

Physical Activity Behavior of Dog Owners: Development and Reliability of the Dogs and Physical Activity (DAPA) Tool

Hayley E. Cutt, Billie Giles-Corti, Matthew W. Knuiman,
and Terri J. Pikora

Background: This study aimed to develop a reliable instrument, the Dogs and Physical Activity (DAPA) tool, for measuring important attributes and scales relating to the dog-walking behavior of dog owners. **Methods:** Items measuring dog-specific individual, social environmental, physical environmental, and policy-related factors that affect dog owners' walking with their dogs were assessed for test-retest reliability. Factor analysis was undertaken to demonstrate that the collection of test items had underlying constructs consistent with the theoretical framework. **Results:** DAPA-tool items had test-retest reliability scores $>.7$, indicating a high level of stability. Distinct general and dog-specific constructs of subscales measuring dog-supportive features of parks, barriers to dog walking, and behavioral beliefs about the outcomes of regular dog walking were demonstrated through factor analysis. **Conclusions:** The DAPA tool is the first comprehensive, reliable tool for measuring important attributes and scales relating to dog owners' physical activity and the context-specific factors that affect owners' walking with their dogs.

Keywords: walking, exercise, pet ownership, environment, reproducibility of results

Increasing levels of overweight and obesity accompanied by low levels of physical activity are a major public health concern in many industrialized countries.¹⁻³ The link between physical inactivity and disease has been shown for a number of diseases, including cardiovascular disease, type 2 diabetes, and some cancers.⁴

Social support is one variable that has consistently been associated with physical activity.⁵⁻⁸ Social support is usually a measure of the support provided by family, friends, and coworkers. Another form of instrumental and emotional support, which has received less attention, however, is the support provided by companion animals. One study that included pets as a form of social support found that women who reported no company or pet to walk with were 31% less likely to walk for exercise or recreation.⁹ There is a large potential for dogs to provide

an important form of social support for regular walking because almost half of all households in both the United States and Australia own dogs.^{10,11}

A handful of studies have compared dog owners' and nonowners' levels of physical activity.¹² Most of these studies have found that dog owners engage in more physical activity than nonowners and are more likely to exercise at the recommended level of 150 minutes per week.^{1,13} Other studies, however, found that up to half of dog owners in Australia do not walk their dogs.^{14,15} Declining levels of physical activity, coupled with high levels of dog ownership in industrialized countries, highlight the need to examine the potential of dog ownership to increase physical activity levels in the community and the importance of investigating the individual, social environmental, physical environmental, and policy-related factors that affect owners' walking with their dogs.

Considering the fact that a large proportion of the community owns dogs but up to half do not walk their dogs, the public health implications of increasing the physical activity level of even a small percentage of dog owners could be significant.¹⁴ Thus, understanding the factors that affect owners' walking with their dogs is important for developing appropriate interventions. Although a number of instruments have been developed to measure physical activity in general¹⁶ and the exercise behavior of dogs,¹⁷ none of these use dog-specific variables or take into account the owner–dog relationship or the wider built environment and policy-related factors that might influence owners' walking *with* their dogs. The aim of this study was to develop and test the reliability of a tool for measuring owners' dog-walking behavior and the individual, social, and physical environmental factors that affect dog owners' walking with their dogs in public places.

Methods

Theoretical Model Used to Guide Development of the DAPA Tool

The theory of planned behavior (TPB) was used as a theoretical framework in designing items to measure the factors that relate to walking with a dog. The TPB¹⁸ is well established¹⁹ and has been successfully used to predict general physical activity behavior.²⁰⁻²³ A recent study found that the constructs of intention and perceived behavioral control explained 13% of the variance in walking behavior, with dog obligation adding another 11%.²⁴ Dog obligation measured the level of obligation or responsibility for walking a dog. This study was the first to use the TPB to examine individual factors affecting dog owners' walking and was the first to have identified a dog-specific factor, dog obligation, as important in explaining owners' walking behavior. It is likely, however, that the predictive capacity of the TPB could be improved if behavior-specific (dog walking) and context-specific (walking the dog for recreation in the neighborhood) variables were measured.²⁵

