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Equine-Assisted Therapy and Learning Interventions With Youth: A Meta-Analysis and Quasi-Experimental Study.

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**EQUINE-ASSISTED THERAPY AND LEARNING INTERVENTIONS WITH YOUTH:
A META-ANALYSIS AND QUASI-EXPERIMENTAL STUDY**

A Master's Thesis

Presented to

The Graduate College of

Missouri State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Science, Counseling

By

Sarah Fuller-Lovins

December 2022

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EQUINE-ASSISTED THERAPY AND LEARNING INTERVENTIONS WITH YOUTH: A META-ANALYSIS AND QUASI-EXPERIMENTAL STUDY

Counseling, Leadership and Special Education

Missouri State University, December 2022

Master of Science

Sarah Fuller-Lovins

ABSTRACT

Equine-assisted psychotherapy interventions have become increasingly used and tested as an alternative or complementary approach with youth. This project presents two studies. The first study consists of an overview of existing reviews and a meta-analysis of controlled and comparison studies on the effectiveness of equine interventions with youth. A comprehensive search and selection procedure produced 3,525 records, from which 56 quantitative studies were identified, and ultimately 16 controlled or comparison studies were selected for inclusion in the meta-analysis. Results showed a statistically significant, medium, and homogenous effect size for the overall effectiveness of equine interventions for youth psycho-social outcomes ($n = 16$, $d = .535$, 95% CI [.345, .726], $p < .001$, $I^2 = 0.39$). Included studies showed several limitations in design, as determined by the Joanna Briggs Institute (JBI) Checklist for Quasi-Experimental Studies, most frequently concerning the lack of complete, analyzable follow-ups, inappropriate or inadequate statistical analyses or reporting, and a lack of a clear control and experimental group. The second study is a pre-post quasi-experiment, which first, examined the reliability and validity of the Horses Assisting Youth Parent (HAY-P) and Staff (HAY-S) scales. Study 2 also examined differences in psycho-social outcomes after the implementation of equine-assisted learning interventions with youth referred for emotional and behavioral problems and if there were differences in the changes between genders. This study consisted of 560 participants (ages five to 17), who were deemed “at-risk” and presented with social/emotional challenges. De-identified data was analyzed for this study. Prior to the main analyses, the HAY-P and the HAY-S scales were examined for its reliability and validity of scores. Results showed statistically significant ($p < .001$) improvements for youth on the HAY-P and HAY-S Total, Contentment and Communication, as well as Compliance and Focus scores with large to very large effect sizes ($d = 1.081$ to 2.717) across all six outcome measures. Though the meta-analysis found equine-assisted therapies/activities to be an effective intervention for youth with psycho-social challenges compared with comparison treatments and the quasi-experiment showed significant improvements from pre to post treatment, more research is needed utilizing larger samples, randomized control designs, and concerning specific outcomes and groups.

KEYWORDS: equine-assisted therapy, youth, mental health, meta-analysis, quasi-experiment

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YOUTH: A META-ANALYSIS AND QUASI-EXPERIMENTAL STUDY**

By

Sarah Fuller-Lovins

A Master's Thesis
Submitted to the Graduate College
Of Missouri State University
In Partial Fulfillment of the Requirements
For the Degree of Master of Science, Counseling

December 2022

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In the interest of academic freedom and the principle of free speech, approval of this thesis indicates the format is acceptable and meets the academic criteria for the discipline as determined by the faculty that constitute the thesis committee. The content and views expressed in this thesis are those of the student-scholar and are not endorsed by Missouri State University, its Graduate College, or its employees.

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OVERVIEW

Equine-assisted interventions are becoming an increasingly attractive alternative/complementary treatment modality for a variety of mental health diagnoses, particularly with at-risk youth. Equine-assisted Learning (EAL) and Equine-assisted Psychotherapy (EAP), which focus on psycho-social improvement, have garnered attention in recent years by clinicians and researchers as an intervention for use with emotional disorders (Ewing et al., 2007; Greenwald, 2001; Holmes et al., 2012; Roberts & Honzel, 2020; Stebbins, 2012; Tereault, 2006; Tucker, 1997), people who had experienced trauma (Coffin, 2019; Kruger, 2012; McCullough et al., 2015; Mueller & McCullough, 2017). Attention Deficit Hyperactivity Disorder (Garcia-Gomez et al., 2016; Cuypers et al., 2011), and at-risk youth (Bouchard, 2014; Gibbons et al., 2017; Trotter et al., 2008). Previous research on EAL, particularly with youth, has shown positive influence on social skills, decreased depression, decrease in aggressive behaviors, and decreased hopelessness (Bouchard, 2014; Frederick et al., 2015; Gibbons et al., 2017; Ho et al., 2017; Shultz, 2005; Trotter et al., 2008; Whitely, 2009). Likewise, research on EAP has indicated it can significantly reduce symptoms of trauma (Forstrom D'Agostino, 2019), decreased psychological, emotional, and behavioral problems (Dzięgielewski, 2014), and increased self-esteem and self-efficacy (Kendall et al., 2015).

While several systematic reviews have examined various forms of equine assisted interventions, there is still a lack of consolidated information concerning the effectiveness of such interventions. Likewise, there are concerns related to the quality and validity of the research in this field due to the use of small sample sizes and the lack of experimental control groups,

proper experimental procedures, and unbiased raters in studies as noted by Anestis et al. (2014) in a systematic review of 14 studies.

This thesis, therefore, aimed to address the existing gaps in the literature with two studies. In order to address some of the quality issues of existing systematic reviews, in the first study, the study authors meta-analyzed 16 existing controlled studies involving equine assisted psycho-social therapies with youth with attention to an assessment of publication bias, use of independent raters, etc. To address the issue of small sample sizes and of study design of existing studies, in the second study, the study authors employed a quasi-experimental design to assess the effectiveness of equine learning interventions using pre-post data from 492 youth presenting with psycho-social problems.

CHAPTER 1

**THE EFFECTIVENESS OF EQUINE-ASSISTED MENTAL HEALTH
INTERVENTIONS FOR YOUTH: A META-ANALYSIS OF CONTROLLED STUDIES**

Abstract

There has been an increase in mental health concerns among youth, and they can be a challenging population to work with using traditional talk-based prevention and treatment options. This meta-analysis aimed to synthesize existing studies on the effectiveness of equine-assisted interventions with youth. Search and selection procedures involved screening 3,525 records yielding 16 controlled studies, published between 2009 and 2021, with 1,009 participants. Results showed a statistically significant, homogenous, and medium effect for the overall effectiveness of equine interventions for youth psycho-social outcomes ($n = 16$, $d = .535$, 95% CI [.345, .726], $p < .001$, $I^2 = .39$). Results also showed similar statistically significant effects for externalizing problems, internalizing problems, and adaptive efficacy. However, the effectiveness of equine-assisted interventions for the self-esteem and depression of youth was statistically non-significant, and the studies were heterogeneous, suggesting they may not be measuring the same effect. Future research on equine-assisted interventions for the mental health of youth should utilize designs with larger sample sizes, randomization, a credible comparison treatment, complete and analyzable follow-up measurements, and adequate statistical analyses and reporting.

KEYWORDS: equine therapy, mental health, youth, meta-analysis, controlled studies

INTRODUCTION

Recently, there has been increasing interest in the implementation of equines in mental health interventions, particularly with at-risk youth (White et al., 2020). Mental health challenges, especially in youth, are becoming a growing national health concern. In a recent report, Youth.Gov (2020) noted that 17% of youth in the United States experience a mental health disorder, and one in 15 attempt suicide each year. More recently, Racine et al. (2021) meta-analyzed 29 studies, including 80,879 children and adolescents globally, and found that the prevalence of depression and anxiety doubled from numbers reported in Youth.Gov's report during the COVID-19 pandemic. This rise in mental health challenges faced by youth, in recent months, warrant a closer examination of possible interventions and treatments for this population.

While traditional psychotherapy services may be beneficial to many, they can be restrictive to youth who may not yet have the skills, ability, or desire to articulate their way through a talk therapy session. Similarly, children are often referred to therapy by their parent/guardian(s), but do not recognize their issues as being problematic, which can make therapeutic engagement difficult (Wilkie, 2016). Emerging evidence indicates that complementary and alternative therapies and learning interventions may be useful in reducing symptoms for a wide range of mental health issues (Wang et al., 2018), both for internalizing (e.g. depression, anxiety, fearfulness) and externalizing factors (e.g. aggression, disruption, acting out; Williams, 2013). Likewise, as youth often benefit from a variety of alternative treatment options, especially animal-assisted therapies (Phenow, 2016), equine-assisted interventions may be a particularly desirable form of treatment for this population. In short,

equine-assisted psychotherapy and learning combines traditional therapeutic methods with creative activities focusing on the relationship and connection between the client and the horse (Shultz, 2005). Components of multiple psychological theories such as solution-focused, reality, Gestalt, and rational emotive theories can be seen in such equine interventions.

To date, several systematic reviews have been conducted on studies focusing on hippotherapy (Guindos-Sanchez et al., 2020; Menor-Rodríguez et al., 2021), work with people with physical (e.g., Tseng et al., 2013) and developmental (e.g., Mendoza, 2019; Trzmiel, 2019) disabilities, and animal assisted therapies involving equines along with other animals (e.g., May et al., 2016; Nimer & Lundahl, 2007). In a systematic review of studies on the effectiveness of animal-assisted therapies in improving outcomes for Autism spectrum symptoms, medical difficulties, behavioral problems, and emotional well-being, Nimer and Lundhal (2007) found an overall moderate effect for improving behavioral problems and emotional well-being. In a more recent review, Trzmiel et al. (2019) examined the effectiveness of equine-assisted therapies and activities for youth diagnosed with Autism Spectrum Disorder (ASD) and found improvements in socialization and maladaptive behaviors. Overall, existing reviews have found positive outcomes for animal assisted therapies and provide preliminary evidence for the usefulness of incorporating equines in the treatment of a variety of diagnoses.

