

A Systematic Review of Randomized Controlled Trials of Animal-Assisted Therapy on Psychosocial Outcomes

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ABSTRACT The use of animal-assisted interventions (AAls) to achieve psychological benefits has expanded rapidly over the last few years. However, this is a vastly under-researched area, and the research to date has been largely descriptive, in the form of case studies, or has used only small groups of participants with no control condition. Remarkably few studies have utilized gold standard randomized controlled designs. The aim of the present review was to examine the current state of the literature in regard to only randomized controlled trials (RCTs) examining the psychosocial benefits of AAls, which is a necessary step in order to move the field forward. A search of relevant databases was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A total of 66,180 articles were identified at the outset; this was reduced to eight articles (involving 7 studies), following the removal of duplicates (39,377), unrelated titles (26,525), and those that did not meet inclusion criteria (270). Findings from the present review suggest that AAls may be of benefit to a wide range of individuals, including children with autism, and adults with psychological disorders, including schizophrenia. However, further research using well-designed RCTs is required to more definitively explore what specific types of AAl are beneficial for specific populations. Recommendations for future research are provided.

Keywords: animal-assisted activities, animal-assisted intervention, animal-assisted therapy, psychosocial outcomes, randomized controlled trial



The last few years have seen a rapid expansion in the use of animal-assisted interventions (AAls). These use a variety of animals (e.g., horses, domestic pets, farm animals) to achieve psychological benefits in a wide range of populations. AAls consist of

two types of intervention: “animal-assisted therapy” (AAT), a goal-directed intervention in which an animal is an integral part of a treatment process to achieve specific goals, and “animal-assisted activities” (AAA), a less structured intervention which aims to achieve positive psychological outcomes through creating a positive environment with animals (Delta Society n.d.). Although AAIs have incorporated a wide range of animals (e.g., Breitenbach et al. 2009), the most common programs have focused on horses (Trotter et al. 2008; Burgon 2011), farm animals (e.g., Pedersen et al. 2012), or domestic pets (e.g., Chu et al. 2009). There is generally agreement that AAIs lead to positive psychological outcomes (e.g., Nimer and Lundahl 2007; Wells 2009; Ernst 2012). However, this is a vastly under-researched area in need of well-designed randomized controlled trials (RCTs). Research pertaining to the psychological benefits of AAIs has been largely descriptive in the form of single-case studies, small groups of participants with no control condition, or non-randomized interventions that included a control group (Smith-Osborne and Selby 2010). Remarkably few studies included in these previous reviews have utilized gold-standard, randomized controlled designs.

Several researchers have published reviews (Garrity and Stallones 1998; Hooker, Holbrook Freeman and Stewart 2002; Filan and Llewellyn-Jones 2006; Barker and Wolen 2008; DeCoursey, Russell and Keister 2010; Rossetti and King 2010) and meta-analyses (Nimer and Lundahl 2007; Souter and Miller 2007) about the psychological benefits of AAIs. Hooker et al. (2002) carried out an historical review of the preceding 50 years of research involving pet therapy. In particular, they focused on the use of domestic animals for psychosocial benefits and reported increasing levels of popularity and interest among researchers over this period. The studies reviewed by Hooker et al. (2002) were largely single-case studies, or uncontrolled trials, which provide some initial, promising support for the use of AAIs with domestic animals. However, as the authors stated, there is more work to be done in regard to establishing the efficacy of these interventions.

Filan and Llewellyn-Jones (2006) conducted a review of the evidence pertaining to the use of AAI for dementia. The large majority of studies investigating the use of AAI to address the behavioral and psychological symptoms of dementia were small-scale, uncontrolled studies, and the authors noted several methodological limitations with regards to the individual studies. Specifically, the authors highlighted the need for well-designed, randomized controlled trials to investigate the beneficial effects of AAIs. Nonetheless, Filan and Llewellyn-Jones (2006) concluded that there is some initial evidence that AAIs have beneficial effects on symptoms of dementia, with some small studies indicating that the presence of a dog may reduce agitation and enhance sociability in individuals with dementia.

