Critical Review: Effects of animal assisted therapy on communication, social behaviours, and cognition following acquired brain injury in adults

Rachel Woldmo
M.Cl.Sc (SLP) Candidate
University of Western Ontario: School of Communication Sciences and Disorders

This critical review examines the effects of animal assisted therapy (AAT) in supporting communicative, social and cognitive abilities for survivors of stroke and brain injury. Results of the literature review yielded the following study designs: case study (1), single subject design (2), baseline-treatment design study with pre-, mid- and post-testing (1), randomized controlled within-subject trial (1), and a systematic literature review (1). Overall, the research is suggestive that individuals with brain injury may benefit from AAT. However, the scope of this research is limited, and the few existing studies have several design and methodological flaws that should be addressed in future research.

Introduction

The longstanding animal-human bond is ubiquitous and undeniable. As such, the use of animals in health care settings is subsequently becoming more widespread (Gocheva, 2018). Growing evidence suggests that animals are effective in promoting well-being for individuals with diminished social, mental, emotional, physical, and communicative capacities (Nimer & Lundahl, 2007). Animal assisted therapy (AAT) is a form of goal-directed intervention performed by a health care professional who works within his or her scope and who utilizes a trained, live animal as an adjunct to treatment (Gocheva, 2018).

Animals possess various qualities and temperaments that allow for unconditional acceptance, empathetic listening and social catalysis, aptitudes that lend themselves well to the rehabilitative setting. The literature offers plenty of evidence detailing the positive outcomes of AAT in numerous populations, such as dementia and various psychiatric illnesses, and spans a variety of fields including speech language pathology, occupational therapy, physiotherapy, psychiatry, psychology, nursing and veterinary sciences (LaFrance, 2007; Gocheva, 2018). However, there is little research describing the role of animals as communicative facilitators within the field of communication disorders. Still more meagre is the evidence supporting the potential communicative, social and cognitive benefits of AAT for survivors of stroke and brain injury.

Several issues are encountered within this realm of research. First is the issue of terminology as the literature lacks a standardized definition of AAT as it differs from Animal Assisted Activities (AAA). Many researchers inaccurately use the term AAT when referring to AAA, or the use of animals to enhance quality of life through activities that are neither therapeutic nor goal-oriented. (Stapleton, 2016). Another inherent issue is the heterogeneous nature of the population of individuals with a brain injury and the consequent challenges associated with implementing effective study designs and methodologies (Gocheva, 2018).

Nonetheless, the existing research examining the benefits of incorporating animals as adjuncts to rehabilitative therapies is suggestive of positive outcomes for brain injury survivors. This inquiry has important implications for health professionals hoping to take an evidence-based behavioural approach to supporting the rehabilitation of communicative, social, and cognitive abilities of adults with acquired brain injuries.

Objectives

The primary objective of this review was to critically evaluate the existing literature that has examined how AAT affects communication, social behaviour and cognition intervention for adults following brain injury. Secondarily, this review aims to determine the clinical value of these research outcomes in order to provide evidence-based recommendations for speech-language pathologists in supporting individuals with brain injuries.

Methods

Search Strategy

Computerized databases including Google Scholar, PsychInfo, Web of Science, PubMed, and Scopus were searched using the following search term: (("animal assisted therapy" OR "animal assisted intervention" OR "therapy dog" OR “dog therapy” OR “animal therapy” OR “pet therapy”) AND (“stroke” OR "brain injury")

AND ("communication" OR "aphasia" OR "Apraxia")).

Selection Criteria

Inclusion criteria for article selection required that all studies addressed the impact of AAT on communicative, social or cognitive abilities of individuals with a brain injury. Only articles written in English that involved adult participants were included. No limitations were set on the demographics of research participants or outcome measures.

Data Collection

Results of the literature review yielded the following study designs congruent with the above selection criteria: case study (1), single subject design (2), baseline-treatment design study with pre-, mid- and post-testing (1), randomized controlled within-subject trial (1), and a systematic literature review (1).

