

RESEARCH ARTICLE

Service Dogs and People with Physical Disabilities Partnerships: A Systematic Review

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Abstract

Occupational therapists have recognized the benefits that service dogs can provide people with disabilities. There are many anecdotal publications extolling the benefits of working with service dogs, but few rigorous studies exist to provide the evidence of the usefulness of this type of assistive technology option. This systematic review evaluates the published research that supports the use of service dogs for people with mobility-related physical disabilities.

Articles were identified by computerized search of PubMed, CINAHL, PsycINFO, OT Seeker, the Cochrane Database of Systematic Reviews, SportDiscus, Education Research Complete, Public Administration Abstracts, Web of Knowledge and Academic Search Premier databases with no date range specified. The keywords used in the search included disabled persons, assistance dogs or service dogs and mobility impairments. The reference lists of the research papers were checked as was the personal citation database of the lead author. Twelve studies met the inclusion criteria and whereas the findings are promising, they are inconclusive and limited because of the level of evidence, which included one Level I, six Level III, four Level IV and one Level V. All of the studies reviewed had research design quality concerns including small participant sizes, poor descriptions of the interventions, outcome measures with minimal psychometrics and lack of power calculations. Findings indicated three major themes including social/participation, functional and psychological outcomes; all of which are areas in the occupational therapy scope of practice. Occupational therapists may play a critical role in referral, assessment, assisting clients and consulting with training organizations before, during and after the service dog placement process. In order for health care professionals to have confidence in recommending this type of assistive technology, the evidence to support such decisions must be strengthened. Copyright © 2011 John Wiley & Sons, Ltd.

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Keywords

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Introduction

Dogs have been found to be important social supports with health benefits in the role of companions, pets

and visitors (Friedmann *et al.*, 1980; Allen *et al.*, 2001; Allen *et al.*, 2002). The Delta Society, an international human services organization that facilitates human–animal interactions, refers to casual visitations

as animal-assisted activities (AAA) (Delta Society, 2009). Dogs also participate in intervention sessions, which are referred to as animal-assisted therapy (AAT) (Delta Society, 2009). In addition, dogs are trained and permanently placed with individuals as assistance dogs (guide dogs, hearing dogs and service dogs) (Figure 1). Guide dogs assist individuals who have visual disabilities or are blind (Sachs-Ericsson *et al.*, 2002; Assistance Dogs International, 2009a). Hearing dogs assist individuals who are hard of hearing or are deaf (Guest *et al.*, 2006; Assistance Dogs International, 2009b). Service dogs are trained to assist people who have mobility and balance challenges, to alert or respond to medical issues such as diabetes and seizures and to support people with psychiatric disabilities and autism (Assistance Dogs International, 2009c). This systematic literature review is focused on service dogs that work with people who have physical disabilities. Service dogs may help to conserve energy and prevent further injury by activating devices and door openers, assisting with obtaining supplies and helping people undress. They can retrieve dropped items, drag a laundry basket, and provide counter balance for transitional movements. In addition, they may detect and respond to medical crisis including carrying medications, alerting to monitors, retrieving a phone, using a switch to call emergency services, and going for help (Assistance Dogs International, 2009c).

All types of assistance dogs are becoming increasingly recognized for supporting people with disabilities to carry out daily meaningful occupations (Roth, 1994;

Rabschutz, 2006; Rintala *et al.*, 2008). From an occupational therapy perspective, the recommendation for service dogs as assistive technology options is an emerging practice area, and the evidence of the effectiveness is in its infancy (Winkle & Zimmerman, 2009). Some major barriers in the analysis of the existing literature discussing the roles that dogs can play are the lack of uniform terminology and inconsistent training standards across disciplines and organizations (Winkle & Canfield, 2008). This is now changing with the establishment of Assistance Dogs International, a volunteer membership organization for assistance dog training organizations (Assistance Dogs International, 2008). Twenty-seven countries in the America, Asia, Europe, New Zealand, and Australia are listed as members of Assistance Dogs International. Their mission is to facilitate communication and learning among member organizations, educate the public and to set minimum standards for assistance dog trainers, the dogs being trained, and the assistance dog recipients.

