

## An investigation of the association between socio-demographic factors, dog-exercise requirements, and the amount of walking dogs receive

Chris Degeling, Lindsay Burton, Gavin R. McCormack

### Abstract

Risk factors associated with canine obesity include the amount of walking a dog receives. The aim of this study was to investigate the relationships between canine exercise requirements, socio-demographic factors, and dog-walking behaviors in winter in Calgary. Dog owners, from a cross-sectional study which included a random sample of adults, were asked their household income, domicile type, gender, age, education level, number and breed(s) of dog(s) owned, and frequency and time spent dog-walking in a usual week. Canine exercise requirements were found to be significantly ( $P < 0.05$ ) positively associated with the minutes pet dogs were walked, as was the owner being a female. Moreover, dog walking frequency, but not minutes of dog walking, was significantly associated with residing in attached housing (i.e., apartments). Different types of dogs have different exercise requirements to maintain optimal health. Understanding the role of socio-demographic factors and dog-related characteristics such as exercise requirements on dog-walking behaviors is essential for helping veterinarians and owners develop effective strategies to prevent and manage canine obesity. Furthermore, encouraging regular dog-walking has the potential to improve the health of pet dogs, and that of their owners.

### Résumé

*Les facteurs de risque associés à l'obésité canine incluent la quantité de marche effectuée par le chien. L'objectif de ce projet était d'étudier les relations entre les exigences d'exercice canin, les facteurs socio-démographiques et les habitudes de marche des propriétaires à Calgary en hiver. On demanda à des propriétaires de chien, provenant d'une étude sectorielle qui incluait un échantillonnage aléatoire d'adultes, le revenu familial, le type d'habitation, le sexe, l'âge, le niveau de scolarité, la quantité et la ou les races de chiens possédés, et la fréquence et le temps passé à marcher les chiens durant une semaine normale. Les exigences d'exercice canin étaient associées de manière significativement positive ( $P < 0,05$ ) avec le nombre de minutes que les chiens étaient marchés, et également avec le fait que le propriétaire était une femme. De plus, la fréquence à laquelle les chiens sont marchés, mais pas le nombre de minutes de marche, était significativement associée au fait de demeurer dans des logements attachés (i.e. appartements). Les différents types de chien ont différentes exigences d'exercice pour maintenir une santé optimale. Une compréhension du rôle des facteurs socio-démographiques et des caractéristiques reliées au chien telles que les exigences d'exercices sur les habitudes de marche est essentielle pour aider les vétérinaires et les propriétaires à développer des stratégies pour prévenir et gérer l'obésité canine. De plus, encourager la pratique régulière de marcher les chiens a le potentiel d'améliorer la santé des chiens, et celle de leurs propriétaires.*

*(Traduit par Docteur Serge Messier)*

The incidence of obesity and weight-related health problems in canine populations in western societies is rising (1). Canine obesity is increasingly seen as a pressing animal welfare concern because of the implications of excessive weight gain for chronic diseases and a pet dog's quality of life (2). In the simplest terms weight gain and obesity occurs when there is an imbalance between energy intake (diet) and energy expenditure (exercise). For this reason dietary adjustment and increased levels of physical activity are generally seen to be important components of weight management for pet dogs (3,4). A significant amount of research has focused on the role of dietary factors (nutritional, physiological aspects, and owner behavior) in the etipathogenesis, treatment, and prevention of

canine obesity (5–7). Yet it is only relatively recently that veterinary researchers have sought to measure the patterns and amounts of physical activity an individual canine undertakes in a given period, in Canada or elsewhere (8–12).

Time spent walking with their owners is only one component of the amount of exercise a dog will receive. Time spent walking is also likely to vary over the canine life course, and as a function of an owner's social and physical environment, capacities, and preferences. Survey-based studies conducted in Australia suggest the duration and frequency of weekly exercise a pet dog receives significantly influence the risks of obesity (8,10). Yet without adequate information about dog-related and socio-demographic characteristics it is

Population Health Intervention Research Centre, University of Calgary, Alberta, Canada (Degeling, Burton, McCormack); Centre for Values, Ethics, and the Law in Medicine, University of Sydney, Australia (Degeling).