In light of the growing concern over the mental health of youth, coupled with emerging research on the benefits of equine-assisted interventions, the present study sought to examine the effectiveness of equine-assisted interventions in improving outcomes for youth with psychosocial problems (e.g., stress, mental health diagnoses) that are not developmental (e.g., autism) or considered hippotherapy (e.g., cerebral palsy).

Overview of Previous Literature Reviews

While few in number, several systematic reviews focused on equine-assisted interventions for psycho-social problems among youth exist. A review of the literature yielded 16 systematic reviews of equine-assisted interventions with youth suffering from psycho-social symptoms published between 2009 and 2021 (see Table 1.1). Overall, these reviews provide some support for the use of equine-assisted interventions with struggling youth. However, these reviews were limited in several ways. First, only seven of the 16 reviews were focused on children or adolescents exclusively; the other nine focused on and/or included adults. Second, for the seven studies focused on children, the number of studies included was small, ranging from seven to 22 studies. Third, only one review, conducted by an undergraduate and containing just seven studies, computed an effect size and mixed both controlled and pre-post studies (Wilkie et al., 2016). Fourth, three reviews focused on a particular subpopulation of kids and adolescents with ADHD (Helmer et al., 2021; Pérez-Gomez et al., 2020; White et al., 2020), one concerned at-risk youth who were victims and offenders (Williamson, 2017), and one concerned traumatized children (Phenow et al., 2017). Finally, only one review involved a diverse presentation of children and adolescents, as is most typical in equine-assisted treatments for youth, yet it included only 20 quantitative studies, the majority of which were not controlled studies (Lentini & Knox, 2009).

Current Meta-Analysis

To address the above-mentioned limitations of the existing research, this study aimed to provide a more comprehensive search, identification, and selection of controlled studies assessing equine interventions for a broad array of psycho-social (not physical or developmental)

outcomes with youth and to meta-analyze the selected studies. This study sought to answer the following research questions:

1. What is the overall effectiveness of equine-assisted intervention programs for improving mental health outcomes with youth?

Table 1.1 Previous Systematic Reviews of Equine Therapies for Psycho-Social Outcomes

Authors	YEAR	Focus: Included Adults	Number of Studies
Anestis et al.	2014	All mental conditions, primarily critique	14
Selby & Smith-Osborne	2013	Equine approaches	14
Jormfeldt & Carlsson	2018	Schizophrenia	6
Kendall & Maujean	2015	All psychological problems	15
Lee et al.	2016	All equine psychotherapy	24
Kovacs et al.	2020	Psychodynamic equine-assisted therapy with adults	12
Niessen-Derry	2015	Female sexually abused vets	8
Staudt & Cherry	2017	Trauma-focused	9
Kinney et al.	2019	Vets with service-related conditions	6
Focus: Children and Adolescents			
Lentini & Knox	2009	Children and adolescents	20
Helmer et al.	2021	Kids ADHD	12
Pérez-Gomez et al.	2020	Kids ADHD	9
White et al.	2020	Kids ADHD	10
Wilkie et al.	2016	At-risk youth	7
Williamson	2017	At-risk youth victims and offenders	22
Phenow et al.	2016	Children with trauma	9

2. What is the effectiveness of equine-assisted intervention programs for specific outcomes with youth, including internalizing problems (e.g., anxiety, depression, fearfulness), externalizing problems (e.g., physical aggression, disruption, acting out), self-esteem, depression, and adaptive skills/self-efficacy (e.g., ability to handle difficult situations)?

METHOD

Search and Selection

Figure 1.1 presents the PRISMA flow diagram, depicting the search, identification, and selection procedures. A search of PsycINFO yielded 82 potential works for inclusion in the meta-analysis of equine-assisted interventions for psycho-social outcomes with youth. Keywords used for the search were: *equine therapy or equine psychotherapy or equine-assisted therapy or therapeutic horseback riding; youth or adolescents or young people or teen or young adults or children or kids; quantitative*. Of the 82 potential studies, 29 were assessed for inclusion using full text. The exact inclusion criteria were that the study had to have: 1) a quantitative study design, 2) participants were children or adolescents, 3) the treatment/intervention used was an equine intervention, 4) the focus was on psychosocial outcomes, 5) the work was peer reviewed (which, theses were herein considered to be), and 6) was written in English. Studies were excluded if they involved: 1) occupational therapy, 2) autism, physical or developmental disabilities, 3) a study design that was not quantitative, 4) treatments that included animals other than horses, and/or 5) those written in languages other than English.

Next, references from the included studies, beginning with the 29, and then including all additional included studies yielded 3,496 additional potential works for inclusion. Therefore, the authors used a total of 3,525 sources for potential inclusion. The authors excluded 3,453 works through title and/or abstract screening. This left 72 works to screen by full text based on the inclusion/exclusion criteria listed above, which resulted in the exclusion of 16 studies for one or more of the following reasons: the study was (1) not concerned with youth (e.g., concerned with adults), (2) not sufficiently quantitative for extraction of effect size (e.g., a case study), or (3)

concerned with occupational or therapeutic horse riding for people with physical or developmental disabilities (e.g., hippotherapy).

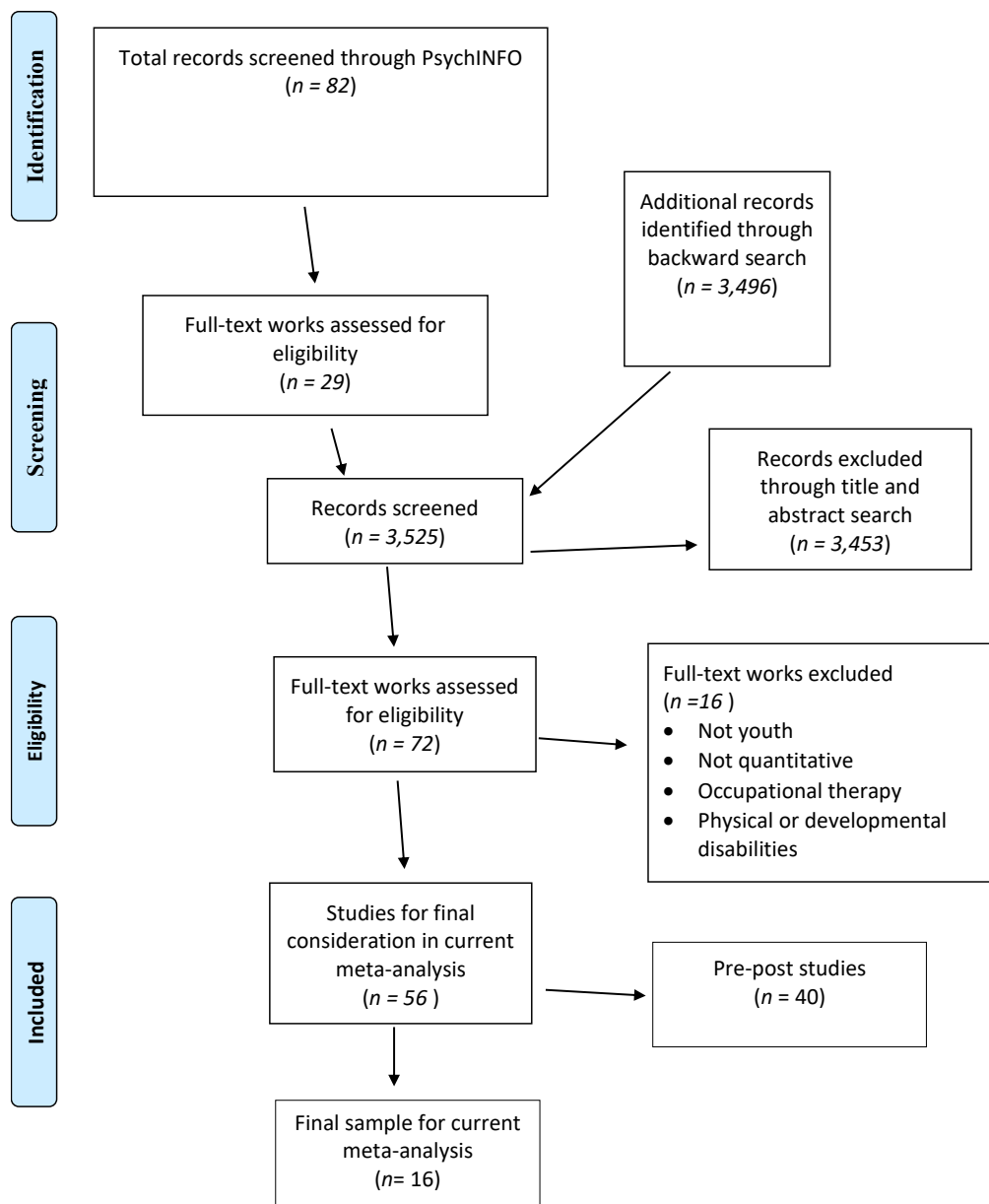


Figure 1.1 PRISMA Flow Diagram of Search Procedures

This resulted in a total of 56 studies for consideration in the meta-analysis. At this point, studies were categorized and separated by study design into pre-post, controlled, and neither. For the current study, the 16 controlled studies were selected for inclusion in the meta-analysis.

