

BANKWEST CURTIN ECONOMICS CENTRE

A STRENGTH-BASED PROGRAM

for adolescents with autism

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Executive summary

It is widely recognised that many individuals with Autism Spectrum Disorder (ASD) have abilities and strengths well suited to employment in the Information and Communication Technology (ICT) industry. Despite this, their overall employment rate remains marginal. A recent international survey of ASD experts revealed that 92 per cent of experts perceived that people with ASD had specific strengths and abilities, including attention to detail, a strong sense of morality, trustworthiness, loyalty, and memory. In addition, certain common attributes such as visual perceptual skills, mathematical abilities, memory and attention to detail are specifically well suited to tasks in the Information and Communication Technology (ICT) industry.

Recent studies have proposed that implementing strength-based programs that prepare adolescents with ASD for the workforce could improve their employment outcomes in adulthood. Unfortunately, there is minimal research on what actually constitutes a strength-based program and how these programs should be developed and delivered.

This report embeds current knowledge, as reported in literature, together with data obtained by observations and interviews from three existing strength-based ICT-groups. The aim was to develop guidelines for strength-based ICT programs for adolescents with ASD. In order to enable the provision of recommendations for service providers intending to deliver strength-based programs, this report identifies essential components of an effective, strength-based ICT program. Data analysis identified that while each of the programs employed differing strategies in implementing a strength-based approach, collectively the strategies could be clustered as components crucial in the implementation of autism specific strength-based ICT programs. The findings indicated three essential areas that service providers should consider when developing and delivering strength-based programs for individuals with ASD; 1) facilitators, 2) activities and 3) environment. This report also provides recommendations for service providers relating to the components to be considered in these areas when developing strength-based ICT-program.

Key findings

Facilitators

Facilitators were found to be a critical element underpinning the delivery of any community-based program. In strength-based ICT programs organisations need to consider the personal traits of the facilitators and their ability to build rapport with the adolescents with ASD, teach specific computer skills and create a safe environment where the adolescents can engage in tasks autonomously.

Good rapport was fostered when facilitators were perceived as experts in their field, displayed consistency in their attendance and behaviour, and authentically shared interests with adolescents. Facilitators require teaching skills, which underpin an individualised and collaborative approach, and consideration of adolescents' individual needs and preferences. Flexibility within programs enabled facilitators to adapt to 'the mood' of students, motivating them and creating opportunities for autonomous learning.

In implementing a strength-based approach the following should be considered:

- Recruiting facilitators based on their field of expertise while attempting to match these with adolescents' areas of interest.
- Recruiting facilitators with experience in ASD and/or disability.
- Educating facilitators in adopting an individualised flexible and collaborative approach and in teaching strategies for engaging adolescents with ASD.
- Emphasising the importance of consistent attendance and implementing strategies supporting facilitator retention.

Activities

Incorporating special interests within teaching activities resulted in a number of positive outcomes. In a strength-based ICT program, activities benefited from being tailored to include the adolescent's interests, facilitating the learning of new technology skills and encouraging socialisation. They should also focus on improving existing skills or talents, or on developing new skills relevant to the career goals of the adolescent. They should consider incorporating routine and structure, along with greater choice as adolescents expressed a preference for these in, strength-based programs.

Common strategies identified with effective strength-based approaches for individuals with ASD included managing expectations, focusing on visual learning strategies, identifying the "right level of challenge for individuals," and supporting adolescents to cope with failure. Peer mentoring emerged as a potentially effective approach to teaching new skills, but this requires on-going facilitator support. Providing the adolescents with an opportunity to showcase and/or demonstrate their technical skills to each other and their families emerged as an important factor associated with a sense of pride and enhanced socialisation.

In implementing a strength-based approach the following should be considered:

- Educating facilitators in goal setting techniques, grading student activities to the right level of challenge, modifying activities to incorporate adolescent interests and incorporating visual components.
- Developing strategies to enhance peer mentoring, such as educating facilitators on peer mentoring strategies and inviting graduates of a program to mentor new participants.

- Preparing adolescents for attending a program by providing visual material outlining the available activities, or by inviting families to visit prior to enrolling.
- Providing opportunities for informal and formal presentations of participants' work/portfolios, celebrating technology and participants' skills.
- Providing flexible hardware/software resources allowing facilitators to customise the activities to the adolescent's interests.
- Assessing the level of autonomy available within specific activities included within the program. For example, some software programs require following rigid instructions with no or few opportunities to exercise creativity.

Environment

Environmental factors, including those associated with the cultural, institutional and physical environment collectively impacted the outcomes of the programs. The strength-based programs observed in this study shared similar cultural environments, characterised by an acceptance of ASD, with adolescents defined not by their diagnosis, but by their personalities and strengths. While ASD was not a focus, allowances were made in relation to participants' needs and preferences, with a culture of "no pressure" to complete activities. Adolescents' shared experience of a diagnosis of ASD underpinned the strength-based approach, resulting in an environment in which participants felt safe and free to be themselves.