Rossetti and King (2010) reviewed the evidence for the effectiveness of AAIs (specifically, AAT) with psychiatric patients, concluding that AAIs have positive effects on a wide range of psychological and social outcomes, including reductions in anger, anxiety, depression, and general distress, and beneficial effects on socialization. DeCoursey, Russell and Keister (2010) reviewed the literature pertaining to the psychological and physiological health benefits of AAIs for critically ill patients. Multiple studies were identified that found positive psychological or physiological markers of health in critically ill patients. The authors concluded that AAIs had the potential to reduce stress, anxiety, and boredom, as well as improve mood and physiological markers of well-being such as reduced heart rate and blood pressure. Although they found no research suggesting AAI was not efficacious, it was noted that AAI may not be beneficial for everyone.

Souter and Miller (2007) conducted a meta-analysis of the efficacy of AAls (both AAA and AAT) on depression. It consisted of only studies that utilized a control group and random assignment, as well as a sufficient measure of depression. Further, in order for studies to be included in the meta-analysis, the studies had to report sufficient information to allow for effect sizes (i.e., a statistical indication of the strength of the effect of treatment) to be calculated. Five studies were included in the analysis, and the results revealed that, overall, there was a statistically significant moderate effect size, showing a reduction in depressive symptomatology. That is, there was compelling evidence that the AAls were associated with improvements in depression, as the only studies included in the analyses were well-designed, randomized controlled trials.

A meta-analysis conducted by Nimer and Lundahl (2007) revealed that AAls were effective across several domains. Specifically, there were large effect sizes for behavioral difficulties and symptoms of autism, moderate effect sizes for indices of wellbeing, and moderate effect sizes for behavioral and medical indicators. Importantly, four studies included in the review compared AAls with active interventions rather than a wait-list control group, demonstrating that AAI was as effective as the alternative intervention, and in some cases more effective (Holcomb and Meacham 1989; Haughie, Milne and Elliot 1992; Bernstein, Friedmann and Malaspina 2000; Marr et al. 2000). However, only one of these studies (Marr et al. 2000) used a randomized controlled design.

In brief, there is some initial evidence that AAls may be beneficial across a wide range of populations and domains. However, conclusions are limited as much of the research in this area has been descriptive, or has consisted of uncontrolled trials. The aim of the present review was to examine the current state of the literature since previous reviews (e.g., Nimer and Lundahl 2007). An examination of the current evidence-base for animal-assisted interventions is a necessary step to move the field forward. The National Health and Medical Research Council (NHMRC 2009) guidelines suggest that the highest level of evidence (Level I evidence) is a systematic review of Level II studies (i.e., well-designed, randomized controlled trials). Thus, in the present review, we included only randomized controlled trials investigating the effects of AAls on psychosocial outcomes.

Methods

Selection of Studies

To review the literature since these previous reviews, we searched for articles on AAls published between 2008 and 2012. Keyword searches were conducted of six databases (PsycINFO, MEDLINE, PROQUEST, Scopus, Web of Science, and CINAHL). In addition, the reference lists contained in the retrieved articles were examined for any additional articles that warranted inclusion. Keywords relevant to the present review used for the search were “animal-assisted therapy,” “pet therapy,” “equine facilitated learning,” “hippotherapy,” or “therapeutic horse-riding,” paired with key terms “well-being,” “health,” “recovery,” “rehabilitation,” “healing,” “treatment,” “intervention,” “psychotherapy,” or “illness.” In line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Liberati et al. 2009), the results of the systematic review are presented in Figure 1.

The initial search found 66,180 articles, which was reduced to 26,803 when duplicates were removed. An initial review of the abstracts was conducted to remove articles that were clearly unrelated to AAls, or were not written in English, leaving 278 articles. The abstracts of these studies were then reviewed by two independent raters, and articles were retained for the

