


# The feasibility and acceptability of integrating dogs into inpatient rehabilitation therapy with children with acquired brain injury

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## Abstract

**Introduction:** Children with acquired brain injury (ABI) are at risk for poor therapeutic engagement due to cognitive impairment, affect lability, pain, and fatigue. Animal-assisted therapy (AAT) has the potential to improve patient engagement in rehabilitation therapies; however, the feasibility of integrating AAT into the rigorous therapy schedule of inpatient clinical care or its reception by patients, families, and staff is unknown.

**Objective:** To examine the feasibility and acceptability of incorporating dogs into physical therapy and occupational therapy sessions with pediatric patients being treated on an inpatient rehabilitation unit for acquired brain injury.

**Design:** A feasibility study of AAT within the context of a within-subjects cross-over study.

**Setting:** Pediatric inpatient rehabilitation unit.

**Participants:** Sixteen patients, aged 7–28 years (mean = 13.6 years, standard deviation [SD] = 5.2 years; 50% male), being treated on the inpatient rehabilitation unit following ABI.

**Intervention:** AAT – the integration of dogs into inpatient physical therapy and occupational therapy sessions.

**Main Outcome Measures:** Feasibility measures: enrollment rate, the proportion of AAT sessions a dog attended, adverse events, instances where therapist or handler ended session early, patient animal closeness, and utilization of dog in session. Satisfaction measures: parent satisfaction questionnaires and therapist feedback.

**Results:** Feasibility was supported by high enrollment rate (88.9%) and dog attendance rate of 93%–95%; 84.3% of sessions used the dog in multiple ways and patients reported a high level of closeness with the dog in session, indicating that the dogs were integrated in meaningful ways. No adverse events were noted, therapists reported that intervention was convenient, and clinical care was not negatively impacted. A high level of satisfaction was reported by families and therapists.

**Conclusions:** Findings suggest that AAT is feasible and acceptable, and it may be a valuable tool for therapists working with patients with ABI on an inpatient rehabilitation unit.

Human–animal interaction (HAI) benefits are well established,<sup>1</sup> with HAI through animal-assisted therapy (AAT) receiving recent attention. AAT is associated with improvements in many pediatric outcomes. Specifically, the use of dogs in interventions is linked to increased social interactions,<sup>2</sup> fewer aggressive behaviors,<sup>3,4</sup> greater positive affect,<sup>3,5–7</sup> increased motivation,<sup>8,9</sup> and reduced physiological distress.<sup>10–12</sup>

In hospitalized pediatric populations, animals create a sense of normalcy,<sup>13,14</sup> decrease patient and family distress,<sup>15–17</sup> and improve parent's impression of the milieu.<sup>14,17</sup> Despite growing enthusiasm supporting AAT in pediatric settings, integration of AAT into inpatient settings is complicated with concerns about infection and disruption of care delivery.<sup>18,19</sup> These concerns are largely unfounded as AAT is not associated with increased infection rates,<sup>20</sup> risk of adverse events,<sup>15</sup> disruption in care, or extra work burden.<sup>16,19</sup> In fact, AAT interventions are well received by patients and families,<sup>14,16,21</sup> hospital staff, and medical personnel.<sup>21,22</sup>

Acquired brain injury (ABI) is a common diagnosis on inpatient rehabilitation units. Following acute medical stabilization, inpatient rehabilitation therapies for ABI are intensive. Inpatient ABI rehabilitation involves daily physical therapy (PT), occupational therapy (OT), speech and language therapy, and recreational therapy, among others. Engagement in acute inpatient therapies is critical for recovery.<sup>23–25</sup> Children with ABI are at risk for poor therapeutic engagement due to cognitive and sensory impairment, emotional adjustment, labile mood, fear of pain, and fatigue. In addition to decreasing distress and normalizing the hospital experience, AAT has the potential to improve patient engagement in rehabilitation. Despite its promise, the feasibility of integrating AAT into existing inpatient clinical care or its reception by patients, families, and staff is unknown. Specifically, the rigorous therapy schedule on inpatient rehabilitation units poses a potential barrier to integrating AAT, and although the feasibility and positive effects of incorporating AAT into rehabilitation therapies on *adult* inpatient rehabilitation settings have been documented in a handful of studies,<sup>26–28</sup> the feasibility within a *pediatric* inpatient rehabilitation setting is unclear.

