

Dog Ownership and Health-Related Physical Activity Among Japanese Adults

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Background: Dog ownership appears to have associated health benefits as a result of increased physical activity through dog walking. This study examined the association between dog ownership and health-related physical activity among Japanese adults. **Methods:** Male and female respondents to an Internet-based cross-sectional survey were divided into the following groups: dog owner (DOG), nondog pet owner (NDOG), and nonpet owner (NPOG). Moderate and vigorous physical activity amount (MVPA), walking amount (Walking), and sedentary behavior time (SB) were estimated from the International Physical Activity Questionnaire. Analyses of covariance and logistic regression analysis were used. **Results:** The differences in MVPA, Walking, and SB were statistically significant among the three groups. DOG had a significantly greater amount of MVPA than NDOG and NPOG. DOG also had a significantly greater amount of Walking and less SB time than NPOG, and DOG was 1.5 times more likely to meet the physical activity recommendation than NDOG and NPOG. **Conclusions:** The dog owners had higher physical activity levels than owners of other kinds of pets and those without any pets, suggesting that dogs may play a major role in promoting physical activity. However, only 30% of the dog owners met the recommended criteria for physical activity.

Physical activity promotion is now a national health priority of disease prevention policy. The health benefits of regular physical activity are well established. Regular physical activity is associated with the reduced incidence of cardiovascular disease, stroke, hypertension, type 2 diabetes mellitus, osteoporosis, obesity, colon cancer, breast cancer, anxiety, and depression.^{1,2} Thus, regular physical activity is strongly recommended by

both domestic and international public health guidelines. The Centers for Disease Control and Prevention and American College of Sports Medicine in the United States as well as the Department of Health and Aging Care in Australia recommend that adults should accumulate “a minimum of 30 minutes of physical activity of moderate intensity (eg, brisk walking) on most, if not all days of the week.”^{1,3,4} However, the proportion of American and Australian adults who attain this physical activity recommendation ranges from 26% to 46%.^{1,3,5-9}

In Japan, new guidelines for physical activity and exercise, the Exercise and Physical Activity Reference for Health Promotion 2006, have been published by the Ministry of Health, Labor, and Welfare. According to the new guidelines, every Japanese adult should accumulate 23 metabolic equivalents (METs)-h/wk of physical activity with an intensity of 3 METs or greater to prevent chronic diseases and derive numerous health benefits.¹⁰ Similar to American and Australian adults, only 25% of Japanese adults were reported to participate in the recommended level of physical activity, which suggests an exceedingly evident need to develop a wide variety of new interventions, in addition to the already existing approaches, for increasing the physical activity level of the population.^{11,12}

In Australia and the United States, approximately one-fourth of the households own a dog, which was reported as the most popular pet.^{13,14} The positive association between pet ownership and various physiological and psychological health outcomes was reported in previous studies, including cardiovascular benefits such as lower systolic blood pressure, plasma cholesterol, and triglyceride levels,^{15,16} as well as lower levels of mental stress.¹⁷ Increased physical activity through dog walking can be cited as a potential health benefit only of dog ownership. Thus, the approach for physical activity promotion with dog(s), which is a constant and regular stimulus to walk, may have considerable potential to increase the proportion of the population engaging in the recommended level of physical activity in a relatively large subgroup of the community.

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Considering the association between dog ownership and engagement in physical activity, a limited number of studies have been conducted and most have recognized that dog owners were more physically active than nondog owners.^{16,18–23} However, whether dog owners achieve the recommended level of physical activity is still controversial.^{18,23–25} Thus, extensive investigations are required. Finally, as in the United States and Australia, dogs appear to be the most popular and desired pet in Japan.²⁶ Few studies have examined the association between physical activity level and dog ownership in Japan. Therefore, the current study examined the association between dog ownership, health-related physical activity, and the achievement of the recommended physical activity level among Japanese adults.

Methods

Participants

The data sample in the current study consisted of 5,253 male and female respondents to an Internet-based cross-sectional survey, which was conducted by a Japanese Internet research service organization. Owning approximately 264,000 voluntarily registered samples and with the availability of detailed sample sociodemographic attributes, this Internet research service organization was capable of targeting specific attributes according to each survey requirement. The set sample size and attributes in the current study were as follows: approximately 5,000 male and female adults aged 20 to 79 years with an equivalent number of males and females in each age bracket. Potential respondents ($n = 16,776$) were randomly and blindly selected from the registered samples in accordance with the set sample size and attributes, and were invited to participate in the Internet-based survey via e-mail. Internet-based questionnaires were placed in a protected area of a web site and the potential respondents received the specific URL in an invitation e-mail. The potential respondents could log on to the protected area of the web site using their own login identification and password. The Internet research service organization provided reward points valued at ¥80 as incentives for participating. A total of 5,253 (response rate: 31.3%) respondents voluntarily completed a demographic data information form and signed an online Institutional Review Board-approved letter of informed consent. In addition, the following measures were administered.