Address all correspondence to Dr. Chris Degeling; telephone: +61 2 90363420; fax: +61 29036 3436; e-mail: [cjdegeli@ucalgary.ca](mailto:cjdegeli@ucalgary.ca); Web site: <http://www.ucalgary.ca/phirc>

Dr. Degeling's current address is: The Centre for Values, Ethics and the Law in Medicine, School of Public Health, The University of Sydney, Level 1, Medical Foundation Building K25, NSW, Australia, 2006.

Received July 16, 2011. Accepted September 4, 2011.

not possible to evaluate the relative importance of canine physical activity to modifiable disease risks, and thereby canine health (4). In this study we begin to address aspects of this gap in knowledge. Our starting point is a recent population health investigation of seasonal dog-walking patterns in Calgary where it was found that the average time dog owners themselves spent walking for recreation (including walking pet dogs) in a week was approximately 214 min during the summer and approximately 253 min during the winter (13). However, evidence continues to emerge that the health of pet dogs often reflects the health and activity patterns of their owners (11,14). Specifically, compared with owners who do not walk their dogs, owners who regularly walk their dogs are more likely to accumulate physical activity at levels sufficient to provide optimal human health benefits (15). The aim of this study was to examine the extent to which dog exercise requirements and socio-demographic factors are associated with the frequency and time dogs typically spend walking with their owners during winter in Calgary. Understanding the role of socio-demographic and dog-related factors, such as dog-exercise requirements, on dog-walking behaviors is essential for helping veterinarians and dog owners develop effective strategies to prevent and manage canine obesity, and subsequently influence human health.

Participants for this study were recruited through the EcoEUFORIA (Economic Evaluation of using Urban Form to Increase Activity) project — specifically from the winter survey (16). A random sample of participants ( $n = 2223$ ; response rate = 36.7%) completed telephone interviews during January through April of 2008. A subset of participants ( $n = 927$ ) also completed a self-administered postal questionnaire. Only respondents who completed both the telephone interview and self-administered postal questionnaire and who reported being dog owners ( $n = 268$ ) were included in the current study.

Socio-demographic characteristics collected include: age, sex, type of residence (detached or attached including apartments, duplexes, fourplexes, and bachelor suites), highest level of education achieved (tertiary including university/college degree/diploma, or high school or less), and annual gross household income (< \$79 999, \$80 000 to 1 399 999,  $\geq$  \$140 000, or unknown/missing).

Dog characteristics were measured by asking respondents how many dogs live in their household and the dog breed(s). Using the Canadian Kennel Club (CKC) (17) and British Kennel Club (BKC) (18) standards, this information was codified into 3 separate variables; breed group, size, and exercise requirements. Breed group and size were used for descriptive purposes only, while exercise requirements were examined in relation to dog walking behavior. Breed groups recognized by the CKC and BKC (in brackets) include sporting (gundogs), hounds, working, terriers, toys, non-sporting (utility), or herding dogs (pastoral). Mixed breed dogs were categorized as multiple breed types (e.g., terrier/hound). Using the BKC standards dogs were separated into size categories of small, medium, large, extra large, or multiple sizes (i.e., for owners who had multiple dogs or different sizes of dogs). For cross-breeds where the size of the dog could not be determined, dog size was coded as missing. Finally dogs were categorized according to BKC recommendations of exercise requirements of little (< 30 min/d), moderate ( $\leq$  1 h/d), or considerable (> 2 h/d). To account for owning multiple dogs,

exercise requirements for 2 or more dogs were combined into new multiple breed exercise requirement variable. Number of dogs owned was coded into 1 dog, or 2 or more dogs.

