

# Effectiveness of a 6-week Hippotherapy Program in Children With Autism Spectrum Disorder

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All data collection sessions will take place at the HETRA facility in Gretna, Nebraska. A summarized description of all assessments can be found in Figure 1. Pre- and post-HPOT assessments will take place in a comfortable room located next to the barn at the HETRA facility. The HPOT session will take place within the barn facility.

Standing posture data will be collected pre- and post-HPOT sessions. To collect standing posture data, ground reaction forces (GRF) and moments will be recorded (200 Hz) from a portable force platform (Bertec Corp., Columbus, OH). During quiet stance trials, children will stand with their feet comfortably apart on the force platform. Foot positioning will be marked and used for all subsequent trials. During each trial, children will be asked to stand as still as possible for 20 s with their arms at their sides and facing a bare wall. Children will perform 3-5 trials of standing.

Social play will also be conducted pre- and post-HPOT session. The principal investigator, a student, and caregivers will engage in 10-minute semi-structured play interactions with the child. We will provide board games, building blocks, books, and similar age-appropriate toys depending upon the age of the child. This session will be videotaped for subsequent analysis of targeted social behaviors. At the end of this session, we will also assess the caregiver's perception of the behavior of their child. This survey examines the alertness, emotional reaction, level of interest and attention, comfort level around strangers, level of activity, overall level of communication, and play behavior of the child. The response required from the parents is a three-point scale that assesses/evaluates at *less*, *typical*, or *more/greater* in each behavioral domain. A similar survey will be used to assess therapist's perception of the success of the HPOT session.

During the HPOT session, the researchers will monitor the heart rate variability of the horse and the rider. Heart rates will be recorded with the Hylofit system (<https://hylofit.com>) worn by the human and horse, respectively. Both horse and rider will wear an electrode strap around the upper thorax. To assess movement coupling between the horse and rider, five tri-axial inertial sensors (OPAL, APDM, Inc, Portland, OR) will be used. The sensors will collect actively synchronized tri-axial accelerometer and gyroscope data at 80 samples per second. One inertial sensor will be placed dorsal at the rider's pelvis, one frontal at the top of the helmet, and one frontal at the top of the sternum. The sensors on the horse will be fixed on the back of the horse on the spine level between T8 and T10 and on the head. Data will be stored on each sensor's internal memory and downloaded following the collection.

## Biostatistical Analysis

**Specific Aim 1, Hypothesis 1:** For the postural sway and social skill measures, as well as the equine stress measures, we will perform a two-way mixed (2x2) ANOVA. We will compare dependent variables between TD children and children with ASD before and after a 6-week HPOT program.

**Specific Aim 2, Hypotheses 1, 2:** For the coupling measures of heart rate variability and movement, we will perform an independent t-test between the group of children with ASD and the group of TD children at each session. We will also perform a 2x3 mixed way ANOVA to determine how the coupling measures change over time and with intervention.

**Specific Aim 3, Hypothesis 1:** We will utilize a multivariate regression model to examine the relationship between changes from pre- to post-HPOT session in standing posture, social behavior, and caregiver perception, with the equine temperament and heart rate and movement coupling indices between horse and rider.