Randomized Controlled Trial for Superpower Glass

Extended Protocol for IRB-34059
ClinicalTrials.gov Identifier: NCT03569176

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Updataed Protocol as of 5/07/2018

1. Purpose

a) In layperson's language state the purpose of the study in 3-5 sentences.

The purpose of this research is to study the effects of a novel combined software-hardware device built onto commercially available Google Glass technology that provides an automated emotion expression recognition system and face tracker to determine the effects of providing social cues to individuals with a diagnosis of ASD. This novel device will use a camera, microphone, and head motion tracker that will record the behavior of the subject during interactions with other people. The system is designed to give participants non-interruptive social cues in real-time and will record social responses that can later be used to help aid behavioral therapy.

b) State what the Investigator(s) hope to learn from the study. Include an assessment of the importance of this new knowledge.

Investigators hope to learn the effects of this novel software-hardware device in terms of providing social cues to individuals with ASD. Refining and evaluating this system has implications to not only help aid behavioral interventions with individuals with ASD, but it also has broader implications on new forms of human-computer and human-human interaction. The system's ability to provide continuous behavioral therapy outside of clinical settings will enable dramatically faster gains in social acuity that may, within a limited and self-directed period of time, encourage the child to engage in more advanced social settings on his/her own.

c) Explain why human subjects must be used for this project.

Human subjects must be used for this project because the purpose of the study is to determine the efficacy of this novel device in social interactions for individuals with ASD. There are no suitable animal models for facial emotion recognition in ASD, nor are there comparable behavioral therapies for animals, and therefore, human subjects must be used.

2. Study Procedures:

Participants: Participants will be ages 6-12 years old. We anticipate recruiting up to 80 ASD participants. We will also be recruiting family members and friends of participants to consent to participate as "non-participants." The research staff will obtain informed consent before any study procedures begin. Consent and assent will be obtained either electronically or in-person.

For n=50 participants, we will run a cross-over design study where 25 participants will randomly be assigned to group one and continue treatment as usual (control), or group two and continue treatment as usual plus study procedures (treatment). For these 50 participants, they must receive ABA therapy in the home at least 2xs/week. We will try to understand the efficacy of the device in comparison to ABA therapy.

The procedures for the "treatment" group are as follow:
1/ complete screening questionnaires and phone screen
2/ come in for onboarding session (as described above) and take device home to use for 6 weeks. They will use the device at least 4xs/week for 20 minute sessions with either their parents or ABA therapist. They will have phone calls with study managers to see how usage of the device at home is going.
3/ come in for conclusion (as described above) and return device
4/ come in 6 weeks later for follow up (as described above)

During onboarding, conclusion, and follow-up, we will also conduct unstructured interviews to get feedback from research participants. At the end of the 12 week "treatment group" period and they complete the follow up, a $50 Amazon gift card is provided as compensation for participation in the study.

The procedures for the "control" group are as follow:
1/ complete screening questionnaires and phone screen
2/ come in for onboarding session (as described above)
3/ come in for an appointment (appointment 1) 6 weeks after onboarding and conduct evaluations again. Participants will now take device home to use for 6 weeks. They will use the device at least 4xs/week for 20 minute sessions with either their parents or ABA therapist. They will have phone calls with study managers to see how usage of the device at home is going.
4/ come in for conclusion (as described above) and return device
5/ come in 6 weeks later for follow up (as described above)

During onboarding, appointment 1, conclusion, and follow-up, we will also conduct

unstructured interviews to get feedback from research participants. At the end of the 18 week "control group" period and they complete the follow up, we will provide to them a $50 Amazon gift card.

Screening Questionnaire: We will send around a link to a redcap survey for all recruited participants from the recruitment website and with other recruitment efforts. We will ask interested participants to fill out the Screening Questionnaire. Our goal will be to determine eligibility based on location (needs to be local to Stanford), still interested in participating, has a child that meets our eligibility criteria, and a brief overview of the child. Eligible families will be contacted via email or phone to set up scheduling for in-lab study sessions. Parents will be asked to fill out these questionnaires no more than 4 times each (Baseline, at the end of the intervention, and at 6-weeks follow-up).