The lengthy national waitlists with professional service dog training organizations provide evidence that significant numbers of individuals with disabilities are interested in such interventions (Sachs-Ericsson *et al.*, 2002). The purpose of this study is to review the literature focused on the use of service dogs for people with mobility-related physical disabilities. The following research question guided the selection of research studies for the review: What is the evidence for the effectiveness (social/participation, function and psychological) of service dogs for children and adults with physical disabilities?

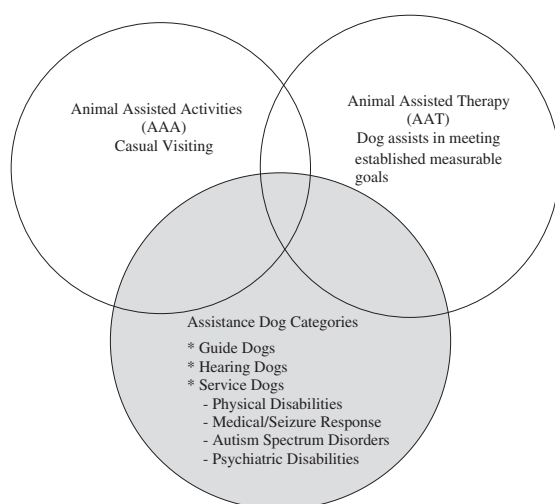


Figure 1 Types of animal-assisted (dog) interventions

Methods for conducting the evidence-based review

The focus of this review was on original, peer-reviewed, quantitative research addressing the topic of the effects of service dogs in partnership with people with mobility impairments. Extensive literature searches were conducted, and findings were evaluated with inclusion and exclusion criteria to accurately reflect the goal of this review.

Literature Search

Database searches, which were completed over a 2-year period (2008 to 2010) included: PubMed, CINAHL, PsycINFO, OT Seeker, the Cochrane Database of

Systematic Reviews, SportDiscus, Education Research Complete, Public Administration Abstracts, Web of Knowledge and Academic Search Premier. Searches were limited to English language, with no date limits and controlled vocabulary were used to perform a comprehensive search. Careful consideration was given to the combination of terms such as canine or dog, which led to numerous false hits. The same text words were used across all databases, but subject headings were modified depending on the database searched to optimize results. Keywords used included dogs and disabled persons, assistance dog* or service dog*, and (dog* and (handicap* or disab*)). The search excluded papers using terms relating to disabilities not covered by this review, such as visual or hearing impaired, mental disorders or autism.

Inclusion and exclusion criteria

The initial searches yielded 432 papers, with an additional 119 identified in the lead author’s personal citation database. After removal of duplicate records, two of the authors reviewed the titles and abstracts to further exclude descriptive or anecdotal papers, review

papers, qualitative studies or dissertations. The full text of the remaining 23 papers was closely examined for focus on the effect of service dogs with people with ambulatory disabilities (neurological, congenital or acquired) and for examining any aspect of the service dog partnerships with psychosocial and/or functional outcomes. Twelve papers met inclusion and exclusion criteria for this review (Figure 2).

Results

An earlier review of the evidence supporting service dog partnerships with people with disabilities, included six of the 12 papers we evaluated Modlin (2000). Levels of evidence classifications consist of a hierarchy of research designs that range from the greatest to the least according to the study’s ability to reduce bias. Quality-rating schemes give a means of assessing the scientific rigour of a research study. Each paper was scored for level of evidence using the American Academy of Cerebral Palsy and Developmental Medicine (AAPDM) 5 level evaluation system (Darrah *et al.*, 2008) and for the quality of the study using the AAPDM 7-point scale (Table 1).

