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## Effects of Partnerships between Adolescents with Developmental Disabilities and Service Dogs

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# Effects of Partnerships between Adolescents with Developmental Disabilities and Service Dogs

## Abstract

*Background:* With increasing frequency, service dogs are being placed with children with developmental disabilities (DDs). Occupational therapists and other professionals have advocated for the therapeutic use of service dog partnerships to facilitate greater independence and quality of life. There are no studies that examine service dog intervention with adolescents.

*Method:* This study focused on the effects of partnerships between service dogs and three participant dyads, each including an adolescent with DDs and a parent. A single-subject, alternating treatment design was used to compare the effects of two conditions (service dog present or not present). The effects were examined for adolescents' anxiety behaviors during transitions and during grocery store shopping, for social interactions during grocery store shopping, and for parents' reported levels of stress.

*Results:* Findings were that service dog partnerships reduced the presence of anxiety behaviors during transitions for one of the three adolescents; reduced the presence of anxiety behaviors during grocery store visits for two of the three adolescents; increased social interactions for all three of the participant dyads; and had no meaningful impact on self-reported parental stress level.

*Conclusion:* For adolescents with DDs, professionals may want to consider service dog partnerships to decrease anxiety behaviors and increase social interactions in the community.

## Comments

The authors report they have no conflicts of interest to disclose.

## Keywords

service dogs, interpersonal relations, adolescents, developmental disabilities, human-animal bond

## Cover Page Footnote

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## Credentials Display

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The prevalence of children ages 3 to 17 years diagnosed with developmental disabilities (DDs) was 5.76% in 2014 and had increased to 6.99% by 2016 (Zablotsky, Black, & Blumberg, 2017). DDs are a diverse group of severe chronic conditions that can result in difficulties for families who are raising children with mental and/or physical impairments (Centers for Disease Control and Prevention, 2012). The common challenges of DDs include problematic behaviors and limited social interactions in the community for children and increased levels of stress for parents (Lecavalier, Leone, & Wiltz, 2006; Petrenko, 2013; Rezendes & Scarpa, 2011; Sikora et al., 2013).

With increasing frequency, service dogs, a category of assistance dogs (Assistance Dogs International, 2018), are being placed with children with DDs and their families (Berry, Borgi, Francia, Alleva, & Cirulli, 2013; Butterly, Percy, & Ward, 2013; Carlisle, 2015). Trained service dogs can assist people with disabilities with functional performance tasks (open doors, retrieve items, assist with home and community mobility), increase social and community participation, and assist in psychological adjustments (increase self-esteem, well-being, and positive affect) (Winkle, Crowe, & Hendrix, 2011).

It is important to distinguish between service dogs and emotional support animals. The latter, though they may provide comfort for individuals with disabilities, do not have any required training and have limited public access (Kogan, Schaefer, Erdman, & Schoenfeld-Tacher, 2016; Younggren, Boisvert, & Boness, 2016). By contrast, service dogs have public access and are specially trained to assist individuals with disabilities who need a medical alert or response; have difficulties with social skills, learning, communication, language, or attention; experience movement, mobility, or balance issues; and/or demonstrate anxiety or undesirable behaviors (Assistance Dogs International, 2018; National Education for Assistance Dog Services, 2013). Occupational therapists and other professionals have advocated for the therapeutic incorporation of service dog partnerships to facilitate greater independence and quality of life for select populations (Camp, 2001; Fairman & Huebner, 2001; Herlache-Pretzer et al., 2017; Isaacson, 2013). Current research demonstrates that partnering service dogs with children with DDs and their families results in positive effects, including improved mood and reduced anxiety in children (Davis, Nattrass, O'Brien, Patronek, & MacCollin, 2004; Smyth & Slevin, 2010; Viau et al., 2010); increased social interactions, such as positive community acknowledgements for both the child and his or her entire family (Davis et al., 2004; Mader, Hart, & Bergin, 1989; Smyth & Slevin, 2010); and reduced parental stress (Smyth & Slevin, 2010; Viau et al., 2010).

Two studies quantitatively measured outcomes of service dog partnerships for children with physical disabilities using wheelchairs. Mader, Hart, and Bergin (1989) found that service dogs substantially increased positive social acknowledgements (smiles, friendly glances, and conversations) in a shopping mall. At school, when children were with their service dogs, they received more friendly glances and more conversations than when the dog was not present. Viau and colleagues (2010) assessed basal salivary cortisol secretion and parent-reported changes in the behaviors of children diagnosed with autism spectrum disorders who were placed with service dogs. The results indicated that service dogs had beneficial effects on reducing cortisol secretion in children and decreasing the frequency of parent-reported child anxiety behaviors, such as repetitive mannerisms and self-stimulation episodes.