Respondents reported the frequency and minutes they spent walking or jogging with dog(s) in a usual week. Time spent dog walking was recoded into < 150 *versus*  $\geq$  150 min/wk. The cut-point of 150 min/wk is based on the minimum amount of daily moderate-intensity physical activity necessary for humans to accrue optimal health benefits. Items measuring dog-walking frequency and duration have been found to have acceptable levels of test-retest reliability (interclass correlations = 0.98 and 0.94, respectively) as well as face and construct validity (19).

Poisson log-linear regression was used to estimate the log of dog-walking frequency in a usual week associated with dog-related (i.e., number of dogs owned and exercise requirements) and socio-demographic factors (i.e., gender, age, income, education, and housing type). Binary logistic regression was used to estimate the associations between dog-related and socio-demographic factors and achieving 150 min of dog walking in a usual week. Both unadjusted and adjusted estimates were calculated.  $P$ -values < 0.05 were considered statistical significant; IBM™ SPSS software (version 19) was used to conduct the analysis.

The sample of dog owners consisted mostly of women, those residing in detached housing, and owning only one dog. The mean age of respondents was 50.1 [standard deviation (SD) = 12.9] years. The most common breed types were Sporting (23.1%) and Non-sporting (20.5%). Owners took their dogs for walks on average 5.4 (SD = 4.7) times in a usual week and more than half the owners walked their dogs for at least 180 min/wk (median time). While 10% of owners reported that they did not walk their dogs at all, others walked their dogs up to 28 times per week. The majority of owners in the sample (57.5%) walked their dogs for more than 150 min/wk (Table I).

Complete data were available for  $n = 241$  dog owners. Our results suggest that the owner's gender, age, income, and education and the number of dogs owned are not significantly associated with frequency of dog walking (Table II). However, adjusting for all other factors, dog owners residing in attached homes walked their dogs approximately 1.47 (or  $e^{0.38}$ ) more times per week than dog owners who resided in detached homes ( $P < 0.05$ ). Compared with dogs that required little exercise, dogs that required considerable exercise were walked more frequently; however, this difference approached statistical significance only ( $e^{0.28}$  or 1.33 more times per week,  $P = 0.07$ ) (Table II). McFadden's  $r$ -squared was low ( $r^2 = 0.03$ ) for the fully adjusted Poisson regression model suggesting other unmeasured factors might be important for determining dog walking frequency.

With regard to duration, women were twice as likely than men to achieve 150 min of dog walking in a usual week (OR = 2.02;  $P < 0.05$ ) (Table II). Owners of dogs that required considerable exercise (i.e., > 2 h/d) were also twice as likely to achieve this level of dog walking compared with owners of dogs that required little exercise (OR = 2.02;  $P < 0.05$ ). Moreover, a positive linear trend between the level of dog exercise required and the likelihood of achieving 150 min of dog walking in a usual week was also observed ( $P < 0.05$ ). McFadden's  $r$ -squared was low ( $r^2 = 0.06$ ) for the fully-adjusted logistic regression model suggesting other unmeasured