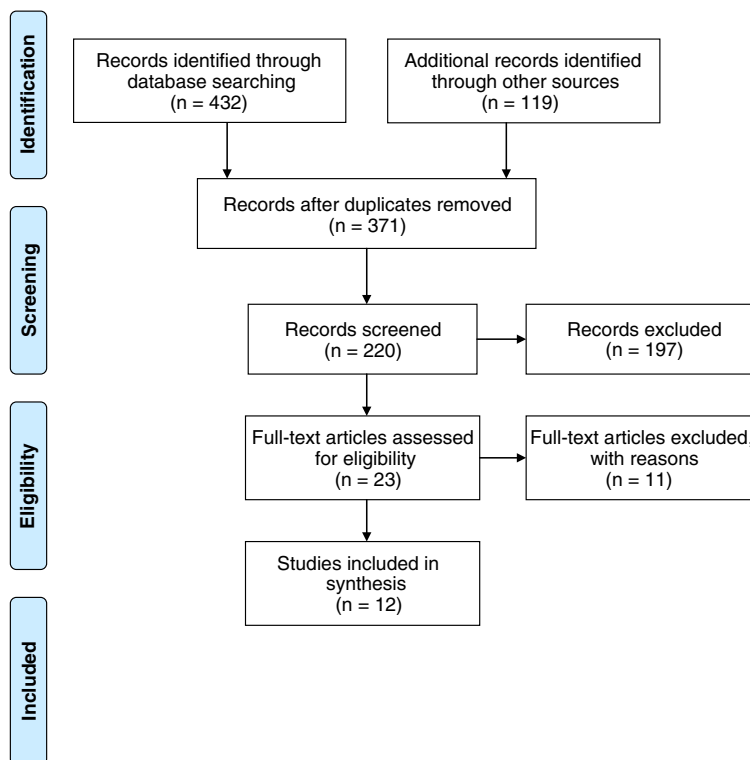


Figure 2 Flowchart of article excluded and included for review

Table 1. AACPDM levels of evidence (Darrah *et al.*, 2008)

Part A: type of research design	
Level non-empirical	Group research
I.	Systematic review of randomized control trials, large randomized controlled trial (RCT) ($n > 100$)
II.	Smaller RCTs ($n < 100$), systematic reviews of cohort studies, “outcome research” (very large ecologic studies)
III.	Cohort studies (must have concurrent control group), systematic reviews of case control study
IV.	Case series cohort study without concurrent control group (e.g. with historic control group)
V.	Case control study
	Expert opinion
	Case study or report
	Bench research
	Common sense/anecdotes
Part B: quality of study	
1.	Were inclusion and exclusion criteria of the study population well described and followed?
2.	Was the intervention well described and was there adherence to the intervention assignment? For two-group designs, was the control exposure also well described?
3.	Were the measures used clearly described, valid and reliable for measuring the outcomes of interest?
4.	Was the outcome assessor unaware of the intervention status of the participants (i.e. was there blind assessment)?
5.	Did the authors conduct and report appropriate statistical evaluation including power calculations?
6.	Was dropout/loss to follow-up reported and less than 20%? For two-group designs, was dropout balanced?
7.	Considering the potential within the study design, were appropriate methods for controlling confounding variables and limiting potential biases used?

AACPDM, American Academy for Cerebral Palsy & Developmental Medicine.

The current evidence to support service dog/people with disabilities partnerships included one Level II study, six Level III studies, four Level IV studies and one Level V studies (Table 2). All 12 studies rated 4 or below in the quality of study indicating weak research designs resulting in potential bias. Four of the 12 studies were not affirmatively rated on any of the seven quality questions. Based on our criteria for evaluation, we found no study that included the dual criteria for high quality. Thus the conclusions drawn from the results must be considered with caution.

Table 3 summarizes the 12 papers examining the efficacy of service dogs regarding study objectives, research design, participants, intervention description, outcome measures and results.

Discussion

Social/participation effects of service dogs

Service dogs seem to positively influence socialization and community participation in a variety of environments. Two studies observed partnerships in natural environments (Eddy *et al.*, 1988; Mader *et al.*, 1989) and reported that community members smiled and conversed with children and adults with service dogs more than children and adults without service dogs,

and community members did not avoid the person with a disability as much when a service dog was present. Hart *et al.* (1987) found that participants who used wheelchairs with service dogs reported more social greetings and approaches in comparison with participants without service dogs, and compared with the period before participants obtained dogs. In a study conducted in the UK, Lane *et al.* (1998) found that 92% of children and adult participants with physical disabilities ($n = 57$) reported that people frequently stopped to talk with them when they were out with their dog, and 75% reported that they had made new friends since owning their dog. One hundred percent of a large sample ($n = 202$) of adults with physical disabilities reported that they were approached more often in public when they had their dogs with them (Fairman & Huebner, 2000). These studies concluded that service dogs facilitated social interaction for children and adults with physical disabilities. Lane and colleagues (1998) concluded that a service dog serves “to shift the focus of attention away from the recipient’s disability toward their competence in handling a highly trained dog” (p. 58). However, a few studies reported concerns for dogs acting as “social facilitators” such as requiring extra time, more attention on the dog than the person and petting the dog, which may interfere

