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Feasibility Study of an Equine-Assisted Learning Intervention for Children with Disabilities

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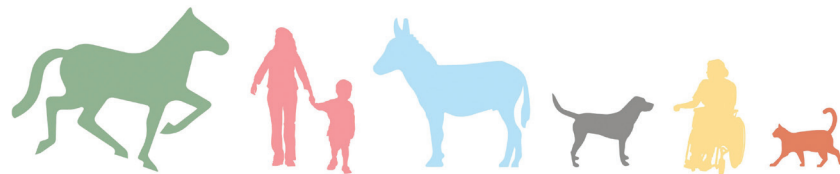
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Cover Page Footnote

The authors are grateful to the American Quarter Horse Association, Transitioning Families, the JAYC Foundation, and the University of Alabama for supporting this project. We greatly appreciate the time and support provided by the staff, parents, and students at the Red Barn, Strides for Success, and UpReach who made this project possible.

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Feasibility Study of an Equine-Assisted Learning Intervention for Children with Disabilities

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Abstract Interest in equine-assisted learning (EAL) has grown rapidly among behavioral health professionals. The available research on the effects of EAL are limited, sparse, and mostly exploratory in nature. In this feasibility study, we evaluated the effectiveness of an EAL intervention, the Just Ask Yourself to Care (JAYC) program, for youth with disabilities. The eight-week JAYC curriculum is psycho-educational, strength-based, and resiliency-focused. We hypothesized that participation in the JAYC program would lead to improvement in social skills, empathy, and self-confidence.

Children with disabilities ($n = 25$) at two sites participated in a feasibility study of implementation and evaluation procedures. Before and after completing the curriculum, children completed two measures, the Self-Efficacy Scale and the Basic Empathy Scale. Parents of participants completed the Strengths and Difficulties Questionnaire (SDQ). Program facilitators completed a fidelity checklist of activities completed during each session. All surveys were self-administered.

The findings demonstrated the feasibility of implementing the JAYC program with fidelity and evaluating the program using the SDQ surveys with parents. The analysis of SDQ data indicates promising trends, although changes were not statistically significant. Specifically, parents reported small improvements in conduct problems, peer problems, prosocial behavior, and internalizing symptoms. In the case of prosocial behavior, scores improved to be consistent with normative scores from a national sample. Children's scores on the Self-Efficacy Questionnaire indicated statistically significant improvement in self-efficacy.

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Introduction

Interest in equine-assisted services (EAS) has grown rapidly among behavioral health professionals. Although horses have been incorporated into therapy for centuries, there is limited research evaluating the effectiveness of EAS in improving well-being (Hallberg, 2018). The extant research is sparse and mostly exploratory in nature. However, many studies point to behavioral, physical, and social benefits from EAS, especially for children diagnosed with autism spectrum disorder (Anderson & Meints, 2016; Dawson et al., 2022). This project expands the existing knowledge base by exploring social behavioral outcomes associated with participation in an equine-assisted intervention.

Equine-Assisted Services

Equine-assisted services represent a broad range of interventions with varying goals. EAS incorporate both mounted and unmounted work with horses. They are increasing in popularity (White-Lewis et al., 2017). In 2021, there were 4,502 certified instructors and 768 therapeutic riding organizations affiliated with the Professional Association of Therapeutic Horsemanship International (PATH), which serve over 60,000 children and adults annually (PATH, 2022).

Settings that have used EAS for behavioral health include counseling programs within correctional facilities (Bachi, 2013; Deaton, 2005), mental health facilities (Bizub et al., 2003), and social service agencies (Burgon, 2003). EAS is also used in addictions treatment (Pollack, 2009) and treatment for trauma, particularly for veterans (Adams et al., 2015; Basile, 1997; Burgon, 2011; Carlsson et al., 2014; Duncan et al., 2014; Gehrke et al., 2019; Jarrell, 2009; Schultz et al., 2007). Research on EAS points to psychosocial benefits, including improved self-esteem, self-confidence, empowerment, independence, and competency (Tan & Simmonds, 2018). In addition to psychosocial benefits, research now shows us that EAS can have an impact on heart rate variability and self-regulation, leading to an increase in relaxation and a decrease

in stress-related symptoms such as those related to PTSD (Gerhke et al., 2019; McKissock et al., 2022).

