The Effects of an Information Technology (IT) Club upon Well-being and Social Communication in Children and Teenagers aged 12 to 17 years with Autism Spectrum Disorder (ASD)

University of New England

August, 2017

Kimaya Sarmukadam

Vicki Bitsika

Chris Sharpley

Brain-Behaviour Research Group,

School of Science & Technology,

University of New England.

Executive Summary

A second ASD-IT Club was conducted in Trimester 1, 2017. The Club was originally designed to improve social communication skills in children and adolescents with Autism Spectrum Disorder (ASD), using an Information Technology (IT) platform. In this cohort, four males aged 12 to 17 years participated in the ASD-IT Club for a total of six two-hour weekly sessions.

Pre- and post-test measures suggested a reduction in participants' overall anxiety and depression levels. Some changes in their perceptions about bullying and IT skill development were also reported. Several individual social changes were observed in each participant over the six-week period. All participants showed subtle, but promising, increases in their interest in each other, exhibited through increased eye contact, social imitation, initiation towards the lecturer, and turn-taking. Emotional self-regulation appeared to be a major gain in all sessions as participants were able to get back to the task at hand despite environmental changes.

Introduction

The ASD-IT Club was originally designed in 2016 to develop Information Technology (IT) abilities and Social Skills in young people with Autism Spectrum Disorder (ASD). This report contains findings from the ASD-IT Club that was conducted during Trimester 1, 2017. Similar to the previous cohort, the ASD-IT Club in Trimester 1, 2017, ran for two-hour sessions every week over six weeks at the University of New England, Armidale, NSW. The room designated for the ASD-IT Club was the same as that used for the previous ASD-IT Club, and was specifically chosen to ensure minimal auditory and visual distractions. Please see Figure 1 for an outline of the ASD-IT Club room and seating arrangements.