Results

Adams (1997) conducted a single subject study with time series design to assess the effect of involving therapy dogs in speech therapy sessions for a 72-year-old female with apraxia and communication difficulties subsequent to two cerebral vascular accidents. The study involved eight biweekly intervention sessions with pre and post assessment. Results from the initial assessment revealed an overall Aphasia Severity Rating of 1 based on the Boston Diagnostic Aphasia Examination (BDAE). Two eight-year-old Blue Merle Shetland Sheepdogs with Companion Dog certification were engaged in the tasks during all eight therapeutic sessions. Social behaviour variables (i.e. smiles, looks, touches, leans, verbalizations, and name-calling) were also recorded. Performance on wh- question and picture identification tasks increased from 30% and 40% at session one to 80% at the final session and a 13% increase in verbalization was noted. The Aphasia Severity Rating did not change. Additionally, the author reported increased responses to interactions and a marked improvement in the participant's behaviour and outlook.

The strengths of this study were that it provided details about the therapy dogs in terms of the breed, age, size, and certification status. This is important because the type of dog used in therapy may have an effect on intervention outcomes (Marx et al., 2010). The methods were also described clearly and in sufficient detail for replication.

Several factors limit the validity of this study. First, the BDAE is a valid and reliable norm-referenced assessment tool designed to diagnose aphasia and related disorders and not apraxia, for which it was used in this study. Further, the role or position of the individual carrying out the AAT was not disclosed. AAT requires a certified therapy dog and handler, and it was unclear whether the therapist and author received adequate handler training. The intervention data were at risk of confirmation bias as they were collected by the primary researcher. The data were analyzed using descriptive statistics prohibiting establishment of statistically significant improvement. The additional results were based on informal anecdotal accounts of improvement alone. It cannot be determined whether the observed changes were due to the AAT, the speech therapy alone, or the sole presence of the therapist interacting with the participant because the study design lacked a control. The participant was also concurrently involved in additional therapy (learning American Indian Gestural Code), therefore it cannot be determined whether the changes were due the AAT alone.

Overall, this study provides equivocal evidence that AAT is effective for increasing communication in adults with apraxia.

Burres and her colleagues (2016) aimed to describe the effectiveness of AAT with a case study of an 80-year-old female reported to have expressive aphasia, receptive apraxia and significant immobility syndrome following right temporal and occipital lobe ischemic stroke. Following ostensibly unsuccessful speech and language intervention, a 6-year-old trained and certified pet therapy Goldendoodle was introduced into the therapy sessions two to three times weekly. The authors reported that the participant spoke with greater ease following just two days of speech treatment. It was speculated that the AAT had helped to relax the participant and reduce her levels of stress enough to allow her to speak. The authors stated that the participant's engagement in a game of catch with the therapy dog helped to improve the participant's ability to follow simple commands and directions. At the time of discharge from speech therapy, the participant was reportedly able to repeat phrases and formulate spontaneous sentences.

The strength of this article was that it appropriately defined and differentiated AAT and AAA, an important distinction that is commonly overlooked in this area of research.

A case study is a method of research and data analysis that involves an empirical inquiry investigating a particular individual or phenomenon. Though the authors label this a case study, it lacks a number of critical components. Namely, an experimental aspect is

missing from this paper including a well-defined research question and a methodology that allows for data collection. The absence of methodology and explicit therapy goals and tasks precludes researchers from replicating the findings reported in this article. Further, the changes the participant reportedly experienced cannot be supported with more than anecdotal observations due to the lack of data collected. Though observational improvements were stated, they lacked in operational definition and were not quantifiable. For instance, the authors wrote, "Within two days of therapy with Lily, [the participant] was speaking with greater ease" (Burres et al., 2016, p. 340). In addition, the article contained statements that could be interpreted as unreasonable and inconsistent, undermining the validity of the results and outcomes presented. For instance, the researchers declared that the presence of the therapy dog "distracted [the participant] from her aphasia" (Burres et al., 2016, p. 340). Further, despite having differentiated between AAT and AAA in the article, the authors later stated that interacting with the pet does not place demands or expectations on the participant. The definition of AAT involves goal-directed intervention that requires the individual to work towards predetermined goals, with the animal directly involved as an adjunct to the therapy. Without a methodology, it is difficult to confirm that this study utilized true AAT.