Standardized Behavioral and Clinical Characterization Scales, Checklists, and Measures:
Clinical Phenotyping Measures Parents: The Social Responsiveness Scale (SRS-2), The Vineland Adaptive Behavior Scale (VABS-2), Social Communication Questionnaire (SCQ), and Child Behavior Checklist (CBCL).

Child: Participants will also undergo the Abbreviated Battery IQ (ABIQ), which consists of two subsections of the Stanford-Binet, 5th Edition Intelligence Test. We will also collect the NEPSY-II Affect Recognition and Emotion Guessing Game, as well as Overall Social Interaction (Brief Observation of Social Communication Change, BOSCC). At one of the in-person appointments, we will have participants and consented/assented family members read aloud a script (see section 16) into a microphone to collect audio data to later analyze to help with expression recognition software.

Study Procedures:
First session (Onboarding): Subjects and family members will be asked to come to the Wall Lab at 1265 Welch Rd to obtain written or electronic consent. Individuals will meet the study team, will discuss expectations with study manager, discuss how to use the device units, and go over scheduling. Cognitive testing will be conducted in a private assessment where participants will complete the ABIQ. The child/family will then take the Glass home for the duration of the study or we will mail the units home.

Glass at Home: Each participating family will have the Glass units for several weeks during which time the child will use the unit in their own natural environment at home on a daily basis. We will engage on a biweekly to weekly basis (will modify timing if and when necessary) to receive and react to feedback, and then have two-four monthly “in-lab” assessments to monitor improvement of the participant. These checkins can be in person or via a video conference. During the sessions, we will conduct semi-structured and structured interviews to obtain

information about face-gaze, emotion recognition capabilities, and feedback on how the at home sessions are going. We will also collect additional information from the families and participants that they are willing to provide about their experience.

Conclusion: Individuals will come to Stanford to return the units and provide feedback on their experience. They can also mail back their units and have the conclusion session via video conferencing. We will have structured and structured interviews.

Follow up: Study team will connect with participants and families to administer the questionnaires and discuss feedback post study.

We will also have a control population for the study. They will not receive Google Glasses or Android phones. They will only be used as a control group to validate the outcome measures for emotion recognition. A blind study member will evaluate the control population as well as the population with ASD on their ability to recognize
facial emotions. They will do this by acting out 8 emotions, 5xs each (Happy, sad, angry, scared, surprised, disgusted, calm, and contempt/meh). We will conduct the emotion recognition evaluation at the checkins for our ASD population and scheduled checkins for our control group. A study team member will meet with the control group,
possibly at a social skills class, school, or in their homes, to remain blind to which cohort they are collecting this data from. This emotion recognition component takes about 5 minutes.
We will partner with Autism Comprehensive Educational Services (ACES) who offer a variety of behavioral and educational services for individuals impacted with autism or other developmental disabilities in the home, school, community, and at accredited sites throughout the United States. Our main contact will be [redacted], Ph.D., BCBA-D, Chief Clinical Officer, and she will manage the staff from ACES. ACES will help with participant selection:

ACES will help recruit some of our participants. They will screen for participants for IRB 34059 from the population for which they serve. ACES will define and assist in the screening process for eligible participants from said population. They will screen for participants based off of recruitment criteria explained in IRB 34059. Upon selection of participants, ACES will provide contact information to Autism Glass, Wall Lab for which Autism Glass, Wall Lab will officially enroll selected participants into IRB 34059.

3. Statistical Analysis Plan

This study will follow an intention-to-treat (ITT) analysis, which will include all participants randomized in the study, regardless of missing data. Our hypothesis is that children randomized to receive the Superpower Glass intervention will show a significant improvement on the primary outcome measures, as compared to controls. We will apply a mixed effects

model analysis to assess change from baseline (week 0) to post-test 1 (week 6) in the primary outcome measures.