Outcomes of service dogs and child partnerships have also been evaluated qualitatively. Davis and colleagues (2004) evaluated child outcomes of assistance dog partnerships and found improved moods, focus, and motivation; improved ease of social interactions; increased independence; more effective communication; and increased quality of life due to greater social status and peer acceptance. Burrows, Adams, and Spiers (2008) found service dogs also increased calmness while decreasing

anxiety and environmental distress, physiological arousal, and trance-like states. This study further reported that the presence of service dogs facilitated social acknowledgements, promoted awareness during public outings, increased ease of daily activities, and reduced the perceived amount of parental stress. Smyth and Slevin's (2010) outcomes demonstrated reduced anxiety and increased socialization for children with DDs with reduced levels of parental stress due to positive changes in their children's behaviors and greater community integration. They stated that the "well-being of the entire family improved, in view of the relief of stress and subsequent emotional and social wellness" for all family members with the intervention of the service dog (p. 16). An evidence-based review (Winkle, Crowe, & Hendrix, 2011) and several other studies (Butterly et al., 2013; Davis et al., 2004; Smyth & Slevin, 2010) highlighted the need for better research designs with more rigor to evaluate the full range of possible outcomes of service dog partnerships. One published study examined the impact of service dogs on functional performance and social interactions in three adults with disabilities using a single-subject research design (Crowe et al., 2014). Service dog partnerships decreased performance time for four of the six tasks, decreased effort for five of the six tasks, increased social interactions for two of the participants, and increased levels of satisfaction with social interactions for all of the participants. Placement of service dogs has expanded to partnerships with veterans with post-traumatic stress disorders and/or traumatic brain injury (Crowe, Howard, Western, Barger, & Sanchez, 2017; Crowe, Nguyen, Tyron, Berger, & Sanchez, 2018; Krause-Parello & Morales, 2018). While these studies and several other peer-reviewed articles provide preliminary support for the use of service dog intervention for children and adults with disabilities, there are currently no studies that specifically examine service dog intervention with adolescents.

Therefore, our research study was designed to examine partnerships between service dogs and adolescents with DDs and their parents (participant dyads). We addressed three research questions: (a) What are the effects of service dogs on adolescents' anxiety behaviors during transitions and during grocery store shopping? (b) What are the effects of service dogs on participant dyad social interactions with others? and (c) What are the effects of service dogs on parent self-reported levels of stress after transitions and after grocery store shopping? A grocery store outing was used because it is a common community activity for adolescents with DDs and their parents.

### **Method**

This study built on previous work by Crowe et al. (2014). In this study and the Crowe et al. study, a single-subject, alternating-treatment design (Barlow & Hayes, 1979; Deitz, 2006) was used to compare the effects of two conditions: non-intervention, no service dog present, and intervention, service dog present. The alternating treatment design can be used to compare the effects of two or more treatments or can be used to compare the effects of treatment and no treatment conditions as was done in our study (Barlow & Hayes, 1979; Deitz, 2006). For our study, the effects of both conditions for each participant dyad were examined for three outcomes: adolescent anxiety behavior (during transition and during grocery store shopping); social interaction (during grocery store shopping); and self-reported parental stress (following transition and following grocery store shopping). Twelve data collection sessions (six sessions per condition) conducted over 6 consecutive weeks were planned for each participant. Prior to the first data collection session, assignment to conditions was randomized in blocks of four without replacement, thus ensuring that in each block of four sessions, two would be without a dog and two would be with a dog. For example, to determine order of conditions for the first 4 days for Participant 3, four slips of paper were placed in a hat. Two said "with dog," and two said "without dog."

These were then pulled out of the hat one at a time resulting in 1 day “with dog,” followed by 2 days “without dog,” and then 1 day “with dog.” This same procedure was repeated two more times for Participant 3. This randomization procedure was instituted to help control for an order effect in data collection.

### Participants

Three participant dyads, each including an adolescent and a parent (two mothers and one father), were prescreened and recruited from Assistance Dogs of the West (ADW), a program that specializes in the training and placement of service dogs. All referred participant dyads met the following inclusion criteria: (a) they had a service dog trained and placed by ADW, (b) they lived in the greater Santa Fe/Albuquerque area of New Mexico, (c) the dyad included an adolescent 13 to 18 years of age with a DD and a parent or caregiver able to consistently participate in the study, and (d) they consented to participate in the study.

Written consent was obtained from each parent and assent was obtained from each adolescent. All three adolescent participants were boys, each with at least two diagnosed DDs. Table 1 details characteristics of each participant.

**Table 1**

*Participant Characteristics*

Characteristics	Participant 1	Participant 2	Participant 3
Age (years)	13	14	14
Ethnic Identity	Hispanic and Non-Hispanic White	Non-Hispanic White	Non-Hispanic White
Diagnoses (as reported by parent)	Cerebral palsy; cortical visual impairment; seizures	Bipolar II disorder with anxiety; pervasive developmental disorder not otherwise specified (PDD-NOS); intellectual disability; dyslexia	Hearing impairment; developmental delays
Mobility Type	Manual chair maneuvered by parent	Independent walking	Independent walking
Communication Type	Assistive communication device; non-verbal facial cues and vocalizations	Verbal: full sentences and phrases	Verbal: full sentences with short phrases
Months with Service Dog	30	9	49
Primary Dog Handler(s)	Adolescent and mother	Adolescent and mother	Adolescent and father
Therapies Received Weekly	1 hr OT 2 hr PT 2.5 hr ST	2 hr OT 0.5 hr ST	1.5 hr OT 0.5hr PT 1.5hr ST

*Note:* OT = occupational therapy; PT = physical therapy; ST = speech therapy.

