheer you up; feeling that everything is an effort; and feelings of worthlessness)

during the past 30 days. Total scores ranged from 0 to 24, with higher scores representing a higher level of psychological distress. We defined psychological distress as a K6 score of 13 points or higher (Kessler et al., 2002).

Ten questionnaire items assessed leisure-time activities in relation to four categories: volunteer activity (assessed by volunteer group attendance), physical activity (attending sports events), outdoor leisure activity (gardening/horticulture, collecting edible wild plants, fishing/hunting, and forest walking), and art activity (creating art work, writing, playing music, dancing, and acting). Participants were asked “Do you carry out the following activities in your daily life?” Participants rated the frequency with which they engaged in each activity (habitually, sometimes, never) by choosing one of three responses: “I habitually carry out the activity,” “I sometimes carry out the activity,” or “I do not carry out the activity.”

2.3. Statistical analysis

The present study analyzed data of residents who provided complete responses.

For each leisure-time activity category, participants were classified into three groups: those who habitually carried out some of the activities in that category, those who sometimes carried out some of the activities, and those who carried out none of the activities.

We first calculated variable distributions, stratifying by sex, and tested for differences between men and women using the chi-square test. We then used unadjusted and multivariable-adjusted logistic regression models to obtain odds ratios and 95% confidence intervals of the association between leisure-time activities and psychological distress, stratifying by sex. All four leisure-time activity variables were included in the multivariable models simultaneously, and we adjusted for age, living arrangements, marital status, employment status, and educational background. We also used multiple regression analysis to test for linear trends across categories in the frequency of leisure-time activities by assigning dummy variables to the three-level frequency of leisure-time activity (Altman, 1991). All analyses were computed using PASW Statistics 18 (SPSS Inc., Chicago, IL, USA).

Table 1
Characteristics of participants of one surveyed town in Akita Prefecture, Japan.

Variables	Men (n = 4720) n (%)	Women (n = 5188) n (%)	p Value ^a
Age (years)			0.027
30–39	692 (14.7)	771 (14.9)	
40–49	821 (17.4)	990 (19.1)	
50–59	1282 (27.2)	1412 (27.2)	
60–69	1092 (23.1)	1074 (20.7)	
70–79	833 (17.6)	941 (18.1)	
Living alone			0.046
Yes	200 (4.2)	264 (5.1)	
No	4520 (95.8)	4924 (94.9)	
Marital status			<0.001
Single	597 (12.6)	249 (4.8)	
Married	3765 (79.8)	3970 (76.5)	
Marital separation/bereaved/divorced	358 (7.6)	969 (18.7)	
Employment status			<0.001
Employee	2358 (50.0)	2227 (42.9)	
Self-employed business	1462 (31.0)	756 (14.6)	
Unemployed	900 (19.1)	2205 (42.5)	
Educational background (years)			<0.001
Compulsory education (9)	1358 (28.8)	1614 (31.1)	
High school education (12)	2714 (57.5)	3062 (59.0)	
Junior college graduate (14)	149 (3.2)	293 (5.6)	
University graduate and higher (>16)	499 (10.6)	219 (4.2)	
Psychological distress			0.001
Low (K6 ^b < 13)	4590 (97.2)	4985 (96.1)	
High (K6 > 13)	130 (2.8)	203 (3.9)	

^a For values of chi-square.
^b The Japanese version of the Kessler Psychological Distress Scale.

2.4. Ethics

This study was approved by the Ethics Committee of Akita University Graduate School of Medicine.

3. Results

Table 1 shows the characteristics of complete respondents ($n = 9908$). Of the residents who received questionnaires, 83.9% (14,261) responded, 58.3% of whom provided complete responses. Average age and proportion of men were respectively 57.0 years and 46.7% among total respondents and 55.5 years and 47.6% among those with complete responses. These were similar to the target population aged 30–79 years in the survey area (average age: 56.0 years; men: 47.4%).

