The Guide Dog as a Mobility Aid Part 1: Perceived Effectiveness on Travel Performance

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This is the first of a two-part study that examined the effects of a guide dog as an aid to mobility; both parts are published in this issue of the IJOM. The first part demonstrates the perceived effectiveness of the dog on travel performance, and the second part describes changes to travel habits, as well as advantages and disadvantages of guide dog mobility. In this first part of the study, the travel performance of 50 people who were blind or vision impaired was investigated retrospectively when participants used (a) mobility aids other than a guide dog (i.e., before a dog was acquired) and where applicable, a dog they considered to be (b) a satisfactory and (c) an unsatisfactory mobility aid. Results indicated that travel performance was considered significantly better when using a satisfactory dog compared to pre-guide dog mobility or an unsatisfactory dog. Follow-up tests were conducted to determine whether differences in travel ability before a dog was acquired affected travel performance when using a satisfactory dog. Participants were separated into three groups (poor, moderate and good travellers) based on their perceived travel ability pre-dog. Significant differences in travel performance were found between all three groups before a dog was used, but no differences were seen between the groups when using a satisfactory dog. Further tests indicated that travel performance was significantly better for all three levels of traveller when using a satisfactory dog compared to pre-dog mobility, with less accomplished travellers showing the greatest gains. The use of a dog also appeared to alleviate restrictions to travel caused by some non-visual conditions.

Perceived effectiveness on travel performance

A loss of independent movement is one of the greatest disadvantages faced by people who are newly blinded or significantly vision impaired, and its reacquisition generally requires the traveller to acquire both orientation and mobility (O&M) skills (La Grow & Weessies, 1994). In the present study, 'orientation' is defined as the ability to establish and maintain an awareness of one's position in space relative to other objects in the environment, and 'mobility' refers to the technical use of a mobility aid that leads to purposeful movement.

Collectively, O&M refers to the process of travelling through the environment safely and efficiently (adapted from Lloyd, 2004). The four main types of mobility aids are (a) sighted (human) guides, (b) a variety of canes (long, short, folding, telescopic), (c) electronic travel aids (laser canes, sonic devices) and (d) guide dogs (Farmer & Smith, 1997). Such orientation devices as GPS and audio-tactile maps are becoming more accessible as technology advances.

There are many anecdotal and autobiographical accounts of the differences guide dogs have made to their handlers' lives (Edwards, 2002; Ireson, 1991; Lambert, 1990; Purves & Godwin, 1981; Stead, 1997; Warnath & Seyfarth, 1982). However, little research could be found that validated the use of a dog as a mobility aid in the last 30 years. The focus of research has been on the long cane and techniques for its use (Blasch & De l'Aune, 1992; Bongers, Schellingerhout, van Grinsven, & Smithsman, 2002; La Grow, Kjeldstad, & Lewnadowski, 1988; La Grow, Leung, & Lyell, 1995; Uslan & Schreibeman, 1980; Wall & Ashmead, 2002a and 2002b) and to a lesser extent, electronic travel aids (Heyes, 1984; La Grow, 1999; McKinley, Goldfarb, & Goodrich, 1994). A body of research evaluating these aids and O&M techniques exists (Dodds, Carter, & Howarth, 1983; Dodds, Clark-Carter, & Howarth, 1984; Dodds, Clark-Carter, & Howarth, 1986; Geruschat & De l'Aune, 1989; Guth, Hill, & Reiser, 1989; Harder & Michael, 2002; Long, Riser, & Hill, 1990; Tellevik, Martinsen, Storllilokken, & Elmerskog, 2000).

When used properly, the long cane will provide the traveller with approximately one metre of warning of obstacles or drop-offs in the path of travel, while transmitting information regarding the texture and quality of the walking surface (La Grow & Weessies, 1994). However, although the lower body is adequately protected, the cane does not afford protection above the waist. Despite the lack of empirical evidence, guide dogs are generally thought to be effective mobility aids and have been credited with increasing functional mobility by providing a straight line of travel, alerting the traveller to changes in the surface of travel and avoiding contact with both stationary and moving obstacles in one's path of travel, including those above waist height (Whitstock, Franck, & Haneline, 1997). Guide dogs are taught to find a safe path around obstacles and to refuse commands that would lead the person and dog into unsafe situations. Dogs are also helpful in locating destinations by finding doorways and remembering commonly travelled routes. As such, they are thought to reduce much of the stress and tension involved in independent travel (i.e., travel without the help of a human guide) for people with vision impairments. In addition to being a mobility aid, dogs also provide companionship, increased social function, and improved self-esteem and confidence (Lloyd, Budge, La Grow, & Stafford, 2000; Miner, 2001; Muldoon, 2000; Sanders, 2000; Steffens & Bergler, 1998; Zee, 1983).