Table 2. Study quality assessment based on the AACPDM^a: assessing quality of conduct of a study (O'Donnell *et al.*, 2004)

Study	Level	1	2	3	4	5	6	7	Total ^b
Allen & Blascovich (1996)	II	√	√				√	√	4
Collins <i>et al.</i> (2006)	III	√		√			√		3
Eddy <i>et al.</i> 1988	III								0
Fairman & Huebner (2000)	IV						√		1
Hart <i>et al.</i> (1987)	III								0
Lane <i>et al.</i> (1998)	IV								0
Mader <i>et al.</i> (1989)	III	√		√					2
Ng <i>et al.</i> (2000)	IV								0
Rintala <i>et al.</i> (2008)	III		√						1
Rintala <i>et al.</i> (2002)	IV	√						√	2
Shintani, <i>et al.</i> (2010)	III	√		√					2
Valentine <i>et al.</i> (1993)	V						√		1

^aAACPDM, American Academy for Cerebral Palsy & Developmental Medicine.

^bStrong ("yes" score 6 or 7), moderate (score 4 or 5) or weak (score ≤ 3).

with the dog's concentration and training (Eddy *et al.*, 1988).

Although one study reported a decrease in loneliness for people with mobility impairments (Valentine *et al.*, 1993), another study (Collins *et al.*, 2006) found no difference in loneliness for people with disabilities with and without dogs. Adults with physical disabilities with service dogs ($n = 202$) reported that their dogs provided emotional support and feelings of security (Fairman & Huebner, 2000). Lane *et al.* (1998) found that a majority of the child and adult participants with physical disabilities in their study reported a close, affectionate and comforting relationship with their dog. In conclusion, service dogs seem to have many positive social effects for people with disabilities, which might increase their participation in the community.

Functional effects of service dogs

Children and adults with physical disabilities report that service dogs most commonly assist them with retrieving items out of reach, opening doors, getting around the community, getting around the house, shopping, and the dog barking to alert others in emergencies (Lane *et al.*, 1998; Fairman & Huebner, 2000; Rintala *et al.*, 2008). Two studies assessed whether having a service dog decreased the need to have others help in daily tasks. Allen and Blascovich (1996) found that a service dog partnership decreased the paid assistance needed by an average of 60 hours over 2 weeks and extrapolated a \$60,000 savings over an 8 years. Fairman and Huebner (2000) found that service dogs reduced

paid human assistance by an average of 2 hours per week resulting in a savings of \$600 per year. Service dogs may contribute to increasing a sense of independence and a decrease in reliance on others for people with disabilities. This finding can also have important benefits to family members. Reduction in the time needed for care-giving can have an overall positive impact on all family members. In qualitative interviews with 22 people with service dogs, four themes emerged: 1) decreased burden for caregivers, 2) greater caregiver peace of mind, 3) freeing up caregiver time for doing other things and 4) caregivers enjoying the dog as a member of the family (Rintala *et al.*, 2002). It should be emphasized that these were perceptions of the people with disabilities, not the caregivers.

Psychological effects of service dogs

Studies from the United States, Japan and the UK found that people with physical disabilities partnered with service dogs reported several psychological benefits including significant increases in self-esteem, internal locus of control, well being and positive affect (Allen & Blascovich, 1996; Rintala *et al.*, 2002; Collins *et al.*, 2006; Shintani *et al.*, 2010). Collins *et al.* (2006) found that people with progressive conditions (e.g. multiple sclerosis and Parkinson's disease) who have service dogs demonstrated significantly higher positive affect scores and that service dogs moderated the effects of depression. However, psychosocial characteristics did not differ significantly between those partnered with service dogs and those without.

