Anthrozoös

A multidisciplinary journal of the interactions of people and animals

ISSN: 0892-7936 (Print) 1753-0377 (Online) Journal homepage: http://www.tandfonline.com/loi/rfan20

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To cite this article: Karlene D. Wilkie, Sarah Germain & Jennifer Theule (2016) Evaluating the Efficacy of Equine Therapy Among At-risk Youth: A Meta-analysis, Anthrozoös, 29:3, 377-393, DOI: 10.1080/08927936.2016.1189747

To link to this article: http://dx.doi.org/10.1080/08927936.2016.1189747

Published online: 17 Aug 2016.

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ANTHROZOÖS VOLUME 29, ISSUE 3 PP. 377–393
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Evaluating the Efficacy of Equine Therapy Among At-risk Youth: A Meta-analysis

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ABSTRACT The present meta-analysis examined the efficacy of equine therapy among an at-risk youth population. Seven studies quantitatively assessed the treatment effects following involvement in an equine therapy program. The random effects model was used to aggregate each study into an overall effect size. Seven effect sizes were included in the pre- versus post-comparison analysis. The results indicate a medium effect size ($g = 0.714$, $p < 0.001$, 95% CI [0.364, 1.064]). Five effect sizes were included in the treatment versus control comparison analysis. The results also indicate a medium effect size ($g = 0.402$, $p = 0.002$, 95% C.I. [0.149, 0.655]). Lack of consistently reported study variables across studies was a limitation that resulted in the inability to run moderator analyses. However, the results indicate that equine therapy is a viable alternative to conventional intervention strategies among at-risk youth.

Keywords: animal-assisted therapy, at-risk, equine-assisted activities, equine-assisted therapy, youth

According to the Mental Health Commission of Canada (2013), one in five youth between the ages of 9 to 18 years experience problems with mental health. This rate is likely higher amongst the population of youth who are considered at-risk. At-risk youth are viewed as vulnerable to negative outcomes when they engage in or are exposed to adverse risk factors (Children and Youth At Risk 2001). Factors that put youth at risk include delinquency, emotional and behavioral difficulties, family discord, maltreatment, low social competence, academic failure, and/or low socioeconomic status (Shultz 2005; Trotter 2007; Whitley 2010; Bachi, Terkel and Teichman 2011; Frederick 2013; Kemp et al. 2014; Pendry et al. 2014). Specifically, these factors are correlated with a "higher probability of having negative developmental outcomes, difficulties in social adaptations, poor academic success, and reduced mental health" (Children and Youth At Risk 2001, p. 7). Furthermore, children and adolescents who experience emotional, behavioral, and/or

Anthrozoös DOI: 10.1080/08927936.2016.1189747

cognitive difficulties are at an elevated risk of subsequent or exacerbated psychopathology as an adult (Kazdin 1991). This supports the importance of early intervention for children and adolescents along with prevention strategies for at-risk youth.

Youth experience a range of mental health concerns and this prompts a need for efficacious, preventative, evidence-based treatment modalities attuned to their needs. It is erroneous to assume that children and adolescents experience therapy the same way as adults (Leve 1995). Outcome research with children and adolescents has found distinctive features differentiating the experiences of minors as it pertains to psychotherapy (Diguiseppe, Linscott and Jilson 1996; Kazdin and Weisz 1998; Weisz, Huey and Weersing 1998). A critical difference between adult and youth psychotherapy is that youth are often referred to treatment by a parent, guardian, or authority figure. Children may be unaware of their presenting problems or perceive their presenting problems as non-problematic and therefore view therapy as unnecessary (Weisz, Huey and Weersing 1998). Consequently, the therapist may have difficulty engaging youth to participate in therapy or when setting therapeutic goals (Kazdin and Weisz 1998). Furthermore, the therapist must work within a framework the child has the capacity to understand.

Understood from a developmental approach, younger children lack most abilities to think abstractly (Piaget 1962). This developmental barrier can make it difficult for the child to understand emotions and behaviors as they relate to their environment, as seen in traditional talk therapy. Where children have the capacity to think abstractly is with the use of metaphors, which can be used to reconstruct themes that occur in the child's life and promote understanding. This is a useful tool and can be used in many activity-based therapies (Chelsey, Gillett and Wagner 2008). Further, from a developmental approach, adolescents are experiencing the development of identity and this critical time in life may be tempestuous. Therapy can be difficult due to potential defiant attitudes, or active opposition toward the goals in an intervention (Weisz et al. 1987).

In sum, traditional psychotherapy can be a "strange and unusual situation" for children and adolescents (Leve 1995, p. 8); therefore alternative therapies have been proposed as better solutions. Specifically, equine therapy has been proposed as an alternative treatment for at-risk youth, warranting further investigation into its efficacy as a treatment. It is hypothesized to benefit children and adolescents because it holds the potential to circumvent barriers often reported in traditional therapy with youth populations.