Several studies on the mobility habits of people who were blind or vision impaired were conducted in the 1950s and 1960s. The following studies, which were mainly conducted in the USA, were cited in an unpublished Ph.D. thesis (Delafield, 1974) and showed that guide dog handlers had better mobility than had cane users (Gray & Todd, 1968), as well as a more positive attitude towards blindness, greater social skills, and fewer feelings of inadequacy (Bauman, 1954), higher levels of employment (Corbett & Keld, 1957; Finestone, Lukoff, & Whiteman, 1960; Gowman, 1957), better levels of education, health, intelligence, emotional stability and were from a higher social class (Finestone et al., 1960). Delafield (1974) pointed out that although these differences were important, these researchers did not attempt to verify where they came from. For example, the differences may have represented the result of using a guide dog (either directly or indirectly), or alternatively, resulted from the people who applied and/or were selected to be trained with a dog already being highly motivated and well adjusted to vision loss (non-causal). Consequently, Delafield (1974) tested the hypothesis that it was the training with and the subsequent use of a guide dog that helped the handlers adjust to their disability by improving mobility, self-esteem and social interactions. By using a longitudinal design, Delafield (1974) found that when a long cane user became a guide dog handler, there were improvements in self-esteem, social function and mobility: the latter improving considerably in terms of stress and safety, but not necessarily efficiency. However, the small sample size ($N = 6$) may have been representative of only a select group of travellers and quite different to that which might be found today. The eligibility criteria used by guide dog schools has evolved in recent times, with schools now accepting a much more heterogeneous group (i.e., a broader age band with both younger and older applicants accepted, a wider range of visual conditions and amount of residual vision useful for mobility, and less accomplished long cane travellers). Therefore, past findings might not be replicable with contemporary guide dog handlers. More recently, Clark-Carter, Heyes, and Howarth (1986) designed and used an instrument, the Percentage of Preferred Walking Speed, which measured the ratio of a person's actual walking speed to his or her preferred walking speed if vision impairment was not an impediment. Despite a small sample size, the researchers found that guide dog handlers ($n = 3$) walked significantly faster than long cane users ($n = 3$), and only handlers reached their optimal efficiency.

As part of a study on the ophthalmic and visual profile of guide dog handlers and other vision impaired adults in Scotland, the health and social circumstances of handlers were compared with those of patients at a low vision clinic, and clients of rehabilitation social services (Refson, Jackson, Dusoir, & Archer, 1998, 1999). The handlers were found to be more mobile than either of the other groups, but were also younger, fitter and healthier: findings that are consistent with a previous study on the visual, health and social status of guide dog handlers in Northern Ireland (Jackson et al., 1994). Refson, et al., (2000) compared mobility habits of guide dog handlers and long cane users who had retinitis pigmentosa and found that 93% of handlers travelled independently daily compared to 65% of long cane users. This result suggests that in terms of frequency, handlers were more mobile than long cane users. However, the use of the dog cannot be considered causative, nor did this study address how many of the journeys were for the dogs' needs. Some long cane users in this and in Lloyd et al's., (2000) study rejected the idea of using a dog, because they thought that their mobility was not sufficiently impaired or because they felt they had too much vision.

Despite the many advantages of long cane mobility, disadvantages associated with its use include a high requirement of concentration, feelings of stress and insecurity, and loss of orientation (Steffens & Bergler, 1998). Both dogs and canes can cause a variety of musculoskeletal problems including sore arms and stiffness from dogs that pull excessively, wrist and shoulder problems related to cane use, and prodding to the torso when the cane lodges into cracks in the pavement (Gitlin, Mount, Lucas, Weirich, & Gramberg, 1997). According to a study by Deshen and Deshen (1989), travelling with a long cane was slow and a large amount of space was necessary for use, which, in crowded situations, presented an obstruction to sighted pedestrians who often stepped on and damaged the canes. In contrast, a dog avoids obstacles, recognises hazards earlier and finds a way to move forward safely in congested places, that is, "not a gadget with limited scope, but a partner who enables a blind person to find quicker, safer ways of solving problems" (Steffens & Bergler, 1998, p. 153).

In an autobiographical account of guide dog training, Warnath and Seyfarth (1982) recommended the dog as a provider of greater freedom than the cane, a confidence builder and a bridge to social contact with sighted people, but not a guarantor of tranquil, unimpeded travel. The dog's response to puzzling or frightening situations might itself generate mobility problems. For example, the dog twisting in its harness to avoid a confrontation with a roaming dog, or pulling the handler off the pavement to avoid a collision with a moving object. Other limits of guide dog use include the fact that as a living creature, a dog may have 'off days', illness and a relatively short life (Rimbault & Romero, 1994).

A recent study by Kirchner, Gerber, and Smith (2008) stated that community accessibility for people with vision and motor impairments tends to be overlooked, as research is usually conducted on those who can walk and see. These authors were unable to find any studies that focused on the ways assistive mobility technologies (including guide dogs), themselves environmental factors, were related to access to and activity in, the built environment. However, although under-researched, problems with access are well recognised in the field of O&M. An historical analysis of the topic by Blasch and Stuckey (1995) reported that attitudinal change has always been the greatest barrier to accessibility and mobility for people who are vision impaired, but that this is changing due, in no small part, to the work of guide dog schools.

In addition to the issues described above, there are many other visual, psychological and physical factors that affect mobility including social and cultural concerns. A thorough review of this literature and its associations in the fields of health and social science can be found in Lloyd (2004).

The purpose of the present two-part study was to examine the effectiveness of the guide dog as an aid to mobility in terms of the heterogeneous population now using dogs via both inferential (part 1) and descriptive (part 2) statistics. This first part focused on the effect of a guide dog on the handlers' perception of their travel performance when using a dog, compared to that obtained when travelling with a mobility aid other than a dog (i.e., before a dog was acquired). The second part investigated the mobility aids used, intensity of travel, avoidance of journeys and problems with access before and after receiving a guide dog. Advantages and disadvantages of using dogs compared to other mobility aids were also identified. The second study can be found in this issue of the *IJOM* (Lloyd, La Grow, Stafford, & Budge, 2008).

Methodology

Participants

Fifty people from across New Zealand participated in this study. Twenty-six were females and twenty-four were males. Forty-one identified themselves ethnically as New Zealanders of European decent, seven as Maori (the indigenous people of Aotearoa/New Zealand), and the remaining two as 'other'. They ranged in age from 21 to 86 years, with a mean age of 50.3 years (*SD* = 15.61). All were registered members of the Royal New Zealand Foundation of the Blind (RNZFB), with an affiliation from 3 to 74 years, and an average membership of 26.7 years. These characteristics approximated the RNZFB's estimation of its client base at the time of the study.