Table 3. Study characteristics

Study objectives/ research design	Participants total/groups	Intervention description	Outcome measures	Results
Allen & Blascovich (1996) To assess the impact of service dogs on the lives of people with disabilities in respect to psychological well-being and social participation and to evaluate the economic impact of service dogs Randomized controlled trial	<i>N</i> = 48, randomly assigned to two groups, sample of convenience • 24 participants with service dogs • 24 participants on wait-list	1. Experimental group received dogs 1 month after study began 2. Control group (wait list group) received dogs 13 months after study began 3. Dogs trained from 6 to 12 months before placement 4. Individualized special training 5. Difficult to determine if all dogs were trained by the same organization	Data collected every 6 months over 2 years/five times Mailed surveys: (Spheres of Control Scale -Internal Locus of Control, Rosenberg Self-Esteem Scale, Affect Balance Scale, Community Integration Questionnaire, school attendance, employment, paid/unpaid assistance hours)	•Significantly different improvement 6 months after receiving service dogs with improvement continued up to 2 years •Psychologically, all participants showed improvement in self-esteem, internal locus of control, well- being and social interaction within 6 months of receiving service dog •Significant difference in school attendance and employment •After 12 months, the presence of a service dog was associated with a decrease of approximately 60 bi-weekly paid assistance hours
Collins <i>et al.</i> , (2006) To examine whether dog/adult partnerships impacted psychosocial well-being and community participation Cross-sectional, non-randomized control study	<i>N</i> = 152, sample of convenience, people with disabilities (58% used powered mobility) • 76 participants with service dogs • 76 participants without service dogs 8 group categories created based on gender, age and progressive/ non-progressive type of disability	1. No specified training reported for service dog or person/dog pairs 2. Participants recruited throughout the United States from multiple groups training service dogs 3. Length of partnership ranged from 0 to 13.1 years	Mailed surveys (Centre for Epidemiologic Studies Depression Scale, Positive and Negative Affect Scale, Rosenberg Self-Esteem Scale, UCLA Loneliness Scale – Version 3, Craig Handicap Assessment Reporting Technique)	•Positive/negative effect, self-esteem, depressive symptoms and loneliness scores did <i>not</i> significantly differ between groups •Among participants with depression, service dog partnership was associated with more positive affect scores •Participant/dog partners with progressive conditions scored significantly higher on positive

Table 3. (Continued)

Study objectives/ research design	Participants total/groups	Intervention description	Outcome measures	Results
				affect than participants with progressive conditions without service dogs
Eddy <i>et al.</i> (1988) To examine whether dog/adult partnerships receive more frequent social acknowledgments from able-bodied people than people in wheelchairs without service dogs Prospective study with non-randomized control group	<i>N</i> = 20, sample of convenience • 10 (4 women, 6 men) with service dogs • 10 (6 men, 4 women) without service dogs	1. Dog and owner/ dog training not described 2. Dogs all trained through Canine Companions for Independence (Santa Rosa, CA) 3. Length of time participant owned dog not reported	Naturalistic observations reporting responses of others (smile, conversation, touch, gaze aversion, path avoidance)	•Smiles and conversation significantly increased for participants with service dogs •Gaze and path avoidance decreased with service dogs but significance level not reported
Fairman & Huebner (2000) To examine the functional assistance (emotional, social, economic) provided by service dogs, to describe the training provided and problems with service dog ownership and to examine the level of satisfaction with dog ownership Post-test survey with no control group	<i>N</i> = 202, adults with physical disabilities, sample of convenience • No comparison group • 51.4% survey return rate	1. Dogs and person/ dog pair trained by one organization 2. Training not defined 3. Length of ownership of dog not clear	Mailed surveys: 28-item survey (author designed) focusing on functional assistance provided by service dogs (activities of daily living, work and productive activities, play/ leisure activities)	•Activities that service dogs most often assisted with: retrieving out of reach/dropped items (99%); getting around community (84%); getting around the house (78%); and shopping (76%) •100% of participants reported that they were approached more in public, and their dogs provided emotional support and feelings of security •Service dogs reduced the hours of paid human assistance by an average of 2 hours/ week and reduced (<i>p</i> = .006) saving average of \$600/year(<i>p</i> = .003)
Hart <i>et al.</i> (1987) To examine the socializing effects of a service dogs in public Prospective study with	<i>N</i> = 28, sample of convenience • 19 participants using wheelchairs with service dogs	1. All owned service dogs 2. All dog/person pairs trained by Canine Companions for Independence	Cannot determine if data collected by written survey or interview Survey asked (number	•Higher number of social greetings reported from adults and children on typical shopping trips with dog compared

Table 3. (Continued)

Study objectives/ research design	Participants total/groups	Intervention description	Outcome measures	Results
non-randomized control group	• 9 participants without service dogs	(Santa Rosa, CA) 3. No specified training described for service dog or person/dog pair	of adults/children approaching them in a friendly way during a typical shopping trip, number of times/ week go out alone during daytime, number of times/ week go out alone at night)	with trips without dog •Participants with dogs reported more social approaches than comparison group without dogs •After obtaining dogs, 11 of 19 participants increased their night outings alone
Lane <i>et al.</i> (1998) To examine potential effects of service dogs: dog as a social facilitator; dog as an affectionate relationship; dog as an emotional/self-esteem support; and dog as an influence on self-perceived physical health One-group, post-test survey design	<i>N</i> = 57, sample of convenience, children and adults with physical disabilities • No comparison group • 81% return rate	1. All dog/person pairs trained by same group – (Dogs for the Disabled in England) 2. Dog/person partner training not described	Study designed questionnaire (telephone interview or personal interview) with 41 items (Demographics, Social Integration, Affectionate/ Supportive Relationship, Self-perceived Health, General Satisfaction with Dog, Most Important Tasks Dog Performs)	•Activities that service dogs performed most often: retrieving/ carrying (84%); opening doors (40%); companionship (35%); command barking (35%) •Majority of participants reported a close affectionate relationship with the dog, increased social integration, dog providing comfort, self-esteem and support, enhanced self-perceived health •Levels of satisfaction with dog's work and the quality of the person/dog relationship significantly greater if ownership was participant's idea
Mader, Hart & Bergin (1989) To examine whether dog/children with disabilities partnerships receive more frequent social acknowledgements than children without service dogs	<i>N</i> = 10, sample of convenience • 5 children with service dog (10–17 yrs) • 5 children without service dog (12–16 yrs) • All used wheelchairs	1. All dogs trained by same group (Canine Companions for Independence in Santa Rosa, CA) 2. Child/dog pair training not described	Naturalistic observations reporting responses (percentages) of other people on school playground and in shopping mall: friendly glances, conversations, smiles	•In school settings, children with dogs received significantly more glances and direct conversation than children without dogs

Table 3. (Continued)

Study objectives/ research design	Participants total/groups	Intervention description	Outcome measures	Results
Non-randomized control study				
Ng <i>et al.</i> (2000) To assess whether service dog/children with disabilities partnerships increases independence Descriptive before and after case series without control group study	<i>N</i> = 5, sample of convenience No comparison group Children 11–17 years (mean 14.4); (2 girls, 3 boys); 1 boy dropped out	1. Children received dog and completed 2 week training programme 2. Visited by dog trainer after completed training 3. Skill refresher course each year	Description of changes (pre/post and follow-up 1 to 4 years after dog placement) Questionnaire with 32 activities, which a dog could assist (school, mobility and physical, home and self-care, community and store, psychological and social)	•All 4 children reporting increased independence on most items •Two children reported no change in the mobility and physical area
Rintala <i>et al.</i> (2008) To examine the functional assistance of service dogs and the satisfaction and problems of owning a service dog for adults with disabilities Pre-post, wait list non-randomized control group study	<i>N</i> = 33, sample of convenience, adults with mobility impairments • 18 with service dogs • 15 on wait list, • 2 participants in both service dog and wait list	1. Dog and owner/ dog training not described 2. 3 assistance dog training organizations involved	Data collected at referral and either 6 months after receiving dog or 6 months on wait-list Mailed surveys (Demographic Impairments, Pre-dog Task Checklist, Post-dog Task Checklist, Dog Performance, Short-Form Health Survey, Functional Independence Measure – Motor Subscale, Craig Handicap Assessment and Reporting Technique, Satisfaction with Life Scale)	•On average, participants were satisfied with assistance dogs, and dogs had a major positive impact on their lives •Activities dogs most often assisted with: retrieving items (89%); carrying items (79%); barking in emergency (78%); opening/closing doors (56%), pushing automatic doors (56%) •Reported decreased dependence on other persons with reduced hours of paid assistance
Rintala <i>et al.</i> (2002) To qualitatively and quantitatively assess the benefits of the placement of service dogs with persons with mobility impairments Pre-post with follow-up, no control group	Sample of convenience <i>N</i> = 22 Time 1 <i>N</i> = 14 Time 2 <i>N</i> = 16 Time 3 <i>N</i> = 12 Time 4 <i>N</i> = 4 Time 5 No comparison group	1. Dog and owner/ dog training not described 2. All trained at Texas Hearing and Service Dogs	Data collected when participant placed on waiting list, just prior to receiving dog, 6, 12, and 24 months after receiving dog Interviews (qualitative) and mailed quantitative questionnaires (Demographic and Disability Information, Expected and Actual Effects of Dog,	•After placement participants indicated that the service dogs had assisted them in the expected domains •Overall satisfaction with service dogs was very high at all post-placement measurements •The majority of participants reported increases in 8 of 11 life areas including increases

Table 3. (Continued)

Study objectives/ research design	Participants total/groups	Intervention description	Outcome measures	Results
			Rosenberg Self-esteem Scale)	in the number of friends, self-esteem, physical fitness, social interaction, leisure interests, independence, happiness and quality of life •Qualitative data indicated that service dogs helped organize participants' days •Small but significant improvement in self-esteem reported after receiving a service dog
Shintani <i>et al.</i> (2010) To assess the effects of service dogs on health-related quality of life Survey with control group	<i>N</i> = 38, sample of convenience • 10 participants with service dogs • 28 participants without service dog but would have qualified for service dog	Training took place in Japan but no description of dog/person training provided	Short Form Health Survey Version 2.0 (SF-36v2) Subscales (Physical Functioning, Role Physical, Bodily Pain, General Health Perceptions, Vitality, Social Functioning, Role Emotional, Mental Health)	•Significant higher scores on Physical Functioning and role Emotional subscales •Significant difference in Mental Component Summary Score
Valentine <i>et al.</i> (1993) To survey the psychosocial impact of dog/people with mobility impairments partnerships Descriptive case report	<i>N</i> = 10, sample of convenience • 10 persons with mobility impairments • No comparison group	1. All owned service dogs 2. Quality of dog and person/dog pair training not described	Author-developed 27-item telephone interviews (30–45 minutes duration), Service Dog Importance and Satisfaction Scale (practical importance, emotional importance, social importance, overall satisfaction)	•People with service dogs perceived their lives to be better after dog ownership •100% stated they had more freedom •90% reported decreased loneliness, increased feelings of safety and increased independence •80% reported feeling more assertive, content, increased friendly encounters with others and increased self-esteem •One person noted negative changes because of requiring more work and less access to public transportation

Issues of service dog ownership

Five studies discussed difficulties associated with owning a service dog (Valentine *et al.*, 1993; Lane *et al.*, 1998; Fairman & Huebner, 2000; Rintala *et al.*, 2002; Rintala *et al.*, 2008). Participants reported that whereas there were few issues, overall physical maintenance (grooming and vet bills) was the biggest problem. Other issues included being challenged or denied access into a public facility or affordable housing, inappropriate petting of the service dog while it was working, or inappropriate behavior of the dog in public.

Satisfaction with the owner/dog partnership and the dog's performance was rated highest in situations where it was the person with the disability's idea to obtain a service dog (Lane *et al.*, 1998). These issues all have implications for clients considering obtaining a service dog and occupational therapists should be aware of these difficulties when making recommendations.

Limitations of research

Although studies found a positive relationship between having a service dog and social/participation, functional and psychological benefits, all of the studies had many concerns related to their quality of research design. All 12 studies were rated weak (see Table 1). Small participant sizes, poor descriptions of the interventions, outcome measures with minimal psychometrics and lack of power calculations led to all of the studies to be rated as weak. It is difficult to conduct a blind investigation of the benefits of service dogs, so it is impossible to rule out the contribution of participant expectations.

Participants

Seven of the 12 studies had a comparison group; the other five consisted of one group descriptive studies. Only two of the comparison had sample sizes greater than 20 in each group increasing the probability of a Type II error (i.e. reporting a non-significant difference when a true difference is present). Because of the specialized sample composition requiring all participants to have disabilities, all groups were samples of convenience. This type of sampling can cause bias because of self-selection (Portney & Watkins, 2009) as participant attributes may influence outcomes, which can reduce generalization. Three of the no comparison studies had groups of less than 25 participants with one study having 202 respondents and another with

57 respondents. In general, inclusion and exclusion criteria were vague. In those studies with comparison groups, often there were unequal demographic differences including gender, type and severity of disabilities, marital status or ethnicity. Group differences may have existed because the comparison group may not have qualified to receive a service dog because they may not have met inclusion criteria. In addition, recruitment strategies of intervention and comparison groups sometimes differed. In total, 625 people participated across studies, with 329 involved in studies with comparison groups. Three studies (Mader *et al.*, 1989; Lane *et al.*, 1998; Ng *et al.*, 2000) included children 18 years and under.