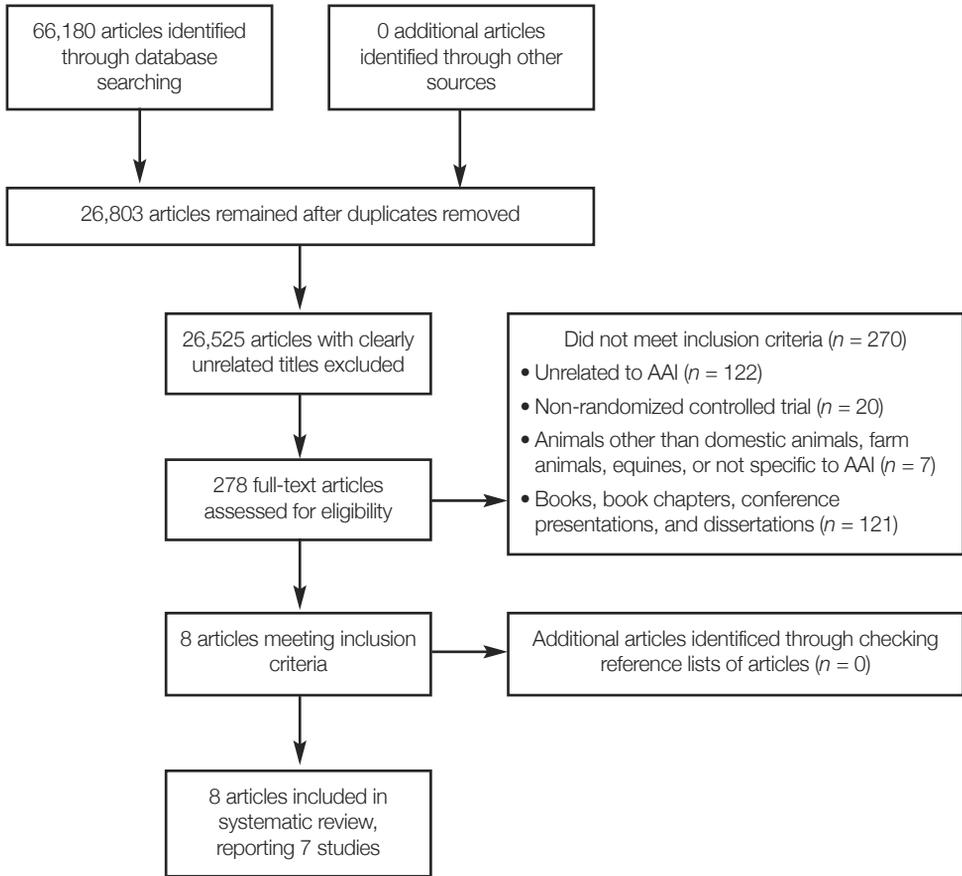


Figure 1. The search strategy.

systematic review if they met the following inclusion criteria:

- 1) Only original published journal articles that investigated the psychological or social outcomes of AAIs were included;
- 2) An AAI was provided and described as part of the study;
- 3) The study design was a randomized controlled trial;
- 4) The article was specific to AAIs, rather than a combination of therapies or pet ownership.

Results

After exclusion of articles, only eight articles remained, describing seven studies. Details of these articles are displayed in Table 1. In line with guidelines provided by the NHMRC (2009), only studies meeting criteria for Level II evidence (i.e., randomized controlled trials) were included in the present review.

All studies reported in the review utilized some form of psychometric outcome measure. However, there was variation in regard to the extent to which the various interventions were shown to be beneficial. Sample sizes of the studies ranged from small ($n = 21$) to relatively large

Table 1. Studies included in the review.

| Author (year) | Sample Characteristics (I = intervention; C = Control) | Targeted Behaviors | Intervention Type | Length of intervention | Number of Weeks | Animals | Outcomes Measures | Findings |
|---|---|---|---|---------------------------------|-----------------|-----------------------------|--|---|
| Bass, Duchowny and Labre (2009) | n = 34 (I = 19; C = 15); Children with autism | Social functioning | Therapeutic horse-riding (hippotherapy) | 1 hour per week | 12 | Horses | Social Responsiveness Scale | Improved social motivation, sensory seeking, sensory sensitivity, and decreased sedentary behavior, inattention and distractibility relative to control group. |
| Berget, Ekeberg and Braastad (2008); Berget et al. (2011) | n = 90 (I = 60; C = 30); Adults with psychiatric disorders | Self-efficacy, coping ability, quality of life, depression, anxiety | Farm animal-assisted therapy | 3 hours twice a week | 12 | Cows, cattle, sheep, horses | Generalised Self-Efficacy Scale; Coping Strategies Scale of the Pressure Management Inventory; Quality of Life Scale, Spielberger State-Trait Anxiety Inventory; Beck Depression Inventory | Improved self-efficacy and coping abilities, and decreased depression and anxiety relative to control following intervention. |
| Chu et al. (2009) | n = 30 (I = 15; C = 15); Adult inpatients with schizophrenia | Self-esteem, self-determination, social support, psychiatric symptoms | AAI (canine) | 50 minutes per week | 8 | Dogs | Adaptations of measures tapping self-esteem; self-determination; social support; psychiatric symptoms (positive and negative symptoms of schizophrenia); and emotional symptoms. | Improved self-esteem and self-determination, and decreased positive symptoms of schizophrenia and emotional symptoms relative to control. |
| Davis et al. (2009) | n = 99 (I = 50; C = 49); Children with cerebral palsy | Quality of life, gross motor function, health status | Therapeutic horse-riding (hippotherapy) | 30 to 40 minutes weekly | 10 | Horses | Cerebral Palsy Quality of Life Questionnaire for children; KIDSCREEN; Child Health Questionnaire; Gross Motor Function Measure. | After controlling for time 1 data, improvement in family cohesion. No positive effects for main outcomes. |
| Johnson et al. (2008) | n = 30 (DV = 10; FHV = 10; QR = 10); Patients receiving non-palliative radiation therapy | Mood state, self-perceived health, sense of coherence | AAI (canine) | 15 minutes three times per week | 4 | Dogs | Profile of Mood States; Self-Perceived Health Questionnaire; Orientation to Life Questionnaire; Re-searcher-Derived Exit Questionnaire. | No significant improvements on any variable across the three conditions. Participants rated dog visits as less helpful than human visits and the reading condition. |