Equine therapy is the utilization of a horse by a certified professional to reach a therapeutic goal as specified by the needs of the client (PATH International 2014). The range of therapies that utilize horses vary based on the client's needs and intended outcome. PATH International, an organization that promotes safety and positive outcomes by upholding high standards through certification, accreditation, and specific guidelines has outlined the many variations of using horses therapeutically. More specifically, these include:

- Equine-assisted activities (EAA): Planned activity involving equines. EAA does not require a therapeutic practitioner to facilitate the activity. This may include: riding, grooming, and other equine-related activities meant to promote wellbeing.
- Equine-assisted therapy (EAT): Treatment program that meets the needs of a client within the scope of the instructor's standards of practice.
- Equine-facilitated psychotherapy (EFP): Treatment program that specifically focuses on improving mental health. Interaction is geared toward the client's treatment plan

and identified goals, which is facilitated by a mental health practitioner within the scope of his/her practice.

- Equine-facilitated learning (EFL): Program that incorporates educational activities that promote development and personal growth. Activity is planned and facilitated by a credentialed practitioner.
- Hippotherapy: Program that utilizes movement of the horse to improve motor functioning, postural balance, gait, and sensorimotor functioning. Activity is planned and facilitated by a credentialed practitioner (PATH International 2014)

For the sake of simplicity, throughout this manuscript, any reference to an intervention involving a horse has been referred to as equine therapy. Equine therapy geared toward improving mental health and positive development uses an experiential approach to promote therapeutic change (Karol 2007). The experiential approach adapted to equine therapy moves away from the traditional dyad of client-therapist and incorporates the horse as a co-therapist. Unlike other domesticated animals, such as dogs or cats, horses are herd animals that are highly attuned to their surroundings and provide immediate feedback to those in their environment (Bachi, Terkel and Teichman 2011). It is this reciprocal exchange of interaction between client and horse that facilitates and promotes therapeutic change. The therapist encourages clients to use the horse as a mirror for insight into their own emotions and behavior (Brandt 2013). Conceptually, the experiential approach uses the present moment as a means of discovery and learning. The horse can also serve as a metaphor for the client. Personal experiences, past behavior, or the processing of emotions can be projected onto the horse (Klontz et al. 2007). The desired outcome is the ability to experience, process, and regulate emotion and behavior. In return, this personal growth and development can expand outward and be utilized within the client's life.

Interactions with animals in general have been shown to have physiological effects. Fine (2006) highlights beneficial considerations for using animals in practice. For instance, simply having an animal present in the therapy room can mitigate initial tension the client experiences (Fine 2006). The animal can act as a social facilitator and ease the client into conversation (Fine 2006). The anxiolytic effects serve as a catalyst and advocate the development of rapport between client and therapist (Fine 2006). The therapeutic alliance is a predictor of positive therapy outcome, highlighting a critical advantage when utilizing animals (Garcia and Weisz 2002). Kruger and Serpell (2006) concur with Fine's (2006) conceptualizations and further indicate that using an animal within a therapy setting can help reduce client arousal, socially mediate therapy sessions, and the animal can offer itself as a transitional object allowing the therapist to build rapport.

Experimental research has also demonstrated the anxiolytic effects of animals (e.g., Odendaal 2000; Yorke 2010). Due to criticisms of poor methodology in animal-assisted therapy research, Odendaal (2000) took a different approach and used an experimental method to measure changes in hypertension and neurochemicals associated with affiliative behaviors. Results suggested that interspecies interaction increases the neurochemicals related with positive affiliative behavior. The somatic effects that occurred in the experimental group indicated an anxiolytic effect exhibited by increased neurochemicals (oxytocin, prolactin, and β-endorphin) and reduced blood pressure and cortisol levels, mitigating stress. Additionally, similar effects were found in the animal, suggesting the beneficial components of interaction are mutual and naturally derived.

Yorke (2010) also adopted a neurobiological standpoint. He suggested the utility of animals in therapy for children who have experienced trauma, and asserted that early trauma experienced by children, including abuse and neglect, can impede the development of normal brain function. Sustained stress has detrimental effects on the developing brain system and can result in hypervigilance and impair pathways that self-regulate stress. These early-age developmental effects may explain why at-risk children are especially vulnerable to developing emotional and behavioral disorders. Yorke suggested that introducing a child who has experienced trauma into a calm and enriched environment, such as in equine therapy, allows the child to re-experience with touch, affiliation, and boundaries, affording opportunity for therapy and self-regulation to occur.

Previous research has also demonstrated that equine therapy is efficacious with several target groups with varying disorders outlined in the *Diagnostic and Statistical Manual of Mental Disorders–5th edition* (DSM-5) (American Psychiatric Association 2013). For instance, equine therapy has been established as an effective strategy to improve motor functioning, social communication, and adaptive behaviors, while reducing undesirable stereotypic behavior among youth with autism spectrum disorder (Kern et al. 2011; Gabriels et al. 2012; Page 2012). Trotter et al. (2008) found that children and adolescents with behavior, learning, and adjustment disorders benefited from 12 weekly sessions of equine therapy in several domains of adaptive functioning. Furthermore, equine therapy was successful in increasing the social, psychological, and school functioning of children with mood disorders, anxiety disorders, and post-traumatic stress disorder resulting from intra-family violence (Schultz, Remick-Barlow and Robbins 2007).

