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# Physical Activity and Welfare of Guide Dogs and Walking Activity of Their Partners

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**ABSTRACT** Appropriate physical activity is beneficial for physical and psychosocial wellbeing, and it is recommended for people to have 30 minutes of activity on most days of the week, to yield 150 minutes per week. Getting sufficient physical activity particularly challenges people with visual disabilities, and few health-promotion interventions have focused on adults with this disability. Recently, dog walking has been promoted in communities as a way to increase people's physical activity. We surveyed guide-dog partners to assess whether their guide dogs facilitated walking. We also assessed the welfare of these dogs, including their physical activity and social interactions with other dogs and people, especially as there is some concern that these dogs have too little freedom. For comparison, we assessed large and small companion dogs and their handlers, as well. A web-based survey was conducted among people living with guide dogs or companion (pet) dogs: large companion dogs (51 lb or more) and small companion dogs (50 lb or less). Guide-dog partners walked significantly more than handlers of either small or large companion dogs (Guide-dog partners met the healthy standard of 150 min per week of walking, at a level 10 times more than owners of large companion dogs). Guide dogs walked with their partners more frequently and for longer durations per day than owners of companion dogs. Guide dogs with their handlers met more people outside of their homes than did owners of companion dogs, but the groups did not differ in the number of dogs they greeted outside of the house. The frequencies of going to off-leash areas did not differ among the three groups. The findings indicate that having a dog as a guide can lead to a higher amount of walking among guide-dog partners, and that guide dogs have a higher quality of life, in terms of quantity of physical activity and social interactions, compared with large or small companion dogs.

**Keywords:** guide dogs, physical activity, social interaction, visual disabilities



Maintaining an appropriate level of physical activity has benefits for both physical and psychological health (US Department of Health and Human Services; USDHHS 2000). Heart disease, diabetes, and cancer are well known as some of the leading diseases causing deaths in the US (Murphy, Xu and Kochanek 2013), and it is reported that the risks of these diseases are decreased by physical activity (Penedo and Dahn 2005; Warburton, Nicol and Bredin 2006). Also, physical activity has been associated with decreased symptoms of distress, including depression, anxiety, and panic disorders (Paluska and Schwenk 2000; Goodwin 2003; Galper et al. 2006). Therefore, a standard recommendation is to have 30 minutes of moderately intense activity for five days a week, for a total of at least 150 minutes per week, to promote and maintain health for adults aged 18–65 years (Haskell et al. 2007). However, many US adults do not achieve this level of physical activity (Center for Disease Control and Prevention 2005; Troiano et al. 2008).

### *Physical Activities of People with Visual Disabilities*

Getting sufficient physical activity is a greater challenge for people with disabilities than for the general population (USDHHS 2000; Boslaugh and Andersen 2006). Low levels of physical activity have been reported for all generations with visual disabilities (Crews and Campbell 2001; Ayvazoglu, Oh and Kozub 2006; Holbrook et al. 2009; Houwen, Hartman and Visscher 2009). Longmuir and Bar-Or (2000) reported that youths with visual disabilities, cerebral palsy, or muscular dystrophy had the most sedentary lifestyles among youths with various types of physical and sensory disabilities. Although the disabilities themselves are considered to be the major factor limiting physical activities of people with disabilities (Finch, Owen and Price 2001), several other factors are implicated. For example, the attitudes and behaviors toward physical activity among parents and teachers of children with visual disabilities, such as less encouragement for physical activity, lower expectations for physical activity, and overprotective behaviors, result in a lower level of, or perceived value of, physical activity among those children (Lieberman and Houston-Wilson 1999; Stuart, Lieberman and Hand 2006; Ward et al. 2012). In addition, although various types of indoor and outdoor physical activity are available, many barriers limit participation of people with disabilities, including visual disabilities, in physical activities: accessibility to various areas of fitness facilities and health clubs (Rimmer et al. 2005), lack of transportation to such facilities (Capella-McDonnall 2007), and fewer neighborhood environmental supports for people with disabilities in terms of walking surfaces, signage, and surroundings (Spivock, Gauvin and Brodeur 2007; Kirchner, Gerber and Smith 2008).