Institutional environmental factors impacted on the adolescents' level of anxiety and frustration, and on their ability to learn new technical skills with

established rules and boundaries perceived as facilitating learning. In regard to scheduling, programs should be delivered in short sessions over a longer period of time, working to avoid fatigue and supporting adolescents to work on projects at home, ultimately enhancing their skill development.

Consideration of the physical environment was found to work towards reducing the anxiety and frustration of adolescents with ASD. The physical space should be constructed with consideration for avoiding sensory overload and managing frustration. While hardware/software failures are at times unavoidable, some frustration associated with equipment can be managed, for example ensuring availability of computers with the required application installed.

In implementing a strength-based approach the following should be considered:

- Educating facilitators in a person-centered approach, placing the person before the disability, and approaches creating a "no pressure" environment.
- Recruiting facilitators with lived experiences with ASD/disability when possible.
- Recruiting facilitators from various backgrounds, with combining facilitators with technology experience and disability experience highly recommended.
- Collaborating and building relationships with parents.
- Consulting with parents and adolescents as to the suitability of the environment and how to best accommodate individuals needs and preferences.
- Providing opportunities for parents to receive technology training to support their child.

- Developing programs exclusive to adolescents who have/are in the process of receiving an ASD diagnosis in order to create a safe environment.
- Setting rules and boundaries which support adolescents to control and self-manage their actions.
- Conducting weekly sessions (of approximately two-hours) over a longer period.
- Accommodating the sensory preferences of individuals with ASD, with particular consideration for the fact that individuals with ASD may require more space than standard room capacity recommendations.
- Limiting hardware/software failures through the following approaches; 1) updating hardware and software prior to every session, 2) requesting students save their work regularly, 3) requesting students bring in a USB to save their work, and 4) matching hardware and software to student goals.

In conclusion, the findings of this report identified a number of components within three essential areas to be considered as the core of strength based ICT programs. As the aim of a strength-based program is to support an individual to reach their potential, the majority of the identified components in this report were external to the adolescent, focusing on activity or environmental aspects.

This should not be interpreted as implying that a strength-based approach ignores the challenges related to a specific condition. To the contrary, strength-based approaches should aim to support the individual's existing strengths and skills, acknowledging preferences and individuality without minimising their challenges and needs. It is believed that approaches such as this can both celebrate neurodiversity and help to build better futures for young people with autism.

"Today you are You, that is truer than true. There is no one alive who is Youer than You."

- Dr. Seuss

Background

and methods



Background and methods

In Australia, available data suggests that only 40.8 per cent of individuals aged 15 to 64 years with ASD participated in the workforce (Australian Bureau of Statistics (ABS), 2015), a rate substantially lower than that of all people with and without disabilities, as seen in Figure 1. Internationally, data suggests that individuals with ASD who are employed are still unable to support themselves financially due to underemployment (Cimera & Cowan, 2009; Howlin *et al.*, 2004; Eaves & Ho, 2008). The low employment rate is surprising because many individuals with ASD possess many attributes and strengths that are potentially appealing to employers (Bölte *et al.*, 2014; de Schipper *et al.*, 2016). A recent international survey of ASD experts revealed that 92 per cent felt that people with ASD had specific strengths and abilities, including attention to detail, a strong sense of morality, trustworthiness, loyalty, and memory (de Schipper *et al.*, 2016). In addition, certain strengths, such as visual perceptual skills, mathematical abilities, memory and attention to detail (de Schipper *et al.*, 2016; Diener *et al.*, 2015; Dierner *et al.*, 2016; Dawson *et al.*, 2007; Motttron *et al.*, 2006; Baron-Cohen & Wheelwright, 2007; Baron-Cohen *et al.*, 2009; Happe & Vital, 2009) are well suited to tasks in the Information and Communication Technology (ICT) industry.

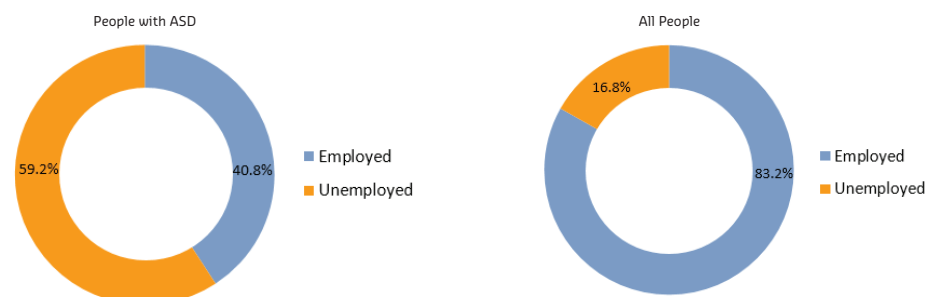
Several ICT companies have already recognised these strengths, such as Specialisterne in Australia who employ individuals with ASD to complete specific coding tasks (Specialisterne, 2017). Specialisterne's success has led to employment partnerships with Hewlett-Packard Enterprise (Australia), the Australian Department of Human Services and the Australian Department of Defence.