Data Extraction

After initial familiarization with the included studies, the authors coded basic study information of a few studies, including year of publication, sample size and characteristics, length of intervention, presenting problems, outcomes assessed, research design characteristics, and effect size information. During this initial pilot coding period, researchers collaboratively determined a coding protocol to define coding procedures as well as the specifics of the data to be included in the data extraction table. Subsequently, two coders independently extracted required information from all studies. In addition to basic study information listed above, details related to sample characteristics, such as participant gender, country and treatment setting, and treatment modality (e.g. EAP, EAL, equine facilitated learning, etc.) were coded. Likewise, in terms of outcomes assessed, information regarding assessment measures were also coded. After coding of all studies was completed independently, differences were reviewed collectively between two authors and then by a third author until consensus was obtained.

Data Analysis

The Joanna Briggs Institute (Tufanaru, 2020) Checklist for Quasi- Experimental Studies was used to assess the quality of the included studies. The JBI Checklist asks nine questions (with guidelines for each) in the following categories: clarity of independent and dependent variables; use of equivalent groups; receipt of plausible alternative treatment in control group;

presence of a control group; use of multiple outcome measures of the meta-analyzed variables including pre- and post-tests, follow-up (i.e., a third measurement after the conclusion of treatment), and assessment of parallel outcomes; use of reliable outcome measures; and application of appropriate statistical tests.

Hedge's d was used as the effect size indicator in this study with the following benchmarks for interpreting the effect size estimates: values near 0.2 for a small effect size, between 0.5 and 0.8 for medium effect size, and greater than 0.8 for large effect size (Cohen, 1988). For studies reporting more than one psycho-social outcome, a combined study-level effect size was used, which was calculated by averaging the effect sizes (Berkeljon & Baldwin, 2009). The random effects model was used to compute the weighted mean effect size tab). Homogeneity and Heterogeneity tests, as well as trim-and-fill analysis, were also employed to assess the presence of possible moderators, rate of variance about the effect size, and publication bias.

RESULTS

Descriptive Results

Table 1.2 provides study characteristics, quality, and effect size information of the 16 controlled studies. Every study had a different first author. The studies were published between 1997 and 2021 with an average publication year of 2013. The average sample size was 63.06 with a range of 14 to 164 participants and a total of 1,009 participants across all included studies. The average gender breakdown in the studies was approximately 64.75% male. Treatment length ranged from a 2-day workshop to 24 sessions with 11.6 as the average number of sessions. There was a range of presenting problems with 31% of participants falling into an “at-risk” category and another 31% identified as having either emotional or behavioral problems. Two of the studies focused on youth with an ADHD diagnosis. Most studies included more than one dependent variable. In terms of outcomes assessed, 43.75% of the studies focused on internalizing factors (e.g. depression, anxiety, fearfulness) and 37.5% on externalizing factors (e.g. aggression, disruption, acting out). Other outcomes assessed included adaptive efficacy (56.25%), self-esteem (37.5%), and depression (31.25%). Studies utilized a variety of modalities. Five studies employed Equine-facilitated Therapy (EFT) or Equine-assisted Psychotherapy or Therapy (EAP/T) as their method of treatment. Four utilized Equine-assisted (or Facilitated) Learning/Activities (EAL/A), one used therapeutic riding, and others were either unspecified or used some variation of “horse assisted therapy.”

Regarding study quality, as assessed by the JBI Checklist (rated on a scale of 0 to 9), all studies scored between 6 and 9 with a mean score of 7.56, suggesting moderate quality. Three studies scored at 9, indicating a relatively small number of high-quality studies. The weakest

design feature of the included studies was the lack of complete, analyzable follow-ups, as only five studies were thus categorized. In some cases, studies did have follow-up assessments, but they were inadequate due to a variety of inconsistencies (e.g., only the experimental group was followed up with or follow-ups had large attrition and/or very small samples). Another detriment to study quality was inappropriate or inadequate statistical analyses or reporting, such that only 11 studies were deemed adequate. For example, some studies only reported that certain effects were nonsignificant instead of reporting the actual effect sizes. Likewise, some studies included corrections for pre-test differences while other studies either did not assess or correct for such differences. The third study quality concern was that only 12 studies clearly demonstrated the equivalence of the control and experimental groups either through (a) the use of large samples and randomization or (b) adequate testing to determine equivalence between groups on demographic characteristics and variables of interest on pre-tests. A final study quality concern was that only 13 studies had a credible comparison treatment (e.g., treatment as usual) rather than a simple control.

Inferential Results

Overall Effectiveness of Equine-assisted Services for Youth Mental Health

Outcomes. The first research question concerned the overall effectiveness of equine-assisted interventions for all youth psycho-social outcomes, which was assessed through meta-analytic procedures. Results showed a statistically significant, medium effect for the overall effectiveness of equine-assisted interventions for youth psycho-social outcomes ($n = 16$, $d = .535$, 95% *CI* [.345, .726], $p < .001$, $I^2 = 0.39$). The Q test was not significant ($Q = 24.06$, $df = 15$, $p = .06$), indicating a lack of moderators. The low $I^2 (< .50)$ =together with the distribution of effect sizes

Table 1.2. Study Characteristics, Quality, and Effect Sizes

First Author	Year	Sample Size	Length of Intervention	Presenting Problem	Gender	Study Quality	Outcomes Assessed	Hedge's <i>d</i>
Aviv	2021	123	20 weeks	ADHD	72% male	9	self-esteem	0.892
Bachi	2011	29	20 sessions	At-risk	unknown	9	adaptive efficacy, self-esteem	0.549
Boshoff	2015	39	8 sessions	Problem behaviors	100% male	7	adaptive efficacy	0.757
Forstrom D'Agostino	2019	85	10 sessions	Trauma exposure	males and females, percentage unknown	8	internalizing, depression	0.164
Frederick	2015	26	5 weeks	At-risk	34.6% male	8	internalizing, depression	0.733
García-Gómez	2016	14	24 sessions	ADHD	66.67% male	7	externalizing, internalizing, depression	0.371
Gibbons	2017	37	2 day workshop	At-risk	62% male	7	externalizing, adaptive efficacy	0.623
Hauge	2014	49	16 weekly sessions	Non-clinical	14% male	8	adaptive efficacy, self-esteem	0.259
Jordhøy	2014	119	12 90-minute sessions	Youth addiction treatment	63% male	8	self-esteem	0.301

Table 1.2 cont.

First Author	Year	Sample Size	Length of Intervention	Presenting Problem	Gender	Study Quality	Outcomes Assessed	Hedge's <i>d</i>
Kern-Godal	2015	108	12 90-minute sessions	Addiction treatment	72% male	8	treatment retention and completion	0.989
Pendry	2013	95	11 weekly 90-minute sessions	Academic, behavioral, and/or home-stressed children	37.9% male	7	adaptive efficacy	0.443
Shultz	2005	29	Mean of 8 weeks	At-risk	unknown	6	externalizing, internalizing	1.035
Stebbins	2012	51	10-week program	Emotionally disturbed	88.2% male	9	externalizing, internalizing, adaptive efficacy	0.083
Trotter	2008	164	2 hours/week for 12 weeks	At-risk	62.20% male	6	externalizing, internalizing, self-esteem, adaptive efficacy, depression	0.121
Tucker	1997	15	Mean of 6 weeks	Emotional and behavior problems	100% male	6	externalizing, internalizing, self-esteem, adaptive efficacy, depression	0.323

on a funnel plot suggest that the studies are relatively homogenous and may be measuring the same effect. The trim-and-fill analysis also revealed a lack of evidence of publication bias. In other words, the distribution of effect sizes did not imply a need for imputing potential missing studies. Figure 1.2 shows the distribution of study effect sizes with confidence intervals in a forest plot.

Effectiveness of Equine Interventions for Specific Youth Mental Health Outcomes.

The second research question concerned the specific effectiveness of equine-assisted interventions for internalizing behaviors, externalizing behaviors, adaptive efficacy, self-esteem, and depression.

Internalizing Behaviors. Results showed a statistically significant, small to medium effect for the effectiveness of equine-assisted interventions for internalizing behaviors ($n = 7$, $d = .385$, 95% $CI [.152, .617]$, $p = .001$, $I^2 = .00$). The Q test was, again, not significant ($Q = 6.22$, $df = 6$, $p = .72$), indicating a lack of moderators. Moreover, the low I^2 ($< .50$) and the distribution of effect sizes on a funnel plot suggest that the studies are relatively homogenous and may be measuring the same effect. The trim-and-fill analysis revealed a lack of evidence of publication bias.