Procedure

Ethical approval to conduct the study was granted by the National Ethics Advisory Committee of New Zealand and Massey University Human Ethics Committee. The population of interest was all people living in New Zealand who were, or had been, clients of the RNZFB's Guide Dog Services since its establishment in 1973. That number at the time of participant recruitment was approximately 210. No exclusion criteria were applied. For reasons of privacy, a RNZFB staff member mailed the invitations to participate on behalf of the researcher (first author). The invitations consisted of an information document (supplied in the person's preferred format of Braille, audiotape, e-mail, or regular or large print), plus a consent form and a pre-paid, addressed envelope. Participants returned the signed consent form directly to the researcher, thus maximising confidentiality and anonymity. Seventy two percent (*n* = 151) of the target group responded, from which 50 participants were randomly selected (i.e., around one quarter of the entire population of guide dog users in New Zealand at this time). Those not selected were notified and thanked.

Travel performance

A questionnaire was delivered by telephone (80%) or in person (20%). Telephone interviews are recommended by the RNZFB as a useful means of obtaining opinions from its members (RNZFB, 1990) and allowed participants who lived remote from the researcher to be included in the survey. Participants were asked to retrospectively rate their travel performance when using (a) mobility aids other than a dog (i.e., before acquiring a dog) (b) a dog considered a satisfactory mobility aid and (c) a dog considered an unsatisfactory mobility aid. The distinction between satisfactory and unsatisfactory dogs was made because people who took part in a pilot study (Lloyd, 2004) did not believe that both types of dogs should be rated collectively. Participants were asked to recollect their independent travel skills before they acquired a dog, as opposed to their current ability to travel independently without a dog, because using a dog can cause a handler's skills with other mobility aids (e.g., a long cane) to deteriorate through a lack of practice. In addition, the pilot study data suggested that people almost never used other mobility aids when they had a dog. Thus, comparisons were made between the participants' perception of their travel performance with (a) mobility aids other than a dog, and where applicable (b) a satisfactory dog, and (c) an unsatisfactory dog.

Participants responded to a 15-item questionnaire that rated their travel performance under these three conditions. The items measuring travel performance were (1) orientation, (2) mobility, (3) O&M, (4) difficulty with travel and (5) limitations to travel. Participants were informed that travel performance pertained to independent travel only, and not when travelling with another person as a guide, and the definitions for orientation, mobility, and O&M, as described in the introduction to this article, were explained. Responses were made on a 10-point scale ranging from 'very poor' to 'excellent' performance, and 'not at all difficult or limited,' to 'extremely difficult or limited'. After reversing the negatively worded items (i.e., difficulty with travel and limitations to travel), a measure of overall travel performance for each of the three conditions was calculated by adding the scores of the five travel performance indicators. Scores could range from 5 to 50, with 50 being excellent.

Cronbach's alpha coefficients, calculated for each of the three conditions (i.e., travel with mobility aids other than a dog and when using a satisfactory and an unsatisfactory dog), were .90, .54 and .83 respectively. Nunnally (1978) recommends a Cronbach's alpha value of .70 or greater, but values are often small when there are less than 10 items in a scale. The scales measuring travel performance with mobility aids other than a dog and an unsatisfactory dog show good internal consistency, as they are greater than .70. The scale measuring travel performance with a satisfactory dog was less than .70 and therefore a mean inter-item correlation for the items was calculated as an alternative to Cronbach's alpha. The resulting value of .27 falls within the optimal range of .20 to .40 as recommended by Briggs and Cheek (1986). Therefore, all three measures were considered reasonably free from random error and constructed from appropriately linked items measuring the same concept.

Paired-samples t-tests were used to determine if there were any significant differences in travel performance across the three conditions (Table 1). A one-way Analysis of Variance (ANOVA) was not used because only a relatively small number of participants ($n = 13$) had experienced all three conditions, and the use of an ANOVA would have limited the analysis in this study to those 13. To avoid inflating Type 1 errors, the Bonferroni adjustment technique for multiple comparisons was applied where the alpha level being used to judge statistical significance (.05) was divided by the number of comparisons (3). Therefore, p values of less than .017 were considered significant.

Follow-up tests were conducted to determine whether or not the differences in perceived performance in O&M (item 3) had a differential effect on performance when travelling with a mobility aid other than a dog and when travelling with a satisfactory dog. This was achieved by collapsing the sample into three equal groups depending on their percentile rating on the 10-point scale when travelling before a dog was acquired (i.e., scores from 1 to 4 = poor O&M skills, 5 to 7 = moderate O&M skills, 8 to 10 = good O&M skills) (Table 2). A one-way multivariate analysis of variance (MANOVA) was used to determine whether the groups differed on their perception of their travel performance under each of the two conditions. Additional follow-up tests were conducted using paired samples t-tests and Bonferroni adjustments to determine whether the groups differed from condition to condition, and to evaluate the effects of each of the five items comprising travel performance.

Results

Travel performance

Forty seven of the 50 participants had experienced at least one satisfactory dog, 16 had experienced at least one unsatisfactory dog, and 13 had experienced both satisfactory and unsatisfactory dogs. Paired samples t-tests (Table 1) indicated that there was a significant difference between perceptions of travel performance when using a satisfactory dog (M = 45.51, $t(46)$ = 12.09, p < .001) compared to using a mobility aid other than a dog (M = 23.36) and when using an unsatisfactory dog (M = 25.85, $t(12)$ = 7.71, p = .001). However, no difference was noted ($t(15)$ = .24, p = .815) when comparing experiences with an unsatisfactory dog (M = 26.81) with a mobility aid other than a dog (M = 27.31). The eta-squared statistics (Table 1) demonstrate large effect sizes (η^2 >.14) for both significant differences, and a negligible effect size ($\eta^2 < .01$) for the non-significant difference (as per Cohen's, 1988 guidelines).

