Reining in Anxiety: Cognitive-behavioral therapy & adaptive horseback riding

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Therapeutic Riding Center
FIELDSTONE FARM
#FieldstoneSTRONG

Reining in Anxiety

- *Reining in Anxiety* is an adaptive riding program developed by a team of researchers, clinicians, and equestrian specialists derived from evidence-based therapies for youth with mild to moderate anxiety.

- RiA was pilot tested in a randomized trial in NYC (Hoagwood et al., 2021)
  - Youth receiving RiA showed significant improvements over the control group in anxiety symptoms and emotional regulation.

- Replication study Research Questions:
  - RQ1: Are outcomes of youth receiving RiA consistent with results from the initial trial?
  - RQ2: Do saliva measures of cortisol and oxytocin change over time for riders, volunteers, and horses? Are they consistent with self-report measures?
  - RQ3: Was the intervention delivered with fidelity?

Instructor Manual
REINING IN ANXIETY

Adaptive Horsemanship Groups
for Youth with Anxiety or Trauma

Ride	Learn	Practice
To build confidence, self efficacy, and self-regulation	Strategies and skills for managing anxiety	Strategies and skills and use them to rein in anxiety

Methodology: Saliva Sampling

- Need to include physiological indicators to assess mechanisms of change (Esposito et al., 2011; Griffin et al., 2019; Ng, 2021)
    - Saliva sampling is minimally invasive, accurate, and easy to collect (Salimetrics, 2021)
    - Supplies are widely available (Tvarijonaviciute et al, 2020)
    - Cortisol most commonly studied salivary analyte (Pendry & Vandagriff, 2020).
- Saliva sampling is feasible in assessing outcomes for both horses and participants in past HAI trials (Contreras-Aguilar et al., 2019).
    - A modified bit, instead of a cheek swab, may prioritize horses' welfare.
- Funding: Dr. Kimberly Hoagwood, Department of Child Psychiatry NYU, Unrestricted funds/Gift; Salimetrics LLC

Collecting Saliva during COVID-19 …
Parent Expectations: Saliva Collection

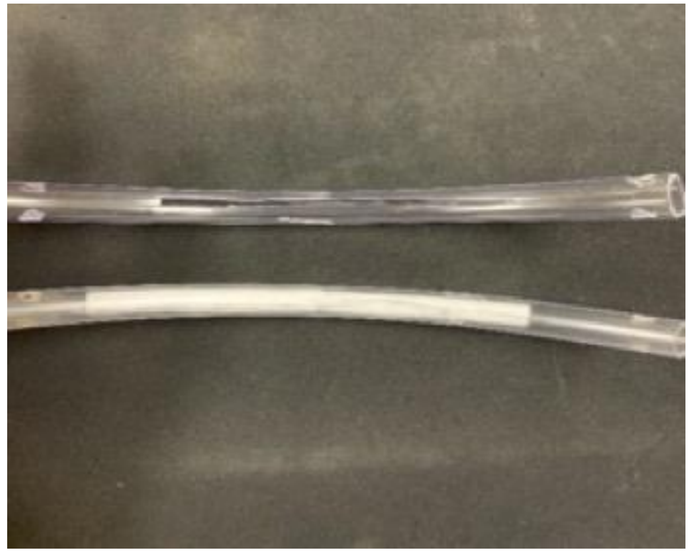
Methods: Preliminary Testing

- Modified bit was created based on Contreras-Aguilar's design (Contreras-Aguilar et al., 2019)
- 8 horses involved in the pilot study had two saliva samples collected in quick succession: one using cheek swab, and one using modified bit.