Measurements

Physical Activity. The short version of the International Physical Activity Questionnaire (IPAQ) was used to estimate the amount of physical activity in which the participants engaged. The IPAQ, a self-administered questionnaire, has been used in several countries²⁷ and

was designed for adults age 18 to 65 years. It identifies the frequency and duration of walking, moderate and vigorous physical activity, and sedentary activity during the past week.²⁷ The 1-week test–retest reliability of the short, self-administered, Japanese version of the IPAQ is good (Spearman $\rho = .72$ to $.93$). The criterion validity for the Japanese version of the IPAQ against an accelerometer is acceptable (Spearman $\rho = .39$).²⁸

The short-form data were used to estimate the weekly amount of total physical activity (METs-h/wk), moderate- and vigorous-intensity physical activity (MVPA), and walking (Walking) by weighting the reported hours per week within each of the 3 activity categories—walking, moderate activity, and vigorous activity—with the MET energy expenditure estimates assigned to each category of activity. The MET value of each activity category was obtained from the study of Craig et al.²⁷ In addition, the average time of sedentary behavior per day (SB: h/d) was estimated. The recommended physical activity levels were dichotomized at 23 or more METs-h/wk according to the recommended guidelines.¹⁰

Pet Ownership Status. Pet ownership was determined using the following question: “Do you own a pet?” The respondents who answered “yes” to this question were further grouped by the specific type of pet they owned—dog, cat, bird, fish, or other. They were divided into the following 3 groups: dog owner group (DOG), nondog pet owner group (NDOG), and nonpet owner group (NPOG). Those who owned multiple pets were classified as dog owners if at least 1 of their pets was a dog.

Demographic Variables. The possible demographic correlates of participation in the recommended level of physical activity included gender, age, marital status, educational level, household income, employment status, type of residence, and whether the participants lived with other people. Age was classified in years as follows: 20 to 29, 30 to 39, 40 to 49, and 50 or older. Marital status was categorized as currently married or currently unmarried. Educational level was classified as less than high school graduate, junior college graduate or equivalent, and college graduate or higher. Household income was classified into 5 categories, ranging from less than ¥3,000,000 to ¥15,000,000 or more annually. Employment status was categorized as employed or unemployed. Type of residence was categorized as single family dwelling with home ownership, apartment with home ownership, rental single family dwelling, and rental apartment.

Statistical Analyses

For the analysis, data were analyzed for 5,177 persons who provided complete information for the study variables. A chi-squared test was used to evaluate the proportional differences between categories of pet ownership for demographic variables and physical activity level. Analyses of covariance (ANCOVAs) were used to

examine the differences in MVPA, Walking, and SB, with the 3 categories of pet ownership as the between-group factor and the following covariates: gender, age, marital status, household income, educational level, employment status, type of residence, and whether participants lived with other people. Bonferroni post hoc tests were performed following significant group differences. A multinomial logistic regression analysis was conducted to calculate the adjusted odd ratios, and a 95% confidence interval was employed to determine the association between the recommended physical activity level and pet ownership with controlling for the demographic variables in the model. Statistical significance was considered to be $P < .05$. The Statistical Package for Social Science for Windows 14.0 was used to compute the statistics.²⁹

Results

Basic Characteristics of the Respondents

In the current study, 2,587 males and 2,590 females were classified into 3 groups according to their pet ownership status. Table 1 presents the distribution of all demographic variables for the study participants. Overall, 65.2% of the respondents were married. Almost 51% had graduated from college or graduate school and 24% had less than a high school diploma. Moreover, 57% of the samples were employed, 86.2% lived with others, and 48.9% lived in a single family dwelling with home ownership. Overall, 15% of the respondents had a household income of less than ¥3,000,000 and 3% earned more than ¥15,000,000 annually.