It follows that if equine therapy has been found to have such positive effects for children with diagnosable deficits in functioning, it would also be beneficial for youth with less severe deficits in functioning. In other words, equine therapy should be an effective intervention for at-risk youth. A few promising studies have already assessed the efficacy of equine therapy with this population. For instance, Frederick (2013) reported an increase in hope and self-efficacy, and reduction of negative affect after youth participated in a 5-week equine therapy program. Kemp et al. (2014) reported a significant decrease in anxiety, negative affect, and undesirable behaviors associated with trauma after experiencing sexual abuse. Furthermore, they generalized their results to both a child and adolescent group.

A meta-analysis was used to aggregate what is currently available in the literature and allow a systematic review of individual studies, which then was converted to a summary effect size. The main question of interest was: Does equine therapy increase overall level of functioning among at-risk youth?

The broad nature of this meta-analysis allowed for generalizability among children and adolescents with different levels of functioning across many equine programs. This knowledge may inform professionals as to whether equine therapy is a viable intervention strategy for at-risk youth.

Methods

Research Design

Meta-analyses obtain their strength from their ability to aggregate a sample of individual studies. Combining a sample of studies mitigates the within study limitations and provides a more accurate effect size by collapsing all studies conceptually into one. The random effects model is a popular method used to compute and interpret data in a meta-analysis (Borenstein et al. 2010). This model assumes that studies included in the meta-analysis are not estimates of *one*

true effect size, as in the fixed-effect model, but are sampled from a *distribution* of effect sizes and are expected to vary (Borenstein et al. 2010).

The random effects model was used for this meta-analysis because the studies that were included were presumed to not share a common effect size. Varying effect sizes may stem from differing equine program protocols, age, or varying risk status among youth. Furthermore, the random effects model disperses weight more consistently across studies (Borenstein et al. 2010). This is beneficial because it acknowledges the importance of the varying effect sizes while allowing each study to exert an influence on the overall summary effect size. This would not be the case if only one common effect size was hypothesized (as is the assumption with the use of a fixed effect model).

Procedure

Eligibility Criteria: The following criteria were developed to guide selection of eligible studies for the meta-analysis. Studies must have reported in English. Interventions must have provided quantitative data amendable to meta-analysis. Studies could have used either pre- versus post-comparisons or treatment versus control group designs, with the exclusion of individual case studies. Pre- versus post- comparisons do not have an independent control group. They are quantified by measuring changes that occurred after the intervention was completed in one group of participants. Treatment versus control group designs may have been quantified in one of two ways. First, there is the possibility of measuring the difference of post-test scores between two independent groups (i.e., treatment group and control group). Alternatively, treatment versus control group designs may have been quantified by first calculating the mean changes that occurred from pre-test to post-test within both treatment group and control group. Then, by comparing the mean change between both groups of participants, a treatment effect could be quantified. In addition, the control group may have been either a waitlist condition or treatment as usual. Ideally, a waitlist control would have been a stronger comparison, however, after scanning the literature, it was common for studies to utilize treatment-as-usual control groups. Therefore, it was rational to include both control groups in order to maximize eligible studies.

To ensure consistency, quantitative data extracted from the each study was limited to pre-intervention and post-intervention. If repeated measurement was taken throughout the course of the intervention, only the first and last measurement was coded. This does not include follow-up measures.

Each study must have had a minimum of four participants. Participants must have been children or adolescents aged between 4 and 19 years old. Participants must have had a justified at-risk status. Interventions must have included an equine as an integral part of therapy. Therapy could be delivered in a group or individual format. Outcome measures must have been standardized and aimed to assess either internalizing or externalizing behavior. Due to incongruent reporting measures there were no preferential measures required for inclusion. In addition, because the participants include a younger population, the intervention facilitator, parent, or guardian (excluding teacher) could complete the relevant outcome measure(s).

Published and unpublished studies were both sought after for inclusion. This reduces the chance of publication bias, therefore attenuating an inflated effect size (Borenstein et al. 2009). There was no publication year limitation, as equine therapy is a developing intervention. Studies were excluded if participants were presented as having a DSM diagnosis. The decision to strictly include youth who were not yet in tertiary care was made to address this gap in the