Adaptive Efficacy. Results showed a statistically significant, small to medium effect for the effectiveness of equine-assisted interventions for adaptive skills and self-efficacy ($n = 8$, $d = .375$, 95% $CI [.133, .616]$, $p = .002$, $I^2 = 0.28$). Similar to the previous results, the Q test was not significant ($Q = 9.25$, $df = 7$, $p = .24$), again, indicating a lack of moderators. The low I^2 ($< .50$) together with the funnel plot analysis of studies within the funnel provide evidence of homogenous distribution and suggest the studies are measuring the same effect. Trim-and-Fill analysis, as seen in the funnel plot in Figure 1.3, suggests two missing studies and a smaller, but

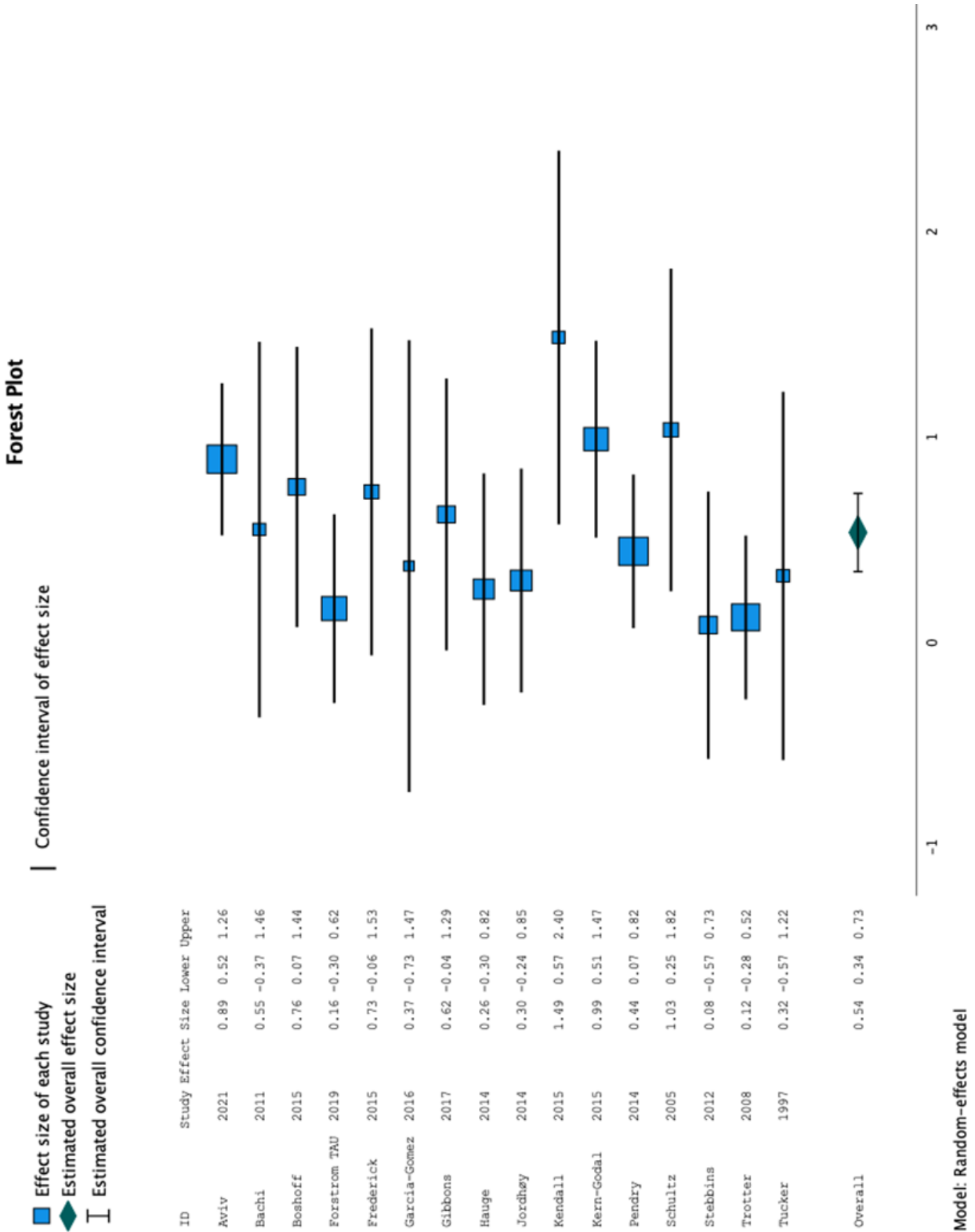


Figure 1.2. Forrest Plot for the Effectiveness of Equine Interventions on All Psycho-Social Youth Outcomes.

still significant effect size ($n = 10$, $d = .260$, 95% $CI [.005, .516]$, $p = .046$) even with the inclusion of the two imputed studies. The horizontal (x) axis shows the effect sizes with larger effect sizes to the right; the vertical (y) axis shows the standard error of the studies with lower error studies near the top.

An ideal funnel plot would show all studies inside the funnel, clustered near the top, evenly distributed on both sides of the mean line, with no imputed studies. Both imputed studies, indicated by the darker dots in Figure 1.3, are closest to the left side of the funnel in the bottom half of the plot, roughly symmetrical to the two studies represented furthest to the right in the funnel. These imputed lower quality, lower effect studies bring the observed plus imputed study effect size down.

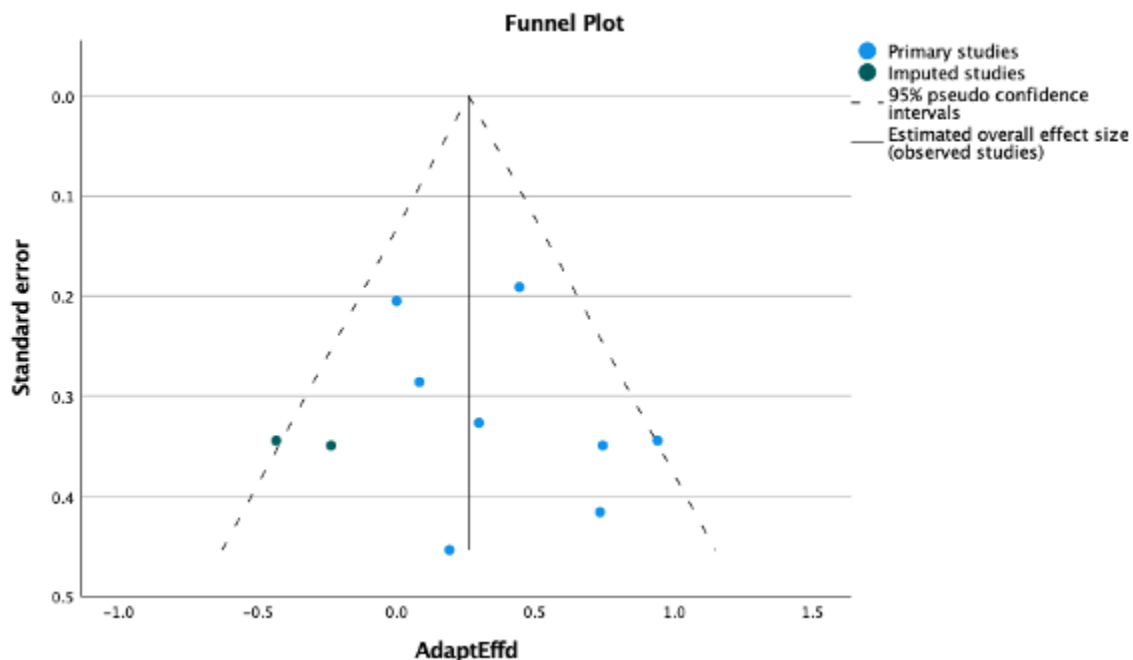


Figure 1.3. Trim-and-Fill Funnel Plot for the Effectiveness of Equine Interventions on the Adaptive Efficacy of Youth.

Self-Esteem. Results showed a statistically nonsignificant, medium, and heterogeneous effect for the effectiveness of equine interventions for self-esteem ($n = 6$, $d = .549$, 95% $CI [- .010, 1.108]$, $p = .054$, $I^2 = .86$). The I^2 was high ($> .50$) and the Q test was significant ($Q = 22.69$, $df = 5$, $p < .01$), suggesting that the studies may not be measuring the same effect. The confidence interval includes 0, meaning there is inadequate evidence to be certain of an effect. Furthermore, as in Figure 1.4, funnel plot analysis showed that one of the studies with the lowest variance (Jordhøy, et al., 2014) was just to the left of the funnel, while one of the studies with the highest variance (Kendall, et al., 2015) was far to the right of the funnel. This pattern of results is typical for a heterogenous distribution of studies where the largest effect size emerges from a small sample study ($n = 26$) and the smallest effect size from a larger sample ($n = 54$). The trim-and-fill analysis revealed a lack of evidence of publication bias.

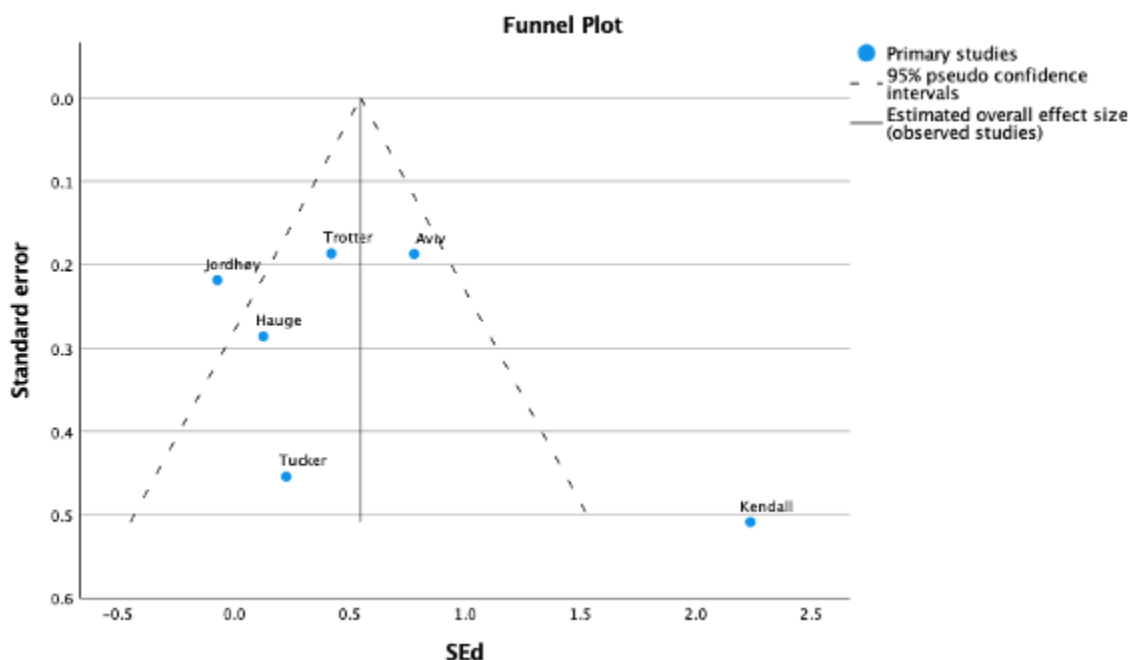


Figure 1.4 Funnel Plot of Studies on the Effectiveness of Equine Interventions on the Self-Esteem of Youth.