All participant dyads reported completing the following activities with their service dogs: recreation and leisure (walking, hiking), community and social outings (restaurants, store visits, health care appointments), and sleeping. In addition, the adolescent in Participant 1 Dyad reported sitting together, watching television, and completing self-care activities with his dog; the adolescent in Participant 2 Dyad reported participating in running, camping, parties, and theater shows with his service dog; and the adolescent in Participant 3 Dyad reported participation in activities such as throwing a ball, snuggling, playing Frisbee®, and caring for a pet.

## Data Collection and Dependent Measures

To ensure procedural consistency throughout the data collection process, client specific checklists were developed during the initial session and used during each data collection session. For each dyad, checklist items included (a) starting cues for transitions; (b) grocery store visited; (c) participating parent; (d) vehicle used; (e) route driven to store; (f) seats in car for researcher, adolescent, parent, and dog; (g) location for dog when not accompanying on store visits; (h) items adolescents and/or parents used during transitions (i.e., iPad<sup>®</sup> or timer); and (i) days and time for data collection.

Three measures, the Transitional Behaviors Outcome Measure (TBOM), the Store Social Interaction and Behaviors Outcome Measure (SSIBOM), and the Parent Stress Measure (PSM), were designed specifically for this study. The first part of the TBOM focused on the duration of transition from home to store. Duration (min and s) of each transition was variable dependent on factors such as the adolescent’s behavior or street traffic. The start of the transitional period was defined by parent verbalization of an established cue in the home, such as “it’s time to get ready to go to the store.” The transitional period included preparing to leave their home and the car ride from their home to the store. It ended when the child exited the car at the grocery store and closed the car door. The second part of the TBOM recorded the adolescents’ anxiety behaviors during the transition. These behaviors were adolescent-specific and identified by the adolescents’ parents prior to the start of the study. See Table 2 for a summary of adolescent anxiety behaviors. Researchers rode in the cars with the participant dyads during the transitions to collect data but did not interact with the families.

**Table 2**

*Summary of Adolescent Anxiety Behaviors as Defined by Parent*

Participant 1		Participant 2		Participant 3	
During Transitions	During Visits to the Store	During Transitions	During Visits to the Store	During Transitions	During Visits to the Store
Stomping; emitting sharp, high-pitched moan with open mouth and raised and furrowed eyebrows; exhibiting neck tension	Same as during transition, and: turning head down with a sad expression or frown in response to someone staring/ making negative comments; not using device to communicate	Pacing; drooling; picking fingernails or cuticles; requesting reassurance with increased frequency; mumbling; speaking inaudibly; asking “are we done yet?” or “can we go?”	Same as during transition, and: rubbing neck; walking on toes; using excessive commands for dog; having flushed face and ears combined with surprised or alerted facial expression	Verbalizing “no, I don’t want it”; eliciting self-stimulatory flapping and ‘pill rolling’ motions	Behaving shy in presence of people; hiding behind parent; spacing out and/or making ‘pill rolling’ motions

The SSIBOM was used to record adolescent anxiety behaviors and social interactions during the store visit for 15 min, beginning when the participant dyad entered the grocery store and ending when 15 min had passed. This form documented the presence of adolescent anxiety behaviors using the same adolescent-specific anxiety behaviors as in the TBOM. In addition, it documented the type of social interaction (conversation, passing verbal greeting); who directed the social interaction (an adult or a child); the number of people involved; and to whom the social interaction was directed (parent or adolescent).

Both the TBOM and the SSIBOM were used to collect data in 10-s intervals using the momentary time sampling method (Deitz, 2006; Harrop & Daniels, 1986). A voice recorder (Olympus Digital Voice Recorder VN-6000, Olympus Corp., Shinjuku, Tokyo, Japan) beeped every 10 s into an earphone used by the data collector. The researchers recorded adolescent anxiety behaviors and social interactions that occurred only on the exact moment the beep sounded. Potential confounding factors and participant comments following data collection also were recorded. A shopping protocol stipulated that the participant dyads spend approximately 5 min in three different store areas (produce, deli, and aisles) while walking through the store in the same sequence for each visit. Thus, for each grocery store session, there was a potential of 90 data points (6 data points per min times 15 min). Prior to implementation of data collection, the TBOM and the SSIBOM were reviewed for clarity and face validity by experts in the field and were piloted to examine interrater agreement.

The PSM was a 5-point Likert scale with the following values: 1 (*no stress*); 2 (*somewhat stressed*); 3 (*considerable stress*); 4 (*high stress*); and 5 (*very high stress*). Parents rated their stress levels on this self-report measure following each transitional period from home to grocery store and following each 15-min store visit.

### **Procedures**

This study was conducted in Santa Fe and Albuquerque, NM, after approval from the University of New Mexico Human Research Protections Office. Two graduate occupational therapy students were data collectors alongside an occupational therapist researcher who completed interrater agreement checks. Previous graduate student researchers trained the graduate occupational therapy students in data collection and consenting procedures using a training protocol prior to data collection. One graduate student collected data for Participant 1 Dyad and Participant 2 Dyad and another graduate student collected data for Participant 3 Dyad.

Prior to the first data collection session, the researchers met with each participant dyad to explain the study, obtain consent to participate, and collect demographic data and additional information necessary for conducting the study (e.g., descriptions of adolescent anxiety behaviors). Data collection was scheduled to occur twice weekly and on consistent days of the week for each family. For example, data collection might occur every Saturday and Sunday at 3:00 p.m. or every Monday and Thursday at 2:30 p.m. each week until all 12 sessions were complete. Individual schedules were minimally adjusted to accommodate family obligations or unavoidable time conflicts. A 1-hr window on either side of the established period was permitted to accommodate unforeseen delays, such as a parent arriving late or medical appointments.

A trial run was conducted with each participant dyad prior to the first data collection session. During the trial run, student data collectors and the occupational therapist researcher achieved a minimum of 90% agreement for identification of anxiety behaviors, presence, categorization of social interactions, and adherence to data collection protocol. The researchers did not communicate with the families during data collection sessions and, except when in the car, they remained approximately 10 feet from the participants. The families were reimbursed for the distance driven to conduct research and were given a gift card following each data collection session.

### **Service Dog Training**

Each participant dyad had a service dog that had been ADW trained for basic obedience, task-specific work designed for each participant dyad, and public access across multiple contexts. The dog training consisted of 20 hr per week over a minimum of 78 weeks. Following this, each parent-adolescent team attended placement training for 2 weeks. Training included handling techniques, specialized tasks, and the dog's cue schedule. It is required that the parent and/or adolescent pass a public access test and practical and written exams certifying competence with service dog handling and care. The mother in Participant 1 Dyad, both the adolescent and the mother in Participant 2 Dyad, and the father in Participant 3 Dyad passed the public access test and exams.

### **Procedural and Interrater Agreement**

To check procedural agreement using the client-specific checklists and consistency in data collection using the TBOM and the SSIBOM, the occupational therapist researcher accompanied the student data collectors on the 1st, 6th, and 12th sessions. Procedural agreement was consistently above 97% on all agreement checks. For the TBOM, the average interrater agreement across the three sessions was 98.1% for Participant 1, 100% for Participant 2, and 100% for Participant 3. The average interrater agreement across the three sessions for the SSIBOM was 97.1% for Participant 1 Dyad, 99.2% for Participant 2 Dyad, and 98.2% for Participant 3 Dyad.

### **Data Analysis**

Anxiety and social interaction data were graphed using Microsoft Excel 2010 and for each participant for each variable. Medians were determined for without-dog conditions and with-dog conditions. The medians provide some assistance in examining the data but should be interpreted with caution. Because transition times varied from day-to-day, daily anxiety behavior during transition was reported as the percentage of total potential daily anxiety data points. Since data collection times were consistent during grocery store shopping, the number of anxiety behavior data points and the number of social interaction data points were graphed. Last, the average reported parental stress level for each adult participant for each setting (transition and grocery store) was calculated.