Equine-Assisted Learning

The intervention for this project focuses on equine-assisted learning (EAL). EAL is a relatively new field within the larger domain of EAS. The terms equine-assisted learning or equine-facilitated learning are used interchangeably in the research literature, although the newly published Terminology Consensus paper uses equine-assisted learning as the accepted terminology (Wood et al., 2021). EAL is grounded in the tenets of experiential or “hands-on” learning. EAL integrates equine-human interaction with the goal of teaching communication, social, and relationship skills, among other life skills. Because the horse is a prey animal, it is highly sensitive to its surrounding environment and the behavior of those nearby (Feh, 2005; Goodwin, 2002; McDonnell, 2003). As such, interactions with horses allow unique opportunities for exploring and raising awareness of patterns of behavior and the impact of those behaviors on others. Because horses are so responsive to human behavior and emotional states, their feedback can help to teach self-regulation (Gonzalez & Sutton, 2011; Kersten & Thomas, 1997). Horses’ intentional responses to human emotions create opportunities for understanding the impact of human behavior on others (Smith et al., 2016). Some have explained the benefits of emotional bonds created between humans and equines with attachment theory (White-Lewis, 2020).

EAL is an experiential approach, which typically involves unmounted work with horses and is facilitated within a group or individual format targeted at developing life skills in education, personal growth, and organizational development contexts. EAL participants engage in structured sessions in which the instructor provides guidance and feedback to participants. The horse is considered a partner in the process. Interventions include equine interaction directed at developing life skills such as communication skills, self-awareness, confidence building, and self-control. Activities may include psycho-education, problem-solving initiatives, mindfulness, and meditation, along

with grooming, leading, and observing horses (Burgon et al., 2018). EAL interventions aim to improve skills in awareness and social skills through interactions with the horse and other group members so that these skills can be generalized to other relationships and situations (Adams et al., 2015).

Research on EAL interventions is in its early stages. Emerging research demonstrates benefits in terms of psychological, physical, and emotional well-being. Although studies are promising, they often include small sample sizes with mixed results. A few studies demonstrate positive outcomes using rigorous research designs. Pendry, Carr, Smith, and Roeter (2014) conducted a randomized controlled trial examining the effects of EAL on adolescents' cortisol levels. The intervention included content on safety, respect, trust, leadership, boundaries, confidence, and relaxation. Participation in the intervention resulted in a significant decrease in cortisol levels (Pendry et al., 2014; White-Lewis et al., 2017).

Few studies have focused on implementation fidelity when evaluating outcomes across multiple sites. Measuring fidelity is important for understanding whether the intervention was delivered as intended and with consistency across programs. One recent study found the use of a manualized program design, such as the JAYC curriculum described below, could improve implementation fidelity across multiple sites with children with autism (Dawson et al., 2022; McKissock et al., 2022).

History of Curriculum Development

The JAYC Foundation created the Just Ask Yourself to Care (JAYC) program to empower, inspire, and bring awareness of caring to communities. Jaycee Dugard developed the original curriculum with Dr. Rebecca Bailey and Debbie Anderson. The program was developed with the aim of creating more nurturing school environments and preventing bullying and was inspired by the experiences of Ms. Dugard's sister. She was only a year old when Ms. Dugard was abducted at age 11. The abduction had a significant impact on the community and school and resulted in dramatic fabricated stories about Ms. Dugard's

disappearance. While teachers tried their best to be understanding and helpful, stories and rumors made up by classmates were very painful for Ms. Dugard's sister. The curriculum was developed in the hopes that developing student skills in compassion and awareness in schools could prevent bullying and harassment.