Side View

Top View

Modified Bit



Vincent, A., Peth-Pierce, R. M., Morrissey, M. A., Acri, M. C., Guo, F., Seibel, L., & Hoagwood, K. E. (2021). Evaluation of a Modified Bit Device to Obtain Saliva Samples from Horses. *Veterinary Sciences*, *8*(10), 232

Results

Method	n	Volume	Oxytocin	Cortisol
Cheek Swab	8	1187.50 µL	129.99 pg/mL	1.04 µg/dL
Bit	7	587.50 µL	128.36 pg/mL	0.29 µg/dL

- All 8 cheek swabs were valid for analysis; 7 of 8 bit swabs valid for analysis (one invalid due to insufficient volume of saliva collected).
- Alpha-amylase not detected in any of the 15 viable samples.
- Average volume collected by swab was higher than average volume collected by bit, with trending significance (p=.09), but bit was adequate for valid analysis.
- No significant difference in oxytocin.
- Cortisol levels significantly higher in swab than bit (p=.00), but bit adequate for valid analysis.

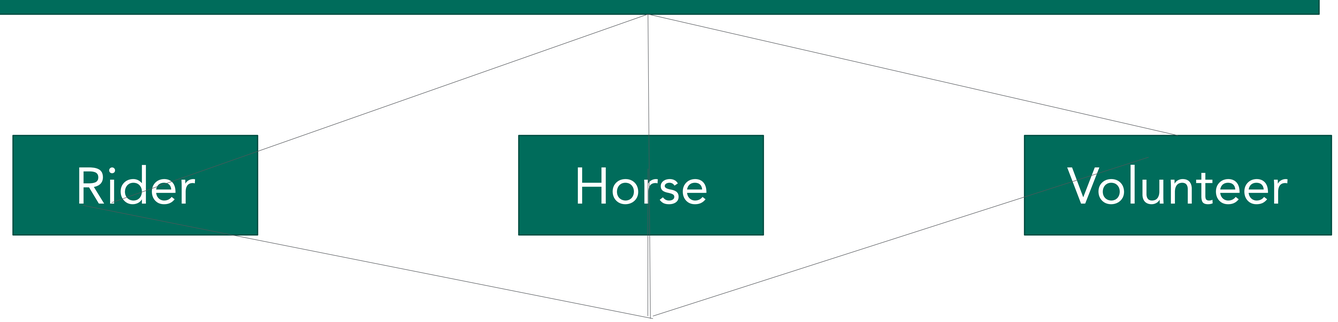
Conclusions

- Bit method viable, but may need to be adjusted.
- Further testing warranted.
- Modified bit is usable for measuring horse cortisol and oxytocin levels, and may be useful for triangulating with self-report measures of anxiety and stress in youth.

Methods, Measures and Demographics

Stage	Measure
Screening Measure (2 min)	Generalized Anxiety Disorder, 2 Items (GAD-2) The Children's Global Assessment Scale (CGAS).
Assessment Measures from caregiver & child (15 min)	Sociodemographic Questionnaire The Screen for Child Anxiety Related Disorders (SCARED) Self-Efficacy Questionnaire for Children, Center for the Study of Animal Wellness (CSAW) Adverse Childhood Experiences Questionnaire (ACE-Q) Emotion Regulation Checklist Children's Sadness Management Scale Anxiety knowledge questionnaire Caregiver satisfaction questionnaire
Saliva (5 min)	1mL pooled saliva before and after lesson
Assessment measures of instructors & volunteers	Instructor and volunteer sociodemographic questionnaire Fidelity checklists Instructor satisfaction

Synchronous Saliva Sampling in Reining in Anxiety



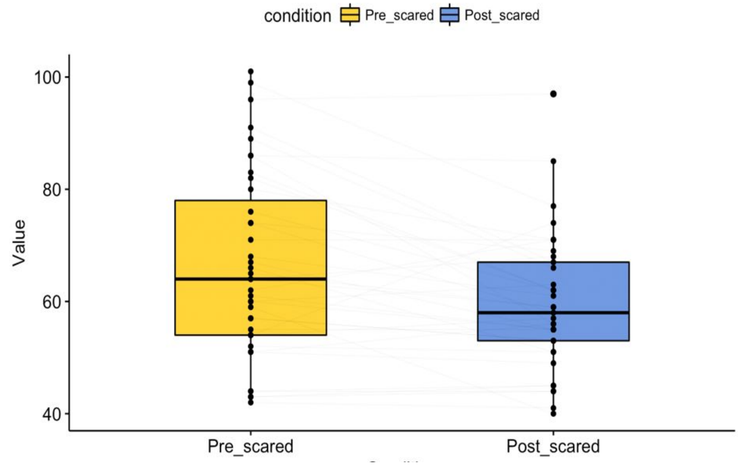
Collected samples from 3 groups based on theory that horses, as prey animals, are attuned to and reflect back emotional state of those around them (Wilson et al., 2017).