Being less physically active, people with visual disabilities have lower fitness levels and higher body mass indexes (BMI) compared with the general US population (Lieberman and McHugh 2001; Holbrook et al. 2009; Houwen, Hartman and Visscher 2009). The odds of being obese for people with blindness or poor vision were found to be 1.5 times greater than for the general population (Weil et al. 2002); despite this problem, the health-promotion interventions for adults who are visually impaired have been limited (Capella-McDonnall 2007).

### *Walking Activity of Dog Owners and Guide Dog Partners*

Among physical activities, walking is the most promising form of exercise: it is accessible for various populations because it requires no special equipment or facility, and has a low risk of adverse events, such as injury (Hillsdon et al. 1995; Siegel, Brackbill and Heath 1995; US Department of Health and Human Services 2008).

Studies over the last decade reveal that dog owners are somewhat more physically active than non-dog owners (Cutt et al. 2008; Oka and Shibata 2009, Lail, McCormack and Rock 2011; Christian et al. 2013). Also, lower obesity was reported among dog owners who walked their dogs (> 0 min per week) compared with dog owners who did not walk their dogs (0 min per week) and non-dog owners (Coleman et al. 2008). Therefore, dog walking is a strategy that could help a large proportion of the population to meet recommended goals for physical activity (Epping 2011) and to improve their physical health.

In a study focusing on mobility of guide-dog partners, travel performances were compared among people using different mobility aids. Guide-dog partners who considered their dog a satisfactory mobility aid were more mobile compared with guide-dog partners who considered their dog an unsatisfactory mobility aid, or to when they were using other mobility aids prior to acquiring their guide dogs (Lloyd et al. 2008a). However, beyond being a mobility aid, acquisition of a guide dog is a life-changing event for their partners, psychologically and socially: increased self-worth, confidence, independence, social interactions, and offers from others (Sanders 2000; Whitmarsh 2005; Wiggitt-Barnard and Steel 2008). These psychosocial outcomes would have synergistic effects on the increased mobility of guide dogs' partners. Therefore, guide dogs may play an important role in facilitating their human partners' walking activities, as has been reported in studies of companion (pet) dogs and their owners. To understand the role of guide dogs as a facilitator of physical activity for people with visual disabilities, we investigated the walking activity of guide-dog partners and compared it with the walking activities of companion-dog owners.

### *Welfare of Guide Dogs*

Most studies of human–animal interactions involving assistance dogs have focused on the benefits that people gain from their dogs. Few studies have focused on the welfare of assistance dogs that are uniquely trained to assist people with disabilities (Serpell, Coppinger and Fine 2010). A few studies have reported that some assistance dogs are stressed because of poor instruction from their partners (Coppinger, Coppinger and Skillings 1998) and lack of social play and rest (Burrows, Adams and Millman 2008). However, generally the daily lives of assistance dogs are not considered. Since people encounter assistance dogs in public where they are usually working, some people think that they are working in harness 24 hours a day, and are concerned that they may not get to act like dogs (Berthelsen 2013; Guide Dog User Inc. 2013). To acquire objective information about the welfare of guide dogs, we investigated their daily lives, in terms of their physical activity and social interactions with people and other dogs, and compared them with those of companion dogs.

## **Methods**

### *Participants and Procedure*

We recruited guide-dog partners and dog owners who were the main caregivers of their dog and were 18 years of age or older. The recruiting advertisement was posted on, or distributed through, on-line social networking groups or mailing lists related to guide dogs or companion dogs (e.g., Guide Dogs for the Blind, Guide Dog Users, Inc., and dog-owner groups on Facebook). Also, the participants were encouraged to inform their friends or acquaintances who lived with dogs about the survey. The web-based questionnaire, created on SurveyMonkey, was accessible directly through the URL shown on the recruitment advertisement. The survey was conducted with anonymous and voluntary participation, and the study was approved by the University of California, Davis, Institutional Review Board Protocol #529485-1.

Among the collected responses, those with missing data or those where the dogs' roles were other than guide dog or companion dog, such as those used in other types of service or law enforcement, were excluded from the analyses. It has been reported that the size of a dog affects the levels of physical activity of owners (Schofield, Mummery and Steele 2005). Because large breeds are used as guide dogs, the responses from companion-dog owners were divided into two groups for comparison with the answers from guide-dog partners: a group for handlers of large companion dogs with body size similar to guide dogs (51 lb or more), and a group for handlers of small companion dogs (50 lb or less).