The JAYC program curriculum aims to give schoolchildren the skills and motivation to communicate more empathy toward others. The vision of Ms. Dugard and the JAYC Foundation is to raise students' awareness of each other and their surroundings and learn to interact with each other in more mindful, compassionate ways. The JAYC groups aim to teach these values early in life by providing children the opportunity and skills to connect with each other. The program involves animals, typically equines, and incorporates the idea of "cow culture," drawing examples from the Pony Express program.

The JAYC group curriculum is a strengths-based psycho-educational program that aims to teach social and emotional skills while building resilience. The eight-week curriculum is intended to serve students from diverse cultural and economic backgrounds with a broad range of characteristics, leadership skills, empathic abilities, and social skills. It is designed to build self-awareness, compassion, and empathy through modeling, verbal processing, and experiential activities. Each module is grounded in one or two of the following themes: respect, safety, awareness, instincts, attunement, trust, support, integrity, empathy, compassion, and creativity. The curriculum is designed to be implemented with small groups of children between the ages of 9 to 15 with a minimum group size of 8 and a maximum of 14 participants. Programming is facilitated by a licensed mental health professional, equine professional, and volunteers through a combination of didactic presentations and activities. Children attend the program once weekly for a 90-minute session for eight weeks.

Research Question

This study assesses the feasibility of implementing and evaluating the JAYC program. We examine whether

participation in the JAYC curriculum is associated with improved social skills, empathy, self-confidence, self-regulation, self-awareness, and family bonding.

Methods

The evaluation of the JAYC curriculum was developed using participatory action research methods by an evaluation team that included the curriculum developers, faculty researchers, and program administrators and staff representing three EAS programs in Alabama, Indiana, and New Hampshire. The team members became acquainted through professional conferences and events focused on EAS and connections facilitated by the JAYC Foundation and curriculum developers Dr. Rebecca Bailey and Jaycee Dugard. Brief descriptions of the programs are provided below. All three are designated as premier accredited centers by the Professional Association of Therapeutic Horsemanship International.

The Red Barn, located in Leeds, Alabama, is a nonprofit agency offering individuals of all ages and abilities the opportunity to work with horses. Programs include therapeutic horseback riding, equine-assisted learning, and related recreational activities, including summer camps. This site regularly offers the JAYC curriculum to children with and without special needs.

Strides to Success was the first center in the United States to become accredited by PATH International incorporating mental health standards. Located

in Indianapolis, Indiana, Strides hosts four mental health practices and EAL services in education, personnel development, and professional development for corporations. Strides is known for producing curricula and other resources for the EAS industry. Strides to Success was the location of the original pilot study evaluating the JAYC curriculum.

UpReach in Goffstown, New Hampshire, serves individuals with a wide range of physical, emotional, and psychological abilities through equine-assisted activities and therapies, including: therapeutic riding, therapeutic driving, equine-assisted learning, equine-facilitated mental health, and hippotherapy. In addition, UpReach has become a training facility for continuing professional education for individuals in the equine-assisted activities and therapies, mental health, and health care industries.

Logic Model

The first step in developing the evaluation plan was articulating a logic model that would guide evaluation procedures and outcome measures. The evaluation team met regularly to develop a logic model that described the characteristics of youth participating in the program, including presenting needs, the core activities of program sessions, short-term process outcomes, and long-term outcomes (see Table 1). The populations served by each program vary, along with some of the outcomes of interest. For this logic model, the group worked to achieve consensus on a few outcomes that would be measured for the program evaluation.

Table 1. Program Logic Model

Youth Needs	Activities	Short-Term Outcomes	Long-Term Outcomes
Social skills	Group oath	Sessions attended	Social skills
Empathy	Discuss theme words	Implementation fidelity	Empathy
Self-efficacy	Role play		Self-confidence
	Connection twine toss		Self-regulation
	Groom horses		Self-awareness
	Five senses exercise		Family bonding
	Personal space exercise		
	Approach exercise		
	Lead horses		

The logic model illustrates some of the needs and goals for improvement for students involved in EAS at the participating locations. The activities listed are considered core activities essential for effective implementation of the JAYC curriculum. Each session begins with an oath that emphasizes respect for each other and all living things followed by peer group and unmounted equine-assisted activities relevant to the theme words for that session. The sessions are organized by the following theme words: Connection and Caring, Respect and Safety, Awareness and Instincts, Attunement to Self and Others, Trust and Support, Integrity and Empathy, Compassion and Creativity. The group discusses these as themes for the day's activities, including how the words relate to students' interactions with each other and with the horses. Students engage in role plays to act out the themes.