Regarding economic status among complete responses, the proportion of unemployed was high (31.3%), and this included those not in the labor force, such as pensioners and full-time housewives. Of those who submitted complete responses, the unemployed rate (unemployed persons among those eligible for the labor force or persons not in the labor force) aged 30–64 years was 8.9% and 28.9%, among men and women, respectively; a rate similar to the national level among men (11.2%) and lower among women (37.7%) (Statistics Bureau, 2010). A low-income level in this area might result in a high labor participation rate among women.

The average age for men was 55.7 years ($SD = 13.1$), and for women was 55.3 years ($SD = 13.2$). A total of 79.8% of men and 76.5% of women were married. In terms of employment status, employees made up the largest group, comprising 50.0% of men and 42.9% of women. In terms of educational background, high school graduates made up the largest group, comprising 57.5% of men and 59.0% of women. Most participants (95.8% of men and 94.9% of women) did not live alone. As evaluated by the K6 scale, 2.8% of men and 3.9% of women were assessed as experiencing psychological distress. Although the number of total respondents varied dependent on certain variables, the numbers of those living alone (5.2%), living separately/bereaved/divorced (14.6%), unemployed (34.7%) and with compulsory education (35.2%) among total respondents were greater than those among complete responses. This appears to be because the total respondents contained a higher percentage of older persons compared with complete responses, such respondents included many widowed women, and women in Japan have longer life expectancy than men. Between complete responses and total respondents there was no difference in the rate of those psychologically distressed (3.4%). The percentages of those habitually engaged in all four leisure-time activities: volunteer (8.4%), physical (8.1%), outdoor leisure (34.9%) and art activities (11.0%) among total

respondents were lower than among the complete responses. Table 2 shows details of distributions of those activities among the complete responses.

In both men and women, about 40% of respondents regularly engaged in outdoor leisure activities, with smaller percentages of participants performing the other types of activities. The distributions of volunteer activity, physical activity, and outdoor leisure activity differed significantly by sex. Compared with women, men more frequently reported regularly performing volunteer, physical, and outdoor leisure activities.

Table 3 shows the associations between leisure-time activity and psychological distress.

The unadjusted analysis indicated that both men and women who engaged regularly in volunteer, physical, outdoor leisure, and art activities were significantly less likely to be psychologically distressed. After adjustment for age, living arrangements, marital status, employment status, and educational background, including all four leisure-time activities (volunteer, physical, outdoor leisure, and art activities) in the model simultaneously, both men and women who engaged regularly in outdoor leisure activity were significantly less likely to be psychologically distressed. Both women and men who regularly performed physical activity were significantly less likely to be psychologically distressed, although the association was not significant for men. However, the association between volunteer activity and psychological distress, and between art activity and psychological distress, was not statistically significant for either sex.

4. Discussion

Each leisure-time activity category was related to psychological distress separately.

Many studies that have shown a positive association between leisure-time activity and psychological health have focused mainly on physical activity. One Japanese study of male workers aged 18–69 years reported that individuals who engaged in exercise that induced sweating less than once a week experienced significantly more depressive symptoms (Wada et al., 2006). A study of a nationally representative sample of the general population aged 16 years and over in Scotland reported that leisure-time sports, walking, and domestic physical activity were all associated with lower psychological distress (Hamer et al., 2009). Another study of lower back pain patients aged 18 years and over conducted in the USA reported that recreational physical activities were associated with a decrease in psychological distress (Hurwitz et al., 2005). Another study of healthy individuals aged 20 years and over demonstrated that taking a walk in the forest may help to decrease the risk of depression (Morita et al., 2007). Additionally, a literature review suggested that physical activity, even in low doses, may protect against depression (Teychenne et al., 2008). One systematic review suggested that sports activities may be associated with improved psychosocial health in adults (Eime et al., 2013).

Regarding art activity, most studies have assessed the association between art therapy and psychological health (Bradt et al., 2011; Hughes and da Silva, 2011; Pratt, 2004). Few studies have addressed the association between leisure-time art activity and psychological health. An Australian study of people with a history of serious illness reported that participating in a poetry-writing program was associated with a decrease in psychological distress (Rickett et al., 2011). Additionally, a study of elderly people conducted in Greece reported that participation in Greek traditional dances was associated with a decrease in psychological distress (Mavrovouniotis et al., 2010). These studies found an association between each leisure-time activity and psychological health. Consistent with this earlier work, the present findings show an association between each leisure-time activity and lower psychological distress.