Primary Outcome Measures:

1. Vineland Adaptive Behavior Scales, 2nd Edition (VABS-II), Socialization subscale
2. Social Responsiveness Scale 2 (SRS-2)
3. NEPSY-II, Affect Recognition subscale
4. Emotion Guessing Game (EGG) scores

Secondary Outcome Measures:

1. Brief Observation of Social Communication Change (BOSCC)
2. Vineland Adaptive Behavior Scales, 2nd edition (VABS-II) Full Scale
3. Child Behavior Checklist (CBCL)

Other measures collected:

1. Stanford-Binet Intelligence Scales, Abbreviated Battery, Fifth Edition (ABIQ)
2. Mobilized Machine Learning Autism Risk Assessment (MARA)
3. Social Communication Questionnaire (SCQ)

We will also perform sensitivity analyses to examine the extent to which outcome measures are correlated to the child's age and autism severity, as well as by usage factors, such as variation in compliance with recommended dosage and missing data from families lost to follow-up. We will use the same approach to assess differences on secondary outcomes between groups using the same mixed effects model analysis. Lastly, we will perform a six-week follow-up analysis on the treatment group to test if a return to baseline occurred.

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CHAIR, PANEL ON MEDICAL HUMAN SUBJECTS

Certification of Human Subjects Approvals

Date: May 7, 2018

To: Dennis Paul Wall, Ph.D., Peds/Systems Medicine

Jessey Nicole Schwartz B.A., Aaron Kline, Anish Nag, Carl B. Feinstein, Catalin Voss BS 2nd year, Jena Daniels BS, Emma Salzman, Isabelle Bankston, Lauren Amy Allerhand, Michael Du, Nicholas Joseph Haber Ph.D, Peter Yigitcan Washington, Qandeel Tariq, Nate Tyler Stockham, Khaled Jedoui, Terry Winograd

From: Darrell M Wilson, M.D., Administrative Panel on Human Subjects in Medical Research

eProtocol Title: Stanford Glass Project

eProtocol #: 34059 **IRB 5 (Registration #:** 4593)

The IRB approved human subjects involvement in your research project on 05/07/2018. **'Prior to subject recruitment and enrollment, if this is: a Cancer-related study, you must obtain Cancer Center Scientific Review Committee (SRC) approval;** a CTRU study, you must obtain CTRU approval; a VA study, you must obtain VA R and D Committee approval; and if a contract is involved, it must be signed.'

The expiration date of this approval is 06/30/2018 at Midnight. If this research is to continue beyond that date, it is your responsibility to submit a Continuing Review application in eProtocol. Research activities must be reviewed and re-approved on or before midnight of the expiration date. The approval period may be less than one year if so determined by the IRB. Proposed changes to approved research must be reviewed and approved prospectively by the IRB. No changes may be initiated without prior approval by the IRB, except where necessary to eliminate apparent immediate hazards to subjects. (Any such exceptions must be reported to the IRB within 10 working days.) Unanticipated problems involving risks to participants or others and other events or information, as defined and listed in the Report Form, must be submitted promptly to the IRB. (See Events and Information that Require Prompt Reporting to the IRB at http://humansubjects.stanford.edu.) Upon completion, you must report to the IRB within 30 days.

Please remember that all data, including all signed consent form documents, must be retained for a minimum of three years past the completion of this research. Additional requirements may be imposed by your funding agency, your department, HIPAA, or other entities. (See Policy 1.9 on Retention of and Access to Research Data at http://doresearch.stanford.edu/policies/research-policy-handbook)

This institution is in compliance with requirements for protection of human subjects, including 45 CFR 46, 21 CFR 50 and 56, and 38 CFR 16.

Waiver of Individual Authorization for recruitment under 45 CFR 164.512(i)(2)(ii)(A),(B),(C), pursuant to information provided in the HIPAA section of the protocol application.

Darrell M Wilson, M.D., Chair

Approval Period: 05/07/2018 THROUGH 06/30/2018

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