The twine toss is typically implemented in the first session and engages students in tossing a ball of twine to their peers. In the course of the activity, the students create a web of twine that is used to illustrate interconnections among the group members and the concept that, when connected, a single person's actions affect others in ways that can be supportive or disruptive.

Multiple sessions involve grooming horses. Students learn the basic techniques for grooming but also engage in activities that require them to attend to each other and to the horse. For example, students are asked to engage in mirror grooming and match their movements with another student. They are also taught to study the horse's body language to assess their comfort level with the activity.

For the five senses activity, students are asked to use their senses of hearing, smell, taste, touch, and sight. They wear blindfolds for the four senses other than sight to experience what it is like to depend fully on these other senses and to relate to others who may not rely as strongly on sight to experience their surroundings.

The personal space and approach exercises help students develop awareness of self and others and explore ways in which others' sense of personal space may differ from their own. Students practice approaching each other to determine others' level

of comfort with personal space. They also practice approaching a horse while attending to the horse's body language and how they communicate their preferences regarding personal space.

Multiple sessions involve leading horses, sometimes through obstacle courses. Students learn best practices for leading a horse while attending to the horse's body language and interpreting the horse's reaction to objects in the environment and the person leading them.

In assessing short-term outcomes, program facilitators tracked attendance at each session and completed a checklist of activities completed in each session. These outcomes were measured to determine the extent to which students received the full curriculum as the curriculum developers intended. Long-term outcomes were assessed using measures described in the following sections.

After developing the logic model and agreeing on the outcomes to be measured, the evaluation team began the task of articulating evaluation procedures. All research procedures were developed collaboratively in regular research team meetings. The team members discussed their projected outcomes and reviewed a range of measures until they achieved consensus on the measures that were the best fit given the aims of the curriculum while considering feasibility of administration in each of the settings.

Setting and Participants

Two of the programs that assisted with implementation planning, the Red Barn and UpReach, participated in the feasibility study of implementation and evaluation procedures. The program was advertised via email and website postings to children and families receiving services from the two programs. Those who responded to the advertisement were provided with a description of the program and asked to provide consent. Consent was obtained from parents and children who participated in the evaluation. Following consent, the parent/guardians were asked to complete two surveys: the Strengths and Difficulties Questionnaire (SDQ) and the Protective Factors Survey. Children who agreed to participate were

asked to complete two measures: the General Self-Esteem Scale (GSE) and the Basic Empathy Scale. Program staff assigned a code number to each participant and placed this code number on the surveys. All surveys were self-administered, although program staff were available to help as needed.

Data for this study was collected between September 2021 and August 2022. Three cohorts from the Red Barn and one from UpReach participated during this time frame.

Measures

Strengths and Difficulties Questionnaire (SDQ). The Strengths and Difficulties Questionnaire (SDQ) is a reliable and valid brief behavioral screening questionnaire that includes 25 items measuring attributes within 5 scales: Conduct Problems, Hyperactivity, Peer Problems, Emotional Problems, Prosocial Behavior. These scales can be combined to obtain measures of internalizing behaviors and externalizing behaviors (Goodman, 1997).

Protective Factors Survey (PFS). The PFS is a self-administered survey for parents and guardians that measures protective factors in five areas: family functioning/resiliency, social support, concrete support, nurturing and attachment, and knowledge of parenting/child development. It has demonstrated good internal consistency and validity (Counts et al., 2010).

Basic Empathy Scale. The Basic Empathy Scale (BES) measures affective and cognitive empathy. It includes 20 items based on four emotions (fear, sadness, anger, happiness). Each scale item asks participants to respond on a Likert scale from 1 representing “strongly disagree” to 5 representing “strongly agree.” The scale has demonstrated good internal consistency and validity (Jolliffe & Farrington, 2006).