Descriptives	N or mean	% or SD
Youth participants	39	
Child age	11.51	2.8
Child gender	19 M/20 F	48.7/51.3
Caregiver gender	8 M/31 F	20.5/79.5

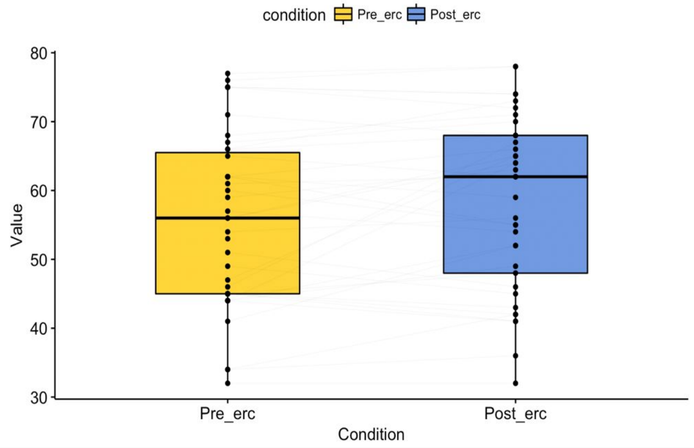
RQ1: Fieldstone Farm Outcomes

- There was a significant difference in anxiety levels at posttest vs pre-test in anxiety symptoms using Screen for Child Anxiety Related Disorders (SCARED) (Plot 1).
- There was a significant improvement in emotional regulation at posttest vs. pre-test as measured by the ERC (Plot 2).
- No significant changes to self-efficacy as measured by the Self-Efficacy Questionnaire for Children (SEQ-C).

Plot 1: Pre/Post SCARED score



Plot 2: Pre/Post ERC score



Measure	Results	Interpretation
Pre/post change in ERC	Significantly differed by race (not by age or gender) p = .034.	
Distribution of CSAW Scores	Consistent range: 66-119, 70-119, 55-119, 69-119. At the low end, the range varies by 15 points.	Consistent over 4 weeks.
SCARED score	The result shows that the mean of the differences (pre-post) is 6.03 ((p=0.001)	The average sum of SCARED scores significantly decreased after intervention.
ERC	The result shows that the mean of the differences (pre-post) is -2.49 (p=0.033).	Total scores significantly increased after intervention.
SEQ-C	The result shows that the mean of the differences (pre-post) is -1.95. The p-value of the test is 0.07 (p= 0.05).	Not enough evidence to conclude that pre and post SEQ-C scores were significantly different.

RQ1: Are outcomes consistent with the first trial?

- Yes!
- In replication, youth (ages 6 to 17) who screened positive for mild to moderate anxiety and their parents demonstrated reduced anxiety on measures of self-report and observation.
- Additional gains:
  - Inclusion of equine welfare
  - Inclusion of physiological data (biopsychosocial data)
  - International collaboration