DV = Dog visit group; FHV = Friendly human visit group; QR = Quiet reading group.

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| Author (year) | Sample Characteristics (I = intervention; C = Control) | Targeted Behaviors | Intervention Type | Length of intervention | Number of Weeks | Animals | Outcomes Measures | Findings |
|---------------------------|--|--|------------------------------|-----------------------------|-----------------|-------------------------------------|---|---|
| Pedersen et al. (2012) | n = 29 (I = 16; C = 13); Adults with depression | Depression, state anxiety, self-efficacy | Farm animal-assisted therapy | 1.5 to 3 hours twice a week | 12 | Cattle, horses, cats, dogs, rabbits | Beck Depression Inventory; State-Trait Anxiety Inventory-State Subscale; Generalised Self-Efficacy Scale. | Increases in self-efficacy, and decreased depression and state anxiety in the intervention condition, and not in the control condition. |
| Vilaita-Gil et al. (2009) | n = 21 (I = 12; C = 9); Adult inpatients with schizophrenia | Psychiatric symptoms, social competence, quality of life | AAI (canine) | 45 minutes twice a week | 25 | Dogs | Positive and Negative Syndrome Scale; Living Skills Profile; WHO Quality of Life Assessment. | Treatment group improved in positive and negative symptoms of schizophrenia, and quality of life related to social relationships. Control groups only improved in positive symptoms and general symptoms of schizophrenia. |

DV = Dog visit group; FHV = Friendly human visit group; QR = Quiet reading group.

($n = 99$). Studies obtained investigated the effects of AAI for several populations: including individuals with schizophrenia, depression, anxiety, and cancer. The interventions differed in terms of length and standardization. To manage this variability, we examined the outcome of these interventions based on the type of animal used in the therapy.

Canine

Three studies were identified in the present review that examined the effects of an AAI with canines. Sample sizes in each of these three studies were small ($n = 21$ to $n = 30$). Across the three studies there were 37 participants in the canine interventions, and 46 participants in the control conditions (did not include contact with dogs).

Chu et al. (2009) conducted a study to evaluate the effects of AAA on self-esteem, control of activities in daily living, and other psycho-physiological aspects. Thirty Taiwanese individuals, who were inpatients with schizophrenia, were randomly assigned to either a 2-month weekly AAI (specifically, AAA) with dogs ($n = 15$) or to a control group ($n = 15$) who received treatment as usual. The AAI sessions were generally held in the hospital garden for 50 minutes each week. Animal-assisted activities included learning to walk the dogs over obstacles, carrying the dogs, playing “throw and fetch” games with the dogs, and learning to relate to the dogs. Group discussions were held to debrief and reflect on patients’ experiences and feelings. Participants in the AAI displayed increased self-esteem, self-determination, and decreased emotional symptoms and positive symptoms of schizophrenia ($p = 0.05$), whereas no such changes emerged in the control condition. Thus, results indicate that a relatively short-term AAI can have beneficial effects on both emotional well-being and symptoms of schizophrenia. However, it is important to note that no follow-up assessments were conducted to assess the durability of the effects. In addition, the control group was a treatment-as-usual group, as opposed to an active control group which received a credible intervention. It therefore remains unclear whether the beneficial effects were specific to this intervention or would have been observed following any structured activity.