Depression. Results for the effectiveness of equine-assisted interventions for depressive symptoms were statistically nonsignificant ($n = 5$, $d = .208$, 95% $CI [-.048, .464]$, $p = .112$, $I^2 = .00$). Additionally, the low I^2 ($> .50$), the nonsignificant Q test ($Q = 3.52$, $df = 4$, $p < .47$), and funnel plot analysis with all studies within the funnel, indicate that the studies are likely measuring the same effect. In other words, there appears to be ample evidence to suggest that either equine-assisted interventions do not have an effect or have a small effect on depressive symptoms of youth. As was the case with adaptive efficacy, trim-and-fill analysis suggested a publication bias, imputing two missing studies and an even lower effect size when addition the imputed studies ($n = 7$, $d = .102$, 95% $CI [-.133, .338]$, $p = .395$), suggesting that there is unlikely even a small effect of equine-assisted interventions on depressive symptoms of youth.

DISCUSSION

This study analyzed the findings from 16 controlled studies assessing the effectiveness of equine-assisted interventions with youth. As expected, this study found equine-assisted interventions to have a medium effect on improving overall mental health outcomes in youth. Findings also found equine-assisted interventions to have a medium effect on externalizing behaviors and a small to medium effect on internalizing behaviors and adaptive skills. These findings are consistent with previous research (e.g., Shultz, 2005; Stebbins, 2012; Trotter, 2008), providing further evidence for the benefits of equine-assisted interventions for improving psychosocial outcomes in youth.

An unexpected finding in the current meta-analysis was that equine-assisted interventions yielded statistically nonsignificant results for depression and self-esteem in youth, which conflict with previous studies that have found positive effects of equine interventions for self-esteem (Aviv et al., 2021; Kendall & Maujean, 2015). The non-significant results may be due to the heterogeneity of the examined studies, which suggest that not all studies were measuring the same effect. At the same time, there are at least two studies in the existing literature that also report findings paralleling the non-significant findings of depression and self-esteem found in the current study (Hauge et al., 2014; Jordhøy, 2014). These mixed findings suggest a need for further research.

As with any study, this meta-analysis is not without limitations. First, the exclusion criteria for this study limited included studies to those conducted in the English language, potentially overlooking studies written in other languages. Second, the studies did not employ a uniform treatment method; studies varied between Equine-assisted Learning (EAL), Equine-assisted Psychotherapy (EAP), Equine-facilitated Psychotherapy (EFP), Equine-assisted Therapy

(EAT), therapeutic riding, and equine-assisted activities. Third, there was no consistent treatment duration across studies with sessions ranging from a two-day workshop to 24 sessions. Finally, the current meta-analysis is limited by the small samples of studies and total number of participants, particularly in those examining specific outcomes.

Due to the aforementioned limitations in the current research, it is evident that more research is needed, particularly concerning specific outcomes with specific groups where confidence is lower. In particular, more studies with greater homogeneity of effect sizes and/or methods might further clarify whether there is or is not an effect of equine-assisted interventions for the self-esteem of youth. In general, future research should utilize designs with larger, more diverse samples, randomization, and tests for equivalence of samples, a credible comparison treatment, complete and analyzable follow-up, and appropriate and adequate statistical analyses and reporting. Despite the limitations, the current meta-analysis provides evidence to support the use of equine-assisted interventions with youth to improve internalizing, externalizing, and adaptive efficacy challenges. Additional research is encouraged for continued development in the field of equine therapy.

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CHAPTER 2:

A QUASI-EXPERIMENTAL STUDY OF EQUINE-ASSISTED LEARNING FOR AT-RISK YOUTH

Abstract

Equine-assisted interventions offer a viable alternative or complimentary approach to traditional talk-based learning and psychotherapy interventions to improve psycho-social outcomes of youth. The primary purpose of this study was to examine the significance of change in at-risk youth ($N=560$) from pre to post implementation of an 8-week equine-assisted learning program, designed to improve social-emotional outcomes. De-identified data was analyzed for this study. Additionally, this study aimed to validate a relevant measure and assess outcomes, particularly on rate of change between boys versus girls. This study employed a pre-post, quasi experimental design. Utilizing dependent t-tests, the youth showed significant improvement ($p < .001$) on all six measures tested— total score, Contentment and Communication, and Compliance and Focus scales from the HAY-P and HAY-S. Effect sizes were large to very large ($d = 1.081$ to 2.717). Results with exploratory factor analysis showed a two-factor structure in both the parent and staff versions of the Horses Assisting Youth (HAY) Assessment with confirmation of known-groups validity concerning gender differences, and adequate, but not high, reliability.

KEYWORDS: equine, youth, mental health, equine-assisted learning, quasi-experiment

INTRODUCTION

The utilization of equines in mental health interventions, particularly with at-risk youth, has seen a noticeable increase in the past few decades (White et al., 2020). Mental health problems, especially in youth, are moving to the forefront of national health concerns. In a 2021 report by the United States Surgeon General, one in five children, ages three to 17, experience some form of mental, emotional, behavioral, or developmental disorder (General, 2021). Traditional psychotherapy services can be difficult for youth who may not yet have the skills or desire to verbally communicate their way through a traditional talk therapy session. Emerging evidence indicates that complementary or alternative approaches may be effective in reducing symptoms in children and adolescents (Wang et al., 2018). Therefore, equine-assisted interventions may be a promising option for this population.

Horses are considered effective team members in the therapeutic process due to a variety of innate characteristics. Like humans, horses are living, sentient, and sensitive beings who share similar basic needs for attachment. Horses also have a mammalian brain and a nervous system that allows them to experience fight, flight, freeze, or fawn. Horses can also be particularly effective in trauma work due to their nature as a prey animal whose brain develops similarly to that of a traumatized human brain (Jobe et al., 2021).

There are a variety of therapies and interventions that incorporate the use of equines. To optimize terminology and differentiate between equine-assisted services, a recent study by Wood et al. (2021) has categorized these services into therapy, learning, and horsemanship. Figure 2.1 outlines the breakdown of these three categories. Another commonly used category of equine-assisted services, known as hippotherapy, refers to therapies that incorporate equine movement

as a therapeutic and learning tool for physical therapy, occupational therapy, or speech therapy (American Hippotherapy Association, 2020). Equine-assisted psychotherapy (EAP) and learning (EAL) are services that combine traditional therapeutic methods with creative activities focusing on the relationship between the client and the horse. Components of multiple psychological theories such as solution-focused, reality, Gestalt, and rational emotive theories can be found in EAP and EAL interventions (Shultz, 2005).

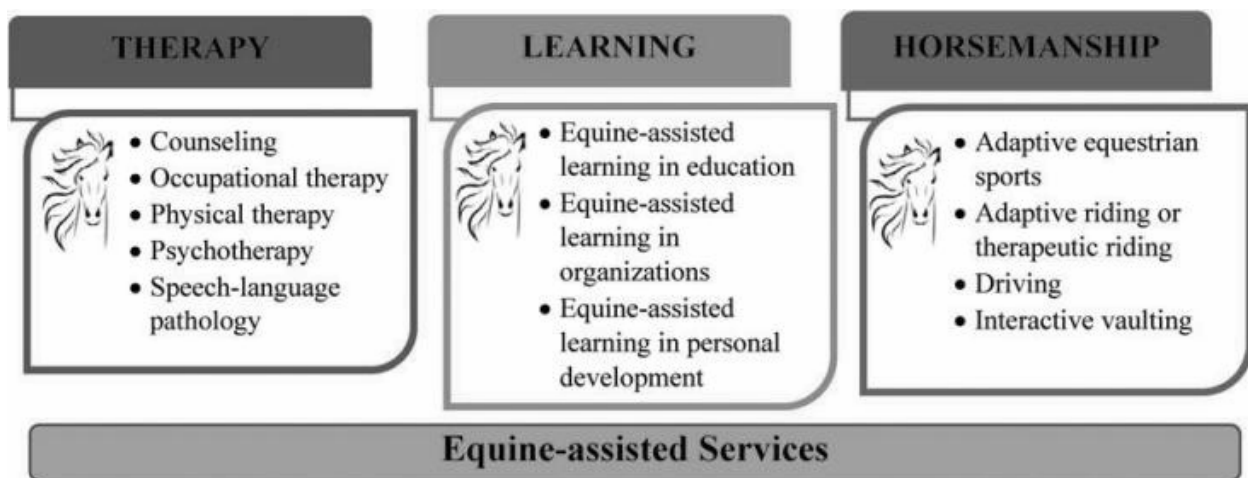


Figure 2.1 Recommended Terminology for 12 Distinct Types of Services, as defined by Wood et al. (2021)

In a recent meta-analysis, the authors have shown how equine-assisted interventions have been successfully used with youth (Author et al., 2022). Specifically, the meta-analysis examined 16 controlled studies and found an overall medium, significant effect ($d = .535, p < .001$) for psycho-social outcomes with youth. The results of the meta-analysis were also significant for specific outcomes employing a variety of measures, including for externalizing problems, internalizing problems, depression, and adaptive efficacy for youth. As part of the search and selection process, the authors also identified 40 additional quasi-experimental, pre-post studies,

with which they are in the process of conducting a second meta-analysis to address the question of how much do youth change from before to after equine-assisted-programs. While there are currently no meta-analyses analyzing pre-post studies on the impact of equine-assisted interventions on mental health outcomes, the overall trajectory of existing findings on this subject point to benefits of such interventions (Dziegielewski, 2014; Holmes et al., 2011; Kemp, 2014; Osborn, 2019; So, 2017). At the same time, the majority of existing studies are limited by small sample sizes, lack of randomized control groups, and short treatment duration.