Given the absence of methodology, intervention approach and data to support clinical or functional change, this study provides equivocal evidence that AAT is effective for increasing communication in adults with communication difficulties following a stroke.

Gocheva and her colleagues (2018) conducted a randomized, controlled, within-subject trial to investigate how AAT effects attention and cognition in 19 individuals with acquired brain injury. Intervention involved 12 standard therapy sessions (speech therapy, physiotherapy, occupational therapy) and 12 paralleled AAT sessions with comparable content over six weeks. The AAT conditions involved a range of animals, such as guinea pigs, rabbits, cats, chickens, goats, sheep, minipigs, donkeys, and horses, all of which were trained for AAT and had experience with patients with brain injuries. An AAT specialist assisted the therapist during therapy sessions. Following each 30-minute video-taped session, participants completed a questionnaire regarding mood, alertness and tiredness. Results revealed more instances of distraction in the AAT condition compared to the control condition, but attention span did not differ between conditions. Further, participants' self-ratings of alertness and participant and therapist ratings of participant concentration increased in the AAT condition.

A strength of this study was the research design, which utilized a randomized controlled trial to determine the effects of AAT. The within-subject aspect addressed each participants' individual differences in functional impairment and the heterogeneity of their rehabilitation process since each participant acted as their own control. Factors such as age, gender, functional impairment, and individual progress were accounted for by the nature of the mixed model analysis. The authors carefully provided appropriate rationales for all aspects of their study design, specified eligibility criteria for their participants, and ensured the study had adequate statistical power. The research question and variables were well-defined, and the methodologies were comprehensive and replicable. Therapy sessions were based on physician-defined therapeutic goals and the therapist, day of the week, daytime, and therapeutic activity were controlled.

Some limitations regarding methodology were identified. The experimental groups were not similar at baseline and there was no blind concealment, which limits internal validity. The abovementioned criticisms hold true for the following studies that examine this population addressed in the current report. However, it is recognizably difficult to overcome these variables given the heterogeneity of the population and the infeasibility of having blind-concealment. Additionally, measurements were based on behavioural coding and questionnaires; these methods are less rigorous than objective, performance-based measures of attention. Finally, the study identifies only the immediate effects of AAT on attention, concentration and mood, and is difficult to generalize to other populations and settings.

Despite the limitations described, the methodologies employed and outcomes from this study provide compelling evidence that AAT is effective for increasing attention and concentration in adults with acquired brain injury.

LaFrance et al. (2007) explored the effects of a therapy dog on social-verbal behaviours (e.g. laughing, attempts to verbalize) and social-nonverbal behaviours (e.g. head nods, eye contact) with a 61-year-old male with non-fluent aphasia secondary to a left cerebral vascular accident. In this study that used a single-subject crossover design, data were collected during the participant's walk from speech therapy back to his room over three conditions: one in which the dog and therapist (dog handler) were absent (Condition A; baseline), one in which only the therapist accompanied the participant (Condition B), and one in which both the

therapist and dog were present (Condition C). The mean social-verbal and social-nonverbal behaviours observed increased from baseline to Condition B, and again from Condition B to Condition C; they decreased from Condition C to Condition A.

Several methodological factors contributed to the strength of this study. For instance, the ABCA design permits the pre- and post-treatment baseline conditions to act as control conditions. The day of the week and time of day as well as the route taken through the hospital were consistent throughout the data collection period. The fact that the speech-language pathologist (SLP) was the dog handler eliminates the possibility that changes were due to the presence of another handler during treatment sessions. The procedures were clear and appropriately designed to address the well-formulated research question proposed. The authors also ensured to include the age and breed of the accompanying dog.

There were several methodological limitations of this study. First, the single subject design did not allow for blind concealment and therefore there is the potential for bias in data collection. The authors did not provide any information about the observer collecting the data. It is unclear whether this observer was aware of the experimental question or what their training and qualifications were. Further, this observer was reportedly positioned “to the right and slightly behind the participant’s wheelchair” (LaFrance, 2007, p. 221), which may not be an optimal position to observe some social-nonverbal behaviours such as eye contact and attention directed towards the handler. The design could be improved by having more than one observer in order to provide a measure of inter-rater reliability. Considering that no statistical analysis was performed on the data collected, it cannot be determined whether the results are significant. The results from this single-subject study are also difficult to generalize beyond the participant and environment described.