The significant difference found between mobility aids other than a dog and a successful dog (Table 1, Pair 1) was further assessed by categorising the participants into three groups (poor, moderate and good travellers) according to their perception of their O&M skills when travelling independently before acquiring a dog. A one-way MANOVA showed a significant difference in travel performance among the groups ($F(2, 44)$ = 76.73, p < .001, partial eta-squared = .78) when using a mobility aid other than a dog, but not when using a satisfactory dog ($F(2, 44)$ = .89, p = .420, partial eta-squared = .04).

Paired-samples t-tests (Table 2) indicated that all three groups' performance was rated significantly higher (better) ($t(15)$ = -13.87, p < .001; $t(19)$ = -13.15, p < .001; $t(10)$ = -5.14, p < .001) when travelling with a satisfactory dog than with other mobility aids. Poor travellers had the greatest difference in mean scores, followed by moderate and good travellers (i.e. approximately +30, +18, +7) respectively. The eta-squared statistics (η^2) (Table 2) indicated large effect sizes for all three conditions.

Travel performance indicators

The five items that measured performance when travelling with mobility aids other than a dog and a satisfactory dog (Table 1, Pair 1) were examined individually to evaluate any specific differences the dog might have made. As the outcome for discrete t-tests and an ANOVA were similar, the former method was conducted for these analyses. Using the Bonferroni adjustment, p values of less than .01 were considered significant (Table 3). The difference in ratings was found to be significantly higher (better) for all items when a satisfactory dog was used compared to before, even with the more stringent alpha level. The eta-squared statistics (Table 3) indicted a large effect size for all items, with the strength of association being greatest for the technical use of a mobility aid (M) (η^2 = .76) and the least for orientation (O) skills (η^2 = .25).

Although the differences in the mean scores for travel performance when travelling with mobility aids other than a dog and an unsatisfactory dog (Table 1, Pair 2) did not reach statistical significance, a paired-

Table 1. Paired-samples t-tests on mean scores for travel performance across three conditions.

Pair	*Travel Performance*	*n*	*M*	*SD*	*t*	*df*	*p =*	η^2
1	Mobility aid other than guide dog	47	23.36	10.44	-12.09	46	.000*	.76
	Satisfactory guide dog	47	45.51	4.08	-	-	-	-
2	Mobility aid other than guide dog	16	27.31	10.03	.24	15	.815	.004
	Unsatisfactory guide dog	16	26.81	8.60	-	-	-	-
3	Satisfactory guide dog	13	45.92	3.84	7.71	12	.001*	.83
	Unsatisfactory guide dog	13	25.85	8.88	-	-	-	-

* Significant beyond the Bonferroni adjustment level for multiple comparisons ($p < .017$)

samples t-test was conducted on each of these five items to ascertain what affect any specific item may have had (Table 4). The difference in ratings for orientation performance was significantly lower (worse) at $p = .027$ at the conventional alpha level of .05, however this did not hold true once the alpha level was adjusted to .01 via the Bonferroni technique. Therefore, under this strict condition, no significant differences in ratings for any of the items were seen. However, large effect sizes (Table 4) were apparent for the differences between the groups for orientation (O) performance ($\eta^2 = .29$) and travel limitations (L) ($\eta^2 = .16$).

Travel frequency

While undertaking the present study, how often participants travelled was not considered an indicator of travel performance, as it

Table 2. Paired-samples t-tests on mean scores for travel performance for three groups across two conditions.

Pair	*Travel Performance*	*n*	*M*	*SD*	*t*	*df*	*p =*	η^2
1	*Poor traveller (1-4 O&M)*							
	Mobility aid other than guide dog	16	15.75	6.52	-13.87	15	000*	.93
	Satisfactory guide dog	16	45.31	4.06	-	-	-	-
2	*Moderate traveller (5-7 O&M)*							
	Mobility aid other than guide dog	20	27.30	4.17	-13.15	19	.000*	.90
	Satisfactory guide dog	20	44.90	4.06	-	-	-	-
3	*Good traveller (8-10 O&M)*							
	Mobility aid other than guide dog	11	40.09	3.86	-5.14	10	.000*	.73
	Satisfactory guide dog	11	46.91	4.18	-	-	-	-

* Significant beyond the Bonferroni adjustment level for multiple comparisons ($p < .017$)

Table 3. Paired-samples t-tests on mean scores for specific travel performance indicators when travelling with a mobility aid other than a dog and a satisfactory dog.

Travel Performance Indicators		Other Aid *M*	Other Aid *SD*	Satisfactory Dog *M*	Satisfactory Dog *SD*	*t*	*p* =	η^2
Orientation	(O)	6.72	2.68	8.53	1.53	-3.91	.000*	.25
Mobility	(M)	5.23	2.25	9.40	0.83	-12.09	.000*	.76
Travel (O&M)	(T)	5.66	2.26	9.40	0.90	-11.51	.000*	.74
Difficulty	(D)	4.13	4.13	8.85	2.24	-11.10	.000*	.73
Limitation	(L)	4.62	4.62	9.32	2.65	-11.40	.000*	.74

$n = 47$, $df = 46$

* Significant beyond the Bonferroni adjustment level for multiple comparisons ($p < .01$)

was understood from the first author's ethnographic fieldwork that there were many factors involved when making the decision to travel, for example, the weather, the dogs' needs, work habits etc. (Lloyd, 2004). This issue is further discussed in the second part of this study (Lloyd et al., 2008) under the heading 'Intensity of Travel'. Therefore, frequency of independent travel was measured separately on a 10-point scale, with 10 indicating more journeys, and paired-samples t-tests were conducted to see whether there were significant differences in how often participants travelled before they used a dog, and when they used satisfactory and unsatisfactory dogs (Table 5).

