SoundScape: An Interdisciplinary Music Intervention
for Adolescents and Young Adults on the Autism Spectrum

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Abstract

Service provision for adolescents and young adults with autism spectrum disorders (ASD) is lacking, particularly post high school. We report on a music intervention program, outline our program model, and report some initial pilot data evaluating the program outcomes. We also discuss implications for undergraduate and graduate students who were involved in the project. Overall, outcomes were positive and highlighted the need for such interventions among the ASD community. We hope our observations focused on the strengths and weaknesses of the program will be helpful to others who may be considering implementing a similar intervention.

Introduction

Autism spectrum disorders (ASD), including autism, Asperger's syndrome, and pervasive developmental disorder - not otherwise specified, are characterized by a triad of impairments in socialization, imagination, and communication (Wing, 1981). Those with ASD may also experience depression, anxiety, high levels of stress, and low self-esteem. Challenges with social skills are a core feature and individuals on the autism spectrum often have few friends and many have been teased or rejected by peers (Dubin, 2007; Ozonoff & Miller, 1995). Such challenges can impact the individual through adulthood and interfere with vocational success (Chadsey-Rusch, 1992).

In 2003, there were 4007 reported cases of autism among individuals aged 6-22 years in our state, an increase of 634% since 1995 (Hollenbeck, 2004). In our University's city, and reflected across the nation, beyond the formal structure of public school and state funded programs, there are minimal opportunities and resources for recreation, self-development and positive peer interactions for individuals with autism spectrum disorders.

We would be remiss not to mention that many foundations run programs for children with developmental issues. Among the many nationally recognized programs, camps, and workshops, are two programs based in California, designed to give autistic students hands-on film-making, musical, and/or theatrical experiences working side by side with professionals.[1] One of the programs run by *Inclusion Films*, provide short filmmaking workshops, which are offered in the summer on several university campuses across the country. For many parents in our community this may not be an option, therefore we were looking to create a service that could be sustained with the help of university students in more of a service learning situation during the school year, with minimal cost to the participants.

This paper describes a community outreach music program called *SoundScape. SoundScape* was created as an interdisciplinary university based music class for high-functioning adolescents and young adults on the autism spectrum (ASD). This was a collaboration of two professors in the departments of psychology and music at a state university in the northeast. While our primary focus is to provide a much needed sustainable service to individuals on the autism spectrum in our community, our secondary focus is aimed at helping our students in the music education and psychology programs, both graduate and undergraduate, gain an understanding of and experience working with this population. As is the case for many music education programs, the topic of students with special needs will most often be covered within the required coursework, though there may not be a specific course and/or field experiences devoted specifically to this population (Colwell & Thompson, 2000). For the music education students in our program, even if they wish to gain more depth in this area, their curricular requirements preclude their ability to take elective courses dealing with special needs

populations. The *SoundScape* intervention program fills a void for those of our students wishing to augment their studies, and as suggested by VanWheeldon & Whipple (2005; 2007), it was hoped the experience of working in *SoundScape* would foster a willingness and comfort level for working with this population in the future.

Music Teacher Preparation and Students with ASD

Darrow (2007), in her historical overview, pinpoints the origin of music's role in the special education curriculum to the 1800's, though it's use was generally limited to achieving non-musical goals. Schools are generally the settings for structured interactions for students with ASD, and the music classroom is typically one of the few spaces where social and academic integration for these students can take place with relative ease (Darrow & Armstrong, 1999). Darrow & Armstrong (1999) suggest the very nature of the music class and the need to listen to others can often supersede many of the social isolation issues generally encountered by students with ASD. Teacher attitudes play an important role in whether or not individuals with ASD experience positive outcomes, yet many music teachers express feeling unprepared to teach this population (Colwell & Thompson, 2000; Hammel, 2001). The lack of diverse, context-specific field experiences, as well as the sheer number of students music teachers will likely see each week, are among the reasons often cited for the clash of expectations vs. reality once music teachers are out in the field (Blair, 2009; Colwell & Thompson, 2000; Devito, 2006; Hammel, 2001; R. M. Hourigan, 2009; VanWeelden & Whipple, 2007). In addition, students with disabilities are generally considered outside the core group of students when districts are creating curricula, with very little consideration given to the wide range of diversity among learners (Hitchcock, Meyer, Rose, & Jackson, 2002). This is compounded for music teachers, who unlike their general education counterparts may only see their students once a week for 30-40 minutes. Blair (2009) states this compressed time frame fosters in music specialists a tendency to move at a rapid pace, "making full participation especially difficult for learners with processing delays" (p. 3). According to Darrow (2003), it is often necessary for music teachers to adapt or alter their presentation as well as modify their content and assessment when working with this population. Yet as indicated by Blair (2009), it is not uncommon for "some specialists to view children with special needs as annoyances who continually disrupt 'their' lessons" (p. 2).