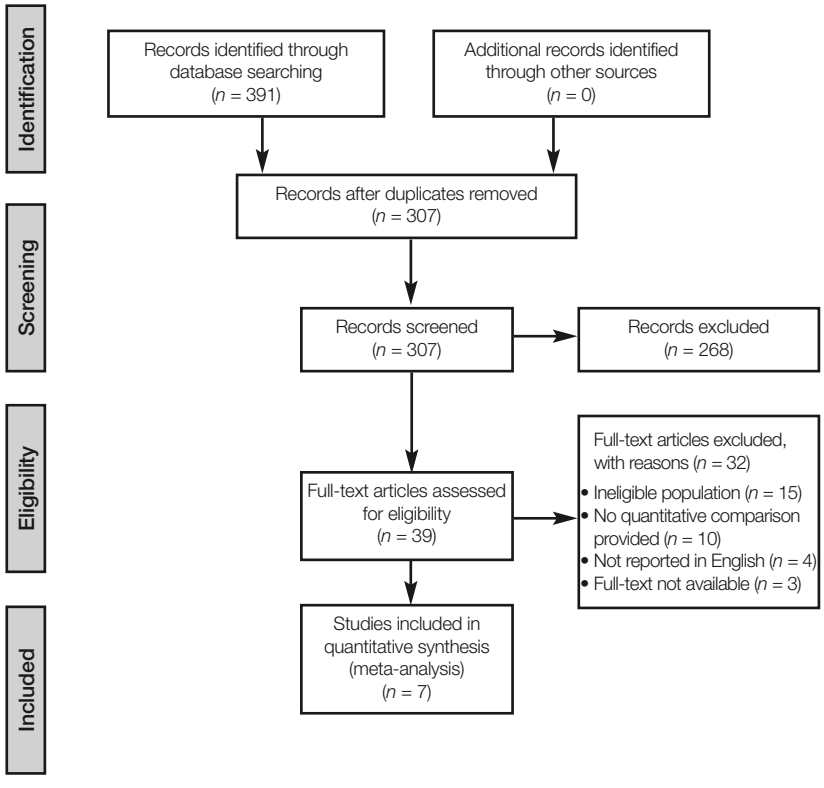

Figure 1. PRISMA 2009 flow diagram.

literature. Participants with neurobiological impairments including developmental disorders, motor disorders, and organic-based neurological disorders were also excluded.

Search Strategy: To guide an effective search strategy, Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines were followed (see Figure 1). This ensured consistency and transparency during the process of identifying, screening, and determining eligibility of studies for inclusion (Liberati et al. 2009). Studies were located by systematically searching six electronic databases. These were PsycInfo, ERIC, PubMed, Scopus, ProQuest Dissertation, and Google Scholar. Keywords used in the search were: "equine assisted therapy," "equine facilitated therapy," "equine assisted activities," "equine assisted psychotherapy," "equine facilitated psychotherapy," "equine assisted counseling," "equine assisted learning," "equine facilitated learning," "therapeutic riding," "ride therapy," "therapeutic horsemanship" and "children," "adolescents," "youth," "young," and "kid." Additional age limits were used to narrow the search results, limiting the search to "children," "school age," and "adolescents."

Search results were initially screened by title and abstract. Studies that clearly failed to meet eligibility were excluded. Next, the full texts of remaining articles were examined for inclusion based on eligibility criteria. After studies had been selected for inclusion, the process of forwards and backwards searching was conducted. This involved reviewing the reference section of each included study as well as reviewing the sources that cited each included study. This strategy was an exhaustive attempt to locate relevant data amendable to meta-analysis.

Coding and Reliability: A coding manual and coding form were used to consistently extract relevant data from eligible studies. A fourth-year undergraduate student, the author, completed primary coding of all eligible studies. A secondary coder coded 100% of the studies. There was no discrepancy in coding (reliability was 100% between coders). After coding was completed, data extracted from the studies was entered into Comprehensive Meta-Analysis Version 3.0 (CMA) for statistical analysis (Borenstein et al. 2009). CMA is a program designed specifically for computing statistics related to meta-analyses.

Data Analysis

Overall Effect Size: In order to suitably evaluate whether therapy with equines was efficacious, a standardized (weighted) mean difference using Hedge's g was computed for each study prior to calculating the overall mean effect size. Due to consistently small n values within each study, Hedge's g provided a more accurate effect size estimate than Cohen's d (Borenstein et at. 2009). Hedge's g improves this estimation by using a correction factor to minimize positive bias. Consequently, this afforded more precision and provided a better approximation of the true mean effect size. Guidelines to interpret the magnitude of effect sizes were as follows: < 0.20, small; 0.50, medium; > 0.80, large (Lipsey and Wilson 2001).

Results

Characteristics of Included Studies

Three published and four unpublished studies met the inclusion criteria for the meta-analysis. Studies were published or prepared between 2005 and 2014. Participants' age across all seven studies ranged between 8 and 19 years old, with the majority of studies reporting on an adolescent population. Gender was evenly distributed throughout the total number of participants, demonstrating good generalizability. Five of the seven studies reported gender composition. After combining the five studies there were slightly more females than males, 53% and 47%, respectively. Factors that place youth at-risk varied substantially, contributing to the generalizability of the results. For example, Frederick (2013) recruited students who were at-risk for academic failure. Trotter (2007) recruited students who were also at-risk for academic failure in addition to low social competence and mild behavior and emotional difficulties. Alternatively, Kemp et al. (2014) recruited youth who had previously been victims of abuse within their family.