Overall, this study provides suggestive evidence that the presence of a therapy dog may be a catalyst to improve both verbal and nonverbal communication skills in individuals with aphasia.

Macauley (2006) conducted a baseline-treatment design study with pre-, mid-, and post-testing in order to identify the effectiveness of AAT on the communicative abilities of three male participants with aphasia subsequent to left-hemispheric stroke. Each participant received 12 weekly traditional speech therapy sessions followed by 12 weekly AAT speech therapy sessions with similar content. All participants met their therapy goals during each 12-week therapy block. The results from the Western Aphasia Battery (WAB) indicate that speech therapy with and without the therapy dog was equally as effective. Additionally, results from the 21-item client-satisfaction questionnaire ratings increased following participation in intervention with the therapy dog present, indicating higher motivation and better attitude toward therapy in the AAT condition.

The strengths of this study include a well-formulated and appropriate research question and study design. The methods included specificity of participant eligibility criteria and sufficient detail for replication with inclusion of an appendix detailing example therapy tasks and the questionnaire. All three participants received treatment from the same clinicians in both treatment blocks, contributing to increased internal validity. An appropriate definition of AAT was included along with details about the therapy dog. The researchers acknowledged the limitations of their study and proposed suggestions for future research on this topic.

This study could be criticized for several reasons relating to design and methodology. For instance, the design could be improved by randomly assigning participants to experimental conditions. In this study, participants all completed the non-AAT condition before completing the AAT condition. The opportunity for the participants to become comfortable with the clinicians during the non-AAT condition may have contributed to the increase in communication and comfort. The heterogeneity and small number of participants may have affected the outcomes. Such effects may be reduced with a larger number of participants, and participants whose stroke occurred within the last six months. Moreover, the results from the WAB pre-treatment, post-traditional therapy treatment, and post-AAT treatment revealed no change in communicative ability. Perhaps a more sensitive assessment tool more suitable for retesting within a small window of time would have revealed a change in results following both treatment blocks. Further, it is unclear how the researchers determined the importance of the changes on the questionnaire following each intervention block and whether this decision was made before administering the questionnaire or post hoc. Maintenance and generalization effects of the AAT remain unclear.

In large, this study provides suggestive evidence that the presence of a therapy dog may increase the levels motivation and attitude that individuals with aphasia experience towards therapy participation.

Stapleton (2016) conducted a systematic literature review to investigate the potential uses of AAT in cognitive rehabilitation therapy (CRT) and social skills training in brain injury rehabilitation. Based on the 10-article review, it was revealed that there is a dearth of rigorous research documenting the effects of AAT, especially for the brain injury population. However, results also showed that anecdotal evidence from brain injury patients and research from other clinical populations suggests that AAT can be an effective and relatively inexpensive means of reducing anxiety, increasing motivation, and means of support and companionship for patients when applied alongside traditional therapies. From this, the author concluded that AAT may also be beneficial as part of a comprehensive and holistic rehabilitation approach to treatment for survivors of acquired brain injury with cognitive impairments.

The strengths of this study were that it provided an appropriate definition of AAT and acknowledged the inherent limitations in this realm of research.

There are several limitations associated with the design and methodology of this study. To start, the goal of the literature review is somewhat unclear. Though the article title portrays a review of studies that investigate the effects of AAT on individuals with brain injury, the authors later stated that few of the studies reviewed directly concern survivors of brain injury. Additionally, the authors did not include the development of search terms and databases used to retrieve the studies or the inclusion and exclusion criteria for the chosen articles; therefore, the selection of studies is not reproducible. Stapleton's (2016) review lacked a quality assessment for the studies, hence the reliability and validity of the methodology cannot be ascertained. Furthermore, the information from the studies could not be tabulated or analyzed because there did not appear to be any data collected from the articles.

Considering the number of limitations in design and methodology, this literature review affords equivocal evidence that AAT may provide the same benefits for individuals with brain injuries as it does in other patient populations.