Villalta-Gil et al. (2009) also examined the efficacy of an AAI which included a trained therapy dog with a group of inpatients with chronic schizophrenia. This study aimed to assess the effectiveness of this intervention program in decreasing levels of positive and negative symptoms, and improving levels of social competence and quality of life. The intervention was a form of the Integrated Psychological Treatment (IPT) (Brenner et al. 1994) that was adapted to allow for dogs to be incorporated into the treatment. Twenty-one inpatients with a diagnosis of schizophrenia were randomly assigned to either the IPT that included activities with dogs (IPT-d) ($n = 12$), or to the IPT which did not include activities with dogs ($n = 9$). Twenty-five sessions were provided to participants twice-weekly, each session lasting for 45 minutes. Participants in the IPT group significantly improved in positive ($p = 0.027$, $d = 0.82$) and general symptoms of schizophrenia ($p = 0.046$, $d = 1.69$). In contrast, participants in the IPT-d group improved in social contact ($p = 0.041$, $d = -1.19$), positive ($p = 0.005$, $d = 1.08$) and negative ($p = 0.005$, $d = 1.64$) symptoms of schizophrenia, and quality of life related to social relationships ($p = 0.024$, $d = -1.12$). These findings suggest that dog-assisted therapy may provide broader beneficial effects when compared with IPT treatment alone. Surprisingly, however, social behavior significantly worsened in the IPT-d group, possibly because the intervention did not specifically focus on these issues. There were no differences between the two groups on any of the outcome measures, both before and after treatment. A strength of this study is that it compared two interventions

that were identical except for the inclusion of a dog and activities relating to the dog. However, again, long-term follow-up assessments are needed.

In the final and most controlled RCT, Johnson et al. (2008) explored the effects of AAA on mood, fatigue, and perceptions of health in cancer patients. Thirty individuals currently receiving non-palliative radiation treatment were randomly assigned to either 12 dog visits ($n = 10$), 12 human visits ($n = 10$), or 12 quiet reading sessions ($n = 10$). Each intervention consisted of three 15-minute sessions per week for four weeks. In the dog-visit group, a dog handler brought two female dogs to visit patients, and the patient interacted with the dog. In the human-visit condition, a friendly person (e.g., volunteer nursing student) engaged with the patient in superficial “small talk,” and not therapeutic counseling. Finally, in the reading group, participants were provided with a selection of magazines that were unrelated to health, cancer, or animals. There were no statistically significant improvements in any of the three intervention conditions with regards to tension, anger, confusion, or fatigue. However, participants tended to rate the sessions as helpful (dog visits, 50%; human visits, 90%; reading, 80%). Interestingly, participants in the dog-visit condition rated the usefulness of the intervention lower than the other two interventions. Comparison between this intervention and all other interventions was not possible as it was less structured and active (i.e., passive visits with a dog). This study suggests that human contact is perceived as more meaningful than animal contact, but that passive animal contact may not be as useful as active engagement. However, it is important to note that the sample size ($n = 30$) was relatively small and may have lacked statistical power to detect an effect.

Farm Animals

Two studies were identified that examined the effects of an AAI with farm animals. In one study, various aspects of psychological outcomes of the same RCT were reported in two separate publications (Berget, Ekeberg and Braastad 2008; Berget et al. 2011), and therefore this intervention is treated as one study in the present review. Sample sizes in the two studies differed substantially, with one study examining the efficacy of the intervention in a relatively small sample ($n = 29$; Pedersen et al. 2012), and the other using a large sample ($n = 90$; Berget, Ekeberg and Braastad 2008; Berget et al. 2011). Overall, there were 76 participants in the animal interventions, and 43 participants in the control conditions.