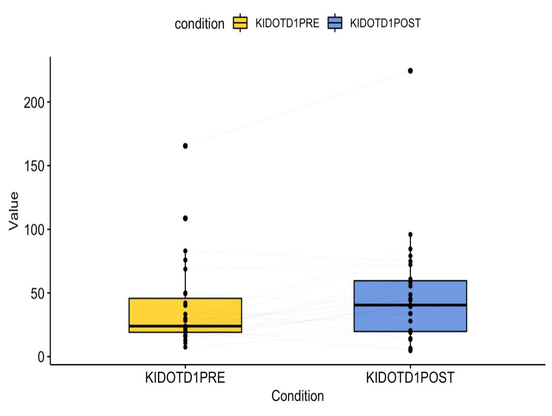
Coping Cards
REINING IN ANXIETY

RQ2: Saliva From Riders

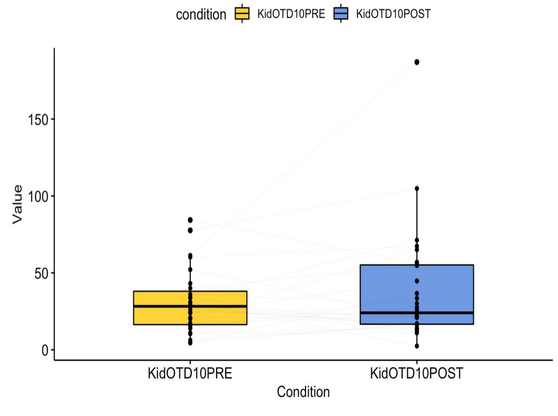
- Saliva samples obtained from riders during sessions show a consistent **decrease** in cortisol with **increases** in oxytocin at 2 of the 4 timepoints.
  - Week 1: Decrease in cortisol and increase in oxytocin.
  - Week 4: Decrease in cortisol and oxytocin levels remained the same.
  - Week 7: Decrease in cortisol and increase in oxytocin.
  - Week 10: Decrease in cortisol and oxytocin levels remained the same.
- Used linear mixed-effects modeling to assess if riding the same horse affected stress or bonding.
- No significant difference between youth riding same horses and youth riding different horses

	Analyte	Difference (Post-Pre)	P-value
Week 1	OT	15.26	0.016*
	SAA	47.51	0.001*
	CORT	-0.04	0.009*
Week 4	OT	17.57	0.202
	SAA	64.45	0.001*
	CORT	-0.09	0.008*
Week 7	OT	5.73	0.050*
	SAA	51.41	0.002*
	CORT	-0.03	<0.001*
Week 10	OT	7.91	0.328
	SAA	9.46	0.516
	CORT	-0.21	<0.001*