We examined the feasibility of incorporating AAT into PT and OT sessions on an inpatient rehabilitation unit, and explored acceptability by patients, families, and staff. Feasibility metrics included patient enrollment rate, proportion of AAT sessions completed, patient-reported patient–animal closeness, integration of dog into therapy sessions, and number of adverse events. Acceptability was assessed by satisfaction reports from patients, families, and unit staff.

## METHODS

This study was conducted on the inpatient rehabilitation unit of a large children's hospital in the midwestern

United States that provides acute pediatric rehabilitation services to individuals ages 0–21+, with all patients receiving at least one PT and one OT session daily. We integrated AAT into PT and OT sessions for scheduling purposes and consistency. PT and OT sessions occur back-to-back, which allowed for scheduling one dog/handler dyad for that time block. Furthermore, on weekdays, patients are scheduled for two PT and two OT sessions per day, which allowed for scheduling flexibility. This process also avoided the scheduling of an AAT session during therapy sessions where the inclusion of a dog/handler dyad may not be appropriate (i.e., showers, grooming, parent education, or community outings) without missing an AAT session on a day randomized to AAT. Other rehabilitation therapies (i.e., speech and language therapy, recreational therapy) occur daily or less consistently throughout the week, potentially increasing the likelihood of missed AAT sessions.

## Eligibility

Patients  $\geq 6$  years of age admitted to the rehabilitation unit for ABI (e.g., traumatic brain injury, brain tumors, vascular injuries, anoxic injuries) with a Rancho score greater than 2 were eligible for the study. Notably, if a Rancho score was not noted in the medical chart (i.e., for patients with non-traumatic or acquired injuries), the study team (including inpatient medical providers) discussed the patient's clinical presentation to determine if their cognitive state/functioning was consistent with a Rancho score of at least 2. Age 6 was chosen based on age ranges of measures collected as part of the outcome study. Children were excluded if English was not their primary language, they had a pre-injury developmental disability, a dog allergy, fear of dogs, or were on contact precautions. All therapists on the unit agreed to participate in the study, and 16 therapists (8 occupational therapists, 6 physical therapists, 1 occupational therapy student, 1 physical therapy student) completed the sessions.

## Animal-assisted therapy intervention

During AAT sessions, the therapist incorporated the dog into sessions in ways that they deemed appropriate based on the patient's functioning and therapy goals. With input from a Child Life Specialist with AAT expertise, training materials were developed to support the successful integration of dogs into sessions and activities for a variety of treatment goals, solutions to common barriers, identifying distress cues in both the dog and patient).

Participating dogs and handlers were part of the institution's volunteer dog program, which includes

48 dogs and their handlers. Although dogs and handlers were active in the institution, they rarely participated in direct patient care sessions on or off the rehab floor previously. All dogs and handlers are required to complete a thorough evaluation, including being temperament tested, and pass the Canine Good Citizen evaluation prior to admission to the program. In addition, dogs are informally assessed at each visit to ensure continued suitability for the program (see Table 1). A cohort of 14 dog–handler teams with dogs of varying breeds and sizes participated and attended a training with study staff to provide education about the study population (ABI), specifics of care on the inpatient unit, and their role in the study. Beyond assisting with the integration of their dogs into the therapeutic activities and exercises as directed by the physical therapists and occupational therapists, the dog handlers were not involved in instructing patients in therapeutic activities.

## Procedure

All procedures were approved by the institutional review board. All therapists and handlers were informed of the study details and protocol, after which they agreed to participate. Research staff identified potentially eligible patients upon admission to the rehabilitation unit and discussed the study with them within the first week of admission. We worked with unit staff and leadership to identify optimal times to meet with families to minimize disruption to care and routines. Informed consent/assent was obtained prior to data collection.