Music and Technology

The difficulty students with ASD have relating to others often results in a tendency to retreat inward (Graham, 2001; Hourigan & Hourigan, 2009). Hourigan & Hourigan (2009) point out the importance of creating activities that keep these students interested in learning and interacting with their peers. It is believed by some music therapists that musical activities, such as improvisation can result in improved communication and social interaction (Gold,

Wigram, & Elefant, 2006). Group improvisational activities require ensemble members to listen and attend to the performance of others in order to create a meaningful musical exchange of ideas among the players. Performers are in effect engaging in a non-verbal, "musical conversation." Yet according to Craig and Baron-Cohen (1999), children with autism exhibit a lack of normal creativity and are less inclined to produce novel or imaginative responses. Their thinking is more reality based. In addition, Blair (2009) suggests that for students who need predictability and routine, such as students with ASD, the creative activities inherent in many musical activities can pose a challenge for these students. The frustrations created by the lack of predictability, as well as other environmental triggers such as loud noises and bright lights can often cause outbursts (Darrow & Armstrong, 1999; R. Hourigan & Hourigan, 2009).

In their study of high functioning adults with ASD by Allen, Hill & Heaton, (2009), the authors sought to uncover what the participants' subjective experiences were with music. Though the study focused on a relatively small sample, they found that large percentages of their respondents used music to alter their mood, help them relax and reduce feelings of loneliness. Consistent with research on adolescents in general, such as a study by North and Hargreaves (1999), the authors of this study found that many of their respondents believed music helped define their identity and gave them a sense of belonging (Allen, et al., 2009). They also found there was a stronger sense of social connectedness, particularly among those who identified more with pop music (Allen, et al., 2009). The authors state, "The majority of our group found music of value in achieving improvements in mood, as well as for improving personal and social integration" (Allen, et al., 2009, p. 36).

As Fowler (1996) states, the arts add important extensions of awareness and comprehension at the same time that they affirm the interconnectedness of all forms of knowing (p. 55). Langer (1996) asserts that music can present us with moods and emotions that we don't necessarily have to have experienced to comprehend and in subtle ways that go beyond the scope of language. The music-making activities incorporated into the *SoundScape* program required students to create, and reflect on their work, allowing them the opportunity to attach personal meaning to their learning. As suggested by Eisner (1996), "The arts provide the resources for the construction of meaning" (p. 8).

The use of technology tends to support the natural social tendencies of children (Druin, et al., 1999). In their research, Druin et al. "… saw technology as a bridge and catalyst for children interacting with each other" and the authors go on to note that "children generally do not create in isolation: they want to share, show and use technology with others" (p. 62). Though their research was focused on a more general population, the literature on students with ASD supports similar findings. Sturmey (2003) suggests the potential for video technology with

this population can aid in their social interactions as well as helping to improve academic performance and language skills. Goldsmith and LeBlanc (2004) believe that due to this population's natural fascination with technology, treatments should be devised to capitalize on this attraction. Compared to more traditional methods of instruction, technology based interventions can increase motivation and attention as well as help to decrease inappropriate behavior and improve self esteem when working with students with ASD (Goldsmith & LeBlanc, 2004; Hutinger, 1996). Contrary to those who believe computers promote isolation, computers are able to accommodate a more cooperative approach, both while students are working at the computer and in promoting shared decision-making (Goldsmith & LeBlanc, 2004; Greher, 2003; Hutinger, 1996). The class activities and projects were designed to encourage social interaction through collaborative projects geared to the students' natural interests in music and technology. While students could opt to work alone, ultimately few chose to. In fact a student in year one chose to create a solo video using drawings to tell her story rather than appear on camera. She returned to the program in year two and was front and center on camera performing with several other students.

Just as teacher training affects a teacher's willingness to work with and adapt curriculum for students with ASD, teacher training is also critical for a teacher's willingness to create technology rich instruction, regardless of the population they are teaching (Bauer, 2007; Cuban, 2001; Hutinger, 1996; McGrail, 2006). So that teachers of students with ASD can effectively work with the technology, they not only need training, they also need to involve families in their decision making regarding technology (Goldsmith & LeBlanc, 2004; Hutinger, 1996). Hutinger found that software programs that allow students to be the decision makers are particularly effective (1996).

It was our belief that the use of music technology would be engaging for the students we were working with. Teaching strategies that we would typically employ with adolescents were adapted to potentially serve as a model of effective strategies for technology integration for our university students. To that end, we chose to work with open-ended creation software which would allow the university students an opportunity to develop teaching strategies in line with a constructivist philosophy, though they would be gearing their lessons to students who need a fair amount of structure. On the surface this might seem contradictory, yet as Brooks and Brooks (1999) believe, an essential aspect of constructivist education is for teachers to understand their students' perspectives in order to create instruction that is relevant to them. The authors suggest, when active construction of meaning is at the core of a teacher's practice, multiple viewpoints are encouraged, and students are better able to work to their strengths and interests (Brooks & Brooks, 1999). It was challenging for our university students at times to understand that structure for these participants can coexist with learner-centered instruction. Yet by engaging the *SoundScape* participants in guided explorations of

music and sound, they could gradually begin to build up their students' confidence in their musical thinking and levels of ability.