* Indicated a significance of p < or = 0.05



Oxytocin pre & post week 1

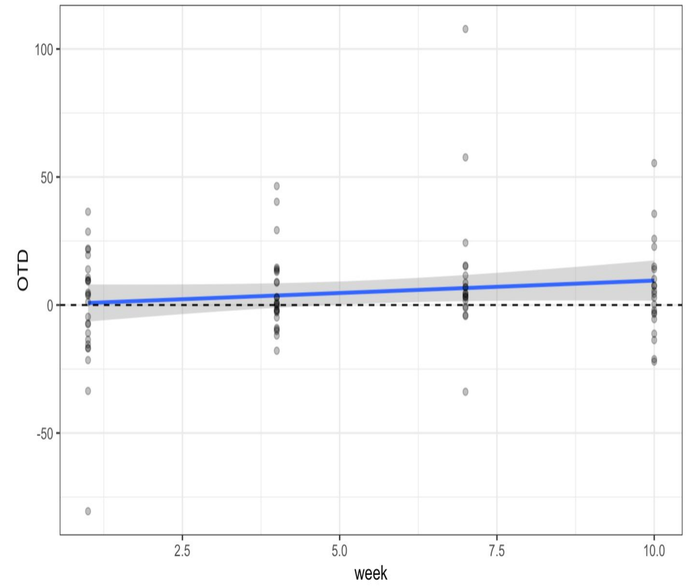


Oxytocin pre & post week 10

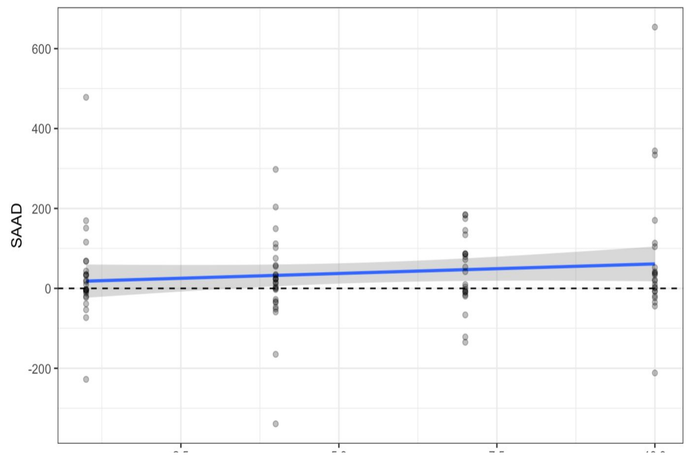
RQ2: Saliva from Volunteers

- Analysis of pre/post changes of volunteers over time
  - Linear mixed-effects models were performed to test the pre/post changes of OT and CORT over 4 time points.

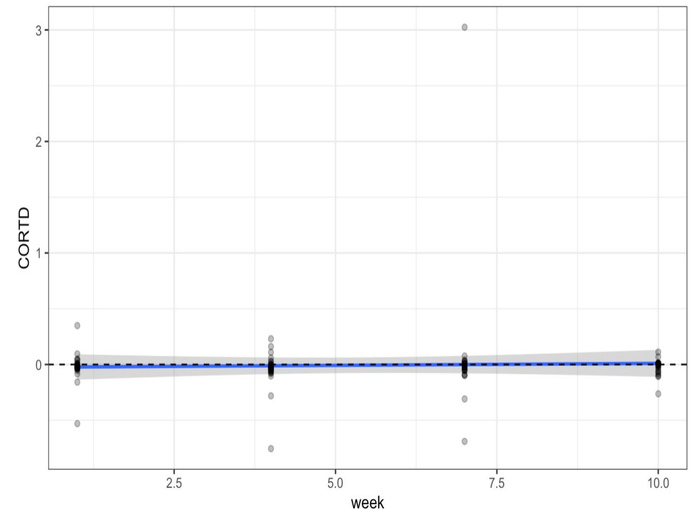
- Overall: changes between weeks
  - The saliva data collected over time from volunteers did not show any significant changes in levels of cortisol or oxytocin
    - Oxytocin significantly increased at week 7 (p = 0.009)



Oxytocin (p = 0.133):



Alpha-Amylase (p= 0.186)

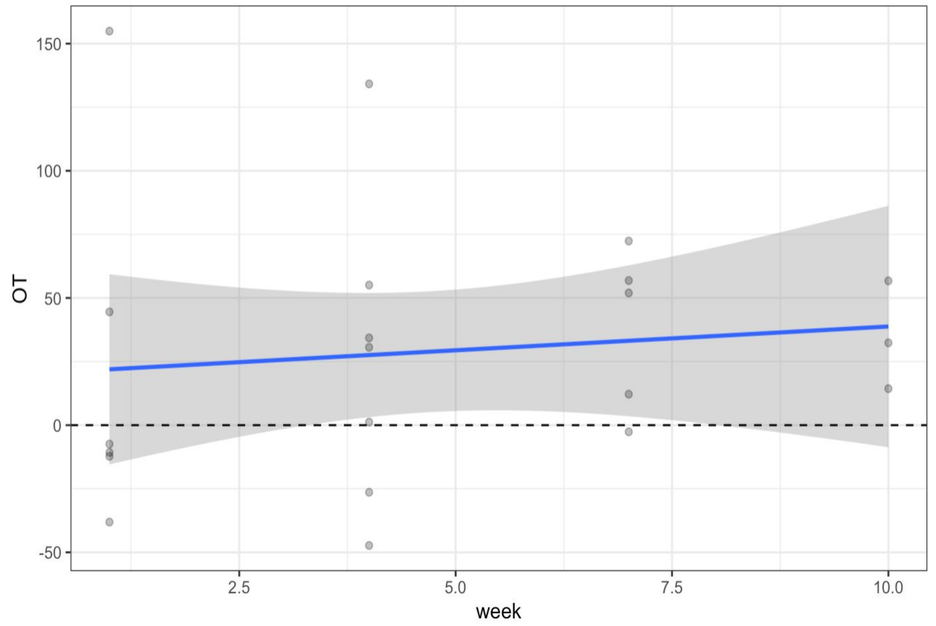


Cortisol (p=0.746)