General Self-Efficacy Scale. The GSE is a 10-item self-administered scale measuring beliefs that one’s actions are responsible for successful outcomes.

It has demonstrated good internal consistency and construct validity (Schwarzer & Jerusalem, 1995).

Implementation Fidelity

Training. With the support of funding from the American Quarter Horse Association (AQHA), the evaluation team developed training modules that illustrated how to implement each of the eight curriculum sessions and the evaluation procedures, including obtaining consent, administering measures, and completing a fidelity checklist. Because sites are located in Alabama, Indiana, and New Hampshire, the training consisted of videos that were made available online to the programs via Google Classroom.

Fidelity Checklist. The instructor implementing the curriculum at each site completed a fidelity checklist that indicates activities that were completed during each session. Facilitators were asked to document any changes made to implementation delivery.

Analysis

Paired sample *t*-tests were used to analyze changes in mean scores between pretest and posttest. All analyses were conducted using IBM SPSS statistical software.

Results

Children with disabilities ($n = 25$) at the two sites participated in the feasibility study. Participants included children with disabilities including autism spectrum disorder, ADHD, learning disorder, and anxiety. Participants included 8 girls and 17 boys. The average age of the child participants was 12 years (range, 5–15).

A comparison of mean scores at pretest and posttest indicates modest but nonsignificant improvements in SDQ scales for conduct problems, peer problems, prosocial behavior, and internalizing problems (see Table 2). There were no significant changes in empathy scores, but scores on the Self-Efficacy scale improved significantly between pretest and posttest.

Table 2. Paired Sample *t*-Test Comparing Pretest and Posttest Scores

	Pretest		Posttest	
	M	SD	M	SD
Conduct Problems (SDQ)	1.7	2.2	1.4	1.9
Hyperactivity (SDQ)	4.4	3.5	4.5	2.7
Emotional Problems (SDQ)	3.6	2.3	3.6	2.5
Peer Problems (SDQ)	4.2	2.8	3.8	2.4
Prosocial Behavior (SDQ)	7.4	2.6	7.8	1.6
Externalizing Problems (SDQ)	5.8	5.0	5.8	4.0
Internalizing Problems (SDQ)	7.5	3.6	7.2	3.6
Empathy	2.9	0.6	2.7	0.7
Self-efficacy	29.5	8.9	35.5	5.8 *