The structure of each equine program was similar. All studies with the exception of one ran their program in a group format. Two of the group-format programs also incorporated segments of one-to-one individualized activities. In addition, all studies reported weekly sessions that ranged from 50 minutes to 2 hours. However, duration of implementing the program differed slightly. Sessions varied from 5 to 12 weeks, including one outlier study that ran its program for a maximum of 26 weeks. There was also some inconsistency among program clinicians; however, they can all be conceptualized under the umbrella of the mental health care field. Four program clinicians identified as counselors, while two of these further disclosed as having received a Master's level education. One clinician self-identified as a psychologist while two others identified as a therapist and a certified social worker. The remaining study reported a plethora of clinicians including both psychologists and undergraduate students in related fields. For a summary of study characteristics, refer to Table 1.

Main Results

Effect size data from studies that used pre- versus post-comparisons were run separately from effect size data from treatment versus control comparisons, due to the moderate effect

Table 1. Characteristics of the studies included in the meta-analysis.

Study	Publication Type	*n*	Age Range (Years)	Risk Factor(s)	Interventionist	Duration of Program	Format
Bachi, Terkel and Teichman (2011)	Journal article	24	14–18	Low SES, delinquency	Social worker	14–26 weeks	Individual
Frederick (2013)	Dissertation	25	11–17	Academic failure	Counselor	5 weeks	Group
Kemp et al. (2014)	Journal article	30	8–17	Abuse/ maltreatment	Counselor	9–10 weeks	Group
Pendry et al. (2014)	Journal article	95	Not reported[a]	Low socioemotional competence	Psychologist with university students	11 weeks	Combined
Shultz (2005)	Master's thesis	29	12–18	Low SES, family dysfunction, perinatal stress, substance abuse	Therapist	6–10 weeks	Combined
Trotter (2007)	Dissertation	164	8–14	Academic failure, low social competence	Counselor	12 weeks	Group
Whitley (2010)	Dissertation	10	12–19	Low SES, family dysfunction	Counselor	6 weeks	Group

Note. This table displays the basic characteristics of each study.

[a]The authors only reported that participants were between the 5th and 8th grade and did not provide a specific age range.

size discrepancies between each group. Therefore, two separate summary effect size estimates were calculated.

Seven effect sizes were included in the pre- versus post-comparison analysis. All seven effect sizes were quantified by measuring the difference of pre-intervention data to post-intervention data. The results indicated a medium effect size ($g = 0.714$, $p < 0.001$). Five effect sizes were included in the treatment versus control comparison analysis. Three effect sizes were quantified by measuring the difference of post-test scores between the treatment group and control group (Bachi et al. 2011; Frederick 2013; Pendry et al. 2014). The remaining two effect sizes were quantified by comparing the mean change of the treatment group with the mean change of the control group (Shultz 2005; Trotter 2007). The results indicated a small to medium effect size ($g = 0.402$, $p = 0.002$). Refer to Figures 2 and 3 for individual effect size calculations.

Heterogeneity

Heterogeneity, represented by Q_T, allows us to infer the degree to which the effect size from each study varies within the distribution of effect sizes (Borenstein et at. 2009). This statistic is a strong indicator of unaccounted variance between study effect sizes. There is the possibility that certain variables inherent to each study may be moderating the effect size in addition to the assumption of random error.

After testing for heterogeneity among the studies that did not utilize a control group (i.e., pre- versus post-comparisons), the result suggested that the disbursement of effect sizes may be partially due to moderator variables ($Q = 35.99$, $p < 0.001$). This suggests that the studies are heterogeneous. As mentioned above, a random effects model was used for this meta-analysis because the studies that were included were presumed to not share a common effect size. A forest plot was created to visually inspect the dispersion of effect sizes and identify any observable outliers (see Figure 2). Outliers were identified as those with standardized residuals greater than 1.96. Among the pre- versus post-comparison effect sizes, one study was identified as an outlier (Kemp et al. 2014 [adolescent group]). Unfortunately, due to inconsistent reporting standards across studies, we were unable to control for and statistically infer if moderator variables were influencing variation.

In contrast, heterogeneity among the treatment versus control group comparisons indicated much lower variance ($Q = 5.60$, $p = 0.231$). It is important to note there were fewer effect sizes in the treatment versus control analysis than its non-control group counterpart and therefore caution must be used to interpret this statistic, as the Q_T statistic is vulnerable to detection of true homogeneity in small sample sizes (Huedo-Medina et al. 2006). Therefore, lack of significant findings does not confirm a lack of heterogeneity. Theoretically if no heterogeneity exists, utilizing a random effects model is equivalent to a fixed effect model. There is no detriment to the use of a random effects model. A forest plot was created to visually inspect the dispersion of effect sizes and identify any observable outliers (see Figure 3). Among the treatment versus control comparison effect sizes, no studies were identified as outliers. It is necessary for future research to investigate if specific variables are indeed systematically moderating the size or direction of treatment effects.