Participants were enrolled for a 2-week (10 week-days) period. This 2-week period correlates with the average inpatient rehabilitation length of stay. Dogs (AAT) were included in 50% (5 of 10 days) of their PT and OT sessions. Dogs participated in one PT session and one OT session on AAT days. The order of AAT and therapy as usual (TAU) was randomized by week to ensure a distribution of AAT and TAU across both weeks of enrollment. The AAT/TAU schedule and which dog/handler would be attending each session were communicated to the therapy teams at the start of each week. Research staff coordinated plans with therapists and dog handlers, confirmed where they should meet the patient, and escorted the dog/handler team to the appropriate location.

## Therapy visits

Patients completed all rehabilitation therapies as scheduled by their treatment team. The duration of each data-collection session was about 90 minutes (45 minutes of PT and 45 minutes of OT). At the end of

**TABLE 1** Behavior requirements for admission to volunteer dog program.

- 
- (1) Walk calmly on a 6-foot leash without a training collar and without pulling on the leash
  - (2) Perform basic commands (e.g., sit, down, stay) without treats
  - (3) Approach people for petting without jumping
  - (4) No licking people when greeting them
  - (5) Take treats nicely from someone's hand without biting
  - (6) Be calm in unfamiliar surroundings including walking on slick floors
  - (7) Be accepting of the presence of other dogs
  - (8) Be willing to make eye contact with strangers and engage with them in a calm manner
- 

each therapy session, therapists and patients completed brief outcome measures.

## Measures

### Feasibility indicators

Feasibility of incorporating AAT into PT and OT sessions on the rehabilitation unit was examined using: (1) willingness to participate as determined by enrollment rates, (2) the number of AAT sessions completed, and (3) the proportion of AAT sessions a dog attended. We also monitored adverse events, instances where the therapist or handler ended the session early due to concerns related to patient or dog well-being, and sessions canceled due to medical issues/complications.

### Feasibility measures collected during AAT sessions

#### *Patient-animal closeness*

This validated measure was adapted from Aron et al.,<sup>29</sup> used similarly by McConnell et al. to assess closeness of animals with one's sense of self,<sup>30</sup> and was completed by patients at the end of AAT sessions. Patients were presented with seven images (Figure 1) and asked to select the number between 1 and 7 that best described how close the patient felt to the dog.

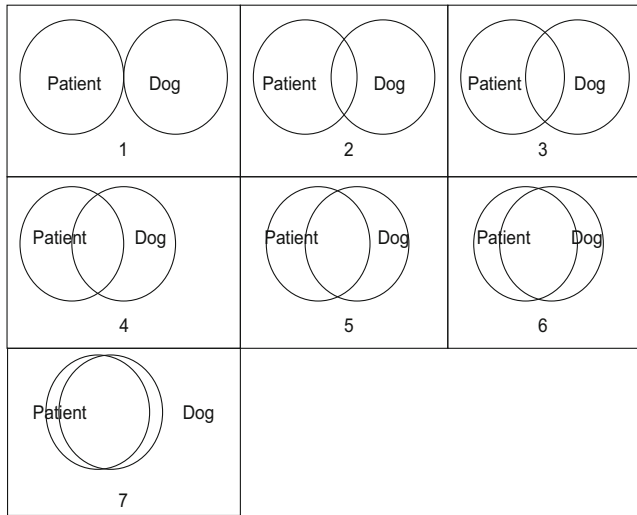
#### *Utilization of animal in sessions*

A brief questionnaire was created to document how the dog was incorporated into each session (e.g., comfort, motivator, reward, physical assistant, and other). Therapists completed this measure at the end of each session.