Note: * = $p < .05$

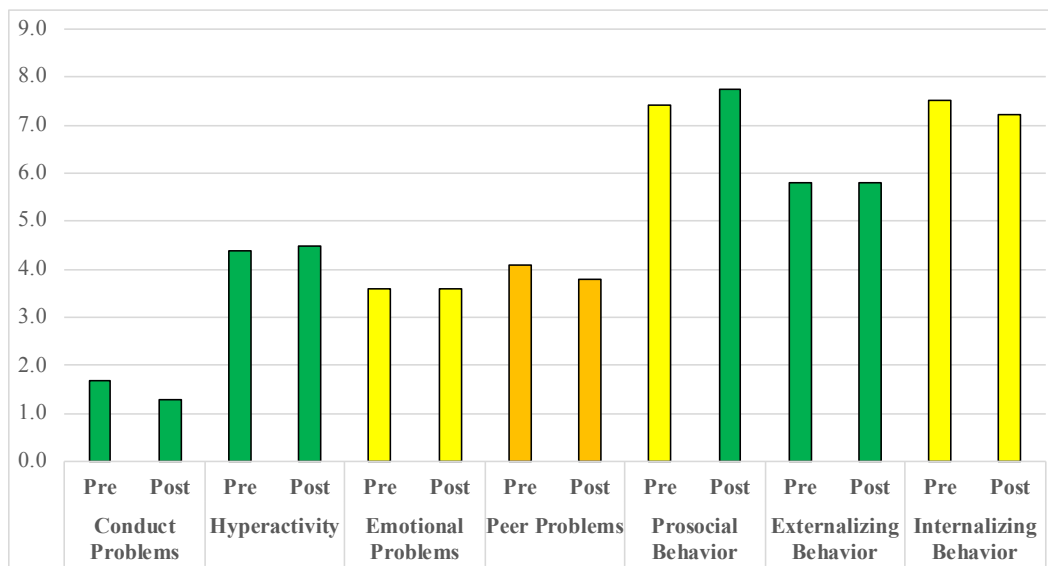


Figure 1. Comparison of mean scores at pretest and posttest for SDQ subscales

Results from the PFS are not included due to incomplete data, with only eight parents providing responses to the PFS at pretest and posttest. Many parents declined to complete this measure and cited concerns with the personal nature of some of the questions pertaining to parenting knowledge and skills and family dynamics. Results from the fidelity checklist indicated that core activities were implemented with

fidelity overall. In some cases, activities were moved to a later session due to severe weather that prevented working with the horses safely.

Figure 1 illustrates scores at pretest and posttest on each of the SDQ subscales. The bars are color coded to indicate comparability with a national sample. Green indicates that scores are comparable with 80% or more of those within the national sample. Yellow

indicates that scores demonstrate slightly increased risk, consistent with scores for 10–19% of the national sample. Orange indicates that scores demonstrate increased risk, consistent with scores for 5–9% of the national sample (Youth in mind, 2015). Although changes were not statistically significant, a comparison of mean scores at pretest and posttest indicates modest improvement in prosocial behavior improving from slightly increased risk to scores within the normal range for the national sample at posttest.

Discussion

Summary of Findings

The findings demonstrate the feasibility of implementing the JAYC program with fidelity and evaluating the program using online and hard-copy SDQ surveys with parents. The findings from an analysis of SDQ data indicate promising trends, although changes were not statistically significant. Specifically, parents reported small improvements in conduct problems, peer problems, prosocial behavior, and internalizing symptoms. In the case of prosocial behavior, scores improved to be consistent with normative scores from a national sample. Children's scores on the Self-Efficacy Questionnaire indicated statistically significant improvement in self-efficacy. This suggests that the curriculum holds promise as a strategy for improving self-efficacy among children with disabilities.

Implementation Challenges

Many child participants had difficulty completing the measures (self-efficacy and basic empathy scales), and these measures took a large portion of the time in the initial session. In order to address this issue, we attempted to administer measures prior to the first session via online administration for one cohort, but there were many errors and missing responses. For parent surveys, we administered questionnaires online for some cohorts and in person for others. For example, a school group attended one of the sessions, and parents were not available in person. For this cohort, parents

completed surveys online. Another cohort brought their children to the session and were provided with hard copies of the questionnaires to complete. Some parents expressed discomfort with the personal nature of questions on the PFS, and fewer than half of the participants completed this measure. Some recommendations suggested by this study include providing one-on-one assistance to children completing the measures and completing the measures at times other than the scheduled session times so that the time spent completing measures does not detract from the content of the sessions. It may also be helpful to allow parents to review measures prior to implementing the program to ensure that they are comfortable answering the questions, and program staff can address questions or concerns proactively.

Impact of COVID-19

Minor revisions were made to the curriculum in consultation with curriculum developers to enhance safety precautions during the COVID-19 pandemic. For example, any activities requiring close contact, such as handshakes, were modified to ensure that participants and facilitators maintained 6 feet of distance when indoors. For the five senses activity, the requirement that children taste an item was removed during the height of the pandemic.

Limitations

The present study is limited by the small sample size and the lack of a comparison group. It is possible that the effectiveness of the program was diluted by the participation of some children who had participated in other EAS programs at the Red Barn and had already experienced improvements in behavior prior to joining this program. In order to determine whether participation in the curriculum improves outcomes for children with disabilities more conclusively, future research on the JAYC curriculum should attempt to include a larger sample and a comparison group. For example, survey responses from children and parents on a wait list can be compared to those actively participating.