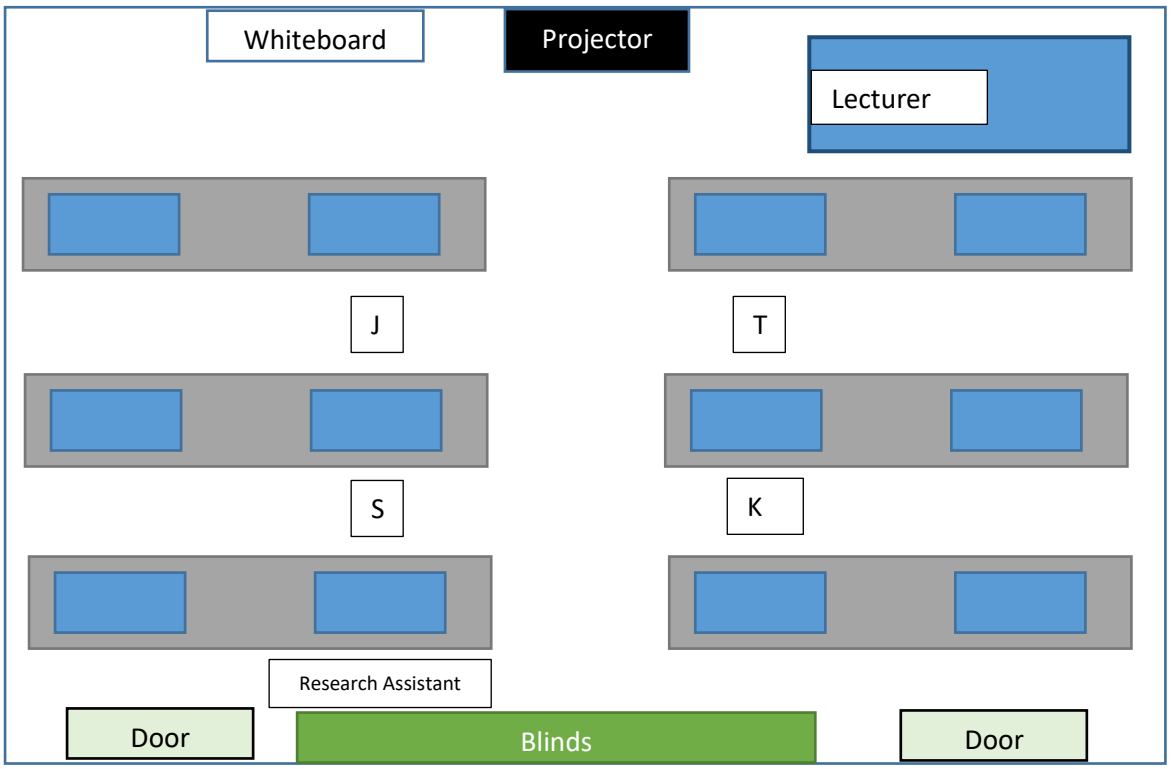

Figure 1. ASD-IT Club Physical Structure and Seating Arrangement

Four young males aged between 12 and 17 years (coded as J, T, S, and K to protect identities) with ASD and identified as being high functioning (IQ > 70), were recruited via publicity materials. All of these young males had expressed an interest in IT activities. The participants were taught early programming concepts using Scratch programming by an IT lecturer. In addition, a research assistant (RA) monitored the sessions and the students' behaviours. The general agenda for each session included an introduction to the current topic, review of activities of the previous session, a transition game, two programming concepts, one or two short breaks, and a post-session questionnaire. Although the duration for these activities

may have varied from session to session, the length of each session was approximately two hours.

Findings

To evaluate interactions between the lecturer, peers, and the RA, a sessional Communication and Socialisation Checklist was completed by the RA for each participant after all six sessions. At the end of each session, the RA asked participants some open-ended questions to obtain feedback regarding their experience of that session. Additionally, following the procedure used in the first ASD-IT Club, a pre-post-test design was used to evaluate the data from participants' self-reports and parents' evaluations. Table 1 describes the methods used to administer those tests.

Table 1: Description of Tests and Administration of Methods.

Type of Test	**Research Issue**	**Type of Administration**
Communication and Socialisation Checklist	To monitor any changes in social communication or social interaction over the 6 sessions	After every session [Questionnaire, completed by RA]
Post-Session Questionnaire	To gain input from participants regarding their experiences after each lecture	After each session [Open-ended questions, completed by participants]
Social Emotional Assets and Resilience Scale (SEARS)	To record participants' social skills development	Pre-post-test design for participants (administered before the first session and after the sixth session) – [Questionnaire, completed by participants]
Child and Adolescent Symptom Inventory (CASI-4) – Subscales	To record participants' behavioural, affective, cognitive symptoms, which may be associated with childhood and adolescent psychiatric disorders – Subscales include CASI-4 items from Categories A (Attention-Deficit /	Pre-post-test design for participants [Questionnaire, completed by participants]

Type of Test	Research Issue	Type of Administration
	Hyperactivity Disorder), D (Generalised Anxiety Disorder), E (Specific Phobias – Agoraphobia, Obsessive Compulsive Disorder, Post-Traumatic Stress Disorder), F (Social Phobia), G (Separation Anxiety Disorder), and K (Major Depressive Disorder)	
Participants' experiences, responses, and attitudes to bullying	To record participants' experiences with bullying in the school environment	Pre-post-test design for participants [Questionnaire, completed by participants]
Participants' attitudes to further IT studies and employment	To record participants' attitudes towards IT	Pre-post-test design for participants [Structured Interview, conducted by RA with participants]
Participants' IT skill development	To record any changes in IT skill development	Pre-post-test design for participants [Structured Interview, conducted by RA with participants]
Parents' attitudes to child's future IT study and employment	To record parents' attitudes regarding their child's attitudes towards IT	Pre-post-test design for parents [Structured Interview, conducted by RA with parents]
Parents' evaluations of their child's ASD-IT Club experience, including environment	To record parents' perceptions on their child's ASD-IT Club experience	Post-test design for parents (administered after the last session) - [Structured Interview, conducted by RA with parents]
Child and Adolescent Symptom Inventory (CASI-4) – Subscales	Parents' evaluations of their child's symptoms associated	Pre-post-test design for parents [Questionnaire, completed by parents]