This current research combined the TPB with the social-ecological model to provide a holistic framework to guide the development of items measuring important attributes and subscales relating to the walking behavior of dog owners (Figure 1). Recently there has been a considerable effort to look beyond the individual determinants of physical activity and explore the effect of the environment. Interventions

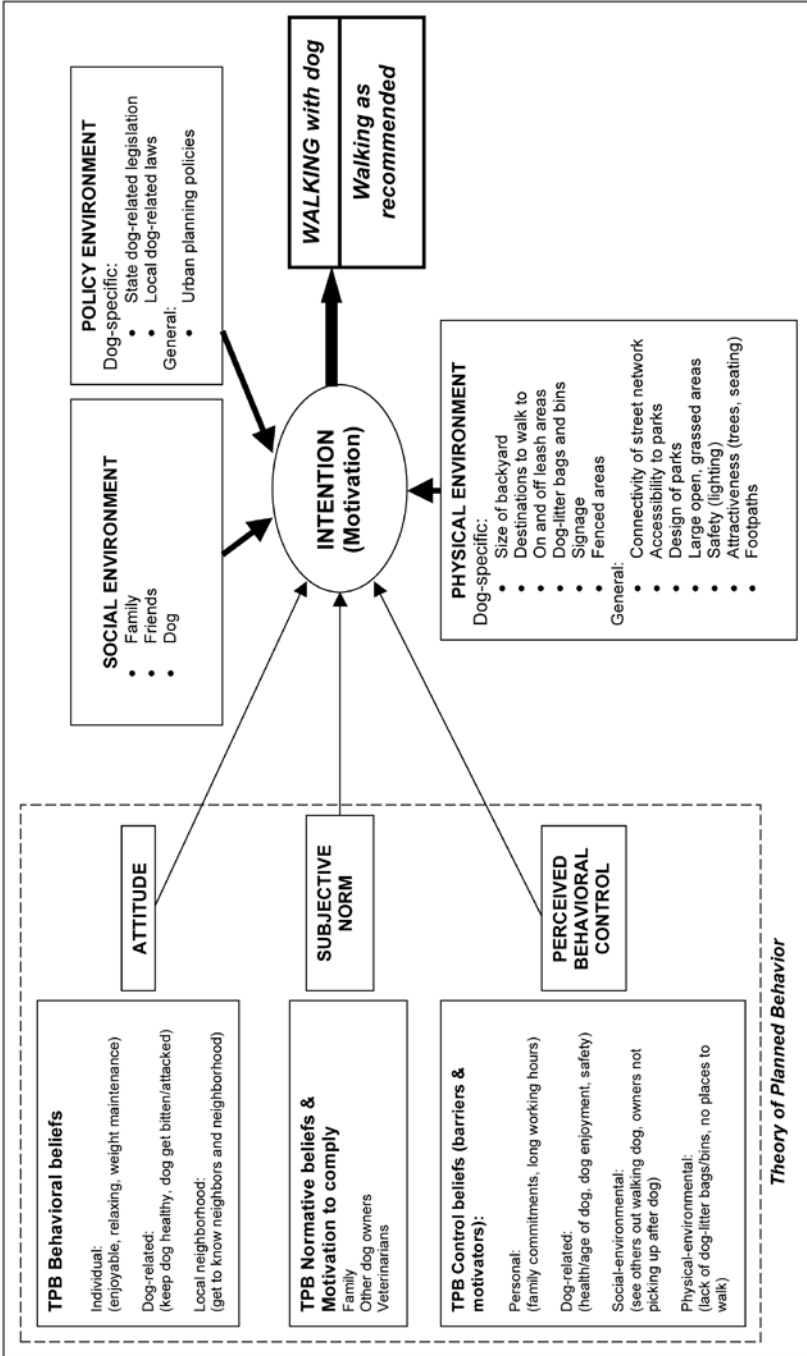


Figure 1 — Theoretical model of the relationship between dog ownership and walking.