Questions to Guide our Research

The purpose of this paper is to outline our intervention program, the strengths and weaknesses of our program model, and to report on some initial pilot data evaluating our program outcomes. Our research questions included:

1.   How successful would a music intervention program utilizing computer technology be for adolescents and young adults on the autism spectrum? How interesting and enjoyable would participants find this type of program?
2.   To what extent would participants benefit socially from such a program?
3.   Would an interdisciplinary program between psychology and music increase our university students' understanding of how to develop strategies for working with individuals on the autism spectrum?

We hope this will be informative to others who may be interested in replicating our program design.

Method

University Student Involvement

Among our objectives for involving our own students in this research was to promote the development of long-term professional career goals among our students, as well as provide psychology majors and future music teachers with a better understanding of disability, and autism spectrum disorders in particular. Involvement in this program would allow students to increase their competency in working with diverse populations. By giving students experience collaborating with colleagues outside of their major field, it was our belief they would gain some insight into different ways of thinking about and problem solving issues that arise when working with this population. As a secondary goal, it was hoped our students would come to see the importance technology plays in the life of today's students. We believed these experiences would increase their comfort levels when working with technology and encourage them to develop projects geared to student interests. *SoundScape* also afforded opportunities for our students to connect and apply course content to practical applications, thereby allowing them to extend their learning beyond the classroom into the community and on to their future career paths.

Participants

Potential group members for *SoundScape* were recruited by the psychology faculty, after being referred by a professional to whom flyers had been sent, or seeing one of our advertisements (either a flyer, information on our website, or a presentation about the program). Initially potential participants were screened using an enrollment form to ensure eligibility for the *SoundScape* program. To be eligible, participants needed an autism spectrum diagnosis, be aged between 13-30 years, and have no severe behavioral challenges. It is important that those joining this program met the typical ASD profile as the program model and curriculum is designed to meet the specific needs of individuals with ASD. Over the past two years, we recruited 22 adolescents and young adults who met these criteria. Participants were aged between 13 and 29 years with an average age of 18. One participant was Asian, and the remaining were Caucasian. There were no non-verbal participants in this study. This past year we involved six teaching assistants. Three students in the music education program and three psychology students implemented the program sessions.

Student Preparation and Support

The psychology faculty member prepared an information packet for the music education students with regard to the various procedures that would be observed as well as background information on Autism Spectrum Disorders. Information regarding how to work most effectively with this population, the importance of consistency in instructions, clear communication, and well-structured sessions were emphasized. The music faculty met with the psychology students to brief them on the types of projects that would be undertaken as well as providing a brief overview of some of the software programs that would be employed.

Based on feedback from the previous year, at the start of our second year of *SoundScape* before we officially began the project, the music teaching assistants (TAs) spent time familiarizing the psychology students with the computer lab and software in order to help them troubleshoot some of the technology issues that would invariably crop up. During the class sessions the music students took the lead running the class while the psychology students were interspersed throughout the room to help handle behavior issues and provide additional support. Throughout the project, the university students involved in the program met weekly with the faculty to discuss and debrief their sessions. They also corresponded through email when issues arose.

Program Model and Data Collection

The program ran 8 weeks for 90 minutes each week. The actual music-making portion consisted of an hour each week, during which an informal parent support group was also established in an adjacent room. Time before and after each session was taken up with pre-

and post-intervention measures used to evaluate the program. This data will not be reported here. However, results from a Feedback Questionnaire completed by both participants and parents at the end of the program will be summarized. The questionnaire consisted of questions answered on a rating scale from 1 to 10 as well as open-ended questions (see Appendix I). The questionnaire was kept anonymous and completed in accordance with the ethical review board of our university. Additional qualitative data was gathered from weekly journals kept by the music education students concerning their perceptions, understandings, and reflections of their experiences facilitating the program sessions. Notes taken from our weekly debriefing meetings provided additional data.

The psychology professor and her TAs, in order to ascertain the efficacy of this type of intervention to relieve stress and improve self-esteem on students with ASD, were responsible for the weekly pre- and post-session data collection, as well as the end of program data collection. Concurrent with the psychology professor's data collection, the music professor and her music education TAs, who functioned as participant observers in this research, were collecting observational data with regard to the effectiveness of the teaching strategies for this population of students. In addition to being a data source, it was believed that through weekly reflective journaling, the music education students would develop the ability to evaluate what did and didn't work each week and make mid-course adjustments to their weekly plan.

The multiple data sources from participants, parents and our student TAs were used to address our research questions. The first two questions, which were targeted towards the outcomes of the participants of *SoundScape* sought to address issues of student interest in the program and improvements in socialization. To that end, with regard to our first question of how successful a music intervention utilizing computer technology would be for adolescents and young adults on the autism spectrum and how interesting and enjoyable they would find this type of program; we would be seeking indicators of whether or not the students were actively engaged in class activities and discussions. With regard to our second question about the extent they would benefit socially; we would be looking for signs of students actively working together on projects. Our third question, aimed at our university students, sought to address whether an interdisciplinary program between psychology and music education would increase our university students' understanding of how to develop strategies for working with individuals on the autism spectrum.