The current study adds to the existing literature by supplying a large sample archival study using pre-post data. Specifically, the study aimed to answer the following research questions:

1. What is the reliability and validity evidence for the Horses Assisting Youth Parent and Staff Assessments (HAY-P and HAY-S)?
2. Are there differences in psycho-social outcomes after the implementation of equine-assisted learning interventions with youth referred for emotional and behavioral problems?
3. Are there gender differences in changes to psycho-social outcomes?

METHOD

Program Description and Qualification for Services

Between 2012 and 2020, the Horses Assisting Youth (HAY) Foundation offered a program in which experiential equine-assisted learning/interventions were used to help children, ages 5-17, who were considered “at-risk.” The program identified “at-risk youth” as those who were facing social/emotional challenges and were at-risk of escalating complications due to stress or mental health diagnoses. Some factors that lead youth to be “at-risk” included poverty, exposure to trauma, poor peer relationships, low self-esteem, and behavioral issues (Just Say Yes, 2019). Some participants of the program presented with diagnoses including, but not limited to, depression, anxiety, attention-deficit hyperactivity disorder (ADHD), posttraumatic stress disorder (PTSD), and oppositional defiant disorder (ODD). Clients with autism spectrum disorder (ASD) and physical disabilities (i.e., cerebral palsy) were excluded from the program, as there were other local equine programs offering services specific to these populations.

To qualify for services, the students had to be referred to the program by a professional such as a counselor, doctor, teacher, or case worker. Once the program received the referral, a phone intake/pre-lesson interview with the child’s parent or guardian was conducted by a HAY staff member. The interview consisted of 10 Likert-type scale questions and subjective questioning on each topic, which is discussed below. Parents/guardians were also asked provide details about the challenges their child was experiencing. Interview results were then sent to the board of directors for a vote to approve or decline the referral.

The program involved one-hour long sessions, once a week, for eight weeks and ran year-round from 2012 to 2020. Once approved by the HAY Foundation staff, the child was enrolled in

the eight-week program. Each one-hour lesson was split into two 30-minute sections. One section was a classroom lesson where educational material about horses was taught by a peer role-model staff member and social skills were emphasized. The other 30 minutes consisted of a riding lesson where each student received one-on-one riding instruction with attention to their psycho-social experiences. Topics such as respect, responsibility, communication, boundaries, emotional regulation, and healthy relationships were discussed during both the classroom and riding lessons. Upon completion of the program, an exit/post-lesson interview was conducted with the same parent/guardian to assess the child's progress on the items on the initial interview form. Post-lesson interviews were typically completed in person on the day of the child's last lesson.

Data were used archivally without identifying information, forgoing the need for informed consent to research and institutional review board procedures. Specifically, only quantitative data from nine of the ten questions on the intake/pre-lesson and exit/post-lesson interviews and demographic information were used in this study. Data from the item concerning a child's experience with horses was not used as it was not a measure of youth psycho-social outcomes.

Participants

Participants studied were 560 children and adolescents ages 5-17 with a variety of presenting problems, including anxiety, depression, grief/loss, PTSD, ADHD, and ODD. The youth included 325 females, 233 males, and two who identified as gender neutral. Race and socioeconomic status were not available at the participant level, but the providers estimated the sample was representative of the larger population in the state of Missouri, which includes

approximately 79% White (non-Hispanic), 12% Black or African American, 4% Hispanic or Latino, and smaller percentages of Native American and Asian Americans according to the U.S. Census Bureau (2021). During program enrollment, 307 youth lived with their biological parent(s), while 55 lived with a legal guardian other than a biological parent, and 51 were in foster care or a ward of the state. Exposure to trauma and guardianship were tracked starting in 2016; of the 292 assessed for trauma, 163 (55.8%) had experienced physical, emotional, and/or sexual trauma/abuse.

Participants completing assessments of the 560 children were 555 parents/guardians and approximately 10 staff completing evaluations on 498 children over eight years. Staff varied over the years of the program, but there were consistently five to nine staff members working during any given session. The staff was majority White (non-Hispanic) and female with one Black/African American female. Socioeconomic status of instructors was not readily available, but providers estimated that approximately 75% would fall into the middle class. Horse riding instructors were required to have had a few years of horse-riding experience and a working knowledge of horse behaviors. Peer role model staff were required to have basic horse knowledge, which could be taught by program leaders. One riding instructor had training and certification as an Equine Specialist in the Equine Assisted Growth and Learning Association (EAGALA) model of EAL/EAP and had eight years of experience co-facilitating EAL and EAP sessions. Another riding instructor was in a master's level school counseling program and was a certified school counselor during the last year of services.

Measures

The study utilized the Horses Assisting Youth-Staff Assessment (HAY-S) and -Parent

Assessment (HAY-P) to collect data on social-emotional outcomes of youth in the program (see Appendix). The HAY-S and HAY-P were designed for ease of use by parents and paraprofessionals without advanced knowledge on diagnostic criteria and are intended to measure a child's level of confidence, happiness, attention, anxiety, respect for adult authority, compulsive behavior, physical aggression, and ability to socialize and communicate with both peers and adults. The HAY-S and HAY-P consist of the same ten questions, which are rated on a 5-point Likert Scale with higher scores indicating better adjustment. This is the first study to assess evidence of the reliability and validity of the HAY-P and HAY-S (results reported below).

RESULTS

Data Preparation and Preliminary Analyses

Two datasets were used in the study: the parent dataset (i.e., data collected from HAY-P) and the staff dataset (i.e., data collected from HAY-S). All analyses in both datasets were conducted in SPSS version 28. Prior to conducting the main analyses, we screened the data for completeness, input accuracy, missing data, and assumptions relevant to the main analyses, including Exploratory Factor Analysis (EFA) and *t*-tests.

We first assessed data for completeness and accuracy. This resulted in omitting participants missing more than 50% of responses (i.e., those who did not complete pre- and/or post-test), which reduced the participant pool in the parent dataset from 560 to 471 and from 560 to 498 in the staff dataset. When we conducted the Little's MCAR test, results indicated that data were missing completely at random in the parent dataset ($\chi^2 = 87.23$, $df = 83$, $p = .354$), but not in the staff dataset ($\chi^2 = 146.06$, $df = 88$, $p < .001$). We then analyzed missing values (excluding the self-harm, trauma, and guardian variables as information on these variables were only collected from some of the program participants, which indicated that 12.74% of cases ($n = 60$) were missing data in the parent dataset and 12.85% ($n = 64$) in the staff dataset. Since more than 5% of the data was missing, we used the multiple imputation (MI) method in SPSS to impute non-categorical missing data. The final sample sizes, therefore, were 471 for the parent dataset and 498 for the staff dataset. All analyses were conducted using the original dataset and the five imputed datasets. We report results of the pooled analysis when available or the average statistic from the five imputed analyses when pooled results were not available.

Data were also checked for the following assumptions in both datasets: adequate sample size, normality, and lack of multicollinearity and outliers. Sample sizes were adequate (parent dataset $n = 471$; staff dataset: $n = 498$), and there was no evidence of multicollinearity or multivariate outliers (parent & staff datasets: Tolerance $> .1$; VIF < 10 ; Cook's distance < 1). However, both datasets failed to meet the assumption of lack of univariate outliers, and the staff dataset also failed to meet the assumption of normality, likely due to the large sample sizes, the type of participants as previously noted (see Participants heading), and the nature of the constructs assessed. More specifically, because the program participants included children with a variety of diagnoses (e.g., anxiety, PTSD, ODD, etc.), it was expected that some participants would have extreme scores on certain items, including anxiety, aggression, and compulsive behavior.

Research Question 1: Reliability and Validity Evidence for the HAY-P and HAY-S

Factor Structure. After completing data screening, we conducted an exploratory factor analysis (EFA) using the pre-test data from each dataset separately to evaluate the factor structure of the nine items. The pre-test data were used as they show the baseline of the change that would be measured and reflect the range of scores prior to potential intervention effects, which if effective, would result in range restriction, limiting the scope of the data for the analysis (Thorndike & Thorndike-Christ, 2010). Minimum conditions for an EFA were first examined and all were met: the determinant of correlation matrix was greater than 0 ($r = .104$ for staff and $.259$ for parents); the Kaiser-Meyer-Olkin measure of sampling adequacy was above the recommended value of $.6$ ($r = .729$ for staff and $.671$ for parents); and Bartlett's Test of

Sphericity was significant (staff: $\chi^2(36) = 1114.84, p < .001$; parents: $\chi^2(36) = 629.90, p < .001$). Principal Axis Factoring (PAF) with a Promax rotation was specified, and factor loadings below .30 were suppressed in all analyses (Brown, 2015).