### Acceptability measures

#### *Parent satisfaction*

AAT satisfaction was evaluated based on responses from patients/families on a feedback questionnaire that



**FIGURE 1** Patient–animal closeness measure. Completed by patients at the end of each animal-assisted therapy (AAT) session.

was completed at the end of their child’s enrollment. Questions included multiple choice items regarding beliefs of AAT in general: (1) “What do you think about children interacting with dogs at the hospital?” (responses: in favor, neutral, not in favor); (2) Do you believe that AAT can be beneficial to patients during their therapy” (responses: yes, no), as well as an open-ended question: “what kind of benefit does it (AAT) bring?” Additional questions asked about their experience with AAT within the study specifically. Again, questions included yes/no questions, with open-ended questions soliciting details of perceived benefits: (1) “Do you feel that partaking in AAT was beneficial to you and your child’s overall experience on the inpatient rehabilitation unit?”; (2) “Overall, do you feel that partaking in AAT was beneficial to your child during their PT/OT in inpatient rehabilitation?”. Six yes/no questions then assessed whether AAT (1) helped child accept admission to hospital more willingly, (2) improved child’s engagement/participation in therapy, (3) motivated child to go to PT/OT, (4) helped child emotionally (e.g., reduce stress, promote positivity, etc.), (5) aided child in achieving therapy goals, and (6) would parent recommend the integration of AAT into PT/OT sessions in the future. One item asked how enthusiastically the child was to participate in AAT (responses: 0-Not at all, 1-A little bit, 2-Somewhat, 3-Quite a lot, and 4-A lot). Finally, four open-ended questions asked for information regarding (1) the effects AAT had on their child; (2) any differences in the child’s attitude, performance, or behavior when there was a dog in PT/OT sessions and when there was not; (3) any suggestions as to how to improve the quality of AAT; and (4) any concerns or additional comments regarding AAT. The proportion of yes responses on the yes/no questions and mean rating of child

enthusiasm were reported. Responses to open-ended questions were compiled and categorized into overarching themes identified by co-authors. All feedback was included and statements in tables reflect direct responses from parents with only minor editing to maintain confidentiality.

### *Therapist feedback*

Informal feedback about the experience including perceived benefits or complications of AAT was also solicited from therapists, and therapists provided feedback to the research team throughout the study via email, comments to research staff during data collection, and notes on data collection forms. This information was compiled to summarize the successes and challenges reported by therapists throughout the study. Materials, data, and analysis code are available from the corresponding author upon request.