### **Questionnaire Design**

The questionnaire consisted of four parts: 1) demographics, 2) participant's walking activity and interaction with their dog, 3) affection for the dog and whether the dog lessened discomfort in public, and 4) the dog's physical activity and interaction with other people and dogs. The questions were close-ended, and the participants could provide additional comments at the end of the questionnaire. The complete list of items in the questionnaire and the response formats can be seen in Appendix 1.

### **Statistical Analyses**

Answers for each question were examined for significant differences among the three groups using chi-square and Kruskal-Wallis tests ( $p < 0.05$ ). When the Kruskal-Wallis test was significant, a Mann-Whitney  $U$  test with Bonferroni correction ( $p < 0.0166$ ) was used to assess the differences between the groups. The effect size of the Mann-Whitney  $U$  test,  $r$ , is also shown in the results section. It is interpreted as: small ( $r = 0.1$ ); medium ( $r = 0.3$ ); and large ( $r = 0.5$ ) (Cohen 1992).

The associations among the three dog groups in terms of walking activity were estimated using logistic regression odds ratios and 95% confidence intervals.

## **Results**

### **Demographics**

In total, 859 surveys were used in the analyses: 230 guide-dog partners (GDPs), 366 large companion-dog owners (LCDOs), and 263 small companion-dog owners (SCDOs). The majority of participants in all three groups were female (GDPs = 74.3%, LCDOs = 87.4%, SCDOs = 83.3%). The participants' ages significantly differed among the three groups (medians: GDPs = 51–60 years old; LCDOs = 41–50 years old; SCDOs = 31–40 years old,  $H = 40.2$ ,  $p < 0.001$ ), with the guide-dog handlers being oldest, and the handlers of small companion dogs being the youngest (pairwise tests: difference between GDPs and LCDOs:  $U = 32597.0$ ,  $p < 0.001$ ,  $r = 0.18$ ; GDPs and SCDOs:  $U = 20951$ ,  $p < 0.001$ ,  $r = 0.25$ ; LCDOs and SCDOs:  $U = 41139.0$ ,  $p < 0.005$ ,  $r = 0.11$ ). The median range of the dogs' ages was 4 to 6 years in all groups, and a large majority of the dogs were spayed or neutered (spay or neutered dogs: guide dogs [GDs] = 97.0%; large companion dogs [LCDs] = 91.3%; small companion dogs [SCDs] = 87.5%). The median for the number of other adults living at home was one in all groups (one other adult: GDPs = 50.4%; LCDOs = 66.3%; SCDOs = 47.7%), and the median for the number of children living at home was zero in all groups (no children: GDPs = 91.7%; LCDOs = 78.3%; SCDOs = 75.7%). The number of other dogs living at home was larger among LCDOs than GDPs (median: GDPs = 0; LCDOs = 1; SCDOs = 0,  $H = 9.9$ ,  $p < 0.04$ ; pairwise tests: difference between GDPs and LCDOs:  $U = 52,422.5$ ,  $p < 0.001$ ,  $r = 0.21$ ; GDPs and SCDOs: ns; LCDOs and SCDOs:  $U = 41,707.5$ ,  $p < 0.004$ ,  $r = 0.11$ ).

### ***Walking Activity of Participants***

There was a significant difference in how much time each group walked with their dog (median [per day]: GDPs = 2 hrs; LCDOs = 40 min; SCDOs = 20 min,  $H = 166.4$ ,  $p < 0.001$ ). The pairwise tests (Mann Whitney  $U$ ) indicated that the GDPs walked with their dog significantly more than LCDOs and SCDOs (difference between GDPs and LCDOs:  $U = 19959.5$ ,  $r = 0.44$ ; GDPs and SCDOs:  $U = 9393.0$ ,  $r = 0.60$ ; LCDOs and SCDOs:  $U = 33605.0$ ,  $r = 0.19$ ,  $p < 0.001$  in all the comparisons). On the other hand, when considering the category of walking done without their dogs, GDPs walked significantly less than LCDOs and SCDOs (median [per day]: 20 min for all groups; 0 min: GDPs = 45.0%; LCDOs = 30.7%; SCDOs = 30.0%,  $H = 29.3$ ,  $p < 0.001$ ; pairwise tests: difference between GDPs and LCDOs:  $U = 50885.0$ ,  $r = 0.23$ ,  $p < 0.001$ ; GDPs and SCDOs:  $U = 36280.0$ ,  $r = 0.23$ ,  $p < 0.001$ ; LCDOs and SCDOs: ns).