The overall musical goals for our project centered on having the students learn more about music; play with and explore sound; compose and improvise music; learn how to produce music using technology; and make videos incorporating music. Admittedly, this was a tall order for an 8-week program, which at most might serve to give participants the confidence to pursue their musical interests further. As we discovered through conversations with parents,

many of the participants were never given opportunities to participate in their school music classes, which is consistent with the research regarding a music teacher's perceived abilities and comfort level working with this population (Blair, 2009; Brooks & Brooks, 1999; Colwell & Thompson, 2000; Darrow & Armstrong, 1999; Devito, 2006; Hammel, 2001; R. M. Hourigan, 2009; VanWeelden & Whipple, 2007).

The music education students designed the curriculum and specific activities for each session with guidance from both faculty members. By applying what they were learning about constructivist approaches to learning, they sought to build on the participants' inherent musical interests and preferences, Given the age of the participants, their interest in music and multimedia production, and the relatively short timeframe of the project, we relied on fairly intuitive computer generated technology such as GarageBand, a digital audio and music looping program and iMovie, a video production application, which was used to create short film scores, stand alone compositions, and videos.

Over the 8 weeks, the participants listened to different types of music and considered the various techniques used in these compositions. They played with and explored sound through composition and improvisation exercises using some acoustic instruments along with technology. In addition to enhancing their abilities for creative thinking and self-reflection, the participants interacted and worked with other adolescents and young adults on the autism spectrum. At the end of the 8 weeks, a presentation/pizza party was planned for the participants to share their compositions and videos with each other as well as with the parents, TAs and faculty.

Additional features

At the first parent meeting of the second year, the parents were wondering if anything was in place to encourage communication outside of the weekly group sessions. In response to their interest, we created a closed invitation only social networking site hosted by NING.COM. This website gave us the ability to post discussion questions outside of the class sessions and provided a forum for students to upload and share their favorite music tracks, pictures, and videos with the group. The site also allowed students to customize their own personal blog space.

During the second year, we also conducted several hands-on music sessions for the parents to help them better understand the technology applications we were working with and the kind of problem-solving activities their children would be experiencing. Since we were working on Mac's and many of the families were PC based, the music professor was able to suggest some low cost music software applications that might be similar to what we were using in *SoundScape*. These sessions turned out to be helpful for the professor as well, since the

informal conversations and activities with the parents provided the music professor with more insight into each child's specific musical interests and/or challenges.

Overview of Program Sessions

As an overview, the first week began with a listening activity that encouraged students to discuss what they were hearing and then try to create a similar composition, first by using body percussion, and then expanding on their composition to incorporate some of the musical instruments in the classroom. There were several guitars, keyboards, a computer workstation, which was also used to record student work, and large drums in addition to the typical collection of pitched and non-pitched percussion instruments found in a music education classroom. These compositions were recorded and played back for some reflective feedback on the process of creating these compositions. As one of our music TAs observed

> **…** it appeared as though the participants in the class were enjoying the activities. I could tell they were really excited about being recorded, because some were on the edge of their chairs, and poised for production. They wanted to practice until they all knew what they were going to do.

During the first year of this project, students were asked to bring in a CD of a piece of music that was meaningful to them to play for the class during the second session. They were asked to discuss what it is about the music and/or the performing group they find appealing. This was expected to be a short activity followed by a music making activity, however the music student leading this discussion soon realized she needed to go "off plan" and go with the flow of the class, as she explains in this excerpt from her journal:

> We talked about elements that were unique to each song and I wrote them down on the board... We compared each piece to the one we had just listened and showed how each song used the same instruments in a different way. Unfortunately, this activity took up almost all of the class. They kept talking about the music, and I didn't think it was right to interrupt them because they were still being productive. I used it as more of a social building skill than a "learning about music moment."

The next day, as this student was apologizing for not following the plan, the music professor was congratulating her for her ability to read the room and change course based on what the students needed. As a result of the experience from year one, this CD exchange became the main focus of the second class, and once again proved to be a major icebreaking experience for all involved. As a TA new to the project this year observed:

> When I was testing the iPod on the speakers, I simply played 2 seconds from a random Police (sic) song that literally consisted of sound effects. Without delay, one of the students alerted me to the exact name of the track. I knew right then that I was in a room with a unique group of people…overall I learned a lot about everyone through (sic) his or her specific music choices.

This listening activity highlighted for the university students the importance of getting to know one's students and how music and musical choices can play a role in that. It also is consistent with Allen, Hill & Heaton's (2009) research regarding music's role in helping shape identity and social interaction.