**Table I. Descriptive statistics of socio-demographics, dog characteristics, and dog-walking behavior**

| Variable                                 |                                   | N   | %    | Mean (SD)   |
|--|-----------------------------------|-----|------|-------------|
| <b>Socio-demographics</b>                |                                   |     |      |             |
| Gender                                   | Men                               | 84  | 31.3 |             |
|  | Women                             | 184 | 68.7 |             |
| Age (years)                              |                                   | 268 | 100  | 50.1 (12.9) |
| Annual gross household income            | ≤ 79 999                          | 82  | 30.6 |             |
|  | 80 000 to 139 999                 | 84  | 31.3 |             |
|  | ≥ 140 000                         | 66  | 24.6 |             |
|  | NA                                | 36  | 13.4 |             |
| Highest education achieved               | ≤ High school                     | 86  | 32.1 |             |
|  | University/college degree/diploma | 181 | 67.5 |             |
|  | NA                                | 1   | 0.4  |             |
| House type                               | Detached                          | 233 | 83.2 |             |
|  | Attached                          | 41  | 15.3 |             |
|  | NA                                | 4   | 1.5  |             |
| <b>Dog characteristics</b>               |                                   |     |      |             |
| Number of dogs owned                     | 1                                 | 212 | 79.1 |             |
|  | ≥ 2                               | 56  | 20.9 |             |
| Breed type                               | Sporting                          | 62  | 23.1 |             |
|  | Hound                             | 13  | 4.9  |             |
|  | Working                           | 15  | 5.6  |             |
|  | Terrier                           | 24  | 9.0  |             |
|  | Toy                               | 23  | 8.6  |             |
|  | Non-sporting                      | 55  | 20.5 |             |
|  | Herding                           | 35  | 13.1 |             |
|  | Cross-breeds                      | 20  | 7.6  |             |
|  | NA                                | 21  | 7.8  |             |
| Breed exercise recommendations           | Little (< 30 min/d)               | 50  | 18.7 |             |
|  | Moderate (up to 1 h/d)            | 96  | 35.8 |             |
|  | Considerable (> 2 h/d)            | 100 | 37.3 |             |
|  | NA                                | 22  | 8.2  |             |
| Dog size                                 | Small                             | 72  | 26.9 |             |
|  | Medium                            | 78  | 28.7 |             |
|  | Large                             | 88  | 32.8 |             |
|  | Multiple sizes <sup>a</sup>       | 12  | 4.5  |             |
|  | NA                                | 19  | 7.1  |             |
| Frequency of dog walking in a usual week | Total                             | 266 | 98.5 | 5.4 (4.7)   |
|  | NA                                | 4   | 1.5  |             |
| Time spent dog in a usual week           | < 150 min                         | 114 | 42.5 |             |
|  | ≥ 150 min                         | 154 | 57.5 |             |

<sup>a</sup> Multiple sizes reflect cases where owners have 2 or more dogs of different sizes.

NA — not available (unknown or missing), N — total number, SD — standard deviation, h — hour(s), d — day(s), min — minute(s).

**Table II. Associations between socio-demographic and dog characteristics and achieving  $\geq 150$  minutes of dog walking (logistic regression) and frequency of dog walking (Poisson log-linear regression) in a usual week ( $n = 241$ )**