that focus on the environmental influences on physical activity have the potential to reach a much wider audience.²⁶ Social-ecological models^{27,28} are being used in physical activity research to explain the direct effect of the environment on people's behavior and its interaction with individual factors such as those in the TPB.^{29,30} Although there is evidence to show that walking is positively correlated with the social support provided by dogs, it is likely that the effect of the physical^{31,32} and local-policy environment³³ might also be important in predicting dog-walking behavior. Figure 1 shows how the social, policy, and physical environment interact independently of and indirectly through dog-specific TPB constructs to predict dog-walking behavior. This theoretical model was used as the basis for developing items to measure factors affecting dog-walking behavior.

The DAPA Tool

The DAPA (Dogs and Physical Activity) tool consists of 12 questions relating to dog ownership and physical activity. It was developed as a supplementary tool for the second RESIDE (RESIDential Environments) survey. RESIDE is a 5-year longitudinal study of the physical activity levels of people building homes in new housing estates in Western Australia.³⁴ The DAPA items were developed after reviewing relevant literature¹² and examining the results of recent qualitative research. Seven focus groups (n = 60) were conducted with dog owners to explore factors affecting people's walking with their dog. The results of qualitative research, as well as the theoretical model shown in Figure 1, were used to guide the development of items for inclusion in the DAPA tool. A copy of the DAPA tool is available from the first author on request.

The DAPA tool asks about the type of pets owned, and for those who own a dog, the tool asks about the dog's size and weight and the level of attachment of the owner to the dog. A 6-item measure of pet attachment ($\alpha = .58$) developed by Garrity and others³⁵ was included and reworded to be specific to dogs. Research focusing on the relationship between companion animals and families regularly uses 1 item (eg, "my pet (dog) is considered part of the family") to measure pet attachment.³⁶ Thus, this item along with Garrity's 6 items of attachment was used in the current questionnaire to measure the level of owner attachment to his or her dog.

The DAPA tool also includes items measuring participants' physical activity undertaken with their dog(s), who in the household usually walks the dog, and the physical environmental features of parks in the neighborhood. The TPB constructs of attitude (behavioral beliefs), subjective norm (normative beliefs and motivation to comply), and perceived behavioral control (control beliefs) were included and modified to be relevant to walking with a dog daily.

Questions used by Saelens and colleagues³⁷ to measure social support provided by family and friends for walking and other physical activity were modified to add an item measuring the social support provided by dogs.

Sample and Procedure

Before recruitment, the research was approved by the University of Western Australia (UWA) Human Research Ethics Committee (No: RA/4/1/479). Participants were recruited via an e-mail sent to subscribers to the UWA-Events list. UWA-

Events is coordinated by the UWA public-affairs unit and is used to advertise future events to staff and students. It was evident that the original e-mail was forwarded to friends and family members beyond UWA. Within 72 hours of the sending of the recruitment e-mail, 197 current dog owners age 18 years or older who were willing to complete 2 postal surveys had responded. This was deemed a sufficient sample size for the purposes of a test–retest reliability assessment and factor analysis.³⁸ Between July and August 2004, 189 people gave their written informed consent, and the first survey was mailed to participants (8 were ineligible). A total of 173 (91.5%) responded, and approximately 1 week later, 168 second surveys (5 withdrew) were sent by post to participants. Because recruitment was stopped once a sufficient sample size had been obtained (after only 3 days), calculation of the response rate is inappropriate. Of the 197 participants, however, 150 completed both surveys.