Publication Bias

Funnel plots were created to visually detect the presence of publication bias among the sample of studies (see Figures 4 and 5). Funnel plots are a useful first step in detecting publication bias because they allow us to search for patterns in the data (Rothstein, Sutton and Borenstein 2005). The shape of the distribution should resemble an inverted funnel with larger

Study Name	Comparison	Statistics for Each Study					
		Hedge's *g*	Standard Error	Variance	Lower Limit	Upper Limit	*p*-value
Trotter (2007)	Pre/Post Comparison	0.262	0.101	0.010	0.063	0.460	0.010
Bachi (2011)	Pre/Post Comparison	0.294	0.200	0.040	–0.098	0.685	0.142
Pendry (2014)	Pre/Post Comparison	0.404	0.120	0.014	0.169	0.640	0.001
Frederick (2013)	Pre/Post Comparison	0.409	0.212	0.045	–0.007	0.826	0.054
Whitley (2010)	Pre/Post Comparison	0.889	0.360	0.130	0.183	1.596	0.014
Kemp (2014) - Children	Pre/Post Comparison	1.395	0.281	0.079	0.843	1.946	0.000
Kemp (2014) – Adolescents	Pre/Post Comparison	1.977	0.350	0.123	1.290	2.663	0.000
		0.714	0.179	0.032	0.364	1.064	0.000

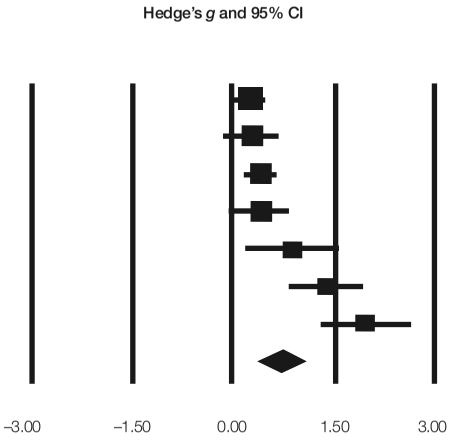

Figure 2. Forest plot of pre- versus post-effect sizes.

Study Name	Comparison	Statistics for Each Study					
		Hedge's *g*	Standard Error	Variance	Lower Limit	Upper Limit	*p*-value
Bachi (2011)	Treatment vs. Control	0.068	0.400	0.160	–0.716	0.853	0.864
Trotter (2007)	Treatment vs. Control	0.235	0.137	0.019	–0.033	0.504	0.086
Frederick (2013)	Treatment vs. Control	0.422	0.392	0.153	–0.346	1.189	0.282
Pendry (2014))	Treatment vs. Control	0.427	0.207	0.043	0.022	0.832	0.039
Shultz (2005)	Treatment vs. Control	0.910	0.271	0.073	0.379	1.441	0.001
		0.402	0.129	0.017	0.149	0.655	0.002

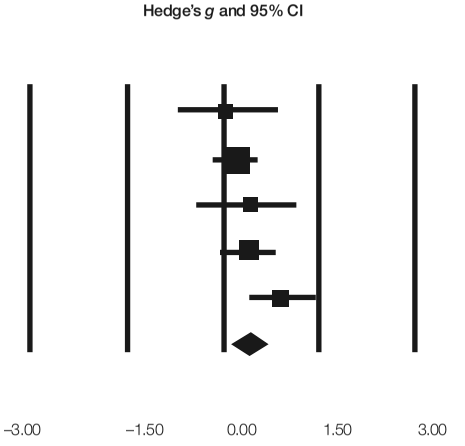

Figure 3. Forest plot of treatment versus control effect sizes.

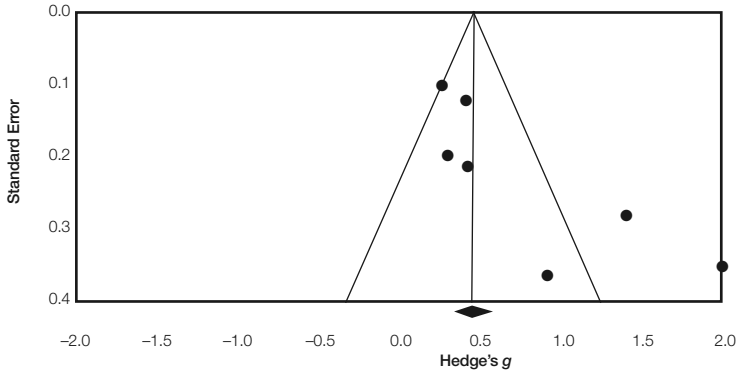

Figure 4. Funnel plot of pre- versus post-effect sizes.