The simultaneous analyses revealed that only some activities were related to psychological distress. Both outdoor leisure activity and

Table 2
Distributions of leisure-time activities among participants in one surveyed town in Akita Prefecture, Japan.

Variables	Men ($n = 4720$) n (%)	Women ($n = 5188$) n (%)	p Value ^a
Volunteer activity			<0.001
Habitually	597 (12.6)	396 (7.6)	
Sometimes	1466 (31.1)	1027 (19.8)	
Never	2657 (56.3)	3765 (72.6)	
Physical activity			<0.001
Habitually	621 (13.2)	318 (6.1)	
Sometimes	1180 (25.0)	620 (12.0)	
Never	2919 (61.8)	4250 (81.9)	
Outdoor leisure activity			<0.001
Habitually	2057 (43.6)	1954 (37.7)	
Sometimes	1685 (35.7)	1814 (35.0)	
Never	978 (20.7)	1420 (27.4)	
Art activity			0.516
Habitually	605 (12.8)	667 (12.9)	
Sometimes	1155 (24.5)	1219 (23.5)	
Never	2960 (62.7)	3302 (63.6)	

^a For values of chi-square.

Table 3

Association between leisure-time activity and psychological distress.

Variables	Men						Women					
	Crude OR ^a	95% CI	p Value	Adjusted OR ^{b,c}	95% CI	p Value	Crude OR ^a	95% CI	p Value	Adjusted OR ^{b,c}	95% CI	p Value
Volunteer activity												
Never	1.00	Reference		1.00	Reference		1.00	Reference		1.00	Reference	
Sometimes	0.48	0.31–0.75	0.001	0.82	0.50–1.34	0.430	0.57	0.38–0.86	0.008	0.89	0.58–1.38	0.607
Habitually	0.57	0.31–1.04	0.066	1.27	0.66–2.46	0.479	0.33	0.14–0.74	0.007	0.71	0.30–1.65	0.421
p Value for trend ^d	0.002			0.867			<0.001			0.505		
Physical activity												
Never	1.00	Reference		1.00	Reference		1.00	Reference		1.00	Reference	
Sometimes	0.53	0.33–0.85	0.008	0.75	0.45–1.24	0.263	0.27	0.13–0.56	<0.001	0.33	0.16–0.69	0.003
Habitually	0.32	0.15–0.69	0.004	0.45	0.20–1.01	0.053	0.07	0.01–0.47	0.007	0.09	0.01–0.68	0.019
p Value for trend ^d	<0.001			0.023			<0.001			<0.001		
Outdoor leisure activity												
Never	1.00	Reference		1.00	Reference		1.00	Reference		1.00	Reference	
Sometimes	0.42	0.28–0.63	<0.001	0.52	0.33–0.80	0.003	0.60	0.44–0.82	0.001	0.67	0.48–0.94	0.021
Habitually	0.26	0.17–0.40	<0.001	0.38	0.23–0.63	<0.001	0.29	0.20–0.43	<0.001	0.39	0.25–0.59	<0.001
p Value for trend ^d	<0.001			<0.001			<0.001			<0.001		
Art activity												
Never	1.00	Reference		1.00	Reference		1.00	Reference		1.00	Reference	
Sometimes	0.59	0.37–0.93	0.023	0.82	0.50–1.34	0.420	0.61	0.43–0.89	0.009	0.78	0.53–1.16	0.223
Habitually	0.39	0.19–0.80	0.010	0.55	0.26–1.17	0.118	0.34	0.18–0.63	0.001	0.60	0.32–1.13	0.112
p Value for trend ^d	0.001			0.200			<0.001			0.123		

OR = odds ratio, CI = confidence interval.