Results suggest that participants travelled significantly more often when using a satisfactory dog than with mobility aids other than a dog. There was no difference in how often one travelled using an unsatisfactory dog compared to mobility aids other than a dog, as the *p* value, which was significant at $p \leq .05$ ($p = .053$), did not retain significance

Table 4. Paired-samples t-tests on mean scores for specific travel performance indicators when travelling with a mobility aid other than a dog and an unsatisfactory dog.

Travel Performance Indicators		Other Aid *M*	Other Aid *SD*	Satisfactory Dog *M*	Satisfactory Dog *SD*	*t*	*p* =	η^2
Orientation	(O)	7.31	2.44	5.94	2.67	2.45	.027*	.29
Mobility	(M)	5.31	2.47	5.00	1.75	.52	.612	.02
Travel (O&M)	(T)	6.00	2.42	5.38	2.03	1.18	.258	.09
Difficulty	(D)	3.88	2.31	4.81	2.11	-1.32	.206	.10
Limitation	(L)	4.81	2.90	5.69	2.50	-1.70	.110	.16

$n = 16$, $df = 15$

* Significant at $p < .05$

**Significant beyond the Bonferroni adjustment level for multiple comparisons ($p < .01$)

Table 5. Paired-samples t-tests on mean scores for travel frequency across three conditions.

Pair	*Travel Performance*	*n*	*M*	*SD*	*t*	*df*	*p* =	η²
1	Mobility aid other than guide dog	47	5.94	2.54	-8.08	46	.000*	.59
	Satisfactory guide dog	47	9.13	1.12	-	-	-	-
2	Mobility aid other than guide dog	16	6.25	2.54	-2.10	15	.053	.23
	Unsatisfactory guide dog	16	7.50	1.32	-	-	-	-
3	Satisfactory guide dog	13	8.92	1.32	3.74	12	.003*	.54
	Unsatisfactory guide dog	13	7.31	1.38	-	-	-	-

* Significant beyond the Bonferroni adjustment level for multiple comparisons ($p < .017$)

at $p < .017$ once the Bonferroni adjustment was applied. A significant decrease in travel frequency was seen when an unsatisfactory dog was used compared to a satisfactory one. The eta-squared statistic (η^2) (Table 5), which ranged from .23 to .59, indicted that the relationships for all three conditions were strong. The distributions for travel frequency and travel performance under these three conditions are shown in Figure 1, and a comparison of the mean scores of the five items comprising travel performance, and travel frequency is illustrated in Figure 2.

Non-visual conditions affecting mobility

Many non-visual conditions can encumber work with a guide dog, for example, impaired circulation (may lead to mobility problems in cold weather), peripheral neuropathy (may mask pain), Charcot's joint (degeneration of the foot leading to an unusual gait), and foot drop (may catch foot on a crack in the pavement that a dog would probably ignore) (Milligan, 1998). Milligan's commentary also described non-visual conditions that can facilitate the use of a dog. These include diabetic hand syndrome (where a dog can be useful to retrieve

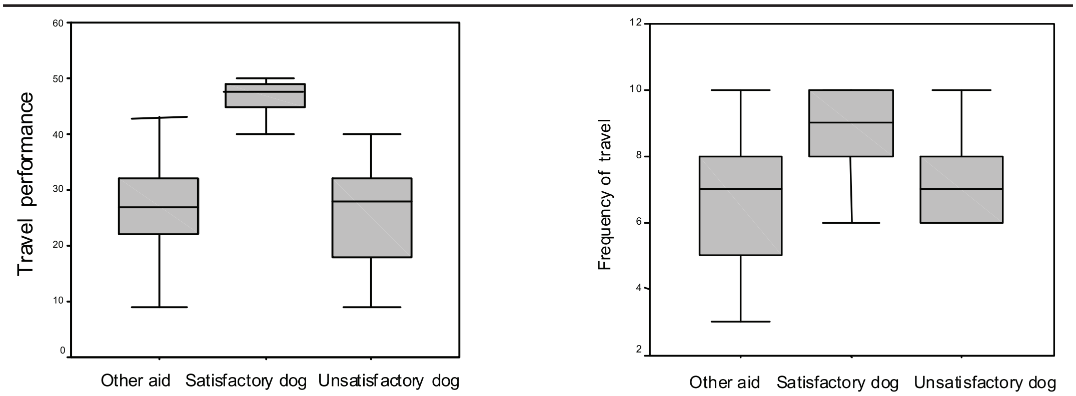

Figure 1. Distributions of differences in travel performance and frequency of travel when travelling with a mobility aid other than a dog ($N = 50$), and when using a satisfactory ($n = 47$) and an unsatisfactory ($n = 16$) dog.