Staff Dataset (HAY-S). The initial solution in the staff dataset produced two factors with eigenvalues above 1, explaining 52.59% of the variance, and with factor loadings ranging from .436 (peer social/communication) to .881 (confidence). Given that a third factor would explain an additional 10.97% of the variance, a three-factor solution was also examined. However, the factor structure of the three-factor solution was inconsistent across the imputed datasets (i.e., different items loaded on a different factor in certain imputed datasets), which prevented a clear interpretation of the factors. Thus, the original, interpretable, simple, two-factor solution was retained for subsequent analyses. In the retained two-factor solution, Factor 1 consisted of five items related to confidence, happiness, anxiety, and communication skills with both adults and peers, and was labeled Contentment and Communication. This scale as a whole, assesses social-emotional security and expression. Factor 2 consisted of four items related to respect, aggression, attention level and compulsive behavior, and was labeled Compliance and Focus. The scale as a whole assesses disruptive, inattentive, and dysregulated attitudes and behaviors. The items and their factor loadings are shown in Table 2.1.

Parent Dataset (HAY-P). The initial solution for the parent dataset produced three factors with eigenvalues above 1, explaining 56.8% of the variance, and with factor loadings ranging from .326 (attention level) to .827 (respect for authority). A solution excluding the lowest loading item (attention level) was then examined but yielded little improvement. Given the two-factor structure of the staff dataset and for the sake of parsimony and ease of comparison of

subsequent analysis results, a two-factor solution with all nine items was also examined. The two-factor solution yielded the same factor structure as the staff dataset, which explained 45.36% of the variance. The factor loadings improved slightly from the initial three-factor solution, ranging from .343 (attention level) to .848 (respect for authority). Thus, the interpretable, simple, two-factor solution paralleling the staff version was retained for use in subsequent analyses. The factor names and items on each factor are the same as in the staff dataset. The items and their factor loadings are shown in Table 2.2.

Table 2.1. Factor Loadings for the HAY-S

	Factor 1	Factor 2
Confidence	.881	
Anxiety	.639	
Happiness	.515	
Adult Communication	.473	
Peer Communication	.436	
Respect		.832
Attention level		.621
Aggression		.493
Compulsive Behavior		.471

Table 2.2. Factor Loadings for the HAY-P

	Factor 1	Factor 2
Confidence	.638	
Anxiety	.535	
Happiness	.438	
Adult Communication	.391	
Peer Communication	.513	
Respect		.854
Attention level		.341
Aggression		.615
Compulsive Behavior		.351

Internal Reliability.

Staff Dataset (HAY-S). As a measure of the internal consistency of the scale scores, Cronbach's alpha values were calculated for the subscales and the total scale in the staff dataset, which indicated moderate reliability of scores on all scales: Total: $\alpha = .75$; Factor 1: $\alpha = .74$; Factor 2: $\alpha = .70$. Additionally, the "Cronbach's Alpha if item deleted" values indicated no improvement in Cronbach's alpha would be made through the removal of any item.

Parent Dataset (HAY-P). We also calculated Cronbach's alpha values for the subscales and the total scale in the parent dataset, which indicated moderate, but lower reliability of scores than those from the staff dataset on all scales: Total: $\alpha = .63$; Factor 1: $\alpha = .62$; Factor 2: $\alpha = .62$. As was the case with the staff dataset, "Cronbach's Alpha if item deleted" values indicated no improvement in Cronbach's alpha would be made through the removal of any item. Results of subsequent analyses should be interpreted with caution due to evidence of lower internal consistency of scale scores with the parent data.

Known Groups Validity. We also examined evidence for known groups validity (Bandalos, 2018) of HAY-S and HAY-P by testing to see if they can distinguish between groups expected to differ in clinical presentations. As there is evidence that boys typically present with higher externalizing (Rescorla et al., 2007) and attention (Willcutt, 2012) problems compared to girls, we expected boys to score statistically significantly lower on the pre-test for the Compliance and Focus factor, which assesses disruptive, inattentive, and dysregulated attitudes and behaviors. Results of the independent samples *t*-test in both the staff and parent datasets showed that boys scored statistically significantly lower on the pre-test for the total scale, and

especially the Compliance and Focus factor, but not on the Contentment and Communication factor (see Table 2.3).

Research Question 2: Changes in Psycho-Social Outcomes from Before to After Treatment

We conducted a dependent samples t -test in both the staff and parent datasets to assess change in psycho-social outcomes before and after treatment. The following benchmarks for Cohen's d were used to assess the size of the effects: $d < .20$ as a small effect, d near .50 as a medium effect, $d > .79$ as a large effect, and $d > 1.50$ as a very large effect.

Staff Dataset (HAY-S). In the staff dataset, results were statistically significant for the total scale as well as for the two subscales, indicating overall improvements in psycho-social outcomes of youth receiving equine assisted interventions: Total scale: $t(497) = 60.628, p < .001$; Factor 1 (Contentment and Communication): $t(497) = 59.176, p < .001$; Factor 2 (Compliance and Focus): $t(497) = 41.402, p < .001$. In terms of effect size, the effect of the intervention in improving outcomes for youth was also very large for the total scale as well as for the two subscales: Total scale: $d = 2.717$ (95% CI, 2.526, 2.907); Factor 1 (Contentment and Communication): $d = 2.651$ (95% CI, 2.464, 2.838); Factor 2 (Compliance and Focus): $d = 1.855$ (95% CI, 1.710, 1.999).

Parent Dataset (HAY-P). Similar results were found in the parent dataset, where results were also statistically significant for the total scale as well as for the two subscales, indicating overall improvements in psycho-social outcomes of youth receiving treatment. For the total scale: $t(470) = 39.669, p < .001$; Factor 1, (Contentment and Communication) $t(470) = 39.938, p < .001$; Factor2 (Compliance and Focus) $t(470) = 23.286, p < .001$. In terms of effect size, the effect of the intervention in improving outcomes for youth was also very large for the total scale

as well as for the two subscales: Total scale: $d = 1.830$ (95% *CI*, 1.561, 1.820); Factor 1 (Contentment and Communication): $d = 1.841$ (95% *CI*, 1.628, 1.904); Factor 2 (Compliance and Focus): $d = 1.081$ (95% *CI*, .869, 1.072). See Table 2.4 for descriptive statistics for pre and post data and inferential statistics for the full sample.

Table 2.3. Pre-Test Descriptive and Inferential Differences by Gender

Outcome	N	Pre Mean	Pre SD	<i>t</i>	<i>p</i>	Cohen's <i>d</i>
Gender Differences						
HAY-S						
Total	F= 287 M= 201	F= 29.947 M=28.432	F= 4.439 M=4.699	3.621	<.001*	.332
Contentment & Communication (Factor 1)	F= 287 M= 201	F= 14.891 M= 14.839	F= 3.127 M= 3.037	0.183	.855	.016
Compliance & Focus(Factor 2)	F= 287 M= 201	F= 15.056 M=13.593	F= 2.363 M= 2.639	6.411	<.001*	.589
HAY-P						
Total	F= 271 M= 192	F= 29.102 M=27.472	F= 4.670 M= 5.197	3.528	.001*	.333
Contentment & Communication (Factor 1)	F= 271 M=192	F= 15.026 M= 15.339	F=3.230 M=3.170	1.037	.134	.098
Compliance & Focus (Factor 2)	F= 271 M= 192	F= 14.076 M= 12.132	F= 2.879 M= 3.406	6.625	<.001*	.624

Research Question 3: Gender Differences in Psycho-Social Improvements

In order to assess gender differences in psycho-social improvements before and after equine-assisted interventions, we first created pre-post difference scores for the total scale and Factors 1 and 2 in both the staff and parent datasets. Then we conducted independent samples *t*-

tests using the difference scores in both datasets. Cohen's d and 95% confidence interval were conducted to assess the practical size of the effects with $d < .20$ as a small effect, a $d = \text{near } .50$ as a medium effect, $d > .79$ as a large effect and $d > 1.50$ as a very large effect.

Table 2.4. Descriptive and Inferential Statistics for the Full Sample.

Outcome	N	Pre Mean	Pre SD	Post Mean	Post SD	t	p	Cohen's d
All Youth HAY-S Total	498	29.324	4.581	38.729	3.897	60.628	<.001*	2.717
Contentment & Commun- ication	498	14.877	3.078	20.919	2.584	59.176	<.001*	2.651
Compliance & Focus	498	14.446	2.581	17.809	1.972	41.402	<.001*	1.855
HAY-P Total	471	28.429	4.950	36.395	4.593	39.669	<.001*	1.830
Contentment & Commun- ication	471	15.152	3.185	20.394	2.814	39.938	<.001*	1.841
Compliance & Focus	471	13.277	3.273	16.001	2.753	23.286	<.001*	1.081

Results indicated no statistically significant differences in psycho-social improvements between the genders in the staff dataset (See Table 2.5 for details). In the parent dataset, there were statistically significant differences between boys and girls on improvement on Factor 1 (Contentment and Communication), report t-score and p-value here as shown above, with girls exhibiting greater improvement over boys (See Table 2.5 for mean pre/post difference scores for

boys and girls). The effect size of the gender differences in improvement on Factor 1 (Content and Communication), however was relatively small: $d = .236$ (95% CI, .050, .421).