^a The associations between each leisure-time activity and psychological distress were analyzed using a logistic model.^b The associations between leisure-time activities and psychological distress were analyzed using a logistic model. All four leisure-time activity variables were included in the model simultaneously.^c Adjusted for sex, living alone, marital status, employment status, educational background.^d Multiple regression analysis was used by assigning dummy variables of 0, 1, and 2 to frequency of each leisure-time activity.

physical activity were significantly associated with psychological distress. Both men and women who engaged regularly in outdoor leisure activities were significantly less likely to be psychologically distressed. Women who engaged regularly in physical activity were significantly less likely to be psychologically distressed; this was also the case for men, although the association was not significant.

Very few studies have investigated the association of psychological distress with leisure-time activity by comparing different leisure-time activities. A study of the general population aged 40 years and over in one community in Japan reported that lack of participation in sports/exercise and social gatherings was associated with psychological distress among both men and women aged 40–64 years, and that lack of participation in neighborhood association activities was related to psychological distress among women aged 40–64 years. However, lack of participation in volunteer activity was not significantly associated with psychological distress among both men and women aged 40–64 years (Kuriyama et al., 2009). In the present study, rather than focusing solely on whether participants did or did not participate in leisure-time activities, we examined in more detail the association of psychological distress with frequency of engagement in different leisure-time activities in one community population. Nevertheless, for volunteer activity and physical activity, our findings reflected those of earlier studies.

In this study, frequent engagement in physical activity and outdoor leisure activity was strongly associated with lower likelihood of psychological distress. However, frequent engagement in art was only weakly associated with reduced likelihood of psychological distress. This was contrary to our predictions, as previous studies have reported that art therapy is associated with improved psychological health (Bradt et al., 2011; Hughes and da Silva, 2011; Pratt, 2004). Our findings may reflect the fact that more active outdoor leisure activities demand more physical activity than do art activities, and therefore perhaps activate the neuroendocrinological system more efficiently to attenuate stress-related psychological disorders (Fleshner, 2005). Additionally, frequent engagement in volunteer activity was not associated with reduced likelihood of psychological distress. Our findings may reflect the fact that those who perform volunteer activities have higher burden related

to those activities than the other leisure-time activities (Murayama et al., 2013).

4.1. Study limitations and strengths

This study has several limitations. First, as this study was cross-sectional, the relationships found could not be interpreted as causal. Second, although fewer than 60% of participants provided a complete set of responses, representativeness of the complete responses was ensured as demographic distributions of the complete responses were similar to those of the target population in the survey area. Those who submitted complete responses, and thus were the sample analyzed, more frequently performed leisure-time activities than the total respondents did. The differences in frequency of leisure-time activities between total respondents and those who submitted complete responses may lead to overestimation of results of the relationships between leisure-time activities and mental distress. Third, as participants were drawn from one suburban community, the results may not generalize to individuals aged 30–79 years residing in other locations in Japan. Fourth, as previous studies have reported an association between job strain and reduced leisure-time physical activity (Bogaert et al., 2014; Fransson et al., 2012), it is possible that those participants in good psychological health tended to perform more leisure-time activity. However, this may have had little effect on the results, as one previous study indicates that leisure-time physical activity was associated with reduced depressive symptoms after adjustment for job strain (Wada et al., 2006). Fifth, that there were no data on residents aged 80 and above, who may be less likely to engage in volunteer and physical activities (Kuriyama et al., 2010), should be kept in mind when interpreting the study results. Finally, it is possible that the area in which participants lived was relatively suitable for outdoor activity, as they lived in the suburbs. However, we did not explore whether the area of residence was suitable for physical and outdoor leisure activities (or for the other activities). Several studies have reported that neighborhood characteristics and access to places for physical activity are associated with leisure-time physical activity (Huston et al., 2003; McCormack and Shiell, 2011). Thus, from the perspective of community health promotion, it is important to examine

whether people live in areas that are appropriate for healthy activity and to make the natural environment readily accessible to people if necessary. The strength of the present study is that we examined the associations between frequency of various types of leisure-time activities and psychological distress after adjustment for physical activity and community involvement. To the best of our knowledge, there has been little or no research on psychological distress in relation to various types of leisure-time activities. As this study had no external validity, further research will be needed to clarify associations between daily leisure-time activities and psychological distress. Despite several limitations, the present study helps to elucidate the association between engagement in leisure-time activity and psychological health and could inform measures for mental health within communities.