Regarding walking activity, as 30 minutes of moderately intensive activity on most days of the week is recommended (Haskell et al. 2007), we divided the participants in each group into two further groups, according to the reported walking time: sufficient and insufficient walking time. Insufficient walking groups included the participants who chose 0 min for both walking categories—with and without the dog, and those who chose 0 min for one of the walking categories and 20 min for the other category. Sufficient walking groups included the participants who chose 20 min for both categories—walking with and without dog, and participants who chose 40 min or more for one of the walking categories. Participants categorized in the sufficient walking group were as follows: GDPs = 98.2%, LCDOs = 82.8%, and SCDOs = 78.8%. A logistic regression showed that the odds of satisfying the walking standard were 11 times higher in the GDP group than the LCDO group (unadjusted odds ratio (OR): 11.41; 95% confidence interval (CI): 4.09, 31.82;  $p < 0.001$ ). After adjusting for genders and ages of participants, ages of dogs, affectionate levels toward the dog, and numbers of dogs and children in the households, the odds were still 10 times higher in the GDP group than the LCDO group (adjusted OR: 10.23; 95% CI: 3.52, 29.75;  $p < 0.001$ ). Also, the time spent walking by SCDOs was less than that of LCDOs (adjusted OR: 0.60, 95% CI: 0.39, 0.94,  $p = 0.026$ ).

### ***Interaction with Their Dogs: Affection for the Dog and Dog's Role to Lessen Discomfort in Public***

Participants had lived with their dog a median of 3 to 5 years in all groups. During waking hours, GDPs spent more time with their dog than did LCDOs and SCDOs (median [per day]: GDP = 10+ hrs; LCDOs = 7–9 hrs; SCDOs = 7–9 hrs,  $H = 209.6$ ,  $p < 0.001$ ; pairwise tests: difference between GDPs and LCDOs:  $U = 17157.5$ ,  $r = 0.50$ ; GDPs and SCDOs:  $U = 8455.0$ ,  $r = 0.62$ ; LCDOs and SCDOs:  $U = 38301.0$ ,  $r = 0.17$ ,  $p < 0.001$  in all the comparisons).

The participants' perceived affection for their dogs was very strong in all three groups (very affectionate: GDPs = 77.9%; LCDOs = 77.8%; SCDOs = 75.1%). Concerning the discomfort that people feel when meeting other people in public, GDPs felt their dogs lessened the discomfort more than SCDOs did, but the effect size was not large (frequently or often: GDPs = 51.0%; LCDOs = 42.1%; SCDOs = 31.3%,  $H = 13.0$ ,  $p < 0.001$ ; pairwise tests: difference between GDPs and SCDOs:  $U = 23157.0$ ,  $r = 0.15$ ,  $p = 0.003$ ; GDPs and LCDOs: ns; LCDOs and SCDOs: ns).

### ***Dogs' Physical Activity and Interaction with Other Dogs and People***

As shown in the walking activities of the participants, GDs walked with their partners significantly longer each day than LCDs and SCDs walked with their owners. On the other hand, GDs walked or played with people other than their partners for significantly less time than

LCDs and SCDs did (median [per week]: GDs = 20 min/40 min; LCDs = 1 hr; SCDs = 1 hr,  $H = 36.1$ ,  $p < 0.001$ ; pairwise tests: difference between GDs and LCDs:  $U = 53108.5$ ,  $r = 0.22$ ,  $p < 0.001$ ; GDs and SCDs:  $U = 39509.0$ ,  $r = 0.26$ ,  $p < 0.001$ ; LCDs and SCDs: ns). However, there was no evidence that the monthly frequencies of going to an off-leash dog park (none: GDs = 79.0%; LCDs = 64.2%; SCDs = 67.7%,  $p = 0.59$ ), or a wild or open area (none: GDs = 63.4%; LCDs = 52.7%; SCDs = 58.9%,  $p = 0.16$ ) differed between the three groups.