Future research should also explore alternative means of obtaining feedback from children that are less burdensome and time-consuming. Research is needed to determine whether the curriculum is more appropriate for children with particular needs and goals. In order to accomplish this, it will be important to evaluate the curriculum in groups of children with similar needs. Implementing the group with children diagnosed with autism may result in different outcomes than when implementing the group with children with attention deficit disorder. It may be that adaptations to the curriculum are needed for different groups of children to improve its effectiveness.

Notwithstanding its limitations, this feasibility study suggests that the program is feasible and has potential benefits for improving social behavior among children with a range of disabilities. As an unmounted EAL group program, the JAYC curriculum is less time and resource intensive than other equine-assisted activities, such as therapeutic riding. Thus, this program may present opportunities for programs looking for an efficient and engaging way of developing skills in a group context.

The present study further develops our growing knowledge of the potential effectiveness of equine-assisted interventions with children in reducing symptoms of anxiety and stress (Gerhke et al., 2019; McKissock et al., 2022; Pendry et al., 2014; White-Lewis, 2019), improving self-esteem and self-confidence (Tan & Simmonds, 2018), and self-regulation (Gerhke et al., 2019; McKissock et al., 2022). In demonstrating children's improvement in the areas of self-efficacy and, potentially, prosocial behavior, the JAYC curriculum evaluation reflects similar themes and provides practitioners with an approach that is feasible to implement and evaluate in the real-world contexts in which they are supporting children and families.

Summary for Practitioners

The intervention for this project focuses on equine-assisted learning (EAL), which typically involves unmounted work with horses and is facilitated within

a group or individual format targeted at developing life skills in education, personal growth, and organizational development contexts. EAL participants engage in structured sessions in which the instructor provides guidance and feedback to participants. The horse is considered a partner in the process. Feedback about the well-being and comfort of the horses is integrated throughout EAL interventions.

The JAYC group curriculum is a strengths-based psycho-educational EAL program that aims to teach social and emotional skills while building resilience. The eight-week curriculum is designed to build self-awareness, compassion, and empathy through modeling, verbal processing, and experiential activities. Programming is facilitated by a licensed mental health professional, equine professional, and volunteers through a combination of didactic presentations and activities. During the sessions, the facilitators prompt students to notice the behavior, affect, and body language of other group members and the horses during curriculum activities. In particular, facilitators teach participants how to attend to and interpret the horse's affect and behavior. They discuss how the group is protecting the comfort and safety of their peers and the horses.

Each session begins with an oath that emphasizes respect for each other and all living things followed by peer group and unmounted equine-assisted activities relevant to the theme words for that session. The sessions are organized by the following theme words: Connection and Caring, Respect and Safety, Awareness and Instincts, Attunement to Self and Others, Trust and Support, Integrity and Empathy, Compassion and Creativity. The group discusses these as themes for the day's activities, including how the words relate to students' interactions with each other and with the horses.

The research team developed a plan to assess whether participation in the JAYC curriculum would be associated with improved social skills, empathy, self-confidence, self-regulation, self-awareness, and family bonding. Two sites participated in the feasibility study of implementation and evaluation procedures. The program was advertised via email and website postings to children and families receiving

services from the two programs. After consenting to participate in the evaluation, the parent/guardians were asked to complete two surveys: The Strengths and Difficulties Questionnaire (SDQ) and the Protective Factors Survey. Children who agreed to participate were asked to complete two measures: the General Self-Esteem Scale (GSE) and the Basic Empathy Scale.

The findings demonstrated the feasibility of implementing and evaluating the JAYC program. Administering questionnaires to children posed challenges, as many children had difficulty completing the measures, and they consumed valuable programming time. Children's questionnaires also had many errors and missing responses. If children's surveys are used, facilitators should consider providing one-on-one assistance to children and administering the measures before or after the time allotted for program sessions. Parents were willing to complete surveys online and in person but expressed discomfort with the personal nature of some questions on the PFS and declined to answer many of these questions. Children participating in the program showed modest improvement in self-efficacy and pro-social behavior.

Ethics/Informed Consent

This research was approved by the Institutional Review Board at the University of Alabama. All parents provided informed consent, and children provided assent prior to engaging in evaluation activities.

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