Type of Test	Research Issue	Type of Administration
	with CASI-4 categories A, D, E, F, G, and K (as described above)	

Social challenges (such as answering questions from lecturer and RA, sitting next to peers, and having more interaction with peers) were also introduced to this cohort. These social challenges were chosen to increase self-regulation and social skills between peers in a controlled and supported environment. Some of those social challenges included participants being asked group or direct questions, and experiencing minor seating changes during session 5. Below are the findings from pre-post-test measures, the Communication and Socialisation Checklists, post-session questionnaires/discussions, plus anecdotal observations made by the RA during all six sessions.

Pre- and Post-Test Measures

In order to evaluate participants' self-reported levels of anxiety and depression, social interaction skills, and experiences with bullying, they completed tests on these domains prior to and following the ASD-IT Club programme. These tests included the *Social Emotional Assets and Resilience Scale (SEARS)*, child's ratings of *Child and Adolescent Symptom Inventory* containing items from categories A, D, E, F, G, and K (*CASI-4 Subscales*), IT-related questionnaires, and structured interviews, as described in Table 1. Parents also completed pre-post-testing comprising parents' ratings of *CASI-4 Subscales* and questionnaires regarding IT development. Post-test design measures were collected approximately one to three weeks after the final ASD-IT Club session finished. Results were analysed using descriptive statistics in IBM SPSS Statistics v24.

Minimal changes were reported for the *SEARS* and *Attitudes to further IT studies and employment* questionnaires. Although not statistically significant, some changes were found for the *Participants' experiences, responses, and attitudes to bullying*, *CASI-4 Subscales*, and *Participants' IT skill development* tests.

The *Participants' experiences, responses, and attitudes to bullying* questionnaire covered two different domains of bullying to gain insight on how ASD-IT Club participants may have been bullied in the school environment. These two domains covered: 1) how much other students had bullied the participants using their words (verbal bullying and teasing); and 2) how much other students bullied the participants using their actions (physical bullying). In

the post-test measure of the *Participants' experiences, responses, and attitudes to bullying* questionnaire, an overall reduction of 47.4% was found over the pre-test measure scores. Specifically, participants self-reported less instances of being verbally bullied and/or teased, demonstrated by a decrease of 65.8% in post-test scores, as compared to a 16.7% decrease in participants being physically bullied.

Post-testing revealed an increase of 19.3% in *Participants' IT skill development*. In addition, all participants reported slight increases (depending on the participant, a 3.8% to 30% increase in IT skills was recorded) in their knowledge or ability to use and learn IT, particularly in response to questions such as "How much do you think you know about IT?" and "Do you feel confident using IT?"

Finally, the greatest differences were reported in the *CASI-4 Subscales* scores. Cumulatively, participants reported (using the child's rating version of *CASI-4 Subscales*) a 67.5% decrease in their post-test scores as compared to pre-test scores. Interestingly, in the *CASI-4 Subscales* scores as evaluated by parents' perceptions, an overall decrease of 28.5% in post-test measures from pre-test measures was also reported. These scores suggest that reduction in some anxiety, specific phobia, and depression symptoms may have been related to the ASD-IT Club environment.

Almost all participants reported that they were less inclined to feel fearful or avoid specific objects or situations in the post-test measure than they reported in the pre-test measure. Additionally, participants' post-test scores (child's ratings) showed reduced ratings on items such as feeling uncomfortable in social situations, feeling sad or depressed most of the day, and feeling irritable, compared to their pre-test ratings. Figure 2 (p. 7) demonstrates the percentage decreases in specific *CASI-4 Subscales* items (from categories A, D, E, F, G, and K) – self-reported by participants - in regards to pre-post-test design scores.

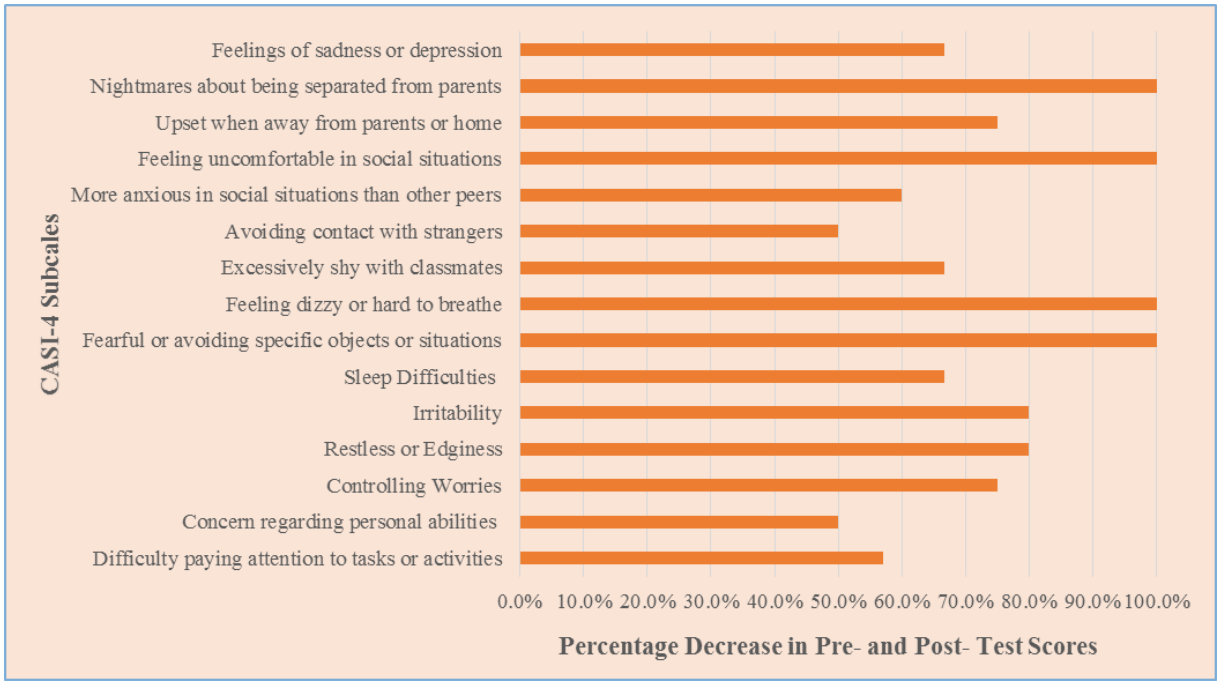

Figure 2. Participants' Percentage Decreases in CASI-4 Subscales Pre- and Post-Test Scores.

Communication

The communication domain of the *Communication and Socialisation Checklist* recorded participants' listening and responding skills to verbal cues presented during each session. Communication criteria consisted of listening to, and complying with, RA and lecturer instructions, answering direct questions from the lecturer, following conversations with the lecturer and others, and using spontaneous language. Findings from the communication domain are reported below.

Individual scores: Figure 3 (p. 9) demonstrates a percentage increase in individual performance in the communication domain from sessions 1 to 6. J's communication skill changes are not shown here because they were already appropriately used from the first session, except in regards to using spontaneous language and following conversations between participants and lecturer. Aside from an increase in showing interest in other participants, no significant change in J's communication was observed.

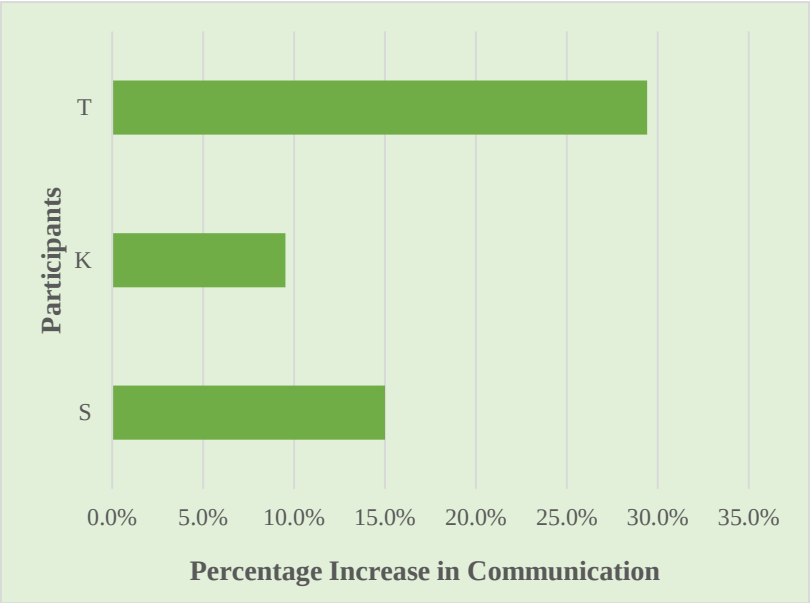

Figure 3. Progression of Communication Skills for Participants for all Six Sessions.

While S spoke most often, T demonstrated the most improvement from the first session onwards. T's communication was more structured. For example, he formed clear sentences that another person could understand, and these sentences were more relevant to the current topic under discussion. On the other hand, S listened and complied more to instructions as sessions progressed, and followed conversations between other participants and the lecturer more often than observed in the first session. K and J were both fairly quiet throughout the six sessions. However, K used spontaneous language (specifically directed towards the lecturer in the beginning of the last session) and followed conversations between peers and adults slightly more than during the first two sessions.

Group scores: Figure 4 (p. 10) demonstrates a percentage increase in group performance in the communication domain from sessions 1 to 6. As a group, participants appeared to show progress in almost each session on items that measured attention, listening skills, and initiation towards adults. Lower scores observed in session 5 may be attributed to unanticipated events (K had not come to the earlier session) and social challenges (higher task demand, more questions asked by the lecturer and RA). Overall, average group communication scores increased from session 1 to 6 by 12.7%.

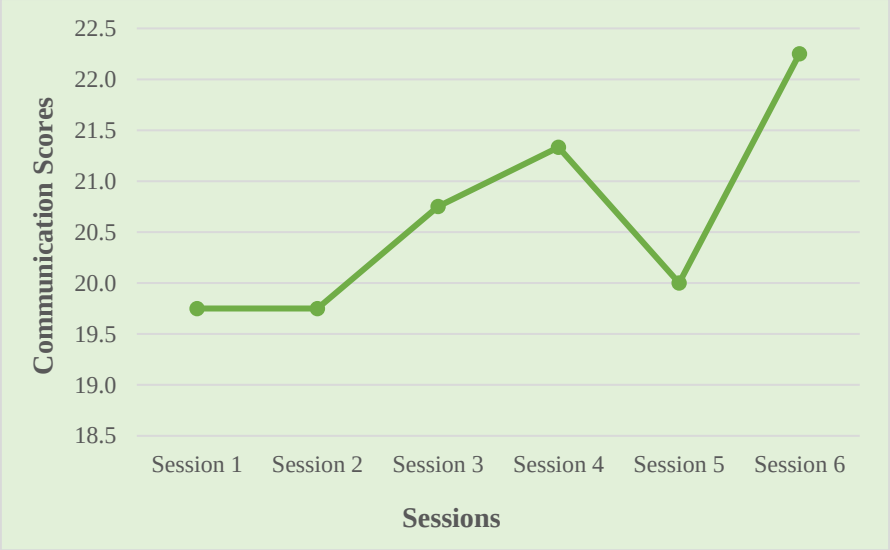

Figure 4. Average of Communication Scores for All Participants.

Socialisation

The socialisation domain of the *Communication and Socialisation Checklist* recorded verbal and non-verbal interactions with peers, lecturer and RA during each session. Socialisation criteria consisted of eye contact, turn-taking, social initiations, emotional regulation, non-verbal interaction (facial expressions, social gestures), and responses to the lecturer's and RA's correction/praise. Findings from the socialisation domain are reported below.

Individual scores: Figure 5 (p. 11) demonstrates individual progress in social interaction skills for all participants from sessions 1 to 6. All participants improved in their social interactions. Specifically, S self-regulated more effectively (instead of hitting himself and grabbing his guardian or the lecturer for comfort when demands were high, he would ask the lecturer more questions about, and focus on, the task at hand), K initiated interaction skills with the lecturer more often, responded more completely to lecturer correction and praise, and looked at peers more often. T engaged in turn-taking more often, had more instances of appropriate eye contact (less staring, more focused towards the person speaking), and initiated more relevant conversations with the lecturer/RA. J engaged in appropriate eye contact more, showed more interest in others, and used social gestures more often. While participants did not show overt social behaviours such as initiating conversation or talking to each other, they did demonstrate subtle social behaviours such as S holding the door for another participant, or K and T taking turns when choosing a piece from the same pizza.

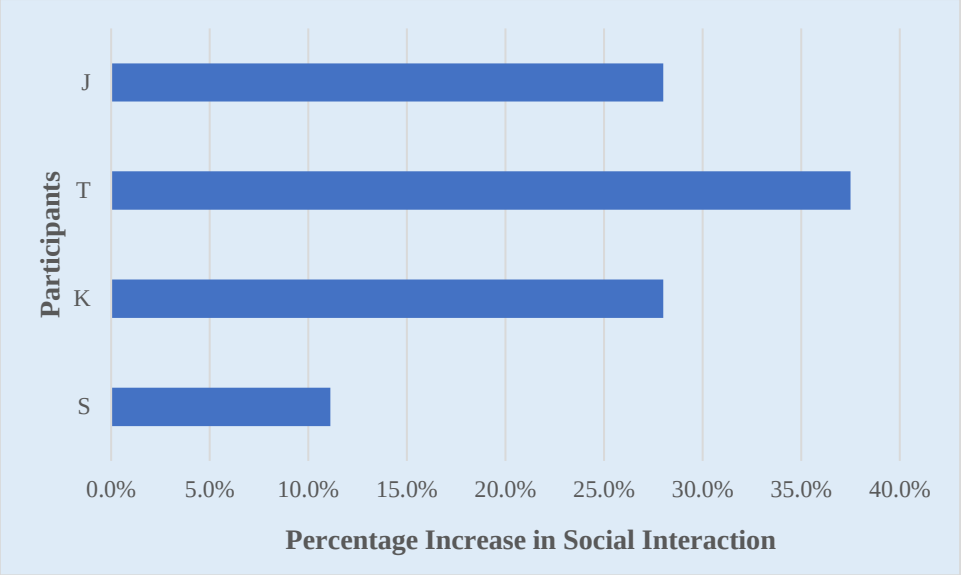

Figure 5. Progression of Social Interaction Skills for Participants for all Six Sessions.

Group scores: Figure 6 demonstrates group progress in social interaction skills for all participants from sessions 1 to 6. As a group, participants demonstrated a progression of social skills such as looking at the lecturer while he was teaching, looking at peers, taking turns, using social gestures, and especially regulating emotions throughout the six sessions. Again, potentially due to setting events and social challenges, a reduction in socialisation scores was found in session 5. Overall, average group social interaction scores increased from session 1 to 6 by 25.7%.

