

Horses and Humans Research Foundation

Final Grant Reporting

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II. A SUMMARY THAT CAN BE POSTED TO THE RESEARCH PAGE OF THE HHRF WEB SITE (IF DIFFERENT THAN #1)

Background: This study sought to assess the feasibility, acceptability, and preliminary efficacy of a newly manualized intervention and assessment protocol for occupational therapy in an equine environment for youth with autism.

Method: A multi-site randomized controlled design was implemented. Twenty-four youth with autism, age 6 – 13, were randomized to receive occupational therapy in an equine environment or occupational therapy in a garden environment. Feasibility indicators included rates of recruitment, treatment delivery, attendance, attrition, fidelity, and assessment completion. Acceptability was assessed with satisfaction surveys (parents and therapists) and focus groups (therapists). Preliminary efficacy was assessed using the following standardized measures: goal attainment scaling measured progress on individual occupational performance goals; the Social Responsiveness Scale, Second Edition measured social functioning; the Aberrant Behavior Checklist, Community measured behavioral regulation; the Pediatric Evaluation of Disability- Computer Adapted Test measured adaptive behaviors; hair cortisol content measured chronic stress.

Results: Twenty-three participants completed the study, attending 89% of occupational therapy sessions in the equine environment, and 88% in the garden environment. Providers achieved 93.7% fidelity to the experimental intervention, and 94.0% fidelity to the control condition. Parents and study staff completed 100% of outcome assessments, however only 54% and 80% of blinded raters in the experimental and control conditions completed all assessments. Parental satisfaction was highest for the experimental intervention (89.7%). Occupational therapists expressed satisfaction with the evaluation (90.7%) and intervention (93.3%), and provided recommendations for future studies.

Youth with autism demonstrated significantly improved goal attainment ($p < 0.001$), irritability ($p = 0.04$), and social motivation ($p = 0.03$) after occupational therapy in an equine environment in comparison to pre-test scores. Participants also demonstrated non-significant trends for improved hyperactivity ($p = 0.11$), social communication ($p = 0.10$), restricted and repetitive behaviors ($p = 0.11$), and adaptive behaviors in the domains of mobility ($p = 0.11$) and social/cognitive behaviors ($p = 0.10$). Contrary to our hypothesis, youth with autism demonstrated a trend towards increased hair cortisol content after the intervention ($p = 0.08$); however, as a whole, participants in both groups demonstrated non-significant trends for increased hair cortisol content in the Summer in comparison to Spring ($p = 0.08$), suggesting changes in cortisol may be attributed to the season rather than intervention condition. In comparison to the control group, participants demonstrated greater goal attainment ($p = 0.05$) and greater improvements in social/cognitive adaptive behaviors ($p = 0.03$) after occupational therapy in an equine environment.

Conclusions: The manualized intervention and assessment protocol is feasible to implement and acceptable to parents and therapists. Minor modification to future study protocols (scheduling make-up sessions, not scheduling during Summer, modifications to the control group) can enhance future studies. Preliminary efficacy data suggest occupational therapy in an equine environment can improve attainment of occupational performance goals, social functioning, and behavioral regulation of youth with autism. In comparison to the control group, participants who received occupational therapy in an equine environment demonstrated greater improvements in goal attainment and social/cognitive adaptive behaviors. These findings suggest that occupational therapists' integration of horses and elements of the equine environment within tailored therapeutic activities most effectively helped children with ASD attain individualized goals and improve some adaptive behaviors.

III. STATE BOTH YOUR FINAL CONCLUSIONS AND HOW YOU FEEL THESE FINDINGS SHOULD INFORM/INFLUENCE EQUINE ASSISTED ACTIVITY PRACTICES.

The manualized intervention and assessment protocol for occupational therapy in an equine environment are feasible to implement and acceptable to parents and therapists. Attendance and blinded rater assessment completion can be improved in future studies through minor protocol modifications. Preliminary efficacy data suggest that occupational therapy in an equine environment can improve attainment of occupational performance goals, social functioning, and behavioral regulation of youth with autism. In comparison to the control group, participants who received occupational therapy in an equine environment demonstrated greater improvements in goal attainment and social/cognitive adaptive behaviors. These findings suggest that occupational therapists' integration of horses and elements of the equine environment within tailored therapeutic activities most effectively helped children with ASD attain individualized goals and improve some adaptive behaviors. Therefore, we suggest occupational therapists working in an equine environment incorporate the following elements into their interventions addressing social and behavioral goals for youth with autism:

1. Use horses to optimize attention and engagement in the therapy session (Integrate strengths, interests, and motivators, including the horse and preferred equine activities; use equine movement to facilitate optimal arousal)
2. Design therapeutic activities with horses that elicit the youth's goal behavior (provide opportunities to practice goal; arrange collaborative activities that promote interaction)
3. Provide positive reinforcement for goal behaviors (natural reinforcement; equine activities as reinforcement; Premack's principle)
4. Scaffold goal performance using behavioral techniques (prompting, fading, shaping, chaining, labeled praise)
5. Arrange the environment to best support goal performance (horse selection based on movement and temperament; tack selection; physical, social, & sensory characteristics of environment)