GDs were perceived as having more “human friends” compared with LCDs, but the effect size was small (median: GDs = 4; LCDs = 3; SCDs = 3,  $H = 12.2$ ,  $p = 0.03$ ; pairwise tests: difference between GDs and LCDs:  $U = 37110.5$ ,  $p = 0.015$ ,  $r = 0.10$ ; GDs and SCDs: ns; LCDs and SCDs: ns). GD met more people outside of the house compared with LCDs and SCDs (median [per day]: GDs = more than 5; LCDs = 1; SCDs = 1,  $H = 207.8$ ,  $p < 0.001$ ; pairwise tests: difference between GDs and LCDs:  $U = 12807.0$ ,  $r = 0.59$ ,  $p < 0.001$ ; GDs and SCDs:  $U = 8081.0$ ,  $r = 0.63$ ,  $p < 0.001$ ; LCDs and SCDs: ns). However, no difference was seen in the number of dogs the dog met outside of the house among the three groups (median [per day] was 1 for all groups,  $p = 0.13$ ).

## Discussion

### *Walking Activity of Participants*

We investigated the self-reported walking activity of guide-dog partners and compared it with the walking activity of companion-dog owners, to understand the role of guide dogs as possible facilitators of physical activity for people with visual disabilities. All but four of the 230 GDPs exceeded the walking standard of 150 min or more of walking per week. The adjusted odds of reaching a comparable duration of walking time among GDPs was 10 times higher than LCDOs. Owners of SCDs satisfied the required walking time even less often than GDPs and LCDOs did. This result, that participants living with large dogs participated in walking more than those living with small dogs, is consistent with Schofield, Mummery and Steele (2005). Small dogs can get relatively more exercise in a smaller indoor space (as in an apartment) than large dogs (Hart and Hart 1988); it appeared that SCDOs had less total walking time compared with GDPs and LCDOs.

Although several studies suggest that dogs could facilitate the physical activity of their owners, not all dog owners take advantage of this aspect of living with dogs. Cutt et al. (2008) reported that 22% of dog owners never walked their dogs in a typical week, and Coleman et al. (2008) also reported that 30% of dog owners had not walked their dogs in the previous week. However, participants in our study self-reported walking their dogs slightly more than the participants in other studies: SCDOs reported the highest proportion of non-walkers (19.4% did not walk with their dogs). This may reflect our recruiting method of contacting people through mailing lists or social networking groups related to guide dogs or companion dogs. These participants may place their dogs more centrally in their lives and spend more time with them compared with the general population. Also, we used snowball sampling as well as advertising the web-study to related groups, which might have resulted in a homogenous sample. However, the proportions of people who answered after reading the advertisement and those who were invited by their friends (snowball sampling) could not be determined, but may have affected the study results. It is noteworthy that the total walking activity with and without a dog of GDPs in our study was the highest we have seen reported amongst any population, occurring despite that people with visual disabilities do less walking than the general population (Holbrook et al. 2009; Willis et al. 2012).

Three factors may relate to our finding of higher walking activity by GDPs. Firstly, guide-dog partners have a high commitment to that role. Some studies have reported that the sense of responsibility and obligation is an important mediator of dog walking (Brown and Rhodes 2006; Hoerster et al. 2011). Guide dogs support partners' lives, something that only becomes possible by many people working together to prepare and provide the dogs. It also is costly to raise these dogs, and they are supported by charitable contributions (Wirth and Rein 2008). In addition, guide dogs have public access to go everywhere with their human partners. For a person to benefit fully from a guide dog, she/he has to take careful note of the dog's behavior, hygiene, and health; people who are not able to satisfy these requirements cannot succeed as guide-dog partners. Taking responsibility for the care of the dog is what guide-dog organizations emphasize when determining whether a person is eligible to become a guide-dog partner (Guiding Eyes for the Blind 2013; Guide Dogs for the Blind 2014a; Seeing Eye, Inc. 2014). Therefore, guide-dog partners may discipline themselves to provide optimal experiences for their dogs.

Secondly, the frequent use of motor vehicles could decrease the opportunities of most people to participate in walking. It is reported that the number of short trips by car is increasing (Mackett 2001), and the distance threshold for driving, defined as the distance at which people are indifferent between walking and driving, decreases as the amount of driving increases (Gärling, Boe and Golledge 2000; Loukopoulos and Gärling 2005). Companion-dog owners may use a car even for a walkable distance, while guide-dog partners are likely to choose walking or taking public transportation, unless someone drives for them. Importantly, as guide dogs increase their partners' independence and confidence (Whitmarsh 2005; Lloyd et al. 2008b), they make it easier for partners to go walking and increase their range of activities (Lloyd et al. 2008b).