Demographic Characteristics and Pet Ownership

Table 2 presents the demographic characteristics of the participants by pet ownership status. Overall, 33.3% ($n = 1723$) of the respondents were pet owners—18.0% ($n = 930$) for dog ownership and 15.3% ($n = 793$) for nondog ownership. The DOG was significantly more likely than the NPOG to be female, 50 years of age or older, married, living with other people, living in a single family dwelling, earning an annual household income of ¥7,000,000 or higher, and to have not graduated college. Compared with the NPOG, the NDOG was significantly more likely to be female, 40 years of age or older, married, unemployed, living with other people, living in a single family dwelling, earning an annual household income of ¥15,000,000 or higher, and to have not graduated college. The DOG was more likely than the NDOG to be 20 to 29 or 50 years of age or older, living in a single family dwelling, and earning an annual household income of less than ¥3,000,000 or ¥7,000,000 or more.

Table 1 Basic Characteristics of Study Participants (N = 5177)

	Participants	
	n	%
Gender		
male	2587	50.0
female	2590	50.0
Age		
20–29	1294	25.0
30–39	1295	25.0
40–49	1302	25.1
≥50	1286	24.9
Marital status		
married	3374	65.2
unmarried	1803	34.8
Educational status		
≤high school graduate	1277	24.7
2 y college or equivalent	1277	24.6
≥college graduate	2623	50.7
Employment status		
employed	2949	57.0
unemployed	2228	43.0
Household income level		
<¥3,000,000	796	15.4
¥3,000,000–4,999,999	1443	27.9
¥5,000,000–6,999,999	1203	23.2
¥7,000,000–9,999,999	1047	20.2
¥10,000,000–14,999,999	526	10.2
≥¥15,000,000	162	3.1
Type of residence		
single-family dwelling with home ownership	2533	48.9
apartment with home ownership	801	15.5
rental single-family dwelling	169	3.3
rental apartment	1674	32.3
Other person lived with		
no	716	13.8
yes	4461	86.2

Physical Activity and Pet Ownership

Table 3 presents the adjusted means for MVPA, Walking, and SB by pet ownership status. A one-way ANCOVA with all of the demographic variables as covariates was conducted to examine the group differences in MVPA, Walking, and SB. Significant group differences were found among the pet ownership groups for MVPA ($F_{2,5166} = 9.145, P = .000$), Walking ($F_{2,5166} = 4.465, P = .012$), and SB ($F_{2,5166} = 5.415, P = .004$). Post hoc Bonferroni analyses indicated that the DOG had a significantly greater amount of MVPA than the NDOG and NPOG ($P < .001$). Moreover, the DOG had a significantly greater amount of Walking ($P = .008$) and less

Table 2 Demographic Characteristics of Participants (N = 5177) by Pet-Ownership Status

	DOG		NDOG		NPOG		Group statistical comparison [§]
	n	%	n	%	n	%	
Gender							1 vs. 2; 1 vs. 3***; 2 vs. 3**
male	401	15.5	368	14.2	1818	70.3	
female	529	20.4	425	16.4	1636	63.2	
Age							1 vs. 2**; 1 vs. 3***; 2 vs. 3***
20–29	219	16.9	150	11.6	925	71.5	
30–39	186	14.4	179	13.8	930	71.8	
40–49	225	17.3	249	19.1	828	63.6	
≥50	300	23.3	215	16.7	771	60.0	
Marital status							1 vs. 2; 1 vs. 3**; 2 vs. 3***
married	288	16.0	238	13.2	1277	70.8	
unmarried	642	19.0	555	16.5	2177	64.5	
Educational status							1 vs. 2; 1 vs. 3***; 2 vs. 3**
≤high school graduate	266	20.8	226	17.7	785	61.5	
2 y college or equivalent	250	19.6	205	16.1	822	64.3	
≥college graduate	414	15.8	362	13.8	1847	70.4	
Employment status							1 vs. 2; 1 vs. 3; 2 vs. 3*
employed	519	17.6	425	14.4	2005	68.0	
unemployed	411	18.5	368	16.5	1449	65.0	
Household income level							1 vs. 2*; 1 vs. 3***; 2 vs. 3*
<¥3,000,000	117	14.7	97	12.2	582	73.1	
¥3,000,000–4,999,999	221	15.3	218	15.1	1004	69.6	
¥5,000,000–6,999,999	201	16.7	194	16.1	808	67.2	
¥7,000,000–9,999,999	215	20.5	179	17.1	653	62.4	
¥10,000,000–14,999,999	138	26.2	75	14.3	313	59.5	
≥¥15,000,000	38	23.5	30	18.5	94	58.0	
Type of residence							1 vs. 2***; 1 vs. 3***; 2 vs. 3***
single-family dwelling with home ownership	698	27.6	439	17.3	1396	55.1	
apartment with home ownership	82	10.2	120	15.0	599	74.8	
rental single-family dwelling	38	22.5	31	18.3	100	59.2	
rental apartment	112	6.7	203	12.1	1359	81.2	
Other person lived with							1 vs. 2; 1 vs. 3***; 2 vs. 3***
no	48	6.7	52	7.3	616	86.0	
yes	882	19.8	741	16.6	2838	63.6	

Abbreviations: DOG, dog owner group; NDOG, non-dog-owner group; NPOG, non-pet-owner group.