Pedersen et al. (2012) explored the efficacy of a 12-week AAA intervention involving farm animals on self-efficacy, depression, and anxiety in individuals with depression. Twenty-nine individuals suffering depression were randomly assigned to either the active intervention ($n = 16$) or to a wait-list control condition ($n = 13$). Participants in the farm-animal intervention condition worked and interacted with the animals twice weekly across the 12-week period, for between 1.5 to 3 hours. Activities included grooming, feeding, milking, and taking care of the farm animals. Following the intervention, participants displayed reduced depression ($p = 0.003$, $\eta^2 = 0.45$) increased self-efficacy ($p = 0.045$, $\eta^2 = 0.24$), and although the decrease in state anxiety was not significant ($p = 0.059$, $\eta^2 = 0.22$), the effect size was large. These benefits were maintained at follow-up, whereas in the control condition no such changes were evident. There were no differences between groups in these outcomes. It is possible that the relatively small sample ($n = 29$) may have limited the extent to which differences between the groups could be detected. However, it is clear that beneficial effects emerged in the intervention condition and not in the control condition. An important strength of the study is that follow-up assessments were conducted at three months.

In two separate reports of the same study, Berget, Ekeberg and Braastad (2008) and Berget et al. (2011) evaluated the effectiveness of an AAA intervention involving farm animals to decrease levels of depression and anxiety, and improve levels of self-efficacy, coping abilities, and quality of life. Ninety individuals with a psychiatric disorder (schizophrenia, mood disorder, personality disorder, or anxiety disorder) were randomly assigned to either 12 weeks of AAA with farm animals ($n = 60$) or to a control group who received treatment as usual ($n = 30$). The AAA intervention consisted of twice-weekly visits to a farm to work with the animals; each session lasted approximately 3 hours. Activities included patting, washing, and grooming the animals, as well as moving them and riding horses. In the first study, participants in the AAA condition displayed a significant increase in self-efficacy ($p = 0.001$, $\eta^2 = 0.25$) and coping abilities ($p = 0.03$, $\eta^2 = 0.11$) at the six-month follow-up, whereas no such changes were observed in the control group (Berget, Ekerberg and Braastad 2008). In the second study, participants in the AAA group also reported significantly lower levels of anxiety ($p = 0.002$, $\eta^2 = 0.21$) and depression ($p = 0.002$, $\eta^2 = 0.21$) at the six-month follow-up. However, unexpectedly, depression also reduced significantly in the control condition during the six-month period ($p = 0.0005$, $\eta^2 = 0.37$), suggesting that the intervention may not have been contributing to this particular observed change (Berget et al. 2011).

In brief, the findings suggest that the AAA intervention was effective in alleviating symptoms of anxiety and improving coping and self-efficacy among individuals with a psychiatric diagnosis, though the effects on depression were somewhat less clear.

Equine

Only two studies focused on AAIs with equines. Sample sizes in the two studies differed substantially, with one study examining the efficacy of the intervention in a relatively small sample ($n = 34$; Bass, Duchowny and Llabre 2009), and the other using a large sample ($n = 99$; Davis et al. 2009). Overall, there were 69 participants in the animal interventions, and 64 participants in the control conditions.

Bass, Duchowny and Llabre (2009) investigated the efficacy of a therapeutic horse riding intervention on the social responsiveness of children with autism ($n = 34$). Thirty-four children were randomly allocated to either an intervention group ($n = 19$) or a wait-list control group ($n = 15$). The intervention group participated in 12 weekly 1-hour sessions involving various horse activities (e.g., riding, horsemanship activities), to facilitate the development of verbal communication and social skills. Children who participated in the therapeutic riding intervention displayed greater social motivation ($p < 0.003$, $\eta^2 = 0.54$), sensory seeking ($p < 0.001$, $\eta^2 = 0.56$), sensory sensitivity ($p < 0.001$, $\eta^2 = 0.68$), and less sedentary behavior ($p < 0.01$, $\eta^2 = 0.57$), and inattention and distractibility ($p < 0.001$, $\eta^2 = 0.61$) following the intervention. In contrast, participants in the control group did not display any significant behavioral changes from pre- to post-assessment. Although no follow-up assessments were reported, the strengths of this study were the inclusion of a control group, the use of random assignment, the implementation of a structured intervention with clear aims and goals, and the use of assessments that adequately measured these specific domains.