|   | Achieving $\geq 150$ min of dog walking<br>in a usual week |                                      | Frequency of dog walking<br>in a usual week |                                     |
|---|--|--------------------------------------|---|-------------------------------------|
|   | Unadjusted<br>OR (95% CI)                                  | Adjusted OR<br>(95% CI) <sup>b</sup> | Unadjusted<br>B (05% CI)                    | Adjusted<br>B (95% CI) <sup>b</sup> |
| <b>Socio-demographics</b>                         |  |                                      |   |                                     |
| Gender  |  |                                      |   |                                     |
| Men   | Ref.   | Ref.                                 | Ref.  | Ref.                                |
| Women   | 2.02 (1.18, 3.46) <sup>a</sup>                             | 2.52 (1.26, 4.03) <sup>a</sup>       | -0.07 (-0.29, 0.16)                         | -0.02 (-0.25, 0.21)                 |
| Age (years)                                       | 1.02 (0.99, 1.04)  | 1.02 (0.99, 1.04)                    | 0.01 (-0.00, 0.01)                          | 0.01 (-0.00, 0.01)                  |
| Annual gross household income                     |  |                                      |   |                                     |
| $\leq$ \$79 999                                   | Ref.   | Ref.                                 | Ref.  | Ref.                                |
| \$80 000 to 139 999                               | 0.82 (0.44, 1.56)  | 0.81 (0.41, 1.64)                    | -0.13 (-0.40, 0.13)                         | -0.06 (-0.34, 0.21)                 |
| $\geq$ \$140 000                                  | 0.85 (0.43, 1.56)  | 0.76 (0.35, 1.64)                    | 0.00 (-0.28, 0.28)                          | 0.05 (-0.24, 0.34)                  |
| NA  | 1.33 (0.57, 3.10)  | 1.31 (0.54, 3.18)                    | -0.20 (-0.56, 0.15)                         | -0.13 (-0.48, 0.23)                 |
| Highest education achieved                        |  |                                      |   |                                     |
| University/college/degree/<br>diploma/certificate | Ref.   | Ref.                                 | Ref.  | Ref.                                |
| High school or less                               | 1.52 (0.89, 2.62)  | 1.45 (0.78, 2.70)                    | 0.08 (-0.15, 0.32)                          | 0.02 (-0.23, 0.27)                  |
| House type  |  |                                      |   |                                     |
| Detached  | Ref.   | Ref.                                 | Ref.  | Ref.                                |
| Attached  | 1.20 (0.59, 2.42)  | 1.30 (0.60, 2.85)                    | 0.40 (0.16, 0.66) <sup>a</sup>              | 0.39 (0.12, 0.66) <sup>a</sup>      |
| <b>Dog characteristics</b>                        |  |                                      |   |                                     |
| Number of dogs owned                              |  |                                      |   |                                     |
| 1   | Ref.   | Ref.                                 | Ref.  | Ref.                                |
| $\geq 2$  | 0.78 (0.41, 1.40)  | 0.91 (0.47, 1.77)                    | -0.10 (-0.37, 0.17)                         | -0.05 (-0.32, 0.22)                 |
| Breed exercise recommendations                    |  |                                      |   |                                     |
| Little (< 30 min/d)                               | Ref.   | Ref.                                 | Ref.  | Ref.                                |
| Moderate (up to 1 h/d)                            | 1.31 (0.67, 2.59)  | 1.26 (0.61, 2.60)                    | 0.19 (-0.11, 0.49)                          | 0.20 (-0.10, 0.51)                  |
| Considerable (> 2 h/d)                            | 2.02 (1.02, 2.59) <sup>a</sup>                             | 2.12 (1.01, 4.72) <sup>a</sup>       | 0.25 (-0.05, 0.54)                          | 0.28 (-0.02, 0.59)                  |

<sup>a</sup>  $P < 0.05$ , NA — Not available (unknown or missing), OR — Odds ratio, Ref. — Reference category.

<sup>b</sup> Adjusted for gender, age, income, education, house type, number of dogs owned, and breed exercise recommendations.

factors might also be important for determining the amount of time owners spend walking their dogs. Differences between the unadjusted and adjusted coefficients estimated from the Poisson and logistic regression models, respectively, were negligible (Table II).

Pet dogs living in attached styles of housing in Calgary were walked more frequently in a usual week than dogs living in a detached house. We found that despite walking their dogs more frequently, owners living in attached residences in Calgary were no more likely to exceed 150 min of dog walking than those in detached types of housing. A possible explanation is that dog owners living in attached style housing, which often do not have backyards, may have to make more frequent walking trips to allow for their pet's need to void regularly. It is also possible that the neighborhood environment may influence how much exercise dogs receive. Studies focusing on human walking behaviors have found that neighborhood characteristics influence how much exercise humans undertake.