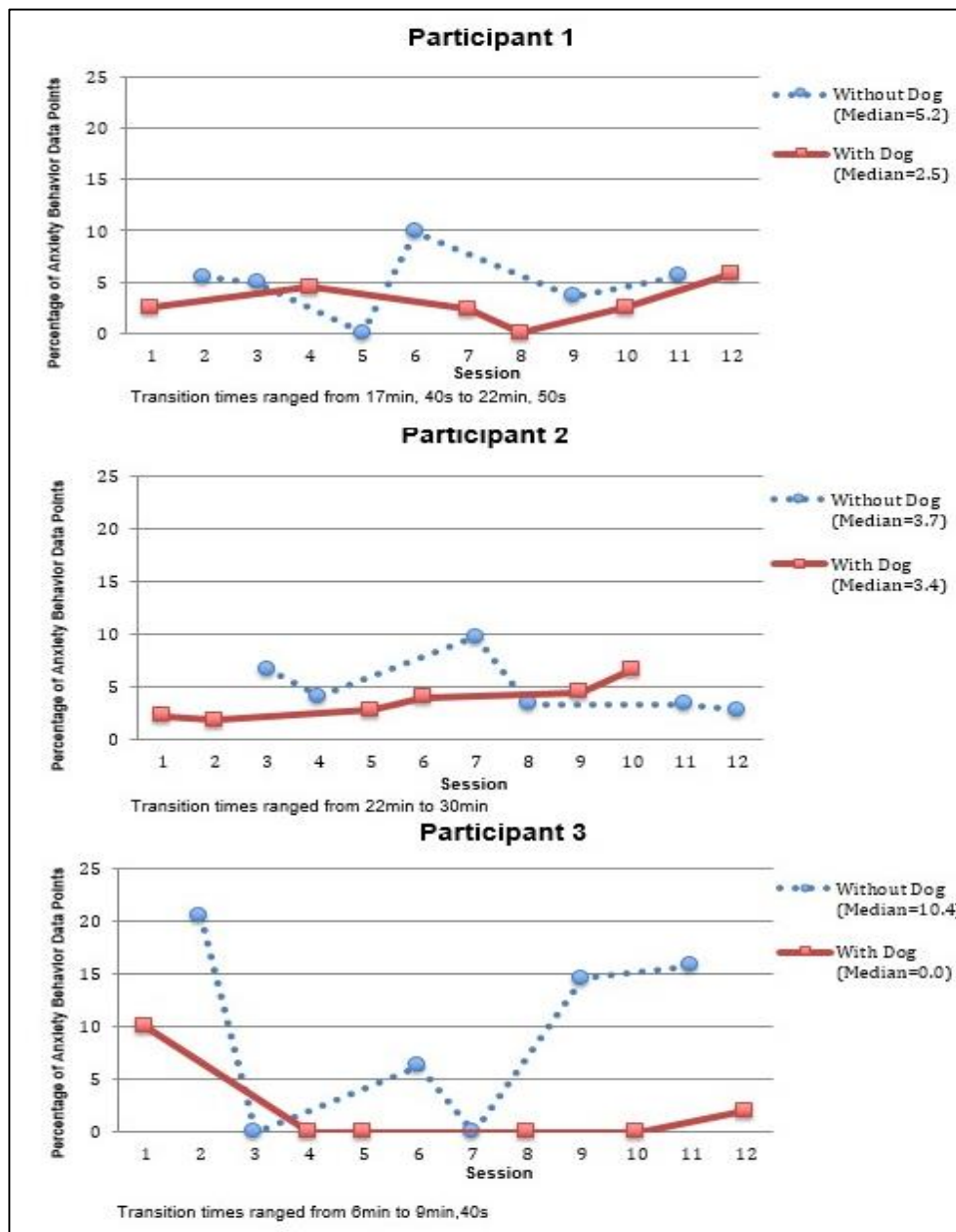
### **Results**

All three participant dyads completed the 12 data collection sessions. Each session occurred within one half hour after the established start time for all three participants. Due to unforeseen time conflicts for the families, the number of weeks to complete the 12 sessions varied between participants with durations of 5 to 7 weeks at a frequency of two to three times weekly.

### **Adolescent Anxiety Behaviors During Transitions**

Figure 1 depicts, for each adolescent participant, the percentage of anxiety behavior data collection points per session by intervention condition (with or without dog). Even though a clear effect for anxiety behaviors during transitions was not noted for Participants 1 and 2, for all three adolescent participants, their highest anxiety behavior data points occurred on days without their dogs and their median scores were higher in the without-dog condition. A clear positive effect was noted for Participant 3, as indicated by three data points in the without-dog condition being substantially above all data points in the with-dog condition, indicating lower anxiety with the dog.