IV. TIME LINE

	Nov '18	Dec '18	Jan '19	Feb '19	Mar '19	Apr '19	May '19	Jun '19	July '19	Aug '19	Sep '19	Oct '19– Apr '20
Recruitment & screening	Complete											
Riding screen & OT evaluation				C								
Pre-test data collection					C							
Treatment group EAOT					Complete							
Waitlist control group garden trips					Complete							
Time 2 data collection							C					
Treatment group garden trips								Complete				
Waitlist control group EAOT								Complete				
Time 3 data collection										C		
Focus groups											C	
Data analysis												Complete
Manuscript Prep												IP

November, 2018 – February, 2019:

Recruitment and initial screening- COMPLETE

February 1 - February 15, 2019:

Riding screening & OT Evaluation- COMPLETE

February 16 – March 2, 2019:

Pre-test: initial efficacy assessment- COMPLETE

March 5 – May 14, 2019:*

EAOT (treatment group) + garden trips (waitlist control group)- COMPLETE

May 15 – May 31, 2019:

Time 2: Second efficacy assessment; acceptability for treatment group- COMPLETE

May 30 – August 12, 2019:*

EAOT (waitlist control group) + optional garden trips (treatment group)- COMPLETE

August 7 – August 20, 2019:

Time 3: Final efficacy assessment; acceptability for waitlist control group- COMPLETE

September, 2019:

Focus groups with therapists- COMPLETE

October 2019 – April 2020:

Data analysis – COMPLETE

October 2019 – April 2020:

Manuscript Preparation- IN PROGRESS

*Due to either school schedules or horse concerns, both Spring and Summer sessions of occupational therapy in an equine environment were extended from 10 weeks to 11 weeks. This pushed back our study timeline by 2 weeks from the original plan. See more details in subsequent sections

V. BUDGET: FINAL BUDGET EXPENDITURES, WITH ANY VARIATIONS FROM THE ORIGINAL SUBMITTED APPLICATION BUDGET NOTED AND EXPLAINED.

Expenditures Before Midway Report

	Description	Cost / Unit	Units	Total
Personnel	Occupational Therapy Student 1: Spring	\$385.32	1	\$385.32
	Occupational Therapy Student 2: Spring	\$385.32	1	\$385.32
	Occupational Therapy Student 3: Summer	\$276.48	1	\$276.48
	PERSONNEL TOTAL			\$1,047.12
Permanent Equipment	PERMANENT EQUIPMENT TOTAL			\$0.00
Consumable Supplies	Waitlist Control Botanic Garden Supplies	\$499.37	1	\$499.37
	CONSUMABLE SUPPLIES TOTAL			\$499.37
Consultant Costs	Biostatistician	\$200	10	\$2,000.00
	CONSULTANT COSTS TOTAL			\$2,000.00
Travel	Travel Reimbursement for Initial and Second Screening	\$0.49	1,363.25	\$667.99
	TRAVEL TOTAL			\$667.99
Client-related Expenses	Hearts and Horses equine-assisted OT Sessions	\$155	85	\$13,175.00
	My Heroes equine-assisted OT Sessions	\$155	114	\$17,670.00
	Hearts and Horses Screening & Evaluation Visits	\$197.50	12	\$2,370.00
	My Heroes Screening & Evaluation Visits	\$197.50	13	\$2,567.50
	Waitlist Control Botanic Garden Passes	\$90	4	\$360
	CLIENT-RELATED EXPENSES TOTAL			\$36,142.5
Total				\$40,356.98

Expenditures Since Midway Report

	Description	Cost / Unit	Units	Total
Personnel	GAS Independent Rater	\$1,093.44	1	\$1,093.44
	PERSONNEL TOTAL			\$1,093.44
Consumable Supplies	~ABC-2 Score Forms (50 forms)		0	0
	*ABAS-3 School Age Parent Forms (25 forms)	\$88.00	1	\$88.00
	*SRS-2 Child/Adolescent Forms (25 Forms)	\$63.00	3	\$189.00
	~Focus Group Transcription			\$393.30
	*ADOS-2 Protocol Booklets (pack of 10)	\$63.00	3	\$189.00
	*Hair Cortisol Content Assays			\$2,525.90
	*Leiter-3 Forms (20 Forms)	\$80.00	2	\$160.00
	*SCQ Score Forms (pack of 20)	\$53.00	2	\$106.00
	*WPS Shipping Fee	\$73.20	1	\$73.20
	CONSUMABLE SUPPLIES TOTAL			\$3,724.40
	Travel	Uber rides to therapy for 1 participant	\$418.70	1
TRAVEL TOTAL				\$418.70
Client-related Expenses	Therapist Compensation for Training	\$340.00	5	\$1,700.00
	~Therapist Compensation for Focus Group	\$127.50	4	\$510.00
	Therapist Compensation for Feasibility Survey	\$21.25	5	\$106.25
	Blinded Rater Incentives for Surveys Time 1	\$20.00	16	\$320.00
	Blinded Rater Incentives for Surveys Time 2	\$20.00	13	\$260.00
	Blinded Rater Incentives for Surveys Time 3	\$20.00	8	\$160.00
	Caregiver Incentives	\$15.00	83	\$1,245.00
	CLIENT RELATED EXPENSES TOTAL			\$4,301.25
Sub-total				\$9,537.79
GRAND TOTAL				\$ 49,894.77