Intervention

A major concern across studies was an inadequate description of the intervention, that being the training of the service dog and the service dog/person partnership. Although several of the studies incorporated service dogs trained by one organization (eight studies), four other studies used dogs from multiple organizations. Three of the studies used dogs trained by the Canine Companions for Independence in Santa Rosa, California (Hart *et al.*, 1987; Eddy *et al.*, 1988; Mader *et al.*, 1989). Without knowing the length and quality of the specialized training of the service dog, criteria for dog or person placement readiness or the content, length and quality of the training for dog or person, it is impossible to replicate these studies.

Outcome measures

Although standardized measures were occasionally used, investigator authored measures designed especially for the study, or rating scales with no report of reliability or validity, were most often used. Four of the 12 studies used at least one standardized instrument (Allen & Blascovich, 1996; Collins *et al.*, 2006; Rintala *et al.*, 2008; Shintani *et al.*, 2010). Self-reported instruments were either completed by mail, telephone interview or face-to-face interviews or completion of a written survey. Two studies (Eddy *et al.*, 1988; Mader *et al.*, 1989) involved observation of the participants in a naturalistic environment. Both of these studies did not report observational inter-rater reliability decreasing confidence in their subjective results. Most studies measured the activities and participation classifications (community integration, school attendance,

social integration, and performance of activities of daily living, productive and leisure activities) according to the World Health Organizations' International Classification of Impairments, Disabilities, and Handicaps (2009). In addition, none of the seven studies with comparison groups reported a power calculation making it impossible to estimate the probability of a Type II error.

Recommendations for future research

Although the findings of this systematic literature review are promising, they are inconclusive and limited. This suggests the need for more rigorous studies to demonstrate the effectiveness of service dog/person partnerships. Areas for further investigation include the benefits of service dogs in comparison with pet dogs, selection and training criteria for service dogs and recipients and cost effectiveness. Additional qualitative studies examining meaningfulness of service dog use, caregiver perspectives, perceived independence, health maintenance and prevention of further disability should be considered. Finally, the abandonment (not used or not accepted) rate of assistive technology and durable medical equipment could be compared with that of service dog use. Research in these content areas could facilitate the evidence to view service dogs as "assistive technology" and also as a means to decrease human assistance to carry out activities of daily living. This is also critical considering the need to demonstrate successful outcomes to facilitate third party funding of service dogs as an assistive technology option. In addition, standardized longitudinal studies are needed to evaluate service dog/people partnerships in relation to changes with aging, medical conditions, or dog behaviour and handler skills.

Defining the characteristics of individuals who would benefit from a service dog might assist with inclusion criteria that are more predictive of positive outcomes. Given the extreme shortage of trained dogs and the potential cost of the dog/person partnership training and care, predicting positive outcomes based on person and dog characteristics are vital. Finally, if we are to recommend service dogs (or any kind of assistance dog) as an assistive technology option, we must study the dog-person evaluation and matching process, training and placement procedures and content, and outcomes for both the person and the dog, across assistance dog training organizations. Anecdotally, the literature

strongly supports the benefits of service dogs, but the research evidence needs to show how service dogs can make a difference in the lives of people with disabilities.

Implications to occupational therapy practice

Two of the studies reviewed involved occupational therapists (Fairman & Huebner, 2000; Ng *et al.*, 2000). The remaining studies were conducted within other disciplines. However, given the holistic, client centred approach of occupational therapy, the collateral work of psychologists, nurses, social workers, rehabilitation specialists, medical doctors, veterinarians and service dog trainers only strengthens our analysis.

Occupational therapists have the opportunity to offer individual's evaluation and intervention in every area of functioning and during all stages of life. Moreover, we are in the unique position to directly intervene at the level of the person, the activity, and the environment and to offer recommendations for assistive technology options in a variety of environments. As members of the interdisciplinary team and as client advocates, we may directly support our clients by becoming educated about the skills that all assistance dogs (including service dogs) offer, become familiar with local assistance dog training organization options and offer to work directly with the dog-training organizations to determine whether or not clients are good candidates for assistance dog use. Occupational therapists may also assist clients and training organizations to overcome barriers before, during and after the placement process.

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