[§] Analyzed with chi-square; 1: dog-owner group, 2: non-dog-owner group, 3: non-pet-owner group.

* $P < .05$. ** $P < .001$. *** $P < .000$.

SB time ($P = .003$) than the NPOG. A multinomial logistic regression with adjustment for all demographic variables in the model indicated that the DOG was 1.54 times more likely to obtain the recommended level of

physical activity than the NDOG and NPOG ($P < .05$, Table 4).

Table 3 Bonferroni-Adjusted Post Hoc Comparison of MVPA, Walking, and SB Among Pet-Ownership Groups (N = 5177)

	DOG		NDOG		NPOG		F [§]	#
	Mean	SE	Mean	SE	Mean	SE		
MVPA (METs-h/wk)	17.0	1.159	10.9	1.229	11.7	.593	9.14***	a**, b***
Walking (METs-h/wk)	12.4	.757	10.5	.802	9.8	.387	4.47*	b*
SB (h/d)	6.4	.135	6.9	.143	6.9	.069	5.42*	b*

Abbreviations: DOG, dog owner group; NDOG, non-dog-owner group; NPOG, non-pet-owner group; SE, standard error; MVPA, moderate and vigorous intensity physical activity; SB, sedentary behavior; MET, metabolic equivalent.

[§]Analyses of covariance for MVPA, Walking, and SB adjusted with covariates of gender, age, marital status, educational level, household income level, type of residence, other people lived with.

Bonferroni-adjusted post hoc comparison; a: DOG vs. NDOG, b: DOG vs. NPOG, c: NDOG vs. NPOG.

* $P < .05$. ** $P < .001$. *** $P < .000$.

Table 4 Adjusted Odds Ratios and Proportion for Recommended Physical Activity Level

	n	%	OR ^a	(95% CI)
NPOG (n = 3454)	863	25.0	1	(ref)
NDOG (n = 793)	209	26.4	1.11	(0.93–1.33)
DOG (n = 930)	306	32.9	1.54	(1.30–1.82)

Abbreviations: DOG, dog owner group; NDOG, non-dog-owner group; NPOG, non-pet-owner group; OR, odd ratios; CI, confidence interval; ref, referent group.

^a A logistic regression for meeting recommended physical activity level adjusted with gender, age, marital status, educational level, household income level, type of residence, other people lived with.

Discussion

The present investigation was designed to examine whether dog ownership would be associated with engagement in health-related physical activity and attainment of the recommended physical activity level among Japanese adults. The prevalence of dog ownership among the surveyed Japanese adults was 18.0%. Moreover, 54% of the pet owners were dog owners. Regarding health-related physical activity, the dog owners were associated with higher MVPA levels than those who owned another type of pet and those without any pets. In addition, the dog owners walked more and engaged in less sedentary behavior time than those without any pets. The prevalence of meeting the physical activity recommendation among dog owners was 32.9%, which represented an approximately 50% higher likelihood than that among other pet and nonpet owners. These results appear to suggest that dog ownership might be positively related to engagement in health-related physical activity and attainment of physical activity recommendations.

The findings of the current study are consistent with those observed in the previous literatures with respect to participation in physical activity.^{16,19,20,22,23} Among the surveyed Japanese adults, dog owners appear to be more physically active than nondog owners. In recent studies, Brown et al¹⁹ investigated the cross-sectional effects of dog ownership on physical activity and walking behavior among 351 Canadian adults aged 20 to 80 years. In this study, dog owners spent more time engaging in mild

and moderate physical activity per week as compared with nondog owners. In addition, Cutt et al²³ surveyed 1,813 Australian adults aged 19 to 78 years and reported that dog owners engaged in more minutes of physical activity per week than nondog owners. Furthermore, a previous cross-sectional study of 2,533 older American adults aged 70 to 79 years by Thorpe et al^{18,22} found a greater percentage of dog owners who reported engaging in physical activity than nondog pet owners and nonpet owners. The results of the current study replicate and strengthen the findings of these previous researches because of the utilization of a random selection and a large population with a wide range of age groups.