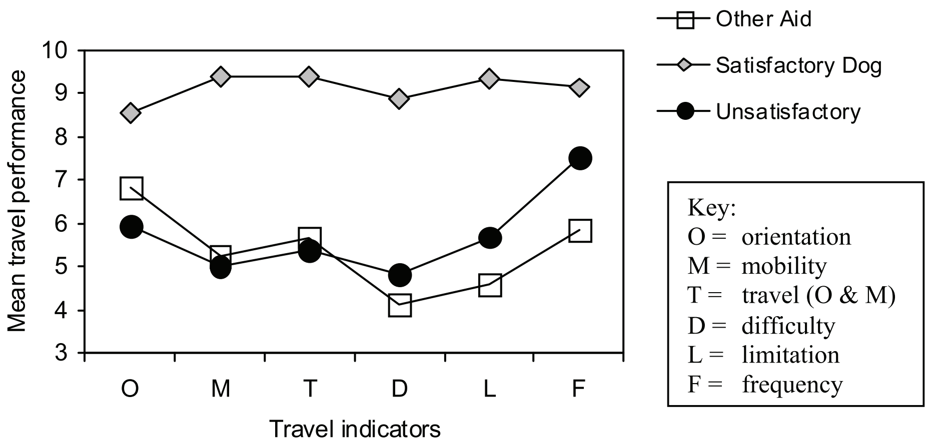

Figure 2. A comparison of mean scores for travel performance indicators (including frequency of travel) when travelling with mobility aids other than a dog ($N = 50$), and when using a satisfactory ($n = 47$) and an unsatisfactory ($n = 16$) dog.

dropped items), carpal tunnel syndrome (intensified by repetitious movements required for long cane use), cranial neuropathy (may lead to hearing loss), and kidney transplant as cane usage does not offer protection from the waist up. Therefore, as an adjunct to assessing travel performance, participants in the present study were asked to state whether or not they had any non-visual conditions that restricted their mobility, and if so, to rate how much the conditions restricted their independent travel (a) before they received a dog and (b) when they used a dog. Ratings were scored on a continuous 1 to 10 scale, with higher scores indicating greater restrictions. Note: Participants were asked to answer on their overall dog experience that is, not differentiating between satisfactory and unsatisfactory dogs.

Thirty four percent of participants had such non-visual conditions as hearing loss and musculo-skeletal problems that restricted independent travel. The type and proportion of these conditions are presented in Table 6. A paired samples t-test found that restrictions in independent travel were significantly less when a dog was used ($M = 2.35$, $SD = 1.00$), $t(16) = 5.10$, $p = .001$) compared to before a dog was used ($M = 5.94$, $SD = 2.88$). This difference is substantial as supported by an eta-squared statistic (η^2) of .62.

Discussion

Anecdotal accounts suggest that the guide dog is an effective aid to mobility and increases independent travel (Edwards, 2002; Ireson, 1991; Lambert, 1990; Purves & Godwin, 1981; Stead, 1997; Warnath & Seyfarth, 1982), and guide dog handlers are reported to have better mobility than other blind or vision impaired travellers (Clark-Carter et al., 1986; Jackson et al., 1994; Refson et al., 1998, 1999, 2000) and to prefer the dog to other mobility aids (Steffens & Bergler, 1998). However, with the exception of Delafield's (1974) longitudinal study on six subjects in the UK, no other study appears to have measured change in travel performance from pre to post guide dog usage within the same sample.

Table 6. Non-visual visual conditions restricting participants' (N = 50) independent travel.

Non-Visual Condition	%
None	66
Hearing loss	12
Arthritis	6
Repetitive strain injury of wrist caused by use of a long cane	6
Unsteady gait	4
Asthma	4
Anxiety	2
High blood pressure	2
Head injury	2

No missing responses.

Total percent does not add to 100, due to open-ended questions/multiple responses.

The participants in the present study perceived their travel performance to be better when using a dog that was considered a satisfactory mobility aid than when using mobility aids other than a dog (i.e., before a dog was acquired), or with an unsatisfactory dog. These findings were upheld on follow-up regardless of how well persons rated their O&M skills before acquiring a dog. Although 'good travellers' rated their performance highly before they acquired a dog, this was considered significantly better when using a satisfactory dog. 'Moderate' and 'poor' travellers also rated their performance significantly better with a satisfactory dog than before. There was almost no difference in the way the three groups rated performance with a satisfactory dog, although there were distinct and significant differences between the groups when rating performance before getting a dog. Hence, poor travellers appeared to gain the most from the use of a dog.

This finding is important, as it is thought that it is "best for guide dog (*sic*) handlers to have good mobility skills if they are to be effective travellers" (Whitstock et al., 1997, p. 272). This attitude is shared by some guide schools whose clients are believed not to be able to achieve success with a dog without prior long cane training (Brooks, 1991). However, in the present study the professed degree of O&M skill before obtaining a dog did not appear to have any effect on the perceived level of travel performance with a satisfactory dog. This finding supports the comment made by I. Cox, formerly of the RNZFB's Guide Dog Services (personal communication, December 1999), who said that for some people, having poor or no long cane mobility skills may not be detrimental to travelling with a guide dog, although in order to travel safely applicants should be well orientated to their usual destinations.

This suggests that O&M could be evaluated as two discrete skills as although technical long cane mobility skills are useful, they may not be essential, and/or orientation skills might be more important to work successfully with a dog. However, travellers who have dog and cane skills are more versatile, as they have a choice of mobility aid to fit the occasion, that is, when it is impractical to use a dog, and can remain independently mobile if the dog is unwell or retired before a replacement dog is acquired (Brooks, 1991). It would be worthwhile to further investigate the level of O&M skills, both combined and as separate entities, required for an applicant to be successful with a dog, as there are many levels of success depending on a traveller's workload. Ideally, this should be done objectively and longitudinally, where real and not perceived change is measured, and over real time before and after a dog is acquired.

Frequency of travel was not included as an indicator of travel performance in this study. However, as the distributions for travel frequency were similar to that of the items comprising travel performance, it may be concluded that travel frequency should be included in future measures of travel performance.