Thirdly, companion-dog owners share the care of their dogs with other people like family members more often than do guide-dog partners. In this case, care means the responsibility to provide enough exercise for their dogs. Our results show that companion-dog owners did not walk their dogs for as much time as guide-dog partners, but their dogs walked or played with other people more often than guide dogs did. On the other hand, guide-dog partners were usually the only persons to take their dogs for walks. As mentioned above, guide-dog organizations consider whether prospective guide-dog partners can provide for the physical and psychological needs of the dog. Therefore, guide-dog partners should provide their dogs with enough exercise by themselves. Any effect of dogs facilitating their owners' physical activity through dog walking would be attenuated among companion-dog owners who share the care with other family members. The unique context of having a guide dog could understandably lead to a higher amount of walking among partners.

However, this study did not compare the walking activity of guide-dog partners and persons with visual disabilities who did not have guide dogs. Therefore, we cannot conclude to what extent guide dogs influence the duration and frequency of walking among people with visual disabilities. Moreover, people who plan to live with a guide dog are likely self-selected from those who prefer an active lifestyle. People who have confidence in their health are more likely to apply for a guide dog (Yamamoto et al. in press). Further, although guide-dog partners were our oldest group of participants, in general, people using guide dogs are reported to be healthier, younger, and more mobile than other people with visual disabilities (Jackson et al. 1994; Refson et al. 1999a, b). A longitudinal study of pre- and post-acquisition of guide dogs would clarify more specifically the detailed effects of guide dogs in facilitating walking amongst people with visual disabilities.



### ***Affection for the Dog and Whether the Dog Lessens Discomfort in Public***

In all the groups, the majority of the participants reported having a strong sense of affection for their dogs. GDPs tended to feel more benefit from their dogs lessening discomfort when meeting other people in public than did SCDOs. People with disabilities sometimes feel societal barriers, including negative public attitudes related to their disabilities, such as social stigma, which makes it difficult for them to interact with others (O'Day 1999; Green et al. 2005). Some studies have reported on the socializing effects of service dogs, showing that people focused on and reacted to the dog in a positive way, rather than focusing on the handler's disabilities (Eddy, Hart and Boltz 1987; Mader, Hart and Bergin 1989). These interactions may help such people feel less discomfort and stigma about their disabilities. In this study, our main focus was on investigating guide-dog partners' walking activities and their dogs' physical activities and social interactions, and we used only single items to measure their perceived affection for their dogs and the effect of dogs in lessening discomfort in public. However, to explore further the relationships among the benefits of dogs and people's perceived affection for their dogs and levels of social discomfort, one would use psychological instruments assessing each aspect (Lane, McNicholas and Collis 1998; Mattick and Clarke 1998).

### ***Physical Activity of Dogs and Social Interactions with Other People and Dogs***

Not surprisingly, guide dogs with their partners walked the most among the three groups of dogs: their main role is to support the mobility of their partners who have visual disabilities. On the other hand, some of the companion dogs (13.1% of LCDs and 19.4% of SCDOs) were generally not walked each day. Although these dogs walked and played with people other than the participants, the duration was still noticeably less than the walking activity of guide dogs.

Going to off-leash dog parks or wild or open areas where dogs can run freely did not differ among the three groups. However, for the guide-dog partners, those areas seemed not to be an ideal place to let their dogs be exercised. One participant raised a reason for not bringing his dog to such an area: "He is my eye and more, so I won't risk him being injured or adding risk of him picking up parasites." Among past attacks on guide dogs and their partners, 16% of them occurred while the dogs were being exercised off lead (Brooks, Moxon and England 2010). It is a critical problem because these guide dogs are not only injured, but also can be traumatized sufficiently to affect their working ability and result in them withdrawing from their work (Guide Dogs for the Blind 2014b; Guide Dogs for the Blind Association 2014).

This survey did not address the physical activity inside the house or in the backyard. Some participants mentioned that they let their dogs exercise in their backyards. However, even for dogs with access to a backyard, their physical activity typically would remain at a low level unless the owners provided structured exercise, like walking or ball chasing (McGreevy et al. 2005; Bland, Guthrie-Jones and Hill 2009). More investigation of the living environment can clarify the detailed interactions of dogs with their owners. More importantly, our data describe the duration of walking but not the quality of it. The walking of guide dogs while they are working cannot be easily compared with the walking of pet dogs. Also, we could not differentiate the walking activity of guide dogs at times when they were working (guiding) versus times when they were engaged in exercise, play, or relaxation. The quality of walking/physical activity of dogs needs to be investigated, with closer examination of their behavior and associated hormonal changes.