5. Conclusion

In the present study, we examined the association between psychological health and volunteer, physical, outdoor, and art leisure-time activities in a community in Japan. Higher frequency of engagement in outdoor leisure activity and physical activity was significantly associated with a lower likelihood of psychological distress.

Conflict of interest statement

The authors declare that there are no conflicts of interest.

Author contributions

All authors contributed to the conception and design of the study. Y. Kaneko acquired the data. All authors analyzed and interpreted the data. M. Toyoshima drafted the manuscript, and Y. Kaneko and Y. Motohashi revised it critically for important intellectual content. All authors have read and approved the final manuscript.

Transparency document

The [Transparency document](#) associated with this article can be found, in online version.

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References

- Altman, D.G., 1991. *Practical Statistics for Medical Research*. Chapman and Hall/CRC.
- Bogaert, I., De Martelaer, K., Deforche, B., Clarys, P., Zinzen, E., 2014. Associations between different types of physical activity and teachers' perceived mental, physical, and work-related health. *BMC Public Health* 14, 534.
- Bradt, J., Dileo, C., Grocke, D., Magill, L., 2011. Music interventions for improving psychological and physical outcomes in cancer patients. *Cochrane Database Syst. Rev.*, CD006911.
- Eime, R.M., Young, J.A., Harvey, J.T., Charity, M.J., Payne, W.R., 2013. A systematic review of the psychological and social benefits of participation in sport for adults: informing development of a conceptual model of health through sport. *Int. J. Behav. Nutr. Phys. Act.* 10, 135.
- Fleshner, M., 2005. Physical activity and stress resistance: sympathetic nervous system adaptations prevent stress-induced immunosuppression. *Exerc. Sport Sci. Rev.* 33, 120–126.
- Fransson, E.I., Heikkilä, K., Nyberg, S.T., et al., 2012. Job strain as a risk factor for leisure-time physical inactivity: an individual-participant meta-analysis of up to 170,000 men and women: the IPD-work consortium. *Am. J. Epidemiol.* 176, 1078–1089.
- Furukawa, T.A., Kessler, R.C., Slade, T., Andrews, G., 2003. The performance of the K6 and K10 screening scales for psychological distress in the Australian National Survey of Mental Health and Well-being. *Psychol. Med.* 33, 357–362.
- Furukawa, T.A., Kawakami, N., Saitoh, M., et al., 2008. The performance of the Japanese version of the K6 and K10 in the World Mental Health Survey Japan. *Int. J. Methods Psychiatr. Res.* 17, 152–158.
- Gigantesco, A., Ferrante, G., Baldissera, S., Masocco, M., on behalf of the PASSI coordinating group, 2015. Depressive symptoms and behavior-related risk factors, Italian population-based surveillance system, 2013. *Prev. Chronic Dis.* 12, E183.
- Goldfield, G.S., Henderson, K., Buchholz, A., Obeid, N., Nguyen, H., Flament, M.F., 2011. Physical activity and psychological adjustment in adolescents. *J. Phys. Act. Health* 8, 157–163.
- Hamer, M., Stamatakis, E., Steptoe, A., 2009. Dose-response relationship between physical activity and mental health: the Scottish health survey. *Br. J. Sports Med.* 43, 1111–1114.
- Honda, H., Ueki, S., Okada, T., et al., 2010. Relationships between participation in community activities and psychosocial and physical health of community-dwelling elderly. *Nihon Koshu Eisei Zasshi (Jpn. J. Public Health)* 57, 968–976.
- Hughes, E.G., da Silva, A.M., 2011. A pilot study assessing art therapy as a mental health intervention for subfertile women. *Hum. Reprod.* 26, 611–615.
- Hurwitz, E.L., Morgenstern, H., Chiao, C., 2005. Effects of recreational physical activity and back exercises on low back pain and psychological distress: findings from the UCLA low back pain study. *Am. J. Public Health* 95, 1817–1824.