In a much larger study, Davis et al. (2009) randomly assigned 99 children with cerebral palsy to either a 10-week therapeutic horse-riding intervention ($n = 50$) or to a wait-list control condition ($n = 49$). Participants in the therapeutic horse-riding intervention group participated in activities designed to emphasize various physical movements to improve postural control, balance, trunk strength, and trunk/pelvis dissociation. Children in the wait-list control group

were requested to continue with their daily/weekly routine. No significant differences emerged between the two groups except for an improvement in family cohesion in the therapeutic riding condition ($p < 0.007$). The relatively large sample size is a significant strength of this study, as it provided adequate statistical power to detect an effect if one was present. However, it is important to note that the psychological measures administered were broad measures of quality of life which may not detect the more specific changes one might expect from an equine-assisted therapy program. Positive changes in family cohesion are important and indicate the potential for longer term benefits from AAls.

Discussion

In this review of seven RCTs, we assessed the current state of the evidence regarding the psychological benefits of AAls. All but one study (Johnson et al. 2008) reported at least some beneficial psychological effects of AAls. Three studies found beneficial psychological effects with farm animal-assisted therapy (Berget, Ekeberg and Braastad 2008; Berget et al. 2011; Pedersen et al. 2012), although two of these studies reported findings using the same sample. Two studies reported positive outcomes of canine-assisted interventions (Chu et al. 2009; Villalta-Gil et al. 2009), and two found beneficial effects of AAls with horses (Bass, Duchowny and Llabre 2009; Davis et al. 2009). The only non-significant study (Johnson et al. 2008) involved a minimal, short-term, unstructured intervention with cancer patients in active radio therapy. It is not surprising to find that this intervention was unsuccessful. Importantly even unstructured human interaction at the same frequency and intensity was not helpful.

Methodological Considerations

As the studies included in the present review were RCTs, the design enabled stronger conclusions to be drawn. However, there was substantial variability among these studies in regard to quality. For instance, only two studies (Johnson et al. 2008; Villalta-Gil et al. 2009) utilized an active control group which participated in a comparison intervention as opposed to a wait-list control condition or treatment as usual. Johnson et al. (2008) found no beneficial effects of AAI, whereas Villalta-Gil et al. (2009) found reductions in negative symptoms of schizophrenia, and an increase in quality of life and relationships in the AAI group relative to the control condition. Without more research utilizing active control groups, it remains unclear whether simply engaging in some form of activity is responsible for the positive outcome, or whether the beneficial effects are specific to the AAI.

There was also considerable variation in the measures used to assess psychological outcomes between the studies. Specifically, some studies used measures that tapped specific constructs, such as self-efficacy (e.g., Berget, Ekeberg and Braastad 2008; Pedersen et al. 2012) and self-esteem (e.g., Chu et al. 2009), whereas others used broader measures, such as overall quality of life for children with cerebral palsy (e.g., Davis et al. 2009). When more specific measures were used, positive changes were identified, suggesting that AAls may have targeted effects on psychosocial outcomes. It is important that the measures selected to assess outcomes are theoretically in line with the aims and scope of the intervention. A brief AAI may not be expected to enhance overall quality of life, particularly when life circumstances are challenging (e.g., Davis et al. 2009). However, it could be reasonably expected to enhance self-efficacy, positive affect, and coping skills if animal experiences are appropriately structured and supported.

The only study that used individual sessions as opposed to group sessions (Johnson et al. 2008) found no beneficial effects as a result of dog-assisted therapy. However, the sample was small and the intervention was shorter in duration (15 minutes, three times per week, for four weeks) than those described in other studies both in terms of session duration and length of treatment. The next shortest intervention was eight weeks for 50 minutes per week (Chu et al. 2009) and was associated with significant increases in self-esteem, self-determination, as well as decreases in positive symptoms of schizophrenia. Thus, it is unclear whether the null findings obtained by Johnson et al. (2008) may be attributed to a lack of efficacy of AAI with dogs, which is unlikely given the findings of other well-controlled studies, individual sessions (as opposed to group sessions), inadequate dosage, or simply lack of power. Consistent with the proposition that dose effects are important, Villalta-Gil et al. (2009) examined the effects of group sessions of AAI with dogs across 25 sessions and found that the intervention was successful in reducing negative symptoms of schizophrenia, which are traditionally more resistant to therapy. Thus, it is possible that longer duration AAIs may be necessary to achieve significant change. This potential dose effect may be an important issue to consider in future research.