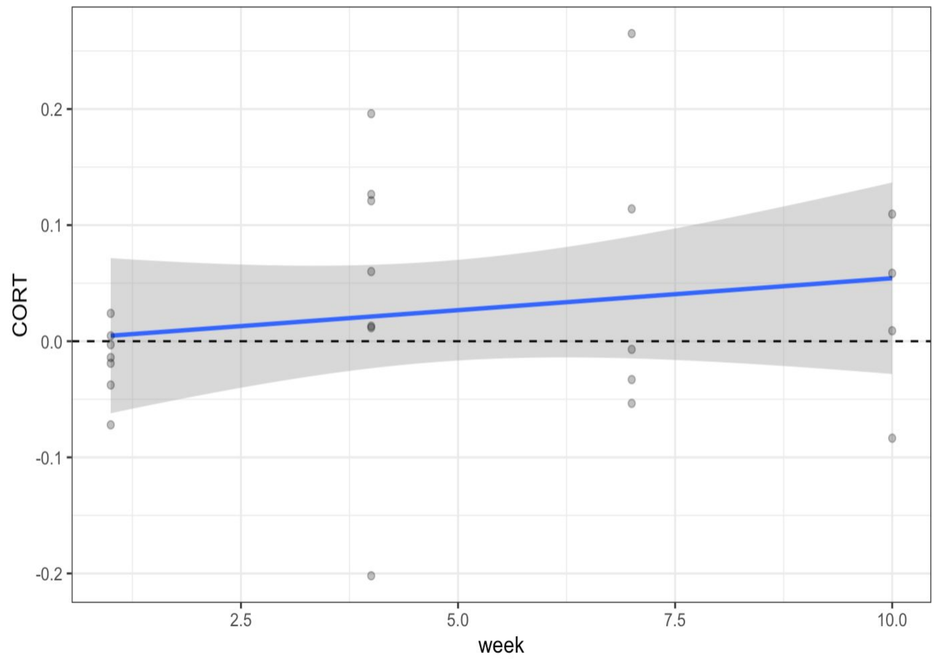
RQ2: Saliva from Horses

- Analysis of OT and CORT of horses over time
  - Linear mixed-effects models were performed to test the changes over the 4 time points.
  - Mean values were used for the horses with different kids at each time point.
  - No evidence that OT and CORT changed over time.

- Analysis of pre/post changes of OT and CORT of horses over time
  - Linear mixed-effects models were performed to test the pre/post changes over time
  - No evidence to conclude that OT and CORT changed over time.
  - Key finding: Though the horses were working, there was no evidence that the RiA program increased their stress.



Oxytocin (p= 0.620)



Cortisol (p = 0.344)

RQ3: Fieldstone Farm: Fidelity

- 8 Fieldstone instructors were trained in delivery of the RiA protocol.
- Fidelity to the intervention protocol was assessed by research assistants using checklists to ensure instructors delivered all key elements of each session (see partial example to the right).
- Average fidelity percentage across all sessions was 97.14%, which far exceeds the threshold of excellent fidelity established in the field (<80%) (Garbacz et al., 2014)
  - Average fidelity scores by session number ranged from 88.4% to 100.0%
  - Average fidelity scores by instructor ranged from 92.5% to 100.0%