Statistical Analysis

SPSS version 12 was used to analyze the data from the test–retest reliability surveys.³⁹ Categorical responses were assessed for reliability using the kappa statistic (κ), and intraclass correlations (ICCs) were used to determine the reliability of quantitative responses. Estimates of reliability were considered to have moderate agreement if the value was from .40 to .60, good agreement if the value was from .61 to .80, and excellent agreement if the value was $>.80$.⁴⁰

Although the primary aim of this study was to test the reliability of the DAPA tool, there was opportunity to undertake factor analysis to assess the factor structure of subscales containing multiple items⁴¹ and to determine if individual items formed underlying constructs as hypothesized in Figure 1. Factor analysis is considered an appropriate method of assessing the construct validity of scales.^{38,42} After cleaning the data and checking for outliers, items that loaded high on a common factor and in the same direction were considered to be assessing a similar construct. The principal-axis factoring method with varimax rotation was used in all factor analyses.

Results

Participants ranged in age from 22 to 70 years (mean = 42 years, SD = 12). Most participants were women (84%) with a bachelor's degree or higher (75%). The DAPA items were assessed by experts such as veterinarians, animal behaviorists, and fellow researchers on the relevance of questions to the research aims and objectives. The items were deemed to have good face validity.

General DAPA Items

As shown in Table 1, participants could reliably recall both the size and the weight of their dogs (ICC = .82–.96). The 7 items measuring owners' levels of attachment to their dogs had good to excellent ICC values (ICC = .65–.92). The modified social support question that included support provided by dogs for walking or other physical activity also had good to excellent reliability (ICC = .67–.90).

Participants very reliably recalled the number of times (ICC = .98) and total time (ICC = .94) they walked or jogged with their dogs in a usual week. Recall of

Table 1 Test–Retest Reliability Results of General DAPA Tool Items

General DAPA items	Intraclass correlation	Kappa statistic (κ)
Dog size		
dog 1	.96	
dog 2	.82	
Dog weight		
dog 1	.82	
dog 2	.91	
Dog attachment ^a		
I consider my dog a friend.	.73	
I talk to my dog.	.67	
Owning a dog adds to my happiness.	.80	
I talk to others about my dog.	.75	
I often play with my dog.	.78	
My dog knows how I feel about things.	.92	
My dog is considered part of the family.	.65	
Social support provided by dog ^b		
went walking with me	.90	
gave me encouragement to go walking	.76	
did other physical activity with me	.67	
gave me encouragement to do other physical activity	.79	
Walking or jogging with dog in neighborhood in a usual week		
frequency	.98	
duration	.94	
proportion of total time ^c walking spent walking with dog		
inside neighborhood	.87	
outside neighborhood	.74	
Main destinations to walk or jog with dog in neighborhood		
beach or river		.72
park, oval, or bush lands		.69
streets (footpaths)		.61

Abbreviation: DAPA, Dogs and Physical Activity.

^a 1 = *strongly disagree*; 5 = *strongly agree*.

^b 1 = *never*; 5 = *very often*.

^c 1 = *none*; 6 = *most of the time*.

the proportion of total time in a usual week spent walking with a dog was reliable for inside (ICC = .87) and outside (ICC = .74) the local neighborhood. In addition, there was good agreement between the test and retest surveys for the main neighborhood destinations to which respondents usually walked or jogged with their dogs ($\kappa = .61-.72$). Participants were asked to indicate whether they had access to areas (eg, parks, beaches, bush land) in their neighborhoods with certain features. All 16 items had good to excellent agreement (ICC = .73-.91, Table 2).

Table 2 Test–Retest Reliability Results for Physical Environmental Features of Local Areas

Physical environmental features ^a	Intraclass correlation
Large open, grassed areas	.74
Paths that provide interesting walks	.83
A fenced area where dogs are allowed to be off the lead	.85
Children's playground separate from dog area	.79
Dog-dropping (poo) bags and bins at entrances and exits	.91
Lighting present	.73
Signs to say if dogs are permitted	.83
Signs to remind people to pick up after their dogs	.85
Signs to say whether dogs are allowed to be <i>on</i> or <i>off</i> the lead	.85
Trees and shrubs for dogs to sniff	.78
Access to drinking water for dogs	.78
Interesting things to look at while walking	.85
Sitting areas with benches	.82
Area is attractive to look at	.86
Area is way from busy roads	.86
A local council that is supportive of people walking their dogs	.82

^a1 = *strongly disagree*; 5 = *strongly agree*.