## RESULTS

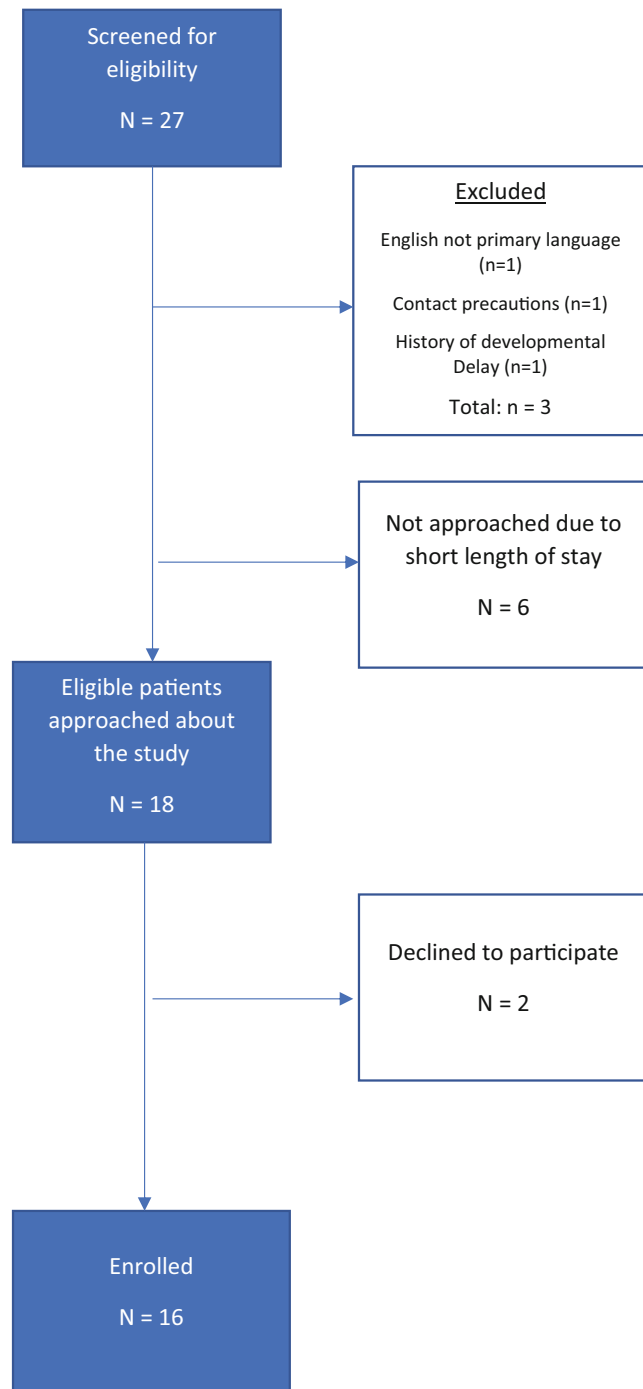
### Feasibility

Twenty-seven patients admitted to inpatient rehabilitation for ABI were screened for eligibility (see Figure 2). Sixteen of the 18 eligible patients were enrolled in the study, resulting in an 88.9% enrollment rate. The sample was 50% male and ranging in age from 7 to 28 years old (mean = 13.6 years, SD = 5.2 years). Table 2 presents demographic information, injury details, and level of functioning at admission.

Data were collected during 121 (56 AAT) PT sessions and 120 (55 AAT) OT sessions. Nine of the 16 participants (56.2%) were discharged before completing the 10-day enrollment and the remaining seven (43.8%) completed the full 10-day schedule. Participants completed an average of 3.50 (SD = 1.55) PT AAT sessions and 3.44 (SD = 1.63) OT AAT sessions. A total of 59 PT and 59 OT sessions were allocated as AAT sessions, and dogs were available and attended 56 (95%) PT AAT sessions and 55 (93%) OT AAT sessions. These high attendance rates indicate that using a volunteer dog program is a feasible means of providing consistent AAT.

### Integration of dogs into sessions

Information about how the dog was used in session was collected during 108 (54 PT and 54 OT) AAT sessions. Therapists reported using the dog in many ways, with 84.3% of sessions using the dog in multiple ways within one session. This did not differ between PT and OT sessions ( $\chi^2(1) = .63, p = .43$ ). The most common use of the dog in session was as a motivator followed by reward (see Table 3).



**FIGURE 2** Patient enrollment/consort diagram.

Patient–animal closeness information was collected during 56 PT sessions and 55 OT sessions. Overall patients reported a high level of closeness with the dog (mean = 6.09, SD = 1.68), which is well above the midpoint of 4. No adverse events were noted, no sessions were ended prematurely by therapist or handler, and there were no reports of AAT sessions disrupting the care of any patients being treated on the unit.

## Satisfaction

### Parent

Feedback was obtained from 10 of the 16 participant families. Notably, this questionnaire was added to the protocol after the first six participants completed the study, and all families enrolled after its addition completed this questionnaire. Participants whose parents did not complete the questionnaire did not differ from those whose parents completed the measure in terms of sex ( $X^2(1) = .42, p = .52$ ), age at injury ( $t(14) = .41, p = .69$ ), or age at enrollment ( $t(14) = .06, p = .95$ ). One hundred percent of families reported that they were in favor of children interacting with dogs during their hospital stay. Ninety percent reported that AAT improved their child's engagement/motivation in therapy, 80% reported that it motivated their child to go to therapy sessions, 90% reported that it helped their child emotionally, and 80% reported that it aided child in achieving therapy goals. Parents were also asked how enthusiastic their child was to participate in AAT. Responses ranged from 2 ("Somewhat") to 4 ("A Lot"), with a mean score of 3.2, indicating that, on average, patients were enthusiastic about participating in AAT sessions. Finally, 100% of parents reported that they would recommend that children's hospitals integrate AAT into patients' therapy. Ninety percent of parents reported that participating in AAT was beneficial to the overall inpatient rehabilitation experience, and reported benefits noted in open-ended questions including improved mood, increased verbalization, and emotional support as well as parent stress relief (Table 4). One hundred percent of parents reported that AAT was beneficial during therapy sessions, and benefits noted in open-ended responses included increased motivation and effort, improved mood, increased comfort, greater enjoyment of therapy, and opportunity for novel or unique therapy activities (Table 5). One parent reported that on days when a patient was tired or unmotivated, *not* having a dog was a challenge. Finally, parents were also asked for suggested improvements and the only suggestion reported was: "Provide the dogs more than 2×-3×'s a week and have them continue through the whole rehabilitation stay."