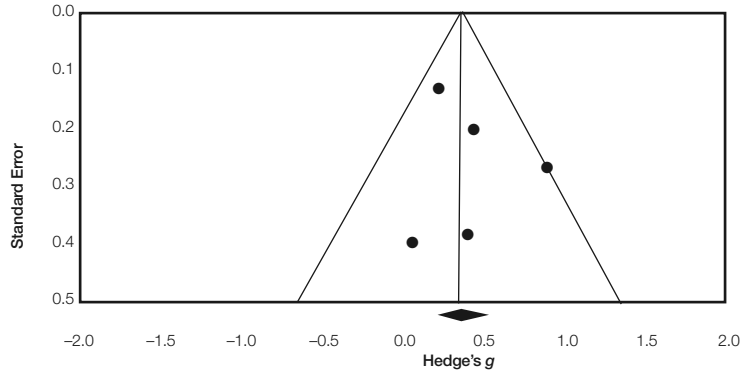

Figure 5. Funnel plot of treatment versus control effect sizes.

studies hovering about the apex, which illustrates the summary effect size. Smaller studies descend symmetrically as the funnel broadens at its base. Theoretically, the distribution should be symmetrical, however, smaller studies need larger effect sizes to meet the criterion of statistical significance. Moreover, small studies that do not produce a large enough effect size will be less likely to achieve statistical significance. Subsequently, these same studies may not provide sufficiently compelling results to become published. This bias leads to a distinctive pattern of effect sizes characterized by a disproportionate number of studies positive to the mean (favoring the right side of the funnel distribution).

By reviewing the funnel plots generated by the data, publication bias does not seem to be visible. Two effect sizes from the pre- versus post-funnel plot do pull the distribution strongly to the right, however these two effect sizes originate from the same study and have previously been identified as an outlier (i.e., Kemp et al. 2014). Furthermore, there were four studies included in the analysis that were not published, thus adding credibility to the speculation that publication bias has not significantly inflated the results. Lastly, there were a limited number of eligible studies included in the meta-analysis. The distribution of effect sizes was not adjusted to account for assumed publication bias (trim and fill analysis) as this may have rendered the results of the study invalid due to the small sample size (Card 2011).

Discussion

Connecting to the Literature

Overall, this meta-analysis found that participation in an equine therapy program effectively increased overall level of functioning among adolescent at-risk youth. These interventions showed a statistically significant medium effect for both pre- versus post-comparison and treatment versus control comparison effect size estimates. The results in the present study fall in line with previous reviews of equine therapy. Graves (2011) conducted a meta-analysis on the effectiveness of equine assisted psychotherapy with severely emotionally disturbed boys and youth with autism. She reported a medium effect size (d = 0.67), which is congruent with the current results. Additionally, a narrative systematic review on the effectiveness of equine therapies concluded that the use of equines was a viable therapy option for interventions targeting psychosocial functioning in both youth and adults (Selby and Smith-Osborne 2013).

In addition to therapies that primarily integrate equines, there are adjacent therapy options that integrate other species of animals. A prominent study authored by Nimer and Lundahl (2007) was the first in the field to conduct a comprehensive meta-analysis on animal-assisted therapy (AAT). AAT is a very broad term that encompasses the use of animals across many different settings. The unifying feature among these therapies warrants that the animal be an integral part of goal-oriented therapy, guided within the clinician's scope of practice (Kruger and Serpell 2006). Their meta-analysis was inclusive of all ages, however, a subset of their data analyzed both children and adolescents. Among the studies involving youth, more than 50% of these participants' therapy targeted wellbeing and/or behavioral symptomatology, which parallels the research interests of the present meta-analysis. Slightly less than half of these studies utilized a horse to facilitate therapy. The majority of animals used were canines. Results from the Nimer and Lundahl (2007) study indicate that younger children may benefit more from AAT than adolescents, which contrasts with the results in the present study. However, the current analysis did not have a good representation of children to guide strong conclusions about this population. Also reported, canines were shown to exceed in effectiveness over equines. A high percentage of the settings reported included an office, camp, or hospital. Nimer and Lundahl (2007) speculate that the higher prevalence of canine use could have been an artifact of availability rather than therapeutic utility; however, the data did indicate a larger effect size when using canines.

In conclusion, it is prudent to proceed with caution when comparing the Nimer and Lundahl (2007) study with the present study. Equine therapy is a fairly novel field. Nimer and Lundahl's search strategy was conducted in Fall 2004. The eligible studies in the present meta-analysis were not prepared or published before 2005, corroborating the speculation that indeed this is a relatively new and developing area of study. After an exhaustive search, there appears to be no other meta-analyses involving AAT with domesticated animals targeting similar at-risk groups.

Limitations

The present meta-analysis has a number of limitations. First, there were a limited number of eligible studies. The critical exclusionary criterion required no reported diagnoses, which severely limited eligible studies. There is a growing amount of literature examining the effectiveness of equine therapy among diagnosable populations; however, research examining at-risk populations seems to be a fairly novel phenomenon. This speculation is substantiated when taking into account how recently the included studies were completed, the oldest study being completed in 2005. A possible explanation for this emerging trend is an increasing emphasis placed on primary and secondary intervention strategies. Additionally, the lack of

studies and the lack of information in the included studies left us unable to conduct any moderator analyses. Without these analyses, it makes understanding the mechanisms underlying the effectiveness of equine therapy impossible. Indeed there were a small number of eligible studies; however, conducting a meta-analysis increases the integrity of our conclusions and converges evidence across many studies, thus confirming the necessity of this research (Cumming 2014).