Table 2.5. Descriptive and Inferential Statistics of Change by Gender

Outcome	N	Mean Change Pre to Post	SD of Change Pre to Post	<i>t</i>	<i>p</i>	Cohen's <i>d</i>
Gender Differences HAY-S						
Total	F= 287 M= 201	F=9.380 M=9.446	F=3.344 M=3.640	.206	.837	.018
Contentment & Communication	F= 287 M= 201	F=6.151 M=5.897	F=2.198 M=2.385	1.209	.227	.111
Compliance & Focus	F= 287 M= 201	F=3.228 M=3.547	F=1.771 M=1.860	1.954	.058	.176
HAY-P						
Total	F= 271 M= 192	F=8.090 M=7.673	F=4.337 M=4.329	1.019	.308	.096
Contentment & Communication	F= 271 M= 192	F=5.494 M=4.824	F= 2.887 M= 2.763	2.504	.012*	.236
Compliance & Focus	F= 271 M= 192	F=2.596 M=2.849	F= 2.395 M= 2.623	1.076	.282	.101

DISCUSSION

The aims of this study were to assess preliminary reliability and validity evidence of the HAY-P and HAY-S assessments and to examine the benefits of an equine-assisted learning program for youth who were categorized as at-risk. Overall, the study found preliminary evidence for adequate reliability and validity of HAY-P and HAY-S scores based on internal consistency of scores, known-groups validity, and factor structure. The results of this study also demonstrated the ability of equine-assisted interventions to generate positive results on psychosocial outcomes in youth who are considered at-risk. Although boys and girls presented similarly at pre-test on the Contentment and Communication factor, assessing social-emotional security and expression with both adults and peers, and differently on the Compliance and Focus factor, assessing disruptive, inattentive, and dysregulated attitudes and behaviors, the results of this study showed similar improvements across both genders at post-test on both subscales. However, greater improvement was found for girls on the HAY-P Contentment and Communication subscale as compared to boys. The very large effect size of the total sample of youth in both datasets (HAY-P and HAY-S) provides promising evidence for the use of equine in future interventions for at-risk youth.

The statistically significant improvement in psychosocial outcomes for youth found in the current study reflects overall trends in the literature as reported in a recent systematic review, which found that 51 of the 56 reviewed studies showed significant effects of equine interventions on at least one psycho-social outcomes tested (Aviv, 2021; Frederick et al., 2015; Shultz, 2005; So, 2017). The results from the current study, however, show larger effect sizes than typically seen and across all measures used, rather than only in some, as is more typical (Boshoff et al.,

2015; Hauge et al., 2014). The current study also appears to have one of the largest samples of the existing studies related to equine-assisted services. As programs vary significantly, comparisons between treatments can be challenging to assess; however, the 8-week program assessed in the current study was close to the mean of 11.6 sessions reported in a recent meta-analysis of studies examining both the overall effectiveness of equine-assisted intervention programs for improving mental health outcomes with youth, and the effectiveness of equine-assisted interventions programs specifically aimed at internalizing and externalizing problems, self-esteem, depression, and adaptive efficacy. (Authors et al., 2022). As a contrasting example from the literature, Kaiser et al. (2004) investigated the effects of a five-day therapeutic riding camp on anger, quality of life, and perceived self-competence with just 16 youth and found significant reductions in measurements of anger, but not quality of life or self-perception after a one-week program. Given that large sample studies generally tend to show smaller effects than small sample studies (Turner et al., 2013), results of the current study are surprising and encouraging for the use of equine-assisted interventions with youth. As is common when comparing pre-post study effect sizes to comparison or controlled study effect sizes (Elliott et al., 2022), the effects found in this pre-post assessment were larger than those reported in a recent meta-analysis of 16 studies. This meta-analysis compared the effectiveness of equine interventions with other treatments as usual options in improving social-emotional outcomes for youth and found medium effect sizes for both overall outcomes and for externalizing and internalizing behaviors (Authors et al., 2022).

While anecdotal evidence has asserted or implied that girls and women respond better to equine interventions than boys and men (e.g., Havenwood Academy, 2014; Toukonen, 2011), the literature has not generally supported this finding. For example, Ho et al. (2017) found no gender

differences in how children respond to an equine learning program. Consistent with the literature, the current study found very large effects for both male and female youth. However, when comparing improvement in psychosocial outcomes based on pre-post difference scores, girls showed greater improvement than boys, specifically from the parent's perspective (HAY-P), on the Contentment and Communication subscale. No definitive conclusions can be drawn from the data and additional research is needed to determine the possible causes for the differences between genders.

One limitation of this study was the fact that the staff did not all have the same level of training or certifications in EAL/EAP. In the future, it would be beneficial for all staff to receive training on the same model or to have a program overseen by one who is trained in a specific EAP/EAL modality such that session content can be more easily replicated. Another limitation of the study was the instruments used: the HAY-S and HAY-P demonstrated adequate, but not ideal reliability and validity. Thus, the results of the intervention could be attenuated. As the present study was the first to examine the psychometric properties of these assessments, more studies should be conducted to gather additional evidence of reliability and validity to support their continued use (Bandalos, 2018). The current study was also limited by the lack of a control group to ensure that the findings were a result of the intervention. Relatedly, some participants were concurrently receiving private counseling services during the course of the program, thus making it difficult to know if the client's apparent progress was due in part to the equine interventions. There was also no follow-up; thus, it is unclear whether these results had a lasting effect. Finally, the program examined consisted of a two- part lesson, with only half being conducted directly with horses. As such, it is difficult to determine how much of the progress was a direct result of the intervention involving the horse(s).

Notwithstanding its limitations, overall, findings from this study provide evidence for the potential effectiveness of equine-assisted interventions for youth who are considered at-risk. Additional research should be pursued, however, to continue to add to the growing body of scholarship in this field. Specifically, future research should include a control group to improve internal validity and to determine whether or not results are a direct response to the equine-assisted intervention. Studies should also include a follow-up assessment to determine the lasting effects of the intervention. Additionally, more research should be conducted with programs that use horses exclusively (with no classroom component or use of other animals).

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CONCLUSION TO THE STUDIES

Equine-assisted services have become increasingly used and tested as an alternative or complementary therapeutic approach with youth. The first study in this project reviewed existing reviews and studies for a meta-analysis of experimental studies on the effectiveness of equine interventions with youth to answer two research questions: 1) what is the overall effectiveness of equine-assisted intervention programs for improving mental health outcomes with youth? 2) What is the effectiveness of equine-assisted intervention programs for specific outcomes with youth, including internalizing problems, externalizing problems, self-esteem, depression, and adaptive skills/self-efficacy? A comprehensive search was conducted, and 16 controlled studies were found to meet inclusion criteria. An additional 40 studies were identified for a future meta-analysis to address the question of to what extent do youth improve on psycho-social outcomes from before to after treatment. Results revealed a statistically significant, medium effect for the overall effectiveness of equine interventions for youth psycho-social outcomes ($n = 16$, $d = .535$, 95% $CI [.345, .726]$, $p < .001$, $I^2 = 0.39$). Results from research question two showed statistically significant improvements in the areas of internalizing and externalizing problems, and adaptive efficacy. Results also showed statistically nonsignificant changes in the areas of self-esteem and depression in youth. Some limitations to those studies included small sample sizes, lack of follow-up, and inadequate statistical analyses or reporting.

The second study assessed the effectiveness of one such program. The quasi-experimental study included a large sample of participants ($N = 498$), ages five to 17, who were deemed at-risk of escalating social/emotional complications due to stress or mental health

diagnoses. This study addressed three research questions: 1) What is the reliability and validity evidence for the Horses Assisting Youth Parent and Staff Assessments (HAY-P and HAY-S)? 2) Are there differences in psycho-social outcomes after the implementation of equine-assisted learning interventions with youth referred for emotional and behavioral problems? 3) Are there gender differences in changes to psycho-social outcomes? Results to research question 1 suggested the HAY-P and HAY-S to have an adequate reliability and validity. Regarding research question two, the current study used a large sample to find that at-risk youth demonstrated very large improvements on overall, on Contentment and Communication, and Compliance and Focus subscales, from before to after an 8-week equine-assisted intervention program. The results from research question three indicated there were not any significant differences between boys and girls; both showed improvements in all areas. Findings from these studies contribute to the existing research indicating equine-assisted interventions to be an effective treatment option for youth with psycho-social challenges.

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APPENDIX



H.A.Y. Tracking# xxxxx

HAY-P/HAY-S Assessments and

Interview Questions

Child's Name: _____ Parents/Guardian or Staff name: _____
 Address: _____
 Phone: _____ Email: _____
 Sex: _____ DOB: (yrs) _____ Grade: _____ School: _____
 Referred by name/title- _____ HAY Foundation Interviewer- _____

Pre and post HAY Foundation questions completed by

xx-parent: pre x/x/xx post x/x/xx

Laurel Arena Staff: x/x /xx post x/x/xx

On a scale of 1 to 5

Rate child's level of confidence
 secure/confident

1 Insecure /not confident 5 Very

Parent: x

Staff: x x

Rate overall happiness level of child

1 Sad 5 Happy

Parent: x

Staff: x x

Rate child's attention level
 on task

1 Easily distracted 5 Concentrates

Parent: x

Staff: x x

Rate child's anxiety level

1 Fearful /worried 5 Calm/assured

Parent: x

Staff: x x

Rate child's physical aggression toward self or others
 aggressive

1 Very aggressive 5 Passive/not

Parent: x

Staff: x x

Parent:		x
Staff:	x	x

Parent:		x
Staff:	x	x

Parent:		x
Staff:	x	x

		1 Rigid behavior	5 Easy going/non
repetitive behavior			
Parent:	x		
Staff:	x	x	

PRE LESSON INTERVIEW with parent

If yes, list:

Height – Weight – lbs

If yes, list diagnosis &/or services received: (Verified as Learning Disabled, ODD Oppositional Defiance Disorder, Behavioral Impairment, mental handicap, Speech or Language Impaired, , receive Chapter 1 reading help)

Are there financial restraints that affect the ability to pay for boots?

Additional information provided:

What do you hope your child achieves from having horsemanship lessons?

(potential times available on Tues for lessons)

PRE LESSON COMMENTS by Laurel Arena Staff

POST LESSON INTERVIEW with parent

Did your child achieve any of the goals you had hoped for? If yes, describe:

POST LESSON COMMENTS by Laurel Arena Staff