### Therapist

Therapists reported that participation was fairly convenient and that they did not have to alter their behavior to accommodate data collection or the presence of the dog and handler. Therapists reported enjoying working with the dogs and shared several benefits (see Table 6), including that patients were more motivated/engaged and seemed to enjoy session more when the dogs were present. Therapists also noted patients

**TABLE 2** Demographic details, injury details, and level of functioning at admission to the inpatient rehabilitation unit.

Participant	Sex	Age (y)	Injury details	Admission WeeFIM score
1	F	11	ABI – Ruptured AVM	55
2	F	18	ABI – Resection of cerebellar pilocytic astrocytoma	87
3	M	13	TBI – MVC	28
4	M	14	TBI – MVC	18
5	M	11	TBI – Bike accident	22
6	F	15	ABI – Ischemic injury	80
7	M	8	ABI – Ruptured AVM	63
8	M	8	ABI – Tumor resection – medulloblastoma	29
9	M	16	ABI – Anoxic injury	37
10	F	14	TBI – car vs. pedestrian	46
11	F	28	ABI – Ischemic injury	61
12	F	13	ABI – Tumor resection – medulloblastoma	73
14	M	16	TBI – MVC	18
15	F	7	TBI – car vs. pedestrian	71
16	F	8	ABI – Acute disseminated encephalomyelitis	19

Abbreviations: ABI, acquired brain injury; AVM, arteriovenous malformation; F, female; M, male; MVC, motor vehicle collision; TBI, traumatic brain injury; WeeFIM, Functional Independence Measure for Children.

**TABLE 3** Themes of parents' reported beliefs about animal-assisted therapy during hospitalization.

Theme	Parental response
Motivation	<ol style="list-style-type: none"> <li>1. Improved motivation and attention span.</li> <li>2. Motivation for therapy.</li> <li>3. Dogs can help calm children and encourage them to do hard tasks.</li> </ol>
Comfort/relaxation	<ol style="list-style-type: none"> <li>1. Bonding, affection, personal satisfaction, and pride.</li> <li>2. Relaxing and enjoyment.</li> <li>3. Patient stated that she was starting to get a little stir crazy and dogs helped relieve this.</li> <li>4. Comfort.</li> <li>5. Naturally relaxing for most children.</li> </ol>
Improved mood	<ol style="list-style-type: none"> <li>1. Joy and happiness.</li> <li>2. Joy, fun, anticipation.</li> <li>3. Happiness.</li> </ol>
Normalizing hospital experience	<ol style="list-style-type: none"> <li>1. Normalizing to have dogs around.</li> <li>2. I believe it helps with emotional stress along with making the patients comfortable in their environment.</li> </ol>

tolerated more difficult or painful activities because the dog served as a distraction. One therapist noted that having a dog in session also made it easier for her: “I give patient the same participation ratings for dog or no dog sessions because the patient does the work no matter what, but the dog makes it easier. It makes it easier on the patient and on me.”

Therapists were asked about areas for improvement. One therapist shared: “The hardest part for me was remembering easily when dogs were coming in order to coordinate other activities around this (e.g., showers,

**TABLE 4** Parental responses to “Do you feel like partaking in AAT was beneficial to you and your child's overall experience on the inpatient rehabilitation unit? If yes, how?”