The presence of sidewalks, perceived safety, loose dogs, and frequent observation of others engaging in physical activity has consistently been found to affect human physical activity behaviors (20). We also found that, compared with men, women were more likely to achieve at least 150 min of weekly dog walking — consistent with findings elsewhere showing higher levels of walking, including dog walking, among women (21). Our results suggest that the BKC breed exercise requirements do seem to reflect variations in how much walking different dog breed types are reported to receive, if not the actual frequency and amount of time spent on this activity. Breed types requiring little exercise (i.e., small and toy breed dogs) were not found to spend much time walking with their owners. In contrast, owners of breed types recommended to receive a considerable amount of exercise were significantly more likely to receive 150 min or more of dog walking in a usual week. The association between the BKC recommendations and walking frequency approached statistical

significance with frequency of walking being higher for breeds that required considerable exercise. A limitation of the BKC breed exercise requirements is that a category for dog breeds that require exercise for 1 to 2 h/d to maintain optimal health is not included. From the perspective of promoting dog health, this may lead to mixed exercise recommendations for dogs of similar breed, particularly if the BKC exercise requirements are being used by veterinarians as a reference for prescribing dog exercise. Despite this limitation, we found a general positive trend between increases in dog-exercise requirements and dog walking behavior which has implications for promoting both canine and human health.

Several other limitations of this study should be considered when interpreting our findings. Data for this study were self-reported so individuals may have inaccurately estimated the frequency and time spent walking their dogs in a usual week. Furthermore, only winter patterns of dog walking behavior were examined. Our previous work suggests, however, that participation and time spent in recreational walking among Calgary dog-owners remains consistent from winter to summer (13). Respondents were randomly selected for the telephone survey; however, respondents then volunteered to complete the postal survey — this might have reduced the external validity of our findings. Moreover, our sample on average was middle-aged and consisted mainly of women thus limiting the generalizability of our findings. The study was cross-sectional and therefore causality cannot be inferred. Some analyses were also limited by the owner's knowledge of dog breeds.

Our findings that housing type is associated with frequency of dog walking and owner gender associated with time spent dog-walking are of significance to veterinarians practicing in Canada. If veterinarians are to help prevent and manage a canine "lifestyle" disease (obesity), awareness of the effects of the social and physical environment needs to factor into discussions on canine obesity. It is also noteworthy that few dog owners in Calgary walk their animals in accordance with BKC recommendations. The BKC suggests that many popular dog breeds require in excess of 2 h exercise a day (upwards of 840 min/wk). Only 8 respondents in our sample walked their dogs for more than 840 min/wk. Although there are other forms of canine exercise, our sample was taken during a Calgary winter when time spent walking is likely to be the most significant component of the dogs' physical activity. That said, the average amount of time spent dog walking reported in our study is comparable with other studies published in the veterinary and human health literature (10,22,23,24). It is difficult to find anything more than anecdotal advice on how much exercise dogs kept in apartments and those with access to a yard should receive, or indeed the exercise requirement of different breeds of dog. What this points to is a need for further research that examines the different determining factors of frequency, duration, and intensity of physical activity specific to the variation among dog breeds.

## Acknowledgments

This study is part of the EcoEUFORIA project funded by the Canadian Institutes for Health Research (CIHR). Chris Degeling is funded through a *University of Calgary Veterinary Medicine Postdoctoral Entrance Award* and support from *Alberta Innovates — Health Solutions*

*Establishment and Incentive Grants*. Gavin McCormack was supported by a CIHR Fellowship. Lindsay Burton's contributions were undertaken for a research practicum in the O'Brien Centre for the BHSc at the University of Calgary.