With only six weeks left to introduce the technology and have students working towards their final video presentation, the music TAs decided to prepare a short presentation on sound and motion, in order to set the stage for imaginative music making. They prepared a short story where two of the TAs played music while the third student acted out the scene. This led to a discussion of music's function in film and video as a prelude to the class breaking into groups to brainstorm ideas for their own mini stories, which the students would perform with music and sound effects. As one TA noted:

> During the performances, the students did a great job of using the music to be both sound effects as well as a device to set the mood. This is something we did not explain to them, they just naturally did it. For example, the first group used the piano and drums to set the mood, then used different hits on the drums to represent ashes falling to the ground. The second group used xylophones and a guitar to set the mood, and then used a drum and a tambourine (sic) to be people talking/arguing.

This TA later noted in her journal:

> …the students did a good job of figuring out what was happening in their pieces and there were some major breakthroughs on the students' parts of overcoming some self-confidence issues along with social issues.

As with the subjects in the study by Allen, Hill & Heaton (2009), this teaching assistant's journal observation indicated that the *SoundScape* participants understood the concept that music could suggest moods and imagery. The activity also created a safe environment for students to exchange ideas and "perform" in front of everyone while promoting social interaction.

During both years when the class moved to the computer lab, it was with the understanding that the students would begin working collaboratively. They began with a short composition project to create a piece of music suggestive of a train, and then they eventually began working towards their large-scale video project. The first phase of the introductory project began with a listening activity to guide their thinking (see Appendix II). Its main purpose was to focus on learning to use GarageBand while creating a piece of music that evoked motion and imagery.

<div align="center">

Click to play Music Composition Example 1
Click to play Music Composition Example 2
Click to play Music Composition Example 3

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In both years, it was noted there were many issues that cropped up concerning control of the mouse or keyboard and overall distractions due to being in front of the computers. Those students who were familiar with the music software application tended to take control of the project, though some pairs seemed to work well together.

The aim of the video project the first year was to tell a short story punctuated by music. The students first had to video a silent story that had a beginning, middle and end. They would add the music and sound effects in the editing phase. In the first year, it was not uncommon for several of the videos to have fight scenes or some other kind of inappropriate adolescent humor. For the second year video project, students were advised to keep the content school appropriate and not include any kind of violence. This journal selection highlights the students' reactions:

> This week we introduced the video project. We decided that we would have the class make a movie trailer in small groups so that we would have a variation from last years' project. Our guidelines were few: no violence, no bad language, and it had to be viewable to a PG audience. When we went over this with the class as a whole, they remarked that we were taking all the fun out of it by saying there could be no violence. It was hard trying to convince them that there were ways to make something look intimidating and scary without violence.

In fact, the reaction from the participants in *SoundScape* to the "PG rule" is no different from the reaction of most adolescent students we work with in public school settings. However, as with the non-ASD adolescents we work with, our *SoundScape* participants eventually came to the realization that the right use of music and sound could suggest what was absent yet implied in the video.

Weeks 5-7 focused on the creation of the video to be shared during the final meeting at the 8th session. During this time, we experienced a great deal of creative productivity mixed in with personal meltdowns as well as technical meltdowns. Issues ranged from not having the correct cables to transfer video to the computers, not being able to install the flip video camera's video software onto the computers due to administrative barriers in our lab, or for students to upload their video one week only to find their work missing the following week. This, along with some of the personal issues that arose from students not used to working collaboratively, created a bit of stress for the TAs.

Dealing with technology mishaps in any classroom situation can be stressful, but when working with a population whose frustration levels can be triggered by the smallest break in routine, having a teacher who can quickly re-direct the students' attention to an alternate activity, can restore calm and productivity in the classroom. In addition to technology issues, there were the many challenges of navigating a great deal of new terrain with regard to interpersonal relationships. It was during this time, based on the reflections provided by the TA journals and TA meeting notes, where the pairing of music TAs and psychology TAs had its greatest benefit. In this case, while the music students were dealing with the technology issues, the psychology students were helping to re-direct the participants' focus.

The 8th week was a sharing session and pizza party. The parents were invited to see what their children have been working on. The students generally sat with their group members and were eager to tell the audience about their creation. In certain instances, students who had been reluctant to perform in public were most eager to share their talents on video. In addition, the Feedback Questionnaires were completed. There was a version for parents / guardians and a version for participants (see Appendix I). These took around 10 minutes.

Results

Overall, we believe our *SoundScape* music program was successful. Participants found the program interesting and enjoyable, and also appeared to benefit socially. Specifically, data from the Feedback Questionnaire indicated positive outcomes. Some questions were answered on a scale from 1-10, some yes / no, and some were open ended. Table 1 summarizes the ratings and yes / no data, and Table 2 summarizes data from the open-ended questions.

Additional feedback was gained informally either through discussions with parents and group members, or by email. Emails such as the following from parents were not uncommon throughout the course of the program:

[He's] very excited after last week's class and looking forward very much to this week's class. Shared interest and excitement with teacher and program coordinator at school. They are looking into the possibility of locating an internship relating to film work. I haven't seen him this excited since high school graduation.