Session 1: Psychoeducation on CBT Components		
A	CHECK-IN	DONE
1	Instructor **introduced themselves** and other **staff members** present in the room	☐
2	Instructor asked **riders** to **introduce themselves**	☐
3	Instructors **introduced riders** to the **horse** they will be riding	☐
4	Instructors **reviewed barn rules** with riders	☐
5	Instructor instructed rider on **how to groom horse**	☐
B	RIDING	
6	**Mount** Instructor asked riders to **mount the horse**	☐
7	**Warm Up.** Instructor **conducted warm up activity** (physical tasks=muscular movements; mental tasks=riders tell jokes)	☐
8	**Activity** Instructor **reviewed horse commands** (WHOA BACK, WALK ON)	☐

Number of RiA sessions completed	141
Number of RiA sessions rated for fidelity	136
Percent of completed sessions rated	96.5%
Average fidelity percentage across all sessions	97.14%

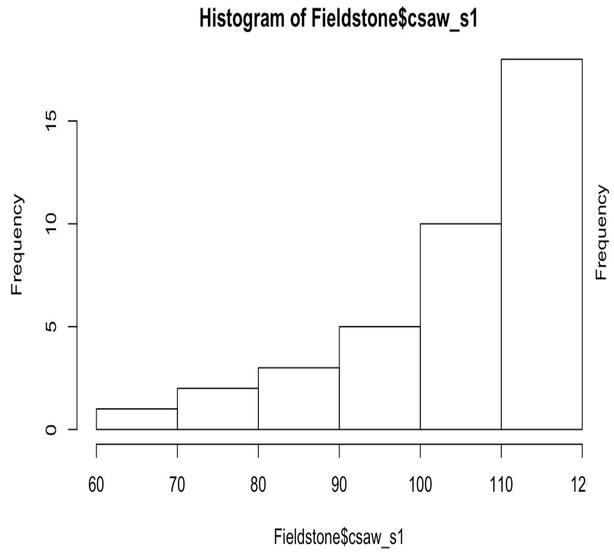
RQ4: Measure Development: Modified Center for Study of Animal Welfare Scale (CSAW). Modified for Youth Report

- Dearth of measures to assess perception of riders' bond with the horse
    - CSAW is only validated measure for horses

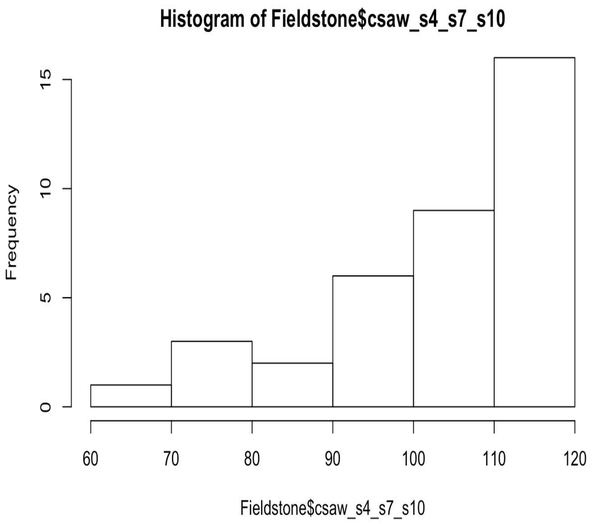
- Adapted S. Maddox from Johnson, R. A., & Meadows, R. L. (2003). Assessing the human-animal bond: A compendium of actual measures. In D. Anderson (Ed.), *Center for the study of animal wellness pet bonding scale, CSAWPB* (pp. 7–9). West Lafayette, IN: Purdue University Press

- Preliminary findings suggest that children have ability to perceive and report on their bond with the horse
    - Sample questions
        - I like the horse
        - I trust the horse
        - I am comfortable with the horse
        - I tell others about the horse
        - The horse accepts me just the way I am.