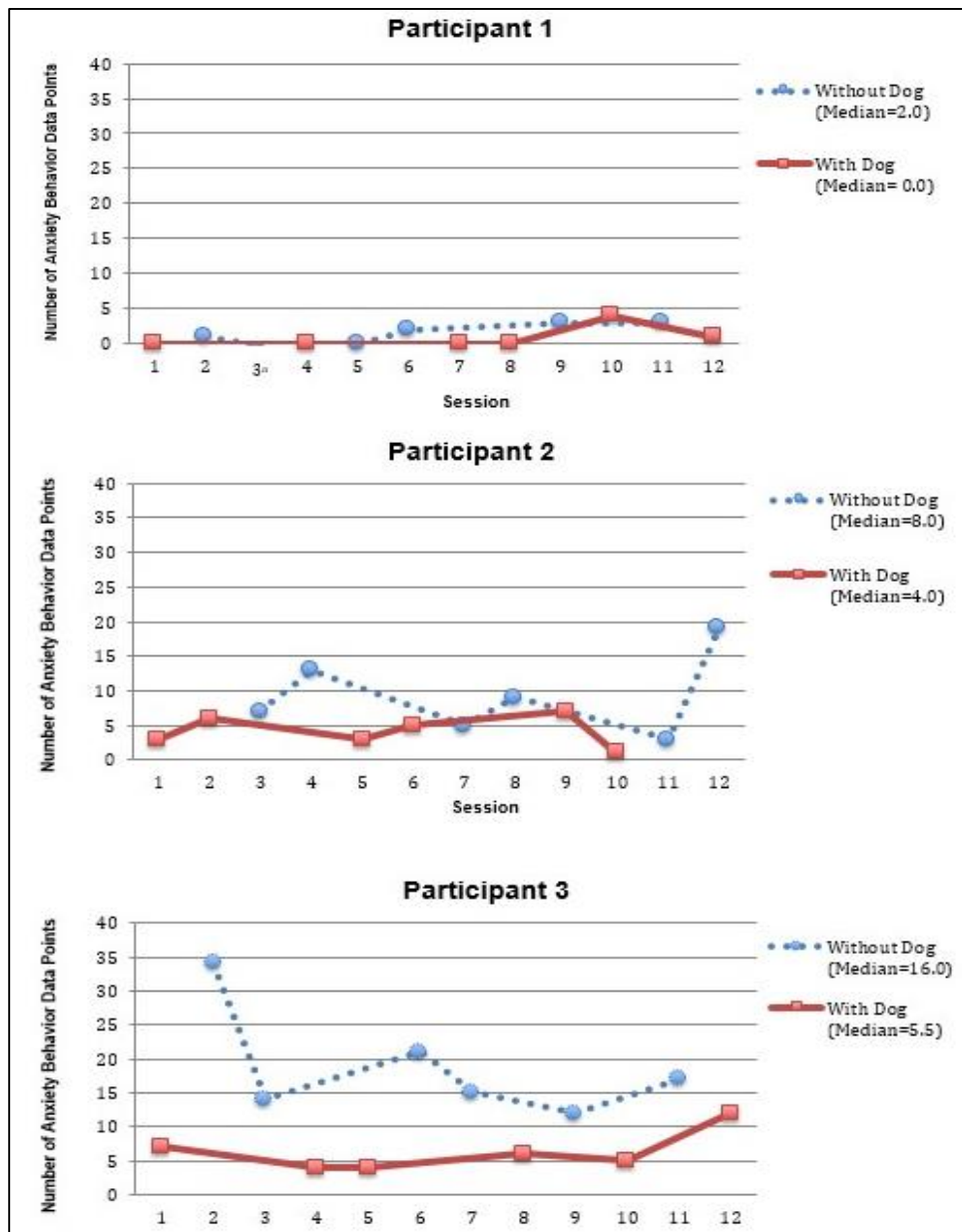


*Figure 1.* Adolescent anxiety behaviors during transition. This figure illustrates the percentage of anxiety behavior data points collected for each participant during the transition from home to store. The percentage of anxiety behavior data points was determined by dividing the number of anxious behavior data points by the total number of data points collected. The variable duration of transition time for each participant is denoted as a range in minutes (min) and seconds (s). Blue dotted lines with circles indicate without-dog sessions and red solid lines with boxes indicate with-dog sessions.

### Adolescent Anxiety Behaviors During Grocery Store Shopping

Figure 2 depicts the number of anxiety data collection points per session by condition for each adolescent participant when grocery store shopping. Data from the third session for Participant 1 were omitted due to a confounding factor (i.e., meeting a known friend in the store and engaging in conversation during half of the data collection session). Participant 1 had a low incidence of anxiety data points both with and without the dog during grocery shopping. A moderate, positive effect of service dog presence on number of anxiety behavior data points was found for Participant 2, indicated by half of

his without-dog data points being higher than all of his with-dog data points. A strong positive effect was found for Participant 3. Note that all anxiety behavior data points for Participant 3 in the without-dog condition were at or above the level of his with-dog data points, again indicating less anxiety behaviors with the dog. The median scores for all three participants were higher in the without-dog condition.



*Figure 2.* Adolescent anxiety behaviors during grocery store shopping. This figure illustrates the number of anxiety behavior data collection points obtained for each participant per data collection session during 15-min grocery store trips. Blue dotted lines with circles indicate without-dog sessions and red solid lines with boxes indicate with-dog sessions.

*Note:* \*Data from the third session for Participant 1 were omitted due to a confounding factor.

### Participant Dyad Social Interactions During Grocery Store Shopping

Figure 3 shows the number of social interaction data collection points per grocery store session by condition (with and without dog), regardless of the type of social interaction, who directed the social interaction (an adult or a child), the number of people involved, and to whom the social interaction was directed. Again, for Participant 1 Dyad, data for the third session were omitted due to the confounding factor. All three participant dyads showed a positive effect of the intervention condition, with each participant dyad having their highest number of social interaction data points during the with-dog condition. Participant 3 Dyad engaged in social interaction only when the service dog was present.