## References

1. German AJ. The growing problem of obesity in dogs and cats. *J Nutr* 2006;136:1940S–6.
2. Lund EMA, Armstrong PJ, Kirk CA, Klausner JS. Prevalence and risk factors for obesity in adult dogs from private US veterinary practices. *Intern J Appl Res Vet Med* 2006;4:177–186.
3. Laflamme DP. Understanding and managing obesity in dogs and cats. *Vet Clin N Am-Small* 2006;36:1283–1295.
4. Roudebush P, Schoenherr WD, Delaney SJ. An evidence-based review of the use of therapeutic foods, owner education, exercise, and drugs for the management of obese and overweight pets. *J Am Vet Med Assoc* 2008;233:717–725.
5. Rohlf VI, Toukhsati S, Coleman GJ, Bennett PC. Dog obesity: Can dog caregivers' (owners') feeding and exercise intentions and behaviors be predicted from attitudes? *J Appl Anim Welf Sci* 2010;13:213–236.
6. Bosch G, Verbrugghe A, Hesta M, et al. The effects of dietary fibre type on satiety-related hormones and voluntary food intake in dogs. *Br J Nutr* 2009;102:318–325.
7. Bland IM, Guthrie-Jones A, Taylor RD, Hill J. Dog obesity: Veterinary practices' and owners' opinions on cause and management. *Prev Vet Med* 2010;94:310–315.
8. Bland IM, Guthrie-Jones A, Taylor RD, Hill J. Dog obesity: Owner attitudes and behaviour. *Prev Vet Med* 2009;92:333–340.
9. Chan CB, Spierenburg M, Ihle SL, Tudor-Locke C. Use of pedometers to measure physical activity in dogs. *J Am Vet Med Assoc* 2005;226:2010–2015.
10. Robertson ID. The association of exercise, diet and other factors with owner-perceived obesity in privately owned dogs from metropolitan Perth, WA. *Prev Vet Med* 2003;58:75–83.
11. Courcier EA, Thomson RM, Mellor DJ, Yam PS. An epidemiological study of environmental factors associated with canine obesity. *J Small Anim Pract* 2010;51:362–57.
12. Yam PS, Penpraze V, Young D, et al. Validity, practical utility and reliability of Actigraph accelerometry for the measurement of habitual physical activity in dogs. *J Small Anim Pract* 2011;52:86–91.
13. Lail P, McCormack G, Rock M. Does dog-ownership influence seasonal patterns of neighbourhood-based walking among adults? A longitudinal study. *BMC Public Health* 2011;11:148.
14. Nijland ML, Stam F, Seidell JC. Overweight in dogs, but not in cats, is related to overweight in their owners. *Public Health Nutr* 2010;13:102–106.
15. Cutt H, Giles-Corti B, Knuiman M. Encouraging physical activity through dog walking: Why don't some owners walk with their dog? *Prev Med* 2008;46:120–126.
16. McCormack GR, Friedenreich C, Shiell A, Giles-Corti B, Doyle-Baker PK. Sex- and age-specific seasonal variations in physical activity among adults. *J Epidemiol Community Health* 2010;64:1010–1016.

17. Canadian Kennel Club. CKC breed standards. [homepage on the Internet] Available from <http://www.ckc.ca/en/> Last accessed May 29, 2012.
18. The Kennel Club (UK). Dog breed standards: Suitability grid. [homepage on Internet] Available from [www.thekennelclub.org.uk](http://www.thekennelclub.org.uk) Last accessed May 29, 2012.
19. Cutt H, Giles-Corti B, Wood L, Knuiman M. Barriers and motivators for owners walking their dog: Results from qualitative research. *Health Promot J Austr* 2008;19:118–124.
20. Trost SG, Owen N, Bauman AE, Sallis JF, Brown W. Correlates of adults' participation in physical activity: Review and update. *Med Sci Sports Exerc* 2002;34:1996–2001.
21. Suminski RR, Poston WSC, Petosa RL, Stevens E, Katzenmoyer LM. Features of the neighborhood environment and walking by U.S. adults. *Am J Prev Med* 2005;28:149–155.
22. Hoerster KD, Mayer JA, Sallis JF, Pizzi N, Talley S, Pichon LC, Butler DA. Dog walking: Its association with physical activity guideline adherence and its correlates. *Prev Med* 2011;52:33–38.
23. Schofield G, Mummery K, Steele R. Dog ownership and human health-related physical activity: An epidemiological study. *Health Promot J Austr* 2005;16:15–19.
24. Cutt H, Giles-Corti B, Knuiman M, Burke V. Dog ownership, health and physical activity: A critical review of the literature. *Health & Place* 2007;13:261–72.