Theme	Parental response
Emotional support	<ol style="list-style-type: none"> <li>1. Seeing how my child benefited was a stress relief for me (mom).</li> <li>2. It helped bring emotional support to my child.</li> </ol>
Improved Mood	<ol style="list-style-type: none"> <li>1. She loved it and was hoping every day that a dog would be present. After, she talked about it all throughout the evening.</li> <li>2. Very beneficial. Patient smiled much more and started giggling more too.</li> </ol>
Normalization	<ol style="list-style-type: none"> <li>1. It helped her be back to her normal self. She was smiling and talking a lot more.</li> </ol>

caregiver education).” She did not recommend changes to procedures, noting that it is “just something for us therapists to get used to.” Another therapist shared a recommendation for improvement: “ask about the appropriateness prior to introducing dog—I did have one patient who did not benefit from having a dog in session.”

## DISCUSSION

Preliminary findings support the feasibility and acceptability of incorporating AAT into inpatient rehabilitation PT and OT sessions for children with ABI. Feasibility was supported by a high enrollment rate, a high proportion of AAT sessions attended by a dog, positive rapport with dogs, and integration of dogs into session activities. No adverse events were noted, no AAT sessions ended early, and therapists reported that

**TABLE 5** Parental responses to: “Do you feel that AAT was beneficial to your child during their PT and OT sessions? If yes, how?”

Theme	Parental response
Willingness to go to therapy	<ol style="list-style-type: none"> <li>1. She was excited to go (to therapies) and enjoyed working with the dogs.</li> <li>2. Much more positive attitude about going to therapy when a dog was in session.</li> <li>3. Helped calm him and make him much more willing to go to therapy.</li> </ol>
Motivation/effort	<ol style="list-style-type: none"> <li>1. Motivation and stress relief.</li> <li>2. Helped him focus.</li> <li>3. Helped with distractions, gave him something to focus on.</li> <li>4. When something was hard the dog was a good end goal.</li> <li>5. Much more willing to work.</li> <li>6. Gave him motivation, friendship, an animal that reacted favorably to his accomplishments.</li> </ol>
Comfort	<ol style="list-style-type: none"> <li>1. It helped make my child more comfortable and gave him a sense of home by playing with dogs.</li> <li>2. Helped with really bad anxiety, especially in PT sessions.</li> <li>3. Helped him enjoy therapy and keep his mind off pain.</li> </ol>
Improved mood	<ol style="list-style-type: none"> <li>1. Made her more joyful.</li> <li>2. Usually happier when a dog was there.</li> <li>3. Joyful.</li> <li>4. Always happy to see the dogs.</li> </ol>
Fun	<ol style="list-style-type: none"> <li>1. Made therapy more fun.</li> <li>2. She enjoyed therapy much more with dogs.</li> </ol>
Unique activities	<ol style="list-style-type: none"> <li>1. Unique therapy experiences (i.e., walking dog).</li> <li>2. Gave her a change from the normal routine.</li> <li>3. Walking the dog was a great real-world exercise.</li> </ol>

participation in the study was convenient and without impact on care. These findings support the feasibility of involving dogs from volunteer dog programs into inpatient rehabilitation therapies. Acceptability was supported by a high level of satisfaction reported by patients/families and therapists.

Therapists readily integrated dogs into therapy sessions with relatively limited training or experience. Furthermore, patients consistently reported high levels of rapport with the dogs. Patients did not always have the same dog in their AAT sessions, and the consistently high level of rapport suggests therapists and handlers facilitated positive interactions allowing patients to establish positive relationships with the dogs during a single session. It also suggests that therapists incorporated the dogs as an integral part of session activities—engaged in the session rather than were merely present.

An unexpected finding was the reports from therapists on the positive effect AAT had on their work. Beyond the subjective report that AAT improved patient behavior and engagement in sessions, AAT made it easier for therapists to engage the patients, allowed