- Huston, S.L., Evenson, K.R., Bors, P., Gizlice, Z., 2003. Neighborhood environment, access to places for activity, and leisure-time physical activity in a diverse North Carolina population. *Am. J. Health Promot.* 18, 58–69.
- Janssen, I., Carson, V., Lee, I.M., Katzmarzyk, P.T., Blair, S.N., 2013. Years of life gained due to leisure-time physical activity in the U.S. *Am. J. Prev. Med.* 44, 23–29.
- Jonsdottir, I.H., Rodger, L., Hadzibajramovic, E., Borjesson, M., Ahlberg Jr., G., 2010. A prospective study of leisure-time physical activity and mental health in Swedish health care workers and social insurance officers. *Prev. Med.* 51, 373–377.
- Kessler, R.C., Andrews, G., Colpe, L.J., et al., 2002. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychol. Med.* 32, 959–976.
- Kuriyama, S., Nakaya, N., Ohmori-Matsuda, K., et al., 2009. Factors associated with psychological distress in a community-dwelling Japanese population: the Ohsaki cohort 2006 study. *J. Epidemiol.* 19, 294–302.
- Kuriyama, S., Nakaya, N., Ohmori-Matsuda, K., et al., 2010. The Ohsaki cohort 2006 study: design of study and profile of participants at baseline. *J. Epidemiol.* 20, 253–258.
- Lahti, J., Holstila, A., Lahelma, E., Rahkonen, O., 2014. Leisure-time physical activity and all-cause mortality. *PLoS One* 9, e101548.
- Mavrovouniotis, F.H., Argiriadou, E.A., Papaioannou, C.S., 2010. Greek traditional dances and quality of old people's life. *J. Bodyw. Mov. Ther.* 14, 209–218.
- McCormack, G.R., Shiell, A., 2011. In search of causality: a systematic review of the relationship between the built environment and physical activity among adults. *Int. J. Behav. Nutr. Phys. Act.* 8, 125.
- Moore, S.C., Patel, A.V., Matthews, C.E., et al., 2012. Leisure time physical activity of moderate to vigorous intensity and mortality: a large pooled cohort analysis. *PLoS Med.* 9, e1001335.
- Morita, E., Fukuda, S., Nagano, J., et al., 2007. Psychological effects of forest environments on healthy adults: shinrin-yoku (forest-air bathing, walking) as a possible method of stress reduction. *Public Health* 121, 54–63.
- Murayama, H., Taguchi, A., Murashima, S., 2013. Exploring the ideal combination of activity satisfaction and burden among health promotion volunteers: a cross-sectional study in Japan. *BMC Public Health* 13, 205.
- Pratt, R.R., 2004. Art, dance, and music therapy. *Phys. Med. Rehabil. Clin. N. Am.* 15 (827–41), vi–vii.
- Rickett, C., Greive, C., Gordon, J., 2011. Something to hang my life on: the health benefits of writing poetry for people with serious illnesses. *Aust. Psychiatry* 19, 265–268.
- Rovio, S., Kareholt, I., Helkala, E.L., et al., 2005. Leisure-time physical activity at midlife and the risk of dementia and Alzheimer's disease. *Lancet Neurol.* 4, 705–711.
- Schnohr, P., Lange, P., Scharling, H., Jensen, J.S., 2006. Long-term physical activity in leisure time and mortality from coronary heart disease, stroke, respiratory diseases, and cancer. The Copenhagen City Heart Study. *Eur. J. Cardiovasc. Prev. Rehabil.* 13, 173–179.
- Statistics Bureau, Ministry of Internal Affairs and Communications, 2010i. Annual Report on the Labour Force Survey 2009 (in Japanese) <http://www.stat.go.jp/data/roudou/report/2009/> (Accessed March 13, 2016).
- Teychenne, M., Ball, K., Salmon, J., 2008. Physical activity and likelihood of depression in adults: a review. *Prev. Med.* 46, 397–411.
- Velten, J., Lavalley, K.L., Scholten, S., et al., 2014. Lifestyle choices and mental health: a representative population survey. *BMC Psychol.* 2, 58.
- Wada, K., Satoh, T., Tsunoda, M., Aizawa, Y., Japan Work Stress and Health Cohort Study Group, 2006. Associations of health behaviors on depressive symptoms among employed men in Japan. *Ind. Health* 44, 486–492.