TPB DAPA Items

Table 3 shows the reliability of items measuring constructs based on the TPB. Items measuring normative beliefs (ICC = .79–.86) and motivation to comply (ICC = .80–.82) had excellent test and retest agreement. Both the barriers (ICC = .68–.89) and motivators (ICC = .65–.80) affecting people's daily walking with their dogs had acceptable reliability. Items measuring behavioral beliefs associated with walking with a dog daily were similarly found to be reliable (ICC = .71–.88).

Factor-Analysis Results

Factor analysis was performed on both the test and the retest data and the factor solutions were found to be similar. Thus, factor-analysis results for only the first test survey are presented here. Tables 4 through 7 show the rotated-factor structure of each subscale, including the items that loaded onto each of the main factors and the variation in those items accounted for by each factor. Only factors that had eigenvalues greater than 1 and were dominant after examination of the scree plot are presented.^{38,43} To assess the construct validity of DAPA subscales, we used the theoretical model to predict that items would load onto single factors for subscales measuring dog attachment, normative beliefs, and motivation to comply and onto general and dog-specific factors for subscales measuring the physical features of dog-walking areas, behavioral beliefs about the outcomes of dog walking, and the

Table 3 Test–Retest Reliability Results of TPB Constructs

TPB construct	Intraclass correlation
Subjective norm	
Normative belief ^a	
Members of my family think I should walk with my dog daily.	.83
Other dog owners think I should walk with my dog daily.	.79
My vet thinks I should walk with my dog daily.	.86
Motivation to comply ^a	
I want to do what most members of my family think I should do.	.82
I want to do what other dog owners think I should do.	.82
I want to do what my vet thinks I should do.	.80
Perceived behavioral control, control beliefs (barriers and motivators) ^b	
the poor health or age of my dog	.79
the difficulty of walking with 2 dogs (as opposed to 1)	.80
my fear of other people's dogs	.83
the shorter days in winter	.87
the weather (eg, too cold, too hot, raining)	.81
not having places to walk to (eg, parks, shops)	.68
dog owners not picking up after their dogs	.72
the unavailability of dog-poo bags	.74
the lack of bins available for dog poo	.77
my family commitments	.75
my long working hours	.89
concern that my backyard is too small	.80
my dog would be unfriendly or difficult to control	.87
my enjoyment of the outdoors	.74
the fact that I feel safe when walking with my dog	.65
seeing other people out walking their dogs	.73
knowing my dog enjoys going for a walk	.66
Attitude, behavioral beliefs ^b	
It would help me to do my own exercise.	.83
It would help me to maintain or lose weight.	.85
It would stop me from feeling guilty.	.80
It would help me to relax.	.75
It would allow me to get to know my neighborhood.	.72
It would help me to get to know my neighbors.	.80
It would be enjoyable.	.88
We would meet uncontrolled dogs that are off the lead.	.82
It would keep my dog healthy.	.71
My dog might get bitten or attacked.	.80
It would reduce (the risk of) my dog barking.	.78
My dog might attack other dogs or people.	.88

Abbreviation: TPB, theory of planned behavior.

^a 1 = *strongly disagree*; 5 = *strongly agree*.

^b 1 = *very unlikely*; 7 = *very likely*.

barriers and motivators for walking with a dog daily. Items that did not load onto a dominant factor were kept in the subscale because they had strong face validity in terms of the theoretical model being tested.