**TABLE 6** Compilation of therapist feedback.

Theme	Therapist response
Helpful with session	<ol style="list-style-type: none"> <li>1. Dog was a huge help and made a big difference.</li> <li>2. Dog was a big help, some stuff he wouldn't have been able to do without the dog.</li> <li>3. Having a dog with us made a positive difference in our session.</li> <li>4. Dog saved the session!</li> </ol>
Tolerate more difficult activities	<ol style="list-style-type: none"> <li>1. Patient was unable to tolerate e-stim during therapy sessions. On an AAT day, the patient agreed (reluctantly) to the e-stim but tolerated it very well because the activities revolved around the dog (petting, brushing, fetch, etc.).</li> <li>2. Does not want to do e-stim without the dog.</li> <li>3. Continues to be a great motivator and allows us to challenge patient in activities we otherwise wouldn't be able to do.</li> <li>4. Dog was a good, fun way to add different cognitive tasks and sessions.</li> </ol>
Enjoyment	<ol style="list-style-type: none"> <li>1. Patient really enjoys dogs in sessions, and talks about the dogs all the time.</li> <li>2. Patient enjoyed sessions more.</li> </ol>
Distraction	<ol style="list-style-type: none"> <li>1. Dog helped refocus when in pain, not continuing to cry/be upset.</li> <li>2. Great distraction for session.</li> </ol>
Motivator	<ol style="list-style-type: none"> <li>1. During the afternoon session with the dog, the patient had increased engagement and participation in OT goals and activities by incorporating dog in tasks and skills.</li> <li>2. Continues to be a great motivator for patient, especially during transitions.</li> <li>3. Helped her participate.</li> </ol>

therapists to diversify activities in sessions, and encourage patients to undertake more challenging tasks than they would without a dog present.

Findings are consistent with research noting that dogs provide a sense of normalcy and improve patient mood and experience during hospitalization.<sup>3,5,6,13,14</sup> Furthermore, AAT did not exert additional therapist burden or disrupt care.<sup>21</sup> In addition, using the institution's existing volunteer dog program was a feasible method for providing dogs for sessions because dogs attended almost all of sessions randomized to the AAT condition. The use of the volunteer dog program, already an existing part of the institutional infrastructure, is a cost-effective way to improve patient and family experience on the inpatient unit and in rehabilitation therapies.

## Limitations

Although these findings support the feasibility and acceptability of AAT in inpatient rehabilitation, limitations should be acknowledged. Although our sample

size is consistent with other studies in the literature, it was relatively small, but it was sufficient to achieve the aim of the study to determine the feasibility and acceptability of incorporating AAT into PT and OT sessions on an inpatient rehabilitation unit. Findings only support the feasibility and acceptability of AAT in school-aged patients (>6 years of age). Although this is a potential limitation because of the high incidence of ABI in children ages 0–4 years of age, the level of functioning and variability in therapy goals in this younger age group would have potentially introduced significant heterogeneity to the population. Future studies should examine the feasibility and impact of AAT in younger populations. Similarly, although level of consciousness was considered during the enrollment process, it was not assessed at each visit in order to explore its role on the participant's ability to complete self-report measures. Although visual anchors/scales were used to support participant completion of the self-report measures in the current study, future studies would benefit from including a measure of consciousness/functioning at each session in order to directly examine the potential impact and consider collecting data from additional informants, particularly when assessing more abstract constructs that may be difficult for patients in the acute stage of brain injury recovery. In addition, unanticipated benefits of AAT on therapists should be explored further (e.g., level of stress, perceived burden). Notably, feedback from therapists was collected in an informal way to limit the additional burden of formal measures. In addition, future studies with larger sample sizes and richer qualitative data would benefit from more structured qualitative methodology. Finally, the aim of this study was to evaluate the feasibility and acceptability of AAT and did not assess the effect on patient outcomes. Future work should examine how AAT may impact patient performance in session, progress in therapy, or rehabilitation outcomes.

## CONCLUSIONS

Patients and families being treated on the inpatient unit experience significant stress. AAT may be an ideal comforting and normalizing intervention for this group of patients. Furthermore, PT and OT during inpatient rehabilitation is challenging and at times painful for pediatric patients with ABI. Engagement in rehabilitation therapies during the acute phase of recovery is an important factor in maximizing recovery. In addition, therapists are faced with planning activities and exercises that challenge the patient to meet their goals while also sustaining interest, motivation, and managing challenging behaviors throughout sessions. The current findings suggest that integrating dogs into therapy sessions can provide

additional value when working with inpatient rehabilitation patients.

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## DISCLOSURE

There are no conflicts of interest to disclose.

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