While some ICT companies, such as Specialisterne, successfully employ adults with ASD, limited research has examined how to use a strength-based approach to train adolescents with ASD to prepare them for the workforce (Wehman *et al.*, 2014; Lee & Carter, 2012; Higgins *et al.*, 2008; Test *et al.*, 2014). The strengths of people with ASD are often overlooked by employers because of their apparent difficulties in communication and social skills (Strickland *et al.*, 2013). It has been proposed that employment outcomes in adulthood could be improved through strength-based programs that prepare adolescence with ASD for work.

To date, there is limited research examining strength-based programs in ASD (Diener *et al.*, 2015; Campbell & Tincani, 2011; Dierner *et al.*, 2015; Mossman Steiner, 2011; Peckett *et al.*, 2016; Wright *et al.*, 2011), with even fewer studies applicable to adolescents. A framework for strengths-based programs for adolescents with ASD is yet to be developed and evaluated.

This report aims to provide recommendations for the delivery of strength-based ICT programs for adolescents with ASD. Future research is planned to evaluate the effectiveness of this program in preparing adolescents with ASD for work.

Figure 1 Workforce participation, 15 to 64 years old, Australia



Source: Bankwest Curtin Economics Centre | ABS Cat No. 4430.0, Autism in Australia.

Methodology

The methodology of this project was guided by The Medical Research Council's (MRC) framework for developing and evaluating complex interventions (Peter *et al.*, 2008). Complex interventions consist of multiple components that may act independently or interdependently causing change for participants (Campbell *et al.*, 2007). This study observed complex interventions in the community; strength-based classes teaching technology skills to adolescents with ASD. These technology classes likely contain many different components that impact adolescents positively or negatively, for example, a component may be the activities that are provided, or how a facilitator teaches a new skill, or whom the adolescent interacts with in class. The MRC framework refers to these components as, 'active components' or 'active ingredients'. Similar to medications, complex interventions have active ingredients, and like medications, removal of the active ingredient renders the intervention ineffective. Therefore, the MRC framework recommends that studies should identify the active ingredients and in doing so, they are identifying how the intervention results in positive change. This report will refer to 'active components' and 'active ingredients', as essential components.

The first step in identifying essential components for complex interventions involves reviewing the literature. This study identified 27 articles that delivered strength-based interventions to individuals with ASD. The articles were reviewed to determine all possible essential components for ASD specific strength-based interventions.

The second step was to deliver the intervention, even though all of the essential components may not yet be identified, and observe which components lead to positive change for the participants. Focus groups and interviews were conducted with the participants to confirm or refute the suspected essential components of the program. This enables programs to be refined based upon this feedback. This study observed and interviewed three service providers who delivered strength-based programs in the community; AASQA CoderDojo, Autism West and Firetech Camp Australia.

AASQA CoderDojo is a computer-coding club based at Curtin University, providing a free service to adolescents with ASD. The club runs every Saturday during the school year. Curtin University staff members, volunteer parents and volunteer Curtin computer science and occupational therapy students coordinate the club and its activities. The generous support of CoderDojo WA, the Ian Potter Foundation and Bankwest helped to supply resources and cover operational costs in order to provide a free service.

Autism West is a Western Australian not-for-profit organisation providing services to individuals with ASD and their families. Autism West runs a weekly group where adolescents with ASD can explore their special interests and strengths. Computer coding is often an activity at the Autism West group.

Firetech Camp Australia delivers technology-based education courses and aims to improve science, technology, engineering, arts and mathematics (STEAM) skills in children. The present study evaluated a Firetech Camp delivered over four days to adolescents with ASD, focusing on game development and robotics. A research grant allowed participants to attend the course without cost.

Separate focus groups and interviews were conducted with adolescents with ASD, their parents and facilitators from each of the above programs. A total of 21 focus groups and interviews were conducted with 20 facilitators, 24 parents and 23 adolescents (Figure 2). Each organisation had similarities and differences in their

approach to delivering their strength-based program for adolescents with ASD, and through observation and interviews this study identified the essential components of a strength-based approach. This report will detail the results in three main areas; facilitators, activities and environment. Recommendations for how service providers can accommodate these components are also included.

Figure 2 Focus group participants and average age



Facilitators



Facilitators

Facilitators are a crucial element of any community-based program, and data from the present study highlighted many facilitator related factors that contribute to a strength-based approach. Facilitator traits and how facilitators interact with adolescents impacted rapport building, teaching specific computer skills, creating a safe environment and autonomy.

The organisations demonstrated many different facilitator related factors that enhance a strength-based approach, including: 1) shared interests, 2) consistent attendance and behaviour, 3) individual and collaborative approach, 4) being a technology expert, 5) authenticity, 6) flexibility, 7) teaching experience and 8) facilitator-adolescent ratio.

Shared interests

When facilitators shared an interest with adolescents, such as a similar interest in video games, YouTube, movies or television series, they were better able to establish a good rapport. Once facilitators had established this rapport through a shared interest, adolescents were more receptive to learning new computer skills during class. The quