Conor Anderson: Board Report – Feb 2024

**Publications**

Recently Published

Title: Predicting Problematic Behavior in Autism Spectrum Disorder using Medical History and Environmental Data

Authors: Jennifer Ferina, Melanie Kruger, Uwe Kruger, Conor Anderson, Daniel Ryan, Jenny Foster, Theresa Hamlin, and Juergen Hahn

Journal: Journal of Personalized Medicine

Results

* For some individuals, the AI models were able to predict aggressive or self-injurious episodes with up to 90% accuracy using data from the prior day. This suggests these methods could help anticipate challenging behaviors so caregivers can plan accordingly.
* The results highlight the importance of gastrointestinal factors and sleep in predicting behaviors. This underscores the need to address GI health and sleep issues in autistic individuals as it may lessen problematic behaviors.

Submitted to Journal for Peer Review

Title: Decoding Daytime Behavior in ASD Children through Infrared Sensor-Driven Sleep Analysis

Authors: Yash Kiarashi, Ali Bahrami Rad, Hyeokhyen Kwon, Conor Anderson, Jenny Foster, Tania Villavicencio, Theresa Hamlin, and Gari Clifford

Journal: IEEE Journal of Biomedical and Health Informatics

Submission Date: Dec 15th 2023

Pre-Print

Title: Identifying Biomarkers of GI Comorbidities in ASD; A Longitudinal Pilot Study Linking Multi-omics with Behavioral and Gastrointestinal Co-morbidities

Authors: Kara Margolis, Ruth Ann Luna, Tor Savidge, Conor Anderson, Vanessa Konefal, Jennifer Frank, Shyam Badu, Sik Yu So, and Theresa Hamlin

Journal: Cell

Submission Date: Q1 2024

Title: From Motion to Emotion: Exploring Self-Injurious Behavior in Autism Spectrum Disorder Through Analysis of Wrist-worn Physiology and Movement

Authors: Ali Bahrami Rad, Yash Kiarashi, Hyeokhyen Kwon, Conor Anderson, Jenny Foster, Tania Villavicencio, Theresa Hamlin, and Gari Clifford

Journal: Sensors

Submission Date: Dec 3rd 2023

Title: Detecting and Predicting Behavior Events in ASD from Video using Attention Model

Authors: Hyeokhyen Kwon, Barun Das, Ali Bahrami Rad, Yash Kiarashi, Conor Anderson, Jenny Foster, Tania Villavicencio, Theresa Hamlin, and Gari Clifford

Journal: TBD

Submission Date: Feb 8th 2024

Title: Transfer Learning and Multimodal Data Fusion of Wrist-worn and Off-body Activity Improve

Sleep-Wake Detection

Authors: Pradyumna Suresha, Qiao Li, Conor Anderson, Theresa Hamlin, Amit J Shah, Viola Vaccarino, Donald Bliwise, and Gari Clifford

Journal: IEEE Transactions on Biomedical Engineering

Submission Date: TBD

Previous Publications

Title: An evaluation on the effects of safe person handling program implementation at long term care facilities for persons with complex intellectual, developmental, and medical conditions

Authors: Daniel Ryan, Conor Anderson, Ann Marie Connolly, Lindsey Veety, Tania Villavicencio, Lindsey Parks

Journal: American Journal of Industrial Medicine

Title: Observational study of medical marijuana as a treatment for treatment-resistant epilepsies

Authors: Orrin Devinsky, Angelica Marmanillo, Theresa Hamlin, Philip Wilken, Daniel Ryan, Conor Anderson, Daniel Friedman, George Todd

Journal: Annals of Clinical and Transitional Neurology

**Internal Projects**

Gut Microbiome Study

Update: Finalizing figures for cross sectional study, goal to submit to Cell by end of Q1. Received metabolomics dataset, downregulated sucralose identified as a common biomarker in interventional dataset in both cross sectional and longitudinal sets. Regression analysis underway to identify correlation between microbiome, metabolomics, behavioral, and GI outcomes in longitudinal dataset.

Results

* Microbial shifts established in multiple bacteria families from baseline (pre-admission)
* Significant decreases in behaviors tracked in validated screening tools demonstrated in the first 6 months in the TCFD program.
* Very significant reduction in non-core food consumption in TCFD diet.
* Strong association with increased food variety and decrease in behaviors tracked in validated screening tools.

Cross-Sectional Study

* Substantial microbiome shift demonstrated in the CFD cohort, when compared with general ASD and TD cohort.
* Microbiome signature similarities to a low FODMAP diet identified in CFD cohort, in both cross-sectional and longitudinal datasets. Indicating that microbiome shifts/benefits of low FODMAP diet can potentially be recapitulated in ASD children by promoting food diversity and avoidance of processed foods, as in the CFD diet. This is a substantial finding due to poor compliance and long-term negative effects of a low FODMAP diet.

Longitudinal Study

* Preliminary results demonstrating significant reductions in target behaviors
* Using linear mixed effect models trends have been identified toward increased food variety and a reduction in repetitive behavior score and stereotypy.
* Analysis of longitudinal microbiome samples confirm similarities to low FODMAP diet in CFD cohort.

Non-Responders

Update: analysis identified significantly more co-morbid problem diagnoses, a direct correlation between the number of problem list diagnoses and average behavior episodes, and higher intensity and longer duration behaviors in the non-responder cohort when compared with designated responder cohort identified by the Chief of Psychology, Johanna Lantz.

Results

* High prevalence of co-morbid diagnosis, 90% > 10.
* High prevalence of problem diagnoses including constipation, ASD, Rhinitis, GERD, Anxiety, and MTHFR deficiency.
* High prevalence of co-morbid tracked target behaviors including Aggression, SIB and Disruptive Behavior.

MTHFR Deficiency

Update: draft proposal from Cornell intern - Comparing Behavioral Outcomes Associated with MTHFR Mutations in Individuals with Autism Spectrum Disorder. The aim of this study is to determine if the type of MTHFR mutation correlates to more severe or specific behavioral outcomes in those individuals previously diagnosed with ASD.

Results

* Compound heterozygous MTHFR mutation C677T/A1298C and Heterozygous MTHFR mutation C677T most prevalent in TCFD group.
* Found significantly elevated levels of B12 when comparing Compound heterozygous MTHFR mutation C677T/A1298C and Homozygous MTHFR mutation C677T to Heterozygous MTHFR mutation A1298C, and substantially lower folate when comparing those groups.

Virtual Reality

Update: working on integration VR into OT, PT, and Speech Therapy. Working closely with Assistant Chief of Clinical services and team to identify suitable candidates and ensure success. Developing outward facing VR promotional content.

VR Therapy

* Successful pilot completed in physical therapy session.

Autism Awareness in Policing

* First VR autism awareness training carried out with Liberty Police Department
* Program written up in Sullivan County Democrat: <https://www.scdemocratonline.com/stories/autism-training-for-liberty-pd,92721>

Emergency Responders

* Similar training to the police awareness under review for first responders.

Proactive Strategies – Stress Reduction and Coping Skills

* Staff training scenarios created to demonstrate how appropriate interventions can be used to de-escalate a situation.
* Demonstrating good and bad examples of how a situation can be handled.

**Reports**

Steve Hidalgo – support for data capture monitoring and reporting. Long term goal to identify and address large gaps in TCFD dataset though deep dive into red flag reporting and working closely with program to establish location and format of data and manually enter where appropriate.

Joshua Nathan – support for development of new VR content, working closely with OT, PT, Speech, and Assisted tech to assist with rollout of VR as a therapeutic tool.

Samantha Miller – support for creating and postproduction of VR video content, working closely with Strategic Outreach team to design outward facing VR promotional content.

Chase Sisk – intern from Cornell, support for research Comparing Behavioral Outcomes Associated with MTHFR Mutations in Individuals with Autism Spectrum Disorder.

**Other Projects**

Sigma Care

Oversight of clinical data capture component. Identifying persistent data gaps and working with program team to carry out root cause analysis at locations with high missing data volume. Implementing corrective actions and continuous improvement initiatives where necessary as we transition to full clinical data capture in Sigma Care.

Building out clinical assessments in SigmaCare necessary for residential tracking, providing support to Health Services in the implementation of new data capture mechanisms.

Pre-Admission Screening

Utilizing a combination of optical character recognition and natural language processing models developed a pipeline to process and analyze pre-admission documentation in narrative format to identify potentially disqualifying conditions.

Results

* Model was able to identify numerous diagnoses/conditions of concern in long form pdf format.

State Ed – Diagnosis Combinations

Developed a pipeline to refactor, normalize and merge data on CSE Classification Mental, Behavioral and Neurodevelopmental disorders, Medical Conditions, and Target Behaviors and format for distribution to state education during visit.

Pose Detection

Implemented PoseNet model on raspberry Pi with Coral accelerator for collection of pose estimation data in lab school environment to support deployment of behavior classification and prediction models.

Sleep

Working with Dr. Ritter to investigate individuals with abnormal sleep patterns/conditions and determine if there are potential corrective actions. Calculated average and standard deviation in sleep hours and interruptions to identify outliers and individuals of interest.

Lab School Migration

Working with lab school team and IT identified equipment list of materials and topology for move to new lab school location. Quote obtained for wiring installation. Ready to move once green light is given.

Applied Machine Learning

* Developing system to identify potential non-responders to TCFD program in the admission process, by profiling existing non-responders utilizing diagnostic, clinical and behavioral metrics.
* Carrying out a deep dive into Methylenetetrahydrofolatereductase deficiency in individuals with ASD at TCFD.
* Utilizing natural language processing sentiment analysis, analyzing narrative behavior data to investigate the frequency of good/bad/indifferent months in individuals with behavior intervention plan.

**Emory**

Update: 1 paper under peer review, 3 papers in pre-print with the target to submit for publication between now and Q1 2024. A number of follow up currently under consideration.

**RPI**

Update: paper published in The Journal of Personalized Medicine. Working on follow up paper and implementation of predictive model in program.