All of the studies in the present review assessed psychosocial functioning before and after the intervention. However, only three studies (Berget, Ekeberg and Braastad 2008; Berget et al. 2011; Pedersen et al. 2012) reported follow-up assessments beyond the end of treatment. It is critically important that long-term follow-up assessments are conducted, as it is useful to know how long the positive effects last following the intervention. It may also be that some beneficial effects are either not observed until sometime after the intervention has finished, or that the beneficial effects may continue to develop post-intervention.

An important issue to consider is the construct validity of AAIs, namely whether the therapeutic improvement is due specifically to the presence of the animal or whether it is due to the more generic aspect of the intervention (e.g., being presented with a novel situation, being placed in a new environment, and being more physically active). In comparison to more traditional interventions, AAI provides a new and often exciting experience for participants, hence these types of intervention may be prone to novelty effects. According to Marino (2012), in order to decrease the impact of novelty effects during AAIs, control groups must use similarly new and exciting stimuli, or the studies should have longer-term follow-up assessments, after the excitement and novelty of the experimental condition has decreased. In the present review, none of the studies included a control group exposed to a comparable activity to control for the novelty effect associated with the AAI. Three studies administered follow-up assessments (Berget, Ekeberg and Braastad 2008; Berget et al. 2011; Pedersen et al. 2012), which demonstrated that the novelty effects associated with AAI may have been short-lived. Specifically, the positive outcomes associated with the AAI were sustained over time.

The studies in this review were conducted using relatively small sample sizes, ranging from 21 (Villalta-Gil et al. 2009) to 99 (Davis et al. 2009). Only one study (Davis et al. 2009) reported a statistical power analysis that confirmed that a sufficient sample size (to detect an effect if it was present) was used. This study found that the AAI was effective in improving family cohesion. Finally, only five of the studies in the present review (Bass, Duchowny and Llabre 2009; Berget, Ekeberg and Braastad 2008; Berget et al. 2011; Pedersen et al. 2012; Villalta-Gil et al. 2009) reported or provided sufficient information to calculate an effect size (i.e., eta squared statistics) to estimate the strength of the intervention effect. These effect sizes

suggested that AAI was effective in improving psychosocial outcomes across a wide range of populations.

Conclusion

The aim of the present review was to identify the conclusions that could be drawn from only randomized controlled trials of AAI in terms of its psychosocial benefit. Two studies found clear evidence that AAI (canine) was beneficial for individuals with severe psychological disorders (Chu et al. 2009; Villalta-Gil et al. 2009). Importantly, Villalta-Gil et al. (2009) found compelling evidence that reductions in the persistent negative symptoms of schizophrenia could be attributed to the dog. We also found that AAI using farm animals may be beneficial for individuals with depression (Pedersen et al. 2012) and other forms of psychiatric disorders (Berget, Ekeberg and Braastad 2008; Berget et al. 2011). In contrast, there was no evidence for the use of canine-assisted therapy with cancer patients (Johnson et al. 2008), and little evidence for the use of equine-assisted therapy for children with cerebral palsy, other than on family cohesion (Davis et al. 2009). However, for children with autism, equine-assisted therapy appeared to have beneficial effects on social responsiveness, suggesting that equine programs may influence a range of social outcomes (Bass, Duchowny and Llabre 2009). However, given the fact that positive outcomes were associated with group-based programs only, these changes may be attributed to a more generic social process.

There is a great need for well-designed RCTs that explore the psychosocial benefits of AAls through the inclusion of active control groups, follow-up assessments, and adequate information pertaining to sample size and effect size estimation. It is also important that the measures used in these studies to assess outcome are not only psychometrically sound, but that they also adequately assess outcomes one would expect to change as a result of AAls. There is also a need to assess the efficacy of AAI interventions in a wide range of populations, as our review has suggested that differential effects may be found depending on the population under investigation.

It is important to note that given the wide range of terms used in the field to refer to various forms of AAI (e.g., AAA, AAT, pet therapy, dog-assisted therapy, canine-assisted therapy, farm animal-assisted therapy), it is possible that similar studies using more precise language were not detected within the present systematic search. However, close inspection of reference lists for additional studies that might warrant inclusion revealed no additional studies. Thus, although it seems unlikely that there are additional studies that were not detected in the present review, this possibility needs to be acknowledged. In summary, although there was evidence that AAls may be of benefit to a wide range of individuals, further research is required to more definitively explore what specific types are beneficial for specific populations.

References

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