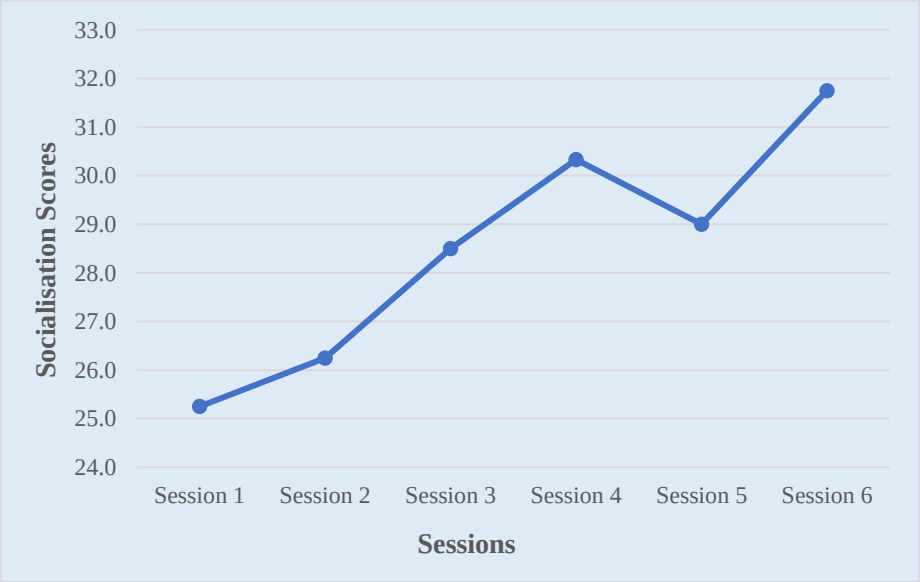

Figure 6. Average of Social Interaction Scores for All Participants.

General Observations

Overall, while participants rarely spoke to each other, their interest in each other grew progressively during each session (e.g. listening, turning to the person talking, trying to look at a neighbour's screen, turn-taking during post-session questions). Increased emotional self-regulation was also observed in the participants over all six sessions. For example, in the first session, T had difficulty regulating his emotions, looked towards anyone making slight movements, stared intently, cowered slightly, and appeared restless. Towards the end of the sixth session, T still showed interest in other participants but was able to focus on the session and self-regulate his behaviour more effectively. Additionally, most participants and their parents reported a decrease in anxiety, depression, social phobia, and other *CASI-4* subscales, a steady increase in self-reported IT skill development, and a decrease in bullying behaviour.

Background factors (having missed attendance at the previous session, knowing which peers would be present, and/or having at least two parents/guardians present at each session) may have had an impact on the quality of each session for some participants.

During the last session of the ASD-IT Club, all participants were observed to ask questions more freely, put up their hands for questions, and be more attentive. Additionally, all participants genuinely appeared to have an interest in the IT material being delivered. In the post-session questionnaires/discussions, S commented that his favourite parts of the club were "Minecraft, pizza, and Plants *vs* Zombies", while T commented that he liked "everything" about each session. One of the participants' parents also said that this course had allowed her son to see a future in IT and was the "first time ever he could see himself doing something in the community".

Conclusions

Participants in this cohort appeared to have had more positive "internal" (or emotional) changes in relation to their experiences with bullying, general anxiety, social and specific phobias, and depression (as identified by the self- and parent- reported questionnaires) than "overt" (or behavioural) social changes. However, although participants may not have initiated interactions or spoken to each other often, there was a steady and increasing interest in each other's activities.

Overall, this cohort of participants appeared to enjoy the structured environment and socially interactive parts of the ASD-IT Club, and increased their interest and self-belief in their IT skills.

Recommendations for further ASD-IT Clubs include incorporating a slow progression of social challenges to increase social interaction throughout the sessions. Providing cooperative two-person activities may increase socialisation with other peers.