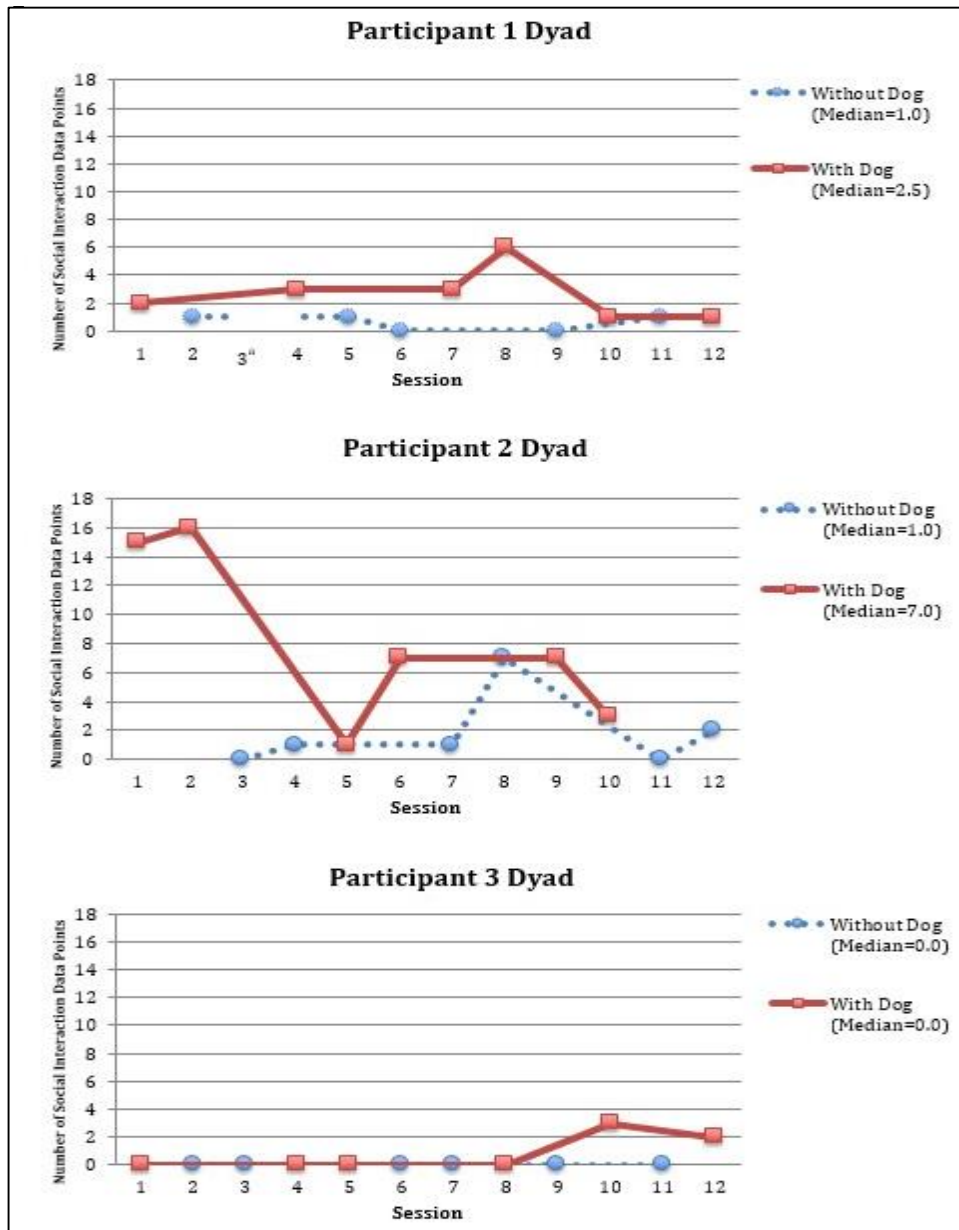


Figure 3. Participant dyad social interactions during grocery store shopping. This figure illustrates the number of social interaction data points collected for each participant dyad per data collection session during 15-min grocery store trips. Social interactions included conversation or passing verbal greeting to participants. Blue dotted lines with circles indicate without-dog sessions and red solid lines with boxes indicate with-dog sessions.

Note: Data from the third session for Participant 1 Dyad were omitted due to a confounding factor.

When service dogs were not present, none of the social interactions were directed at adolescent participants. When service dogs were present, the adolescents were included in the majority of the social interaction data collection points: 64.3% for Participant 1 Dyad; 73.4% for Participant 2 Dyad; and 80% for Participant 3 Dyad. The results indicated that 57.1% of Participant 2 Dyad's and 40% of Participant 3 Dyad's social interaction data points were exclusively directed at the adolescents. Most social interaction data points collected were conversations (96.6% of social interactions for the Participant 1 Dyad, 56.4% for the Participant 2 Dyad, and 100% for the Participant 3 Dyad). All other social interaction data points were categorized as passing verbal greetings.

### **Parental Stress**

The average reported levels of parental stress after transitions from home to the grocery store were generally low for all parent participants and did not differ substantially by condition (with and without dog) for any parent participant. Following the grocery store visit, the parent in Participant 1 Dyad showed a slight, but non-meaningful, difference in level of stress averages by condition (with dog = 1.0; without dog = 1.6). The average level of parental stress was 1.0 for both conditions for the parent in Participant 2 Dyad after grocery store visits. The parent in Participant 3 Dyad showed an average stress level of 1.5 without the dog and 1.3 with the dog. There was no clinically important effect of condition on reported level of parental stress for any participant.

### **Discussion**

Our study demonstrated the positive effects of service dog partnerships for at least one of the three variables (e.g., anxiety behaviors during transition, anxiety behaviors during grocery store shopping, and social interactions) for each of the three adolescent participants with DDs. The results indicated that the service dogs presence reduced anxiety behaviors during transitions from home to store for one of the three participants; reduced the presence of anxiety behaviors during grocery store visits for two of the three participants; and positively influenced adolescent inclusion in social interaction for all three participants. Overall, these findings, combined with the finding of no negative effects of service dog intervention, support the value of service dogs in promotion of anxiety reduction and community inclusion for adolescents with DDs. Relative to self-reported parental stress, the presence of the dog had no clinically meaningful impact. All three parents reported low levels of stress, both with and without their dogs.

### **Anxiety Behaviors During Transition**

The results from our study are consistent with prior research demonstrating that service dogs can reduce anxiety behaviors for children with DDs (Burrows et al., 2008; Davis et al., 2004; Smyth & Slevin, 2010; Viau et al., 2010) and improve facilitation of daily activities in their families, such as during transitions and when grocery shopping (Burrows et al., 2008). Participant 3 had no anxiety behavior data points for 4 of the 6 days when transitioning from home to the grocery store when his service dog was present. For Participant 1 Dyad and Participant 2 Dyad, though their percentages of anxiety behavior data points tended to be slightly higher when their dogs were not present, the difference between conditions was not clinically meaningful.

### **Anxiety Behaviors During Grocery Store Shopping**

The service dogs' presence reduced adolescent anxiety behaviors for Participants 2 and 3 in the grocery store. This outcome was especially clear for Participant 3, where the number of anxiety behaviors without the dog was consistently higher than or equal to the number of anxiety behaviors when the dog was present for each session. Anxiety behaviors observed for Participant 1 were seen at a

very low rate overall. This might be explained by the fact that there were, generally, low numbers of other customers in the store, and subsequently fewer opportunities for anxiety-provoking interactions. In addition, it may have been difficult for data collectors to perceive changes in mood or presence of anxiety due to Participant 1's spasticity and inconsistent volitional movements in his extremities and face.

### **Social Interactions During Grocery Store Shopping**

All three adolescent participants had increased social inclusion when the service dogs were present. These findings were consistent with existing research, which demonstrates increased social interaction and positive community acknowledgement for children with DDs partnered with service dogs (Burrows et al., 2008; Davis et al., 2004; Mader, Hart, & Bergin, 1989; Smyth & Slevin, 2010). Crowe and colleagues (2014) found similar results in a single-subject study. When service dogs were present during grocery shopping, women with mobility challenges reported higher rates of satisfaction with their social interactions, and two out of three participants had an increase in the number of social interaction data points. For adolescents shopping with a parent and their service dogs, not only were there more combined social interactions for each participant dyad, but these social interactions were often directed at adolescents. When dogs were not present, the adolescents were not included in any of the observed conversations. This outcome suggests that service dogs afford opportunities for social inclusion for adolescents that otherwise might not occur.

### **Parental Stress**

The presence of service dogs did not meaningfully impact the parents' reported levels of stress after transitions or grocery store visits. This outcome conflicted with recent research that found reduced levels of stress for parents when service dogs were present (Burrows et al., 2008; Smyth & Slevin, 2010; Viau et al., 2010). Our quantitative findings of no meaningful impact of service dog presence may reflect the generally low levels of stress reported on the PSM by all three parents both after transitions and grocery store visits with averages for both conditions being 1.6 or lower on a 5-point scale. The parents commented that the service dogs' presence was intrinsically calming and elicited positive parental emotions with reduced stress. During the study, the parents also described how the service dogs supported their children with DDs during transitions and social interactions in the community, which reduced their stress levels related to these activities. Even so, as noted, no meaningful quantitative differences in parental stress levels were reported on the PSM, with or without the service dog present. This finding may indicate that the parents only experienced minimal stress. However, it may be that the PSM was not sensitive enough to capture parental stress.

### **Strengths and Limitations**

Our study had several notable strengths. First, the use of a single-subject research design with data collection in the community allowed for good ecological validity and individualization of the definitions of anxiety behaviors so that they matched the characteristics of the participants. Second, adherence to study procedures was consistent throughout the study and inter-rater agreement for data collection was high. Third, randomization of with and without service dog conditions controlled for changes occurring over time.

The main limitation of the study relates to the generalizability of the results. The extent to which results are applicable across social, cultural, and geographic contexts can only be determined by repeating the study with changes in the design related to factors such as the characteristics of the participants (e.g., age, stage of development, culture); the site of community inclusion (e.g., department

stores, schools); or the geographical location. In addition, the presence of a researcher while driving to the store or while grocery shopping (even if not close to the dyad) may have impacted the results. In addition, all the dogs were trained by one assistance dog organization, which may be different from other assistance dog training organizations.

### **Implications for Future Research**

There is a need for more research that evaluates the full range of possible outcomes and the efficacy of partnerships between service dogs and adolescents with DDs. It would be beneficial to measure potential positive effects immediately before and after the dog is placed with adolescents with DDs and their families. In addition, examining the impact of the service dog on both adolescent and family variables over time would assist in understanding the outcomes as the adolescent develops.

### **Implications for Occupational Therapy**

Partnerships between adolescents with DDs and service dogs examined in this study show beneficial outcomes, including reduced anxiety behaviors and increased social interactions in the community. Occupational therapists can support service dog interventions for children with DDs and their families in the following ways:

- Occupational therapists can educate others about the benefits of service dog partnerships, including increasing adolescent and family participation in meaningful occupations.
- Occupational therapists can evaluate the abilities and needs of an adolescent, collaborate with the adolescent and the family to determine the valued occupations a service dog can support and to assist with the integration of the service dog into the adolescent's and family's lives.
- Occupational therapists can assist service dog partnerships to facilitate adolescents' greater social acknowledgement in public, thus improving their quality of life during transitions and in the community (Winkle & Zimmerman, 2009).

### **Conclusion**

Given the potential benefits of service dogs for adolescents with DDs, occupational therapists can help families explore this intervention option and support families who choose service dogs for their adolescents with DDs. Occupational therapists can inform families of current research, evaluate the abilities and needs of adolescents with DDs, collaborate with adolescents and their families to determine valued occupations service dogs could support, and assist with the integration of service dogs into the families' daily lives (Winkle & Zimmerman, 2009).

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