~ Expenditures Lower than Midway Report Budget

1. **ABC-2 Score Forms:** Our lab already owned enough ABC-2 score forms for the study, so we did not purchase additional forms
2. **Focus Group Transcription:** Focus group transcription only cost \$393.30 instead of the budgeted \$600.
3. **Therapist Compensation for Focus Group:** One therapist did not attend the focus group, saving \$127.50

*Expenditures Higher than Midway Report Budget

1. **Standardized Assessments:** All standardized assessments (ABAS-3, SRS-2, ADOS-2, Letier-3, SCQ) increased in cost in 2020 by a small amount.
2. **WPS Shipping Fee:** WPS charged a 10% shipping fee for delivery of all standardized assessments.

VI. SUMMARY OF ANY COMPLICATIONS OR CHALLENGES THAT HAVE BEEN ENCOUNTERED AND HOW THEY HAVE BEEN ADDRESSED.

1. The control group in Northern Colorado was originally planned to occur at Spring Creek Gardens, a botanic garden in Fort Collins. However, upon receiving funding for the study we learned that Spring Creek Gardens would be under construction and not open to the public during Spring 2019. Therefore, we relocated the Northern Colorado control group to the Occupational Therapy gardens on CSU's campus, and bought some additional therapy supplies to facilitate these groups. Due to the relocation, children were able to plant their own garden bed, and taste some of the vegetables they grew.
2. There were several scheduling concerns that caused us to rescheduled a few sessions, described in detail for each location. Despite these challenges, all participants were still offered either 9 or 10 sessions of equine-assisted OT. While we recognize 9 sessions instead of 10 is not ideal, our pilot data demonstrate that significant changes begin to occur in participants after 5 weeks of equine-assisted OT, so we do not believe it will affect study outcomes.
 - i. **Spring Control Group Northern Colorado.** There were 3 snow days on Wednesdays in Spring 2019 that caused us to cancel 3 sessions. We were able to fit in one make-up day. We could not add additional make-up days because the students who were running the group graduated and left for a different fieldwork. Therefore, only 8 sessions were offered to the waitlist control participants in Northern Colorado.
 - ii. **Spring OT in an Equine Environment Group Northern Colorado.** Three of the six participants were cancelled on April 26 due to therapist illness. We were not able to reschedule an additional session without compromising the study timeline, as the Northern Colorado group was already 1 week behind the Denver group due to their Spring Break schedule. Therefore, three northern Colorado participants were offered 9 sessions, and three northern Colorado participants were offered 10 sessions.
 - iii. **Spring OT in an Equine Environment Group Denver.** There was a snow day during one scheduled session in Denver. We were not able to add an additional week to the end of the 10-week session due to lack of staff, so participants in this group were offered 9 sessions.
 - iv. **Summer OT in an Equine Environment Group Northern Colorado.** We pushed back the 10-week session by one week, so that all children would be out of school by the beginning of the session. There was an outbreak of vesicular stomatitis that infected all horses at Hearts and Horses in Summer 2019, causing us to cancel 2 weeks at Hearts and Horses. We were able to reschedule one of these sessions to My Heroes in Northern Colorado. We also added an additional week to the end of the session. Therefore, participants in this group were offered 9 sessions.
 - v. **Summer OT in an Equine Environment Group Denver.** Temple Grandin Equine Center unexpectedly lost two horses in their relatively small herd before the Summer session began. Therefore, we made the determination that all 6 sessions could not be held on the same day, due to the changes in horses available for the study. We moved half of the sessions to Mondays, and kept the other half on Thursdays. We added an additional week to the end of the 10-week session to accommodate this change. All participants in this group were offered 10 weeks of services.
3. One of our participants informed us she was not able to access the Temple Grandin Equine Center using public transportation due to the construction occurring near the facility. Therefore, we scheduled and paid for Uber Health rides to and from the facility, so she could continue participation in the study.

VII. SHARE DETAILED PLANS FOR SUBMITTING MATERIAL FOR PUBLICATION; SUMMARIES OF FINDINGS WITH THE PUBLIC.

1. An abstract was submitted to present findings at the Occupational Therapy Summit of Scholars in June 2020. This conference has since been rescheduled to June 2021 due to COVID-19.
2. We will submit an abstract to present findings at the American Hippotherapy Association Biennial Conference in March 2021.
3. We will submit an abstract to present findings at Gatlinburg, a conference focused on developmental disabilities, in April 2021.
4. We will submit a manuscript summarizing the Feasibility and Acceptability findings to *Research in Autism Spectrum Disorders* in May 2020.
5. We will submit a manuscript summarizing the efficacy findings in August 2020. We are still deciding on the journal, but will consider the *Journal of Autism and Developmental Disorders*.