There was no significant difference in ability when travelling with mobility aids before getting a dog and when using an unsatisfactory dog. This was surprising, as one would expect that an unsatisfactory dog would be less effective than other mobility aids. However, this may be explained by the differences in travel performance between those who considered themselves poor, moderate or good travellers before acquiring a dog, averaging-out across the groups. A comparison of travel performance indicated that the mean score for poor travellers increased (+6) when using an unsatisfactory dog almost as much as it decreased for moderate (-2.8) and good travellers (-4.2) combined. Although the use of an unsatisfactory dog was not found to significantly reduce orientation (due to the application of the stringent Bonferroni adjustment), this effect may be of practical significance as the strength of association was substantial ($\eta^2 = .29$) and thus would merit further study with a larger sample size. Problems with orientation and dogs that perform poorly are discussed further in the second part of this study (Lloyd et al., 2008).

Approximately a third of participants in the present study had non-visual conditions that restricted their mobility, and it appears that these restrictions were alleviated by the use of a guide dog. Conditions included hearing loss (which can hamper orientation) and carpal tunnel syndrome. Provided the dog harness is adjusted to avoid aggravating any existing repetitive strain injuries, these findings support Milligan's (1998) suggestions on who may benefit from guide dog use; especially with the advent of quieter cars. This information should prove useful for instructors when assessing applicants for guide dogs.

The findings of the present study are limited as they rely on memory for the pre-dog ratings and the perceptions of the participants. Although it may be assumed that these perceptions are accurate in terms of perceived differences for individuals, it cannot be ascertained how comparable the ratings were across groups. It is also not possible to know how accurate these perceptions are in terms of travel. However, it is clear that participants rated their travel performance better with a satisfactory guide dog than with mobility aids other than a guide dog, or with an unsatisfactory dog regardless of any perceived ability in O&M.

Conclusions to both parts of the study will be discussed as a whole in the second section (Lloyd et al., 2008).

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References

Blasch, B., & De l'Aune, W. (1992). A computer profile of mobility coverage and a safety index. *Journal of Visual Impairment & Blindness, 86*, 249-254.

Blasch, B. B., & Stuckey, K. A. (1995). Accessibility and mobility of persons who are visually impaired: A historical analyses. *Journal of Visual Impairment & Blindness*, *89*(5), 417-422.

Bongers, R. M., Schellingerhout, R., van Grinsven, R., & Smithsman, A. W. (2002). Variables in the touch technique that influence the safety of cane walkers. *Journal of Visual Impairment & Blindness*, *96*, 516-531.

Briggs, S. R., & Cheek, J. M. (1986). The role of factor analysis in the development and evaluation of personality scales. *Journal of Personality, 54*, 106-148.

Brooks, A. (1991). The value of long cane training prior to undertaking guide dog training. *Proceedings of the 6th International Mobility Conference,* Madrid, Spain, 365-368.

Clark-Carter, D. D., Heyes, A. D., & Howarth, C. I. (1986). The efficiency and walking speed of visually impaired people. *Ergonomics*, *29*(6), 779-789.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences.* Hillsdale, NJ: Erlbaum Associates.

Delafield, G. (1974). *The effects of guide dog training on some aspects of adjustment in blind people*. Doctoral dissertation, University of Nottingham, England.

Deshen, S., & Deshen, H. (1989). On social aspects of the usage of guide-dogs and long canes. *Sociological Review*, *37*, 89-103.

Dodds, A. G., Carter, D. D., & Howarth, C. I. (1983). Improving objective measures of mobility. *Journal of Visual Impairment & Blindness, 77,* 438-442.

Dodds, A. G., Clark-Carter, D. D., & Howarth, C. I. (1984). The sonic pathfinder: An evaluation. *Journal of Visual Impairment & Blindness*, *78*, 203-206.

Dodds, A. G., Clark-Carter, D., & Howarth, C. I. (1986). The effects of precueing on vibrotactile reaction times: Implications for a guidance device for blind people. *Ergonomics, 29*, 1063-1071.

Edwards, R. T. (2002). "Forward!" The experience of a new guide dog owner. *British Medical Journal, 325*(7356), 171.

Farmer, L., & Smith, D. (1997). Adaptive technology. In B. Blasch, W. Wiener, and R. Welsh (Eds.), *Foundations of orientation and mobility, 2nd Edition* (pp. 231-

259). New York: American Foundation for the Blind.

Geruschat, D., & De l'Aune, W. (1989). Reliability and validity of O&M instructors' observations. *Journal of Visual Impairment & Blindness, 83*, 457-460.

Gitlin, L. N., Mount, J., Lucas, W., Weirich, L. C., & Gramberg, L. (1997). The physical costs and psychosocial benefits of travel aids for persons who are visually impaired or blind. *Journal of Visual Impairment & Blindness*, *91*(4), 347-359.

Guth, D., Hill, E., & Reiser, J. (1989). Tests of blind pedestrians' use of traffic sounds for street-crossing alignment. *Journal of Visual Impairment & Blindness, 83,* 461-468.

Harder, A., & Michael, R. (2002). The target-route map: Evaluating its usability for visually impaired persons. *Journal of Visual Impairment & Blindness, 96,* 711-723.

Heyes, A. D. (1984). The sonic pathfinder: A new electronic travel aid. *Journal of Visual Impairment & Blindness, 78*, 200-202.

Ireson, P. (1991). *Another pair of eyes: The story of guide dogs in Britain*. London: Pelham.

Jackson, A. J., Murphy, P. J., Dusoir, T., Dusoir, H., Murdock, A., & Morrison, E. (1994). Ophthalmic, health and social profile of guide dog owners in Northern Ireland. *Ophthalmic & Physiological Optics*, *14*, 371-377.

Kirchner, C. E., Gerber, E. G., & Smith, B. C. (2008). Designed to deter. Community barriers to physical activity for people with visual or motor impairments. *American Journal of Preventive Medicine*, *34*(4), 349-352.