A single factor explained 55.8% of the variance in the dog-attachment items, 66.6% of the variance in the normative-beliefs items, and 68.3% of the variance in the motivation-to-comply items (Table 4). The 16 items used to measure the physical features of dog-walking areas loaded onto 4 factors and explained 61.4% of the total variance in those items (Table 5). The first factor included 6 items measuring the quality of public open space, the second factor included 4 items measuring the presence of dog-related infrastructure in the public open space, the third factor (3 items) related to safety issues for dog owners walking in the public open space, and the final factor included 2 items measuring access to a large, public open space and seating. Only 1 item (presence of lighting) did not load onto any of the main factors.

Items measuring the behavioral beliefs associated with the outcomes of walking with a dog daily also loaded onto 4 factors and explained 67.3% of the total variance in those items (Table 6). The first factor included 3 items measuring the general health and well-being outcomes of walking with a dog daily. The second factor was dog specific and included 3 items measuring the possible negative consequences of coming into contact with antisocial dogs when walking. The third factor (2 items) related to the mental-health benefits of regular dog walking, and

Table 4 Factor-Analysis Coefficients for Dog-Attachment and Subjective-Norm Subscales

Item	Factor coefficient	Percentage variance accounted for
Dog attachment		55.8%
Owning a dog adds to my happiness.	.820	
My dog is considered part of the family.	.722	
I consider my dog to be a friend.	.722	
I talk to others about my dog.	.702	
I talk to my dog.	.685	
My dog knows how I feel about things.	.627	
I often play with my dog.	.579	
Normative beliefs		66.6%
Other dog owners think I should walk with my dog daily.	.786	
My vet thinks I should walk with my dog daily.	.727	
Members of my family think I should walk with my dog daily.	.608	
Motivation to comply		68.3%
I want to do what other dog owners think I should do.	.797	
I want to do what most members of my family think I should do.	.759	
I want to do what my vet thinks I should do.	.619	

Table 5 Factor-Analysis Coefficients for Physical Features of Dog-Walking Areas

Item	Factor 1 coefficients: Quality of public open space	Factor 2 coefficients: Dog- management infrastructure	Factor 3 coefficients: Safety	Factor 4 coefficients: Large public open space with seating
Interesting things to look at while walking	.819	.227	.156	-.009
Attractive area to look at	.803	.244	.048	.137
Paths that provide interesting walks	.703	.249	.340	-.001
Trees and shrubs for dogs to sniff	.494	-.166	.303	.122
A local council that is supportive of people walking their dogs	.428	-.023	.112	.419
Access to drinking water for dogs	.401	.322	.375	.203
Signs to say whether dogs are allowed to be <i>on</i> or <i>off</i> the lead	.065	.782	.188	-.097
Signs to say if dogs are permitted	.157	.758	.020	-.015
Signs to remind people to pick up after their dogs	.039	.749	.029	.224
Dog-dropping (poo) bags and bins at entrances and exits	.122	.591	.164	.243
A fenced area where dogs are allowed to be off the lead	.095	.357	.625	.105
Children's playground separate from dog area	.188	.357	.449	.209
Area away from busy roads	.217	-.0025	.436	.086
Large open, grassed areas	-.025	.100	.101	.577
Sitting areas with benches	.488	.155	.182	.564
Lighting present	.146	.205	.137	.019
Percentage variance accounted for	32.8%	13.6%	8.1%	7.0%
Cumulative percentage of variance	32.8%	46.4%	54.5%	61.4%

Note. Boldface coefficient = an item that best measures a particular construct/factor.

Table 6 Factor-Analysis Coefficients for Perceived Behavioral Outcomes of Walking With a Dog Daily

Item	Factor 1 coefficients: General health and well-being	Factor 2 coefficients: Confrontations with dogs	Factor 3 coefficients: Mental health	Factor 4 coefficients: Neighborhood
It would help me to maintain or lose weight.	.868	-.075	.185	.211
It would help me to do my own exercise.	.787	-.002	.187	.053
It would stop me from feeling guilty.	.426	-.097	.048	.209
My dog might get bitten or attacked.	-.038	.871	.071	-.033
We would meet uncontrolled dogs that are off the lead.	-.020	.721	.028	-.048
My dog might attack other dogs or people.	-.084	.538	.165	.106
It would be enjoyable.	.047	.184	.906	.126
It would help me to relax.	.259	.073	.581	.293
It would help me to get to know my neighbors.	.200	.072	.114	.790
It would allow me to get to know my neighborhood.	.174	-.026	.177	.788
It would reduce (the risk of) my dog barking.	.326	-.244	.297	.232
It would keep my dog healthy.	.247	.092	.345	.010
Percentage variance accounted for	29.0%	18.9%	10.3%	9.1%
Cumulative percentage of variance	29.0%	47.9%	58.2%	67.3%

Note. Boldface coefficient = an item that best measures a particular construct/factor.

Table 7 Factor-Analysis Coefficients for Barriers and Motivators for Walking With a Dog Daily

Items	Factor 1 coefficients: Weather and work- or family- commitment barriers	Factor 2 coefficients: Dog-litter barriers	Factor 3 coefficients: Enjoyment for self and dog, safety motivators	Factor 4 coefficients: Negative- dog-behavior barriers	Factor 5 coefficients: Physical and social environmental motivators
The shorter days in winter	.836	.142	.148	.185	-.064
The weather (eg, too cold, too hot, raining)	.768	.086	.074	.262	-.169
My long working hours	.742	.090	-.065	.036	-.078
My family commitments	.594	.232	-.139	.112	-.151
The unavailability of dog-poo bags	.205	.915	.027	.144	.030
The lack of bins available for dog poo	.185	.912	-.002	.128	-.036
Dog owners not picking up after their dogs	.087	.700	-.057	.077	-.247
The fact that I feel safe when walking with my dog	-.042	-.122	.600	-.074	.247
My enjoyment of the outdoors	.005	.019	.583	.016	.062
Knowing my dog enjoys going for a walk	.079	.072	.396	.039	.293
The poor health or age of my dog	.030	.020	-.370	.147	.166
Difficulty of walking with 2 dogs (as opposed to 1)	.140	.104	-.118	.566	-.038
My fear of other people's dogs	.060	.075	-.140	.549	-.083
My dog would be unfriendly or difficult to control	.147	.068	.108	.519	-.005
Not having places to walk to (eg, parks, shops)	.211	.305	-.204	.153	-.476
Concern that my backyard is too small	-.099	-.020	.008	-.021	.466
Seeing other people out walking their dogs	-.289	-.193	.236	-.115	.439
Percentage variance accounted for	26.0%	11.8%	10.3%	8.3%	6.9%
Cumulative percentage of variance	26.0%	37.8%	48.1%	56.4%	63.1%

Note. Boldface coefficient = an item that best measures a particular construct/factor.

the final factor (2 items) measured neighborhood benefits of walking with a dog daily. Two dog-specific outcomes of walking with a dog daily (keeping the dog healthy and reducing risk of barking) did not load onto any of the main factors. These items were kept in the subscale because they were of theoretical importance and had face validity.

Finally, the barriers and motivators for walking with a dog daily loaded onto 5 main factors and explained 63.1% of the total variance in those items (Table 7). Four items loaded onto a factor measuring common barriers to physical activity generally, such as poor weather and work commitments. Dog litter barriers included 3 items and loaded onto the second factor. The third factor included 4 items related to motivators for walking with a dog, and the fourth factor (3 items) related to negative-dog-behavior barriers. The final factor (3 items) captured aspects of the physical environment, such as having destinations to walk to, and social norms in relation to seeing other people out walking their dogs.

Discussion

To the best of our knowledge, the DAPA tool is the first attempt to develop a comprehensive instrument to measure the dog-walking behavior of dog owners within and outside their neighborhoods and the factors that have the potential to influence whether dog owners walk with their dogs. This study is important because physical activity is declining globally, dog ownership is high in many countries, and dogs are now being recognized as a major source of social support that might assist owners in increasing their levels of physical activity.^{9,12,44} Furthermore, little is known about why such a large proportion of dog owners do not walk their dogs and what might motivate them to do so regularly. The results show that the DAPA-tool items are reliable and form general and dog-specific constructs associated with the theoretical model of dog-walking behavior. Most items in the DAPA tool had test-retest reliability scores $>.70$, suggesting a high level of stability.