In interacting with other people, guide dogs met more people outside of the house and tended to have more human friends than companion dogs. Because guide dogs accompany

their human handlers everywhere, it would be a natural outcome that these dogs are admitted to places with many people more often than companion dogs. However, for the question about “human friends,” we did not define it and left it to the participants’ perspective. Therefore, participants in the two groups might have answered with different perspectives; for example, some might have counted people whom the dog often met, and others counted people with whom the dog was familiar and expressed his/her happiness when meeting them. Regarding interactions with other dogs, the three groups did not differ in the number of non-resident dogs they greeted. Not only working guide dogs but also pet dogs seemed to interact with other dogs infrequently in daily walks.

In conclusion, guide-dog partners spent significantly more time walking than companion-dog owners. Most people apply for a guide dog primarily to become independent, but some expect to get more exercise and go for more walks (Whitmarsh 2005). These results suggest that life with a guide dog may satisfy the desire of those people seeking more physical activity. Also, although people may think that guide dogs have different lives compared with companion dogs, the results indicate that many guide dogs may have more optimal physical activity and social interactions with other people and dogs than companion dogs.

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**Appendix 1. Items (and response options) in the questionnaire.**

1. Number of dogs in your household (1, 2, 3, 4, > 4)

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2. What is the sex of the one dog that you are responding about? (male intact, male neutered, female intact, female spayed)

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3. What is the age of this dog that you spend the most time with? (< 1 year, 1 year, 2 years, 3 years, 4–6 years, 7–9 years, > 9 years)

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4. How long have you had this dog? (< 1 year, 1 year, 2 years, 3–5 years, > 5 years)

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5. What is the breed of the specified dog? (select from list of 40 breeds or specify what type)

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6. What is the body weight of your dog? (large: 51 lb or more (23 kg+), medium: 21–50 lb (9.5–22 kg), small: 20 lb or less (< 9.5 kg))

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7. In what region or country do you and your dog live? (USA: the West, Midwest, East, South, Alaska, Hawaii, Canada, other country)

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8. What response below best describes the degree to which the specified dog is affectionate? (relatively non-affectionate, moderately affectionate, very affectionate)

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9. How many of your waking hours of the day do you spend around your dog? Please select best option. (0–1, 2–3, 4–6, 7–9, 10+)

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10. How much total time on average do you spend walking for any purpose with your dog per day? (0 min, 20 min, 40 min, 1 hour, 2 hours, 3+ hours)

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11. How much total time on average do you spend walking for any purpose without your dog per day? (0 min, 20 min, 40 min, 1 hour, 2 hours, 3+ hours)

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12. How much total time per week on average does your dog spend walking or playing with someone other than you? (0 min, 20 min, 40 min, 1 hour, 2 hours, 3+ hours)

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13. What is the primary function of your dog? (companionship, agility or obedience work, emotional support, household guardian, agility or obedience work, assistance with hearing disability, guide for a visual disability, hunting or sport, law enforcement, service assistance for mobility disability, psychiatric support, other)

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14. Other than you, how many human friends does your dog have? (none, 1, 2, 3, 4, 5+)

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15. How many other people, not including family members, does your dog meet on an average day? (none, 1, 2, 3, 4, 5+)

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16. How many other dogs not living in your home does your dog greet on an average day? (none, 1, 2, 3, 4, 5+)

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17. Do you sometimes feel that your dog lessens discomfort you feel when meeting people? (not applicable, often, frequently, occasionally, rarely, no)

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18. How many times each month do you take your dog to an off-leash dog park? (0, 1–2, 3–8, 9–19, 20+)

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19. How many times each month do you take your dog to an open or wild area where your dog runs free? (0, 1–2, 3–8, 9–19, 20+)

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20. Please indicate your age range below. (under 20 years, 21–30 years, 31–40 years, 41–50 years, 51–60 years, Over 60 years)

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21. What is your gender? (female, male)

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22. How many other adults live with you? (0, 1, 2, 3, 4+)

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23. How many children 17 years or younger live in your household? (0, 1, 2, 3, 4+)

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24. Do you have a diagnosed disability? Check all that apply: (not applicable, hearing, mobility, psychiatric, visual, other)

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25. Feel free to tell us about other interesting activities you enjoy with your dog.

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