A second limitation speaks to study design. Two studies included in this meta-analysis utilized a treatment-as-usual control group instead of a true waitlist control (Trotter 2007; Bachi 2012). While an ethically understandable choice, the use of this type of control group prevented seeing the true impact that equine therapies may indeed have. It is possible that the treatment versus control comparison analysis assessed a very conservative effect size estimate. This effect size may be more suitably interpreted as an index of effectiveness above and beyond what is offered as the conventional intervention strategy. Additionally, two other studies had both treatment and control groups receive their usual counseling services in addition to the equine therapy intervention (Shultz 2005; Frederick 2013). These researchers made active attempts to balance the proportion of participants in both treatment and control groups who were receiving additional services to improve comparability between groups; nevertheless, this confound potentially makes true treatment effects less clear. There was also a paucity of follow-up measures assessing the stability of change over time. This is clearly an important facet to providing strong evidence of program effectiveness temporally. Anestis et al. (2014) made a critical assertion stressing the importance of using follow-up measures to eliminate confounds such as novelty effects. Equine-related therapies are fundamentally stimulating. Not only are individuals brought into a new and unusual environment, they are also engaging in activities that may provide short-term elation by pure novelty. Extrapolating evidence of short-term gain to support the notion of temporal stability is fundamentally unethical. It is essential for continued research to incorporate follow-up measures to tease apart these potential confounds.

A third limitation considers the content of the equine therapy program. The equine program that was implemented within each study varied. A limitation previously noted in the equine literature illuminates the superfluous variation of terms used to identify equine programs (Lentini and Knox 2009). This issue was present in the current study. Specific programs identified in each study include equine-assisted learning, equine-assisted counseling, equine-assisted psychotherapy, equine-facilitated therapy, and equine-facilitated psychotherapy. Although the names identifying these programs vary slightly, the activities remained relatively similar, though not identical. In order to improve how results are interpreted clinically, it is strongly suggested that standardized manuals be implemented and utilized across all equine-related therapies. This ensures that a critical criterion is met; clients must understand the empirical evidence of the treatment they are consenting to (Anestis et al. 2014). In addition, experiments implementing such manuals should use fidelity checks to ensure that programs are being implemented as appropriately as possible to increase validity of clinical interpretation (Anestis et al. 2014). It is noteworthy to mention that each study ascribed to an equine organization, with The Equine Assisted Growth and Learning Association (EAGALA) being most recognized. Those who had ascribed to this association subsequently obtained their certification through them. EAGALA provides certification with high standards and quality of training, as well as certifying their affiliates to implement the EAGALA model for equine-assisted therapy/learning (EAGALA 2009).

Implications

This meta-analysis has practical implications. It suggests that youth respond positively to equine therapy. Compared with traditional talk therapy, bringing the counseling session into a natural setting, such as a ranch, may ease initial anxiety of "therapy." Also, interactive activities may be more attractive and provide more incentive to engage youth. This leads to increased participation, thus fostering more opportunities to facilitate effective therapy. The activity-based, person-centered approach seems to be a viable alternative to increase a broad range of competencies. Furthermore, these benefits appear to be robust when taking into account the variation across equine programs.

Future Directions

There are many directions for future research in equine therapy. One such direction should focus on identifying the optimal duration of an equine program in order to maximize gains in a reasonable amount of time. Amongst the studies in this meta-analysis, program duration extended from 5 to 12 weeks, with one study spanning a maximum of 26 weeks. Understanding what the critical minimum amount of programming is required for therapeutic change is of paramount importance, given the expense of these types of programs, as well as developing strong grant applications to obtain such funding (Zeleznik 2014). Two studies included in the present analysis included an Animal Assisted Therapy Psychosocial Session Form (see Trotter 2007; Pendry et al. 2014). This enabled the researchers to track changes from one session to the next and identify pivotal points during the intervention. This type of form would be beneficial to help assess how many sessions are optimal for treatment.

Another practical area of exploration concerns program clinician. The present study identified people with a range of educational backgrounds implementing the equine programs. It would be sensible to examine the effectiveness of equine therapy when utilizing less specialized and more economically feasible resources such as bachelor-degree graduates. Research should also look into developing strategies to evaluate youths' vantage sensitivities to such programs to ensure more receptive, long-lasting benefits when implementing this type of intervention strategy.

A final area of future research to investigate concerns the age of participants. Unfortunately, there were no children under the age of 8 years among the participants of any study. Evaluating the effectiveness of equine therapy on younger populations would be a fruitful area of exploration. It is tempting to extrapolate the results from the present analysis; however, more efficacy research with children is warranted.

In conclusion, equine therapy interventions among at-risk youth are moderately effective. If available, equine therapy should be considered as an alternative intervention strategy. Conventional intervention strategies may not generate the same positive response across all youth. Everyone deserves the opportunity for a positive outcome; equine therapy may provide that opportunity.

Acknowledgements

Special recognition goes to the Family and Developmental Psychopathology Lab for their unwavering support and guidance throughout the preparation of this manuscript.

Conflicts of Interest

The authors declare there are no conflicts of interest.

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