The results confirm that dog owners can reliably recall the weight and size of their dogs, the level of attachment to their dogs, and the amount of walking they do with their dogs in a usual week. A number of instruments measuring general physical activity at the population level have been found to be reliable.^{16,34} This study demonstrates that general measures of physical activity can be modified to be specific to dog walking and can be reliably used to assess the physical activity behavior of a subgroup of the population (dog owners).

The TPB was used to guide the development of dog-specific questions measuring the individual determinants of walking with a dog.¹⁸ The overall utility of the TPB for predicting general physical activity behavior is supported in the literature.^{20,22,23,45} Attitude, subjective norm, and perceived behavioral control together explain up to 42% of the variation in intention to exercise.²⁰ Furthermore, a study by Brown and Rhodes²⁴ found that the constructs of intention and perceived behavioral control explained 13% of the variance in walking behavior with an additional 11% variance being explained by dog obligation. Although these results are promising, the predictive capacity of the TPB could be improved if behavior-specific (dog walking) TPB constructs were used to predict dog-walking behavior rather than walking in general.

The results of the current study suggest that the TPB constructs of attitude, subjective norm, and perceived behavioral control are reliable and have face validity. The factor-analysis results showed that a number of general and dog-specific key factors emerged and were similar to those predicted in Figure 1, thus confirming the construct validity of these subscales.

Finally, items measuring the potential social and physical environmental factors affecting dog owners' walking with their dogs were found to be reliable and to have face and construct validity. Items that were specific to dog walking were just as reliable as those relating to physical activity in general. These results are important because a mix of both general and dog-specific environmental factors might be important in predicting dog-walking behavior. The social-ecological model is increasingly being used in research and practice to predict and influence physical activity behavior.^{25,46-48} The results of the current study highlight the importance of including such factors so that we might better understand dog-walking behavior.

Study Limitations

Women were overrepresented in the sample, and this might limit the generalizability of some of the exploratory factor-analysis results. For example, the overrepresentation of women might have influenced the inclusion of the "feelings of being safe when walking with a dog" item in the factor "enjoyment for self and dog motivators." The representativeness of the study was enhanced by the fact that nearly one-third (31%) of participants recruited were from outside the university setting after the recruitment message was forwarded by UWA employees to family and friends. Nevertheless, by general-population standards, the sample was relatively highly educated. Future studies might wish to assess the reliability and validity of the DAPA tool with other subgroups of the dog-owning population (eg, children, elderly, socially isolated).

Conclusions

In summary, the DAPA tool is the first questionnaire of its kind and is a reliable tool for measuring the amount of physical activity people do with their dogs and the potential individual and environmental factors that might affect walking with a dog in public. The predictive capacity of the DAPA tool is enhanced because the items are both behavior specific (dog walking) and context specific (eg, walking with a dog for recreation in the neighborhood). The results of factor analysis suggest that there are distinct subscales relating to the physical features of parks that are conducive to dog walking, the barriers to regular dog walking, and the behavioral beliefs about the outcomes of regular dog walking. In view of the high level of dog ownership in the community, this tool could be used to understand factors that influence people to walk with their dogs and develop innovative and effective interventions to increase physical activity levels.

Acknowledgments

This research was funded by an Australian Research Council Linkage grant (Grant No. LPO455453). The first author (Hayley Cutt) is supported by an Australian Research Council, Australian Postgraduate Award—Industry, which has Petcare Information

and Advisory Service as the industry partner. The second author is supported by a NHMRC/NHF Career Development Award (Grant No. 254688). Julie Pheasant is gratefully acknowledged for her illustrations, which were used for the dog size and weight survey items.

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