Several of the participants were interested in continuing to work with each other once the program ended, again indicating the social benefits of the program. There were even emails from parents relating their child's interest in learning to play an instrument. The music education and psychology students involved confirmed the benefits of their participation for their education in applying course content to practical applications, and also for their future careers. Based on the students' journal notes and our post-session weekly discussions, the interdisciplinary nature of the program did seem to benefit their understanding and skill in developing strategies for working with those on the autism spectrum. Their feedback also indicated an increased appreciation for using technology in the classroom to capture and maintain student interest.

Table 1. Summary of average ratings and yes / no data from Feedback questionnaires completed by parents / guardians and participants.

Question	Participants	Parents
How enjoyable have you [your child] found the music program?	7.86	7.91
How interesting have you [your child] found the music program?	7.82	7.95
How much do you believe you [your child] have benefited socially from the music program?	6.95	6.86
Have you [your child] made any friends in the music program?	19 "yes" 1 "kind of" 2 "no"	11 "yes" 4 "not sure" 6 "no"

Note: On the questions rated from 1-10 (questions 1, 2, and 3), a high score indicates a positive outcome. Scores are averages across participants.

Table 2. Summary of open-ended data from feedback questionnaires completed by parents / guardians and participants.

Question	Participants	Parents
What do you think you [your child] have learned through participating in the music program?	-Hard work and dedication. -Learning through participation. -How to use different programs and different ways to play music. -Learned a little fun and something that will stay with me forever. -How to make music. -New technology. -Editing skills, interacting more with people, being myself. -Socialize with peers. -Film making talents. -Passion. -Peer's interests. -Music appreciation. -Working with partners. -Music mixing. -Movie and music. -How music fits into world.	-He loves music anyway—very creative, but seems to enjoy more of a variety of styles now. -Working with peers, music in general, project work, a specific computer program. -Benefited by learning how to work together as a team and more importantly valuing the thoughts and opinions of others. -How to compromise and get along with others. -She feels that there are people like her by who she's accepted. Also she enjoys using the music software. -Thrilled to meet peers similar to himself. -Found interesting activity. -Enjoyed program. -Real life friends (no internet). -He feels less different. -Helpful to meet others with common interests. -Interacting with others similar. -Social dynamics. -Social activity.

How could we improve the music program?	-Watch a movie that is musical and listen to more music. -More instruments. -Sing-a-longs. -Not enough girls. -Group people by age and needs. -Too many weekly changes. -Longer final videos. -Writing down the music. -If people are returning to the program, give them extra time. Give people independent time. -Remainder of comments were either blank or suggested adding extra time to the sessions or making the program longer.	-More than once a week. -Need more technical information on music. -More training in instruments. -Allowing children the opportunity to work alone on a music project to showcase their creativity, or if not this then consider smaller group sizes. -Run throughout the year. -It would be good if they were conducted more frequently during the school year. -Keep up the great work.
Additional Comments?	-I gained a career goal. -Very good.	-Great opportunity due to limited programs. -Should be available at more locations. -Great Job! Thank you! -Wonderful experience. -Meet for longer. -We're all very grateful for the program. It's a comfort because it's helpful without being a clinical program (we have not had good experiences with such things). Being a research program is therefore a good thing for us.

Discussion

Examining our observations and findings from the music program *SoundScape* provided some important information regarding how to implement a successful intervention program for the autism spectrum population, and what some of the key components as well as challenges to success might be. We will further discuss these issues here. Firstly, findings from our Feedback Questionnaire highlighted some useful themes. With regards to our first research question, "How successful would a music intervention utilizing computer technology be for adolescents and young adults on the autism spectrum; how interesting and enjoyable would they find this type of program?", the ratings data shows that both parents and participants rated the program highly for how enjoyable they (their child) found it (average participant rating: 7.86; average parent rating: 7.91) (see Table 1). Ratings were similar in how interesting they reported finding the program.

Regarding our second research question, "To what extent would participants benefit socially from such a program?", ratings for how much they had benefited socially were also quite high (average participant rating: 6.95; average parent rating: 6.86). Nineteen participants and eleven parents agreed that they / their child had made friends in the program. Given the social challenges experienced by those on the autism spectrum, this is a very positive outcome. In fact in both years, the differences in student demeanor and body language changed dramatically from the first session to the last session. In general, there seemed to be a feeling of camaraderie in the room at the last sharing session as suggested by one comment from our debriefing notes:

> We noticed that all the participants sat in their groups during the presentation. They all traded phone numbers, and were making plans with one another to hang out.

It was even noticed that parents were sitting together as well. As suggested by one parent, "I am surprised at how open the kids were in participating in the video!" And as one student commented, "I liked when we made our own songs and movie!" In addition to our initial goals for this project with regard to socialization, we are learning the importance of the role of music making in fostering community building. Wenger (1998) espouses that to be a community of practice, three dimensions are needed; "mutual engagement, a joint enterprise and a shared repertoire (p. 152)." The author also discusses the fact that as a member of a community of practice, the comfort level becomes one where members can feel competent and be recognized by the other members and that these experiences can also contribute to the shaping of one's identity. Through shared music making, interests, and experiences, the *SoundScape* participants had truly come together in a manner suggestive of the beginnings of a community of practice.

In the open-ended data (see Table 2), participants mentioned a range of skills they felt they had learned from the program, including hard work, dedication, learning music, technology, and socialization skills. Comments from parents / guardians more commonly focused on the social benefits of the program, how to interact and work with others, and feeling accepted. Regarding how we could improve the program, many participants and parents mentioned making the sessions and / or program longer. With regard to this, one student who worked alone on a video the first year, by using drawings to tell her story, was front and center year two, singing and performing on camera with several other students. Other comments varied and included wanting more time playing with instruments, singing, and listening to music. The opportunity to add additional comments resulted in some very positive feedback, particularly from parents as can be seen in Table 2.

The weekly notes provided by one of the psychology TAs regarding the overview of the sessions and personality issues that were observed, as well as the weekly journals from the music TAs, provided us with multiple lenses into the weekly dynamics. While personality flare-ups and meltdowns occurred regularly, there were always enough TAs available to deal with those issues, allowing others to keep the classes running productively. In both years, there were one or two students who dropped the program after a few weeks due to either different expectations as to what the program was about or their unwillingness to work collaboratively. There were also students in both years whose interest in TAs bordered on inappropriate behavior. The TAs understood immediately the need to get feedback from the professors in order to deal with matters that required sensitivity. Another issue that was pointed out by one of the graduate music TAs this year based on her experiences from the previous year, was the need to make the weekly sessions longer. During the first year, the actual class time was usually only 40 minutes due to the amount of time it took to fill out the questionnaires at the beginning and end of the sessions. Beginning year two, we lengthened the sessions to allow a full hour for each of the classes.

For our university students, this project provided the opportunity to work between disciplines and gain insight from the fields of both psychology and music to make the sessions successful. Students commented on how working together helped them overcome challenges within the sessions and work most effectively with the participants. They also gained tremendous insight into the autism spectrum population. While the music education students were initially hesitant regarding their ability to work with this population, their journals indicate a continuing arc of confidence building as the weeks went on. They were able to attend to the variety of personality traits and devise strategies for the students to work cooperatively. As noted in one music education student's journal:

> …it appeared to me, that a few of the participants were interacting with each other in a way which could lead to future friendships, or connections. I know this was one of the main goals of this project, so I was very excited to see that happening.

The ability of the music TAs in particular to recognize small cues and slight shifts in behaviors increased throughout the course of this project. The following comment by one of the graduate music TAs is indicative of some of the small breakthrough moments they experienced during their involvement with *SoundScape*:

> From here, student A and student B (sic) really took the lead and started talking to each other and all the group members about what they wanted to do and how this could fit in with the music. One of the best parts for me to witness, was when student B (sic) gave student A (sic) a visual cue (by making eye contact and raising her eyelids) to let him know he needed to get up at that point. This was huge with Asperger's because they have problems with cues and eye contact.

The Music Education students also learned the importance of structure and consistency, clearly stating their objectives, the use of positive reinforcement and understanding the extreme sensitivity of this population. While they experienced many challenging circumstances, the college students observed that certain pairs of participants experienced a great deal of social growth while others experienced a great deal of musical growth as well. In general, consistent with Darrow's (2003) research, the music education students were learning how to adapt curriculum to the students they were working with.

Though the research suggests that students with ASD lack imagination (Craig & Baron-Cohen, 1999; Wing, 1981), our university students found the *SoundScape* participants had many creative and imaginative ideas, but keeping the students focused on their creations and ensuring the groups were making progress proved to be quite challenging. As observed by one of the psychology TAs during one of the computer lab sessions,

> The biggest difficulty of this week, and something that spanned every group, was the organization of ideas and balancing everyone's creative inputs. The moderators were very helpful in diffusing arguments about what should be in the video and helped to keep everyone calm and focused on the task at hand.

The following statement from a TAs journal speaks to the challenge of keeping a positive environment with a population of students with little self-esteem:

It was amazing to see how quickly they navigated through the creation process. As we have seen often in our work with these students, creating is typically not the challenge. Often it is management skills that they struggle with. The group that I was working with that night had a difficult time narrowing down their ideas. They seemed to get discouraged when one idea or concept didn't work out. Where these students needed my help the most was to help them recall the ideas that they had, and to keep the process moving in a positive direction.

As suggested by the research (Bauer, 2007; Cuban, 2001; Hutinger, 1996; McGrail, 2006), learning how to navigate through both the technology and behavioral issues was a constant theme for the music TAs. In one instance after a very long session fraught with technical problems, one TA made this observation in her journal:

Originally we were going to tell them that they couldn't use any CDs or other songs to make their soundtracks and that they had to only use loops from GarageBand. After all the trouble we went through that night, I think it would have been too much to say that they couldn't use songs they had already thought of. The lessons learned from this are to always, always, ALWAYS check the hardware/software before giving it to your students, plan a back up lesson in case the one you have fails...

The following comment from another TA, indicates how they were constantly struggling to find the right balance:

A big problem is the physical control of the computer, and the efforts made to keep everyone involved. I noticed immediately even when they were putting in their audio that certain students took over while others gave up or "checked out". Dr. H (sic) suggested that they control the mouse on a five-minute rotation, and make a game out of it. Although this might work I was hoping to wait and see if the group was working well together first. I think my first priority to help them move through their project while accounting for everyone's ideas. My first view was that as long as this was happening, the physical logistics of the computer would work itself out. However, I am now thinking that having them take turns with the computer is the best approach.

The following week after finishing the videos, he had found the balance that was needed to keep everyone focused and productive as this entry suggests:

> In terms of who controlled the computer, I found myself controlling the mouse more often. I acted as their hand on the project. I never did or suggested anything first. I would always allow them to tell me where to cut and how they wanted things to look. As I made moves, I often narrated them so they could see the process.

The above comments attest to the importance of new teachers learning to not only having backup plans, but also the need for flexibility in order to create a positive learning environment. Looking towards the future, we will build upon what we are learning. For computer work, it might be best to have students first work individually at the computer to learn the programs before starting them on a group project. It might also make sense to have clearly defined 'real-world' roles for the video project, such as producer, director, composer, and camera-person, as well as having students switch roles each week. Some students expressed a desire to play more musical instruments. Perhaps finding a better balance of using technology along with acoustic instruments could be utilized next time.

Overall, the *SoundScape* program filled a gap in service provision for the young adult ASD population in our community, and provides us with some initial insights into how to make such a program successful and beneficial. *SoundScape* provided a unique intervention for adolescents and young adults with ASD connecting their interests in technology with their interests in music; hopefully establishing a long lasting integration of music in their daily lives. Collective music making activities with their peers can be beneficial in providing a positive environment for socialization to bubble up from shared interests. In addition, music education and psychology students were impacted on a number of levels through their contributions to the program. Future work should focus on continuing to improve our understanding of the efficacy of music interventions for those with ASD. We hope these initial observations will facilitate the creation of other music interventions designed to address the needs of those on the autism spectrum.

Notes

1. See *The Miracle Project* for special needs children and their typically developing siblings - www.themiracleproject.com and *Inclusion Film's* filmmaking camps and workshops for students 18 or over interested in film production run by Joey Travolta http://www.joeytee.com

2. Track 1-Example of student performance based on first listening activity which is Warren Benson's *Handclappers* – students are asked to each create a clapped rhythm which they are

then asked to combine their rhythm with a partner's-they then have the option of performing their short composition using percussion instruments. This was from year one.

3. Track 2 – Example of a composition created to highlight a story. This description is from one of the psychology student's notes—

> Students were then split up into two groups to create their own scene with a soundtrack. One group depicted a volcano erupting quite well. Two students played drums and two played the keyboard while another was the actual volcano. They had a beginning, a middle, and an end. I encouraged them to work together with eye contact and to watch each other for visual cues, like the volcano starting to gather steam and momentum, leading up to the explosion. The other group was able to accurately guess what scene this group was depicting by using words like explosive to describe the combination of music and action. This group was a little anxious at the beginning of their performance, but did very well with a little bit of coaching. They gave each other lots of praise afterwards, and also received praise from the audience as well. They were very proud of their accomplishment.

4. Track 3 – This is an example of the train composition created by two students exploring Garage Band

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APPENDIX I

MUSIC PROGRAM - PARTICIPANT POST-INTERVENTION QUESTIONNAIRE

Participant Number: **Group:**   **Date:**

We use your responses on this questionnaire to help us evaluate the impact the music intervention program has had on you. It is important to answer the questions as accurately as possible, based on how you are NOW.

1. How enjoyable have you found the music program?

1	2	3	4	5	6	7	8	9	10

not at all enjoyable   very enjoyable

2. How interesting have you found the music program?

1	2	3	4	5	6	7	8	9	10

not at all interesting   very interesting

3. How much do you believe you have benefited SOCIALLY from the music program?

1	2	3	4	5	6	7	8	9	10

no benefit   great benefit

4. Have you made any friends in the music program?

        Yes   No

Please describe:

_____

_____

5. What do you think you have learned through participating in the music program?
Please describe:

_____

6. How could we improve the music program?

_____

_____

_____

7. Additional comments:

_____

_____

APPENDIX II

Guided Music Listening Activity for Train Compositions

Listen to each of the following pieces of music to discuss what the students heard in each piece.

- Be mindful not to mention the subject matter or title of each piece so that after all three pieces are played and discussed you can ask if there was a common subject or theme around all three compositions.
- Write down all the characteristics of each composition. Once you have uncovered the subject of a 'train' ask the students to discuss some of the techniques each composer used to suggest a train, motion, etc.

1. *Pacific 231* by Arthur Honegger
2. *America Before the War* from *Different Trains* by Steven Reich
3. *The Little Train of Caipira* from *Bachianas Brasileiras no. 2* by Heitor Villa-Lobos

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