La Grow, S. (1999). The use of the Sonic Pathfinder as a secondary mobility aid for travel in business environments: A single-subject design. *Journal of Rehabilitation Research and Development, 36,* 333-340.

La Grow, S., Kjeldstad, A., & Lewnadowski, E. (1988). The effect of cane tip design on three aspects of nonvisual travel. *Journal of Visual Impairment & Blindness, 82,* 13-16.

La Grow, S., Leung, S., & Lyell, M. (1995). Preference for static or revolving cane tips by visually impaired travellers. *International Journal of Rehabilitation Research, 18,* 82-85.

La Grow, S., & Weessies, M. (1994). *Orientation and mobility: Techniques for independence.* Palmerston North, NZ: Dunmore Press.

Lambert, R. M. (1990). Some thoughts about acquiring and learning to use a dog guide. *RE:view*, *22*(3), 151-158.

Lloyd, J. K. F. (2004). *Exploring the match between people and their guide dogs.* Doctoral dissertation, Massey University, New Zealand.

Lloyd, J. K. F., Budge, R. C., La Grow, S. J., & Stafford, K. J. (2000). A focus group exploration of guide dog and user partnerships. [CD-ROM]. *Proceedings of the 10th International Mobility Conference*, Coventry, England, 233-236.

Lloyd, J. K. F., La Grow, S. J., Stafford, K. J., & Budge, R. C. (2008). The guide dog as a mobility aid part 2: Perceived changes to travel habits. *International Journal of Orientation & Mobility*, *1*(1), 34-45.

Long, R., Reiser, J., & Hill, E. (1990). Mobility in individuals with moderate visual impairments. *Journal of Visual Impairment & Blindness, 84*, 111-118.

Miner, R. J-T. (2001). The experience of living with and using a dog guide. *RE:view*, *32*(4), 183-190.

Milligan, K. (1998). Mobility options for visually impaired persons with diabetes: Considerations for orientation and mobility instructors. *Journal of Visual Impairment & Blindness*, *92*(1), 71-79.

Muldoon, C. (2000). Does the presence of a guide dog enhance feelings of social acceptance in guide dog users? [CD-ROM]. *Proceedings of the 10th International Mobility Conference*, Coventry, England, 258-261.

McKinley, J., Goldfarb, E., & Goodrich, G. (1994). An evaluation of the Sonic Pathfinder. In G. Clarke and T. Heyes (Eds.), *Proceedings of the International Mobility Conference 7* (pp. 17-18). Melbourne, Australia: Royal Guide Dogs Association.

Nunnally, J. O. (1978). *Psychometric theory*. New York: McGraw-Hill.

Purves, P., & Godwin, F. (1981). *Tess: The story of a guide dog*. London: Gollancz.

Refson, K., Jackson, A. J., Dusoir, A. E., & Archer, D. B. (1998). Ophthalmic and visual profile of guide dog owners in Scotland. *British Journal of Ophthalmology*, *83*, 470-477.

Refson, K., Jackson, A. J., Dusoir, A. E., & Archer, D. B. (1999). The health and social status of guide dog owners and other visually impaired adults in Scotland. *Visual Impairment Research*, *1*, 95-109.

Refson, K., Jackson, A. J., Plant, C., Parker, E., Dusoir, A. E., & Archer, D. B. (2000). Visual status and mobility of persons with retinitis pigmentosa: Guide dog owners and non-guide dog owners. *Optometry in Practice*, *1*, 43-48.

Rimbault, G., & Romero, J. (1994). Possibilities and limits of the guide dog for the blind as an independent way of locomotion. *Proceedings of the 7th International Mobility Conference*, Melbourne, Australia, 187-189.

Royal New Zealand Foundation for the Blind. (1990). *Focus on rehabilitation: A rehabilitation service delivery plan for people with a vision impairment.* Auckland, New Zealand: Author.

Stead, J. L. (1997). *Blind see-saw*. Hawkes Bay, New Zealand: Spitting Image Copiers.

Steffans, M. C., & Bergler, R. (1998). Blind People and their dogs. In C. C. Wilson & D. C. Turner (Eds.), *Companion animals in human health* (pp. 149-157). Thousand Oaks, CA: Sage.

Tellevik, J. M., Martinsen, H., Sorlilokken, M., & Elmerskog, B. (2000). Development and evaluation of a procedure to assess mobility route learning. *Journal of Visual Impairment & Blindness, 94,* 197-203.

Uslan, M., & Schreibeman, K. (1980). Drop-off detection in the touch technique. *Journal of Visual Impairment & Blindness, 74,* 179-182.

Wall, R. S., & Ashmead, D. H. (2002a). Biomechanical movements in experienced cane users with and without visual impairments. *Journal of Visual Impairment & Blindness*, *96*, 501-515.

Wall, R. S., & Ashmead, D. H. (2002b). Changes in biomechanical features of the two-point touch techniques as it is learned. *Journal of Visual Impairment & Blindness, 96,* 829-841.

Warnath, C., & Seyfarth, G. J. (1982). Guide dogs: Mobility tool and social bridge to the sighted world. *Journal of Rehabilitation*, *48*(2), 58-61.

Whitstock, R., Franck, L., & Haneline, R. (1997). Dog Guides. In B. Blasch, W. Wiener, and R. Welsh (Eds.), *Foundations of orientation and mobility, 2nd Edition* (pp. 260-283). New York: American Foundation for the Blind.

Zee, A. (1983). Guide dogs and their owners: Assistance and friendship. In A. H. Katcher & A. M. Beck (Eds.), *New perspectives on our lives with companion animals* (pp. 472-483). Philadelphia: University of Pennsylvania Press.

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