- Further testing and development underway



Rider's expressed bond at week 1

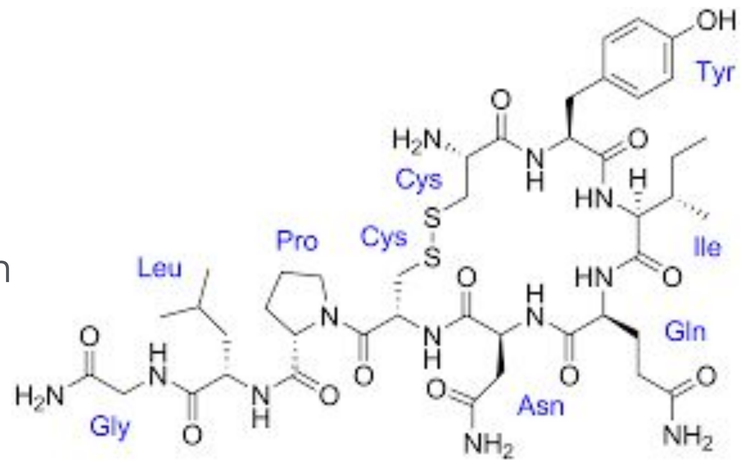


Rider's expressed bond at week 10

	Minimum	Median	Mean	Maximum
Session 1	66.00	107.00	104.10	119.00
Session 4	70.00	109.00	103.50	119.00
Session 7	55.00	111.00	102.40	119.00
Session 10	69.00	106.00	104.20	119.00

Discussion

- Collection of saliva samples from horses, riders and volunteers is viable and valuable as an objective measure of stress and bonding.
- Participants:
    - Cortisol level consistently decreased after each session.
    - Oxytocin level increased at 2 of the 4 timepoints.
- Horses:
    - No evidence of stress (Cortisol level) by participation in the RiA program
- Volunteers:
    - No evidence of stress by participation in the RiA program
    - Positive trend in Oxytocin level
- Horse-rider consistency (i.e., riding same horse each lesson) did not affect either stress or bonding
- Findings support RiA intervention in reducing mild to moderate anxiety for youth ages 6-17
- Implications for social work practice:
    - Intervention for child mental health and well-being
    - Shift towards an evidence-based practice
    - Evidence of CBT + therapeutic riding as an innovative and effective intervention



Limitations

- Sample size
  - ethnicity/race distribution
  - age distribution
  - (attrition: 3 participants)
- Herd considerations
  - Consistent/random matching of horse/volunteer/participant
  - Abscess by one party impact the triad
  - One horse passed away during the study
- Parent engagement
  - Some parents were reluctant to participate (enjoy respite while their children ride)
  - Journals were not consistently reinforced
- Saliva sampling:
  - No all participants were comfortable spitting (i.e. COVID concerns)
  - Oxytocin is reliably measured in pooled saliva
  - Apha-amylase in horses was not readable in the horses' samples

Next Steps

- Dissemination through Presentations (ACT, SSWR, ABCT) and publications (*in works:* Outcomes paper, Fidelity paper)
- Continued research towards developing a multi-site, collaborative study (funding: Eunice Kennedy Shriver National Institute of Child Health and Human Development, considering K23)
  - Replicate with larger sample to see if outcomes are consistent, for whom it is most effective, and to fine-tune collection of biomarkers
  - Consider including heart rates (heart rate variability) of riders and horses
  - Consider the duration of rider's experience with horses prior to enrolling in program
  - Identify optimal timepoints for saliva collection
  - Examine use of alpha-amylase as additional marker of stress
- Adapt Reining in Anxiety for ground-based learning (funding: Horse & Humans Research Foundation)
  - Invited to present research findings to date to the education committee, and potential public webinar in 2022
- Research agenda beyond *Reining in Anxiety*
  - Scale/replicate Equine Facilitated Mindfulness Based Stress Reduction for Veterans with inclusion of physiological indicators (funding: HABRI, HHRF, Bob Woodruff Foundation…)
  - Continue policy evaluation of state efforts to address The Link between interpersonal violence and animal abuse
  - Continue collaborative research regarding Emotional Support Animals
  - Support and collaborate with other researchers (re: HAI or integration of physiological indicators

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Thank you