Motor Synchrony in Adolescents with Autism Spectrum Disorder:

A Feasibility Study on the Use of a Novel Dance Game Intervention

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Introduction

- All living beings experience synchrony; birds flock, bees swarm, humans dance. This instinct to coordinate movements with others may be an essential component of human social behavior.
- Recent empirical studies have shown how synchronous movement can increase cooperation, feelings of closeness, and empathy (Wiltermuth et al., 2009; Tarr et al., 2016; Koehne et al., 2016).
- Research is beginning to examine how synchrony may be connected to social context and behavior for people with social impairments, such as those with Autism Spectrum Disorder (ASD).
- Individuals with ASD have motor synchrony deficits and atypical activation and connectivity in brain regions associated with imitation (Marsh et al., 2013; Wasworth et al., 2017; Fishman et al., 2015).

Hypothesis

Motor synchrony plays an important role in successful social communication, thus we expect improving synchronous motor skills will have a positive effect on social communication ability.

Motor Synchrony → Social Communication

Objectives

1. Assess feasibility of an 8 week synchrony-based intervention
2. Train and quantify synchronous motor behavior using dance video game
3. Examine link between gross motor ability and synchrony ability

Methods

Participants

Intake Group	Participant ID	Gender	Age in Years	FSIQ (SS)(WASI-II)	ADOS-2 Social Interaction Total	ADOS-2 Calibrated Severity Score (1-10)	SRS Raw
ASD (N=2)	Sync03	M	18	108	12	6	58
	Sync06	M	17	99	10	6	80
TDC (N=2)	Sync04	M	16	103	2	2	13
	Sync05	M	15	104	3	1	18

Methods, cont.

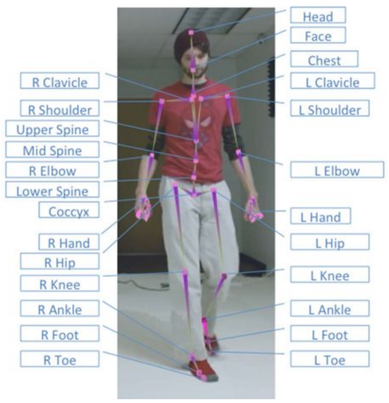
1. Assess Feasibility

- Administer Engagement Interview to determine the optimal length, duration, and content of each training session

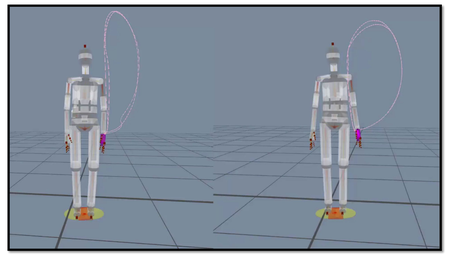
2. Synchronous Movement

- Measure baseline synchrony ability pre and post training
- Train synchronous movement using dance video game (30m/session)
- Use Kinect camera to create 3D skeletal model of subject's body to track movements over time

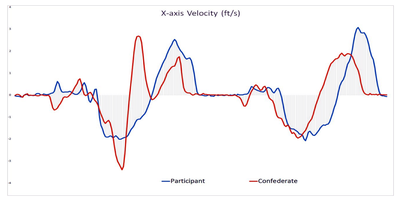
Tracked Body Parts



Synchrony Tracking



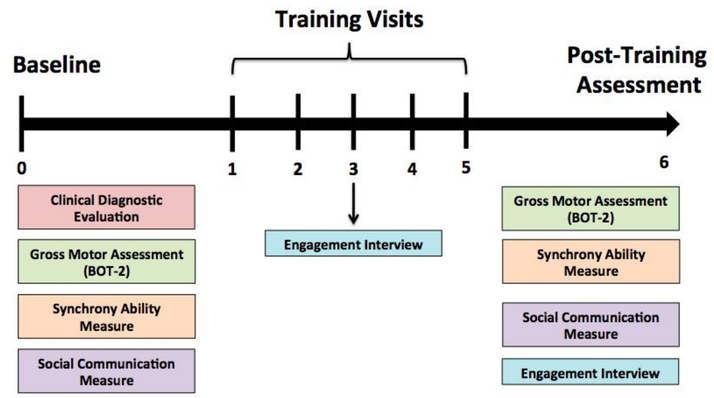
Researcher Participant



3. Gross Motor Ability

- Use Bruininks-Oseretsky Test of Motor Proficiency, Second Edition (BOT-2) pre and post training to measure manual and body coordination

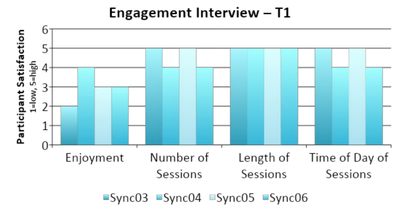
Study Design

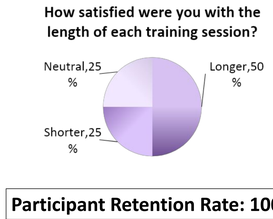


Preliminary Results

1. Feasibility

- Participant feedback was generally positive in both groups:

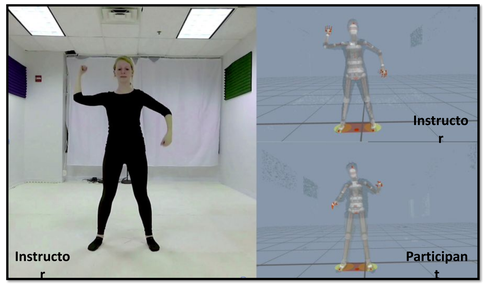




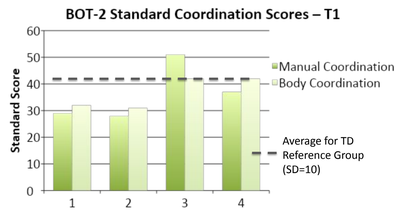
Participant Retention Rate: 100%

2. Synchronous Movement

A quantitative pipeline for comparing movement synchrony is being developed and will be applied to each participant at each time.



3. Gross Motor Ability



- TDC Participants performed average (41-59) or just below average (31-40) in both categories compared to age group
- ASD Participants performed below average (31-40) in body coordination and well-below average (30 and below) in manual coordination
- Once complete, BOT-2 T2 scores will be used to compare pre and post intervention coordination ability.

Future Directions

- Does gross motor ability predict motor synchrony ability?
- Does motor synchrony intervention have an impact on brain regions involved in imitation processing?

For Phase II:

- Develop finely graded dance video repository to allow for more gradual learning
- Standardize dance instruction using recorded training sessions
- Use measures of social ability to investigate synchrony generalizability

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