Discussion

Overall there is suggestive evidence that the incorporation of AAT into traditional rehabilitative therapy is beneficial for individuals with communication challenges following stroke or brain injury. Nonetheless, some caution must be taken when interpreting and drawing conclusions from the evidence presented as several limitations exist within this body of research.

The quality of these studies is variable due to the diversity of study designs and methodologies. Randomized blind control trials are of higher value than single subject designs, yet the latter are most frequently seen in this field of research. A common limitation among the studies reviewed is the insufficient detail for replication. What adds to this challenge is the inconsistency in the frequency of treatment sessions, length of therapy blocks, type therapy tasks, type of animal used, the variability of dependent variables, and method of data collection across the studies. The majority of the studies in this review do not include a statistical analysis of the results, which limits the ability to deem whether the outcomes and changes as statistically significant.

Furthermore, the use of animals both therapeutically and recreationally has increased in the literature; however, there continues to be a lack of agreement in the terminology used. For instance, LaJoie (2004) reported finding 12 different labels for AAT in her literature review (e.g. pet therapy, companion-animal therapy, pet-facilitated therapy, co-therapy with an animal, pet-mediated therapy, etc.). The tendency to weaken or confuse the word *therapy* is highly problematic. Researchers should address the distinction between AAT and AAA and make efforts to employ the correct terms in order to enforce the standardization of terminology and establish a solid literature base.

Additionally, an issue that is inherent to this area of research is the heterogeneous nature of the population under examination. The impacts of brain injury vary greatly among individuals and can affect various aspects of functioning, such as communication, cognitive functioning, mobility and mental wellness to varying degrees. Individuals enter therapy with different goals, attitudes, and levels of motivation. Moreover, the interaction behaviours between the individuals and the animals are somewhat unpredictable. These are factors that can also impact therapeutic outcomes. Thus, the effects of AAT for one survivor of brain injury may be vastly different for another.

Despite the small number of studies that address this topic and the numerous factors contributing to outcome variability, many of the reviewed studies discuss observational or anecdotal evidence that reflects an overall increase in participant motivation, satisfaction, and engagement during communication therapy. None of the studies in this appraisal indicated any negative outcomes from AAT, which may reflect appropriate client and animal selection. However, there are a number of considerations regarding clinician and animal training in addition to animal and client

candidacy for AAT that must be addressed. As such, dogs and other animals may provide individuals with comfort and motivation and act as a catalyst for human communication and interaction.

Conclusion

The studies reviewed in this appraisal provide suggestive evidence that AAT may be beneficial in supporting communicative, social and cognitive abilities for survivors of stroke and brain injury. Given the variability and limitations in study design and methodology discussed above, further research is necessary to examine how AAT could be systematically implemented into clinical practice for communication rehabilitation and to determine the long-term effects of this intervention.

Clinical Implications

The future of AAT in research and in clinical practice is exciting in its numerous possibilities and there exist many avenues through which AAT can be explored. The current evidence for the use of AAT with stroke and brain injury survivors is suggestive yet still evolving. AAT can be an excellent adjunct to traditional speech therapy for individuals with brain injury, provided that several factors have been carefully considered and accounted for. First, the clinician should be proficient in their scope of practice and uphold a high level of creative competency to allow for excellent problem-solving skills required for successful AAT. Should an SLP wish to utilize AAT as an adjunct their practice, it is essential that they seek appropriate and adequate training that encompasses ethical practices of AAT, theory of animal learning and behaviour, and animal health and wellness. Second, the clinician must evaluate the patient's or client's candidacy for AAT, including history of animal interactions, willingness to work with animals, potential animal allergies or fears, and whether the client has aggressive tendencies that may put the animal's safety and welfare at risk. Lastly, the animal chosen must be appropriate for AAT in terms of training and certification, type and breed of the animal, and overall compatibility with the client or patient to optimally support their therapeutic needs.

When utilizing AAT in the field of speech and language pathology, the clinician should be aware the effects of AAT may not necessarily come through in terms of meeting therapeutic goals, but they may appear in the form of client's increased motivation, comfort, satisfaction and attitude towards therapy. These benefits should not be overlooked by the clinician as they can contribute greatly to the overall effectiveness of the patient's therapeutic experience.

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