With regard to walking behavior, dog ownership had a more positive effect on engagement in walking activity than nonpet ownership; however, this effect, although statistically significant, might be relatively small in magnitude. In the current study, dog owners were estimated to walk at an intensity of 3.3 METs (moderate walking pace) for only approximately 5 and 6.4 min (1.9 and 2.5 METs-h/wk) more per day than nondog pet owners and nonpet owners, which implies that dog ownership may not necessarily translate to walking behavior among the surveyed Japanese adults. Schofield et al²⁶ observed that 40% of the dog owner respondents were nondog walkers and that there was no relationship between dog ownership and weekly walking time for leisure. Similarly, Bauman et al²⁵ reported that 58% of dog owners did not walk their dog at all and that dog owners walked only .3 h (about 18 min) more per week than nondog owners, which was not statisti-

cally significant. These findings also imply that many of the surveyed Japanese dog owners might not regularly walk their dog even though it is an important and unique potential benefit of dog ownership in terms of helping people to be physically active for health benefits. On the other hand, Thorpe et al²² reported that dog owners spent more time on non-exercise-related walking as compared with both nondog pet owners and nonpet owners. Brown et al¹⁹ and Cutt et al²³ also observed a positive association between dog ownership and total weekly walking minutes. Clearly, further research is required to gain a better understanding of the association between dog ownership and waking behavior, as well as to determine the contribution of dog walking to an engagement in health-related physical activity among dog owners.

In the current study, the likelihood of attaining the recommended physical activity level through dog ownership was approximately 1.5 times greater than that of attaining it through other pet ownership and nonpet ownership. Moreover, this difference was independent of all major demographic factors. A consistent finding with the current study was acquired in a cross-sectional Australian investigation conducted by Cutt et al,²³ where dog owners were found to be 57% more likely than nondog owners of attaining a sufficient physical activity level. These results suggest that some factors specifically related to dog ownership may influence physical activity levels in dog owners. For example, Bauman et al²⁴ and Schofield et al²⁵ reported that only dog owners who regularly walked their dog achieved a more sufficient level of physical activity for health benefits. Further detailed investigations are required to examine dog-specific correlates of participation in physical activity and attainment of the recommended levels of physical activity. In addition, examining the factors associated with physically active dog owners may promote physical activity and provide relevant information for designing a strategy for motivating sedentary dog owners, who account for approximately 70% of the surveyed dog owners in the current study.

The current investigation had a number of limitations. First, the analysis was cross-sectional, thereby making determinations of cause and effect impossible. Next, the physical activity level was administered using only a self-reported questionnaire. Ishikawa-Takata et al³⁰ found that only 36% of 150 healthy free-living Japanese adults could be equated among the 3 physical activity groups (insufficiently active, sufficiently active, and highly active), according to the total METs assessed by the IPAQ and physical activity level measured by the doubly labeled water method. Thus, an inaccurate estimation of physical activity level and recall bias are unavoidable. Moreover, the current study was conducted in an Internet setting. Eysenbach et al³¹ indicated that issues of generalizability, mainly due to selection bias, were important considerations because of the nonrepresentative nature of the Internet population and self-selection of the surveyed participants. Rhodes et al³² men-

tioned that younger, more educated individuals with a higher income have greater access to the Internet. In addition, people are more likely to respond to a survey if they are interested in its contents or are attracted by the incentives offered for participation.³¹⁻³³ Therefore, it is possible that the respondents were basically biased, which implies that the findings under such a setting may not be sufficiently applicable to the general population.

Conclusions

In summary, the current investigation is the first to examine the contribution of dog ownership to physically active lifestyles among Japanese adults. Dog owners attained higher health-related physical activity levels and were more likely to achieve the physical activity level recommended by the Exercise and Physical Activity Reference for Health Promotion 2006 than those who did not own a dog. However, more than half of the dog owners did not attain the recommended physical activity level for obtaining health benefits. These findings suggest that a new approach for inactive dog owners and their family members, which incorporates dogs, may be one of the useful and practical approaches for increasing the physical activity levels of the population. Again, the current study particularly highlights the need for future researchers to determine the contribution of dog walking to health-related physical activity among dog owners. Moreover, to clarify the potential benefit of dog ownership, the dog-specific correlates should be extensively investigated. Finally, identification of the characteristics and correlates possessed by physically active dog owners is crucial to the development of more effective interventions for increasing the proportion of dog owners who engage in the recommended amount of physical activity that has the potential to produce numerous health benefits.

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