Social Synchrony in Youth at Risk for Psychosis
Results from CALMS: a Biofeedback Videogame Intervention

BACKGROUND

Social synchrony is a measure of the subtle give-and-take in social interactions, seen in rhythmic, reciprocal patterns of movement and behavior between two people. For many people, these processes are automatic. However, those with schizophrenia and other psychotic disorders have been found to show significant deficits in social synchrony (Rafford et al., 2015). This is important, because nonverbal behavior is a fundamental part of communication and social connectedness. In disorders such as schizophrenia, social deficits often surface long before a person is diagnosed with the disorder (Varlet et al., 2012), making social synchrony a potential biomarker for various mental illnesses associated with diminished social functioning. This also makes synchrony a prime target for investigation in a clinical high-risk (CHR) population.

This study sought to test whether social synchrony between CHR youth and their parents increased over the course of a therapeutic biofeedback-based video game. In addition, synchrony data were compared to participants’ self-reports of conflict in their relationship.

METHODS

Participants
9 parent-child dyads, with adolescents meeting criteria for CHR according to the Structured Interview of Psychosis-Risk Syndromes (Miller et al., 2003), provided pre-post synchrony data.

Videogame Intervention
Computer Aided Learning for Managing Stress (CALMS) is a 12-session family therapy. It utilizes a biofeedback video-game designed at Boston Children’s Hospital to help participants reduce stress reactivity (Ducharme et al., 2012). During gameplay, both players must work together and keep their heart rates below a threshold to score points, thus targeting communication & self-regulation skills.

SYNCHRONY & Self-Report Data
Before and after the treatment, dyads were videotaped in a 10-minute interaction during which they were directed to problem-solve a topic that created tension between them. Synchrony was calculated using nonlinear spectral analysis of the pixel changes for both participants’ movements. Correlation coefficients were then compared to a virtually connectedness towards schizophrenia patients. Scientific Reports, 5(1). doi:10.1038/srep08156


REFERENCES


1 Massachusetts Mental Health Center, Beth Israel Deaconess Medical Center, Boston, MA; 2 College of the Holy Cross, Worcester, MA; 3 Harvard Medical School, Boston, MA

RESULTS

1. Change in Social Synchrony during CALMS
At baseline, coherence scores in the CALMS pairs were not significantly above chance (control). Following the videogame intervention, coherence of CALMS pairs was significantly greater than both baseline scores and the chance control (Figure 1). Synchrony was calculated using nonlinear spectral analysis of the pixel changes for both participants and their parents participated in the CALMS family therapy feasibility trial showed a significant increase in synchrony over the course of participation, which suggests that these games may foster social coordination between players in real life.

Data indicate that youth-parent interactions may be enhanced in certain patterns of synchrony, including both short (ex. hand gesturing) and long frequencies (ex. extended talking/listening & turn-taking). Decreased conflict and criticism are most closely associated with better synchrony. However, increased symptoms and improved functioning were also associated with increased coherence at 30 second intervals (Table 2). These results support our hypothesis that reduced conflict in the parent-child relationship will be associated with better synchrony. Decreased symptoms and improved functioning were most closely associated with improved coherence in social synchrony, such as turn-taking, at specific behavioral frequencies.

2. Association of Synchrony Change to Changes in Symptoms and Interpersonal Conflict & Criticism
We conducted a Principal Components Analysis using 7 pairs whose synchrony was greater than chance to examine the clustering of change across measures. Increased synchrony at shorter frequencies was associated with decreased conflict and conflict and improved functioning, but increased symptoms (Table 2). These results support our hypothesis that reduced conflict in the parent-child relationship will be associated with better synchrony.

3. Lag in Interaction for Youth & Parent
Our analysis also examined the interpersonal dynamics of the parent-child interaction compared to a random control condition. During the baseline interaction task, youth movements lagged behind their parents to a degree significantly greater than the control comparison, suggesting that parents led the interaction prior to CALMS. Following CALMS, however, youth led the interaction with parents following (Figure 3).

CONCLUSIONS

Cooperative multiplayer videogames may present a fun, engaging tool to address social deficits in youth at risk for psychosis. Dyads participating in the CALMS family therapy feasibility trial showed a significant increase in synchrony over the course of participation, which suggests that these games may foster social coordination between players in real life.

Data indicate that youth-parent interactions may be enhanced in certain patterns of synchrony, including both short (ex. hand gesturing) and long frequencies (ex. extended talking/listening & turn-taking). Decreased conflict and criticism are most closely associated with better synchrony. However, increased symptoms and improved functioning were also associated with increased coherence at 30 second intervals (Table 2). These results support our hypothesis that reduced conflict in the parent-child relationship will be associated with better synchrony. Decreased symptoms and improved functioning were most closely associated with improved coherence in social synchrony, such as turn-taking, at specific behavioral frequencies.

Figure 1. Coherence before and after videogame intervention compared to virtual control condition

Table 2. Rotated Component Matrix from factor analysis of changes in symptoms, functioning, parent-child criticism, conflict and synchrony

Table 3. Participant demographics

Figure 3. Lag in interaction (positive indicates parent leading, negative indicates youth leading)

Kelsey Johnson, Richard Schmidt, Cole Chokran, Joyce Cheng, Kristen Woodberry

1 Massachusetts Mental Health Center, Beth Israel Deaconess Medical Center, Boston, MA; 2 College of the Holy Cross, Worcester, MA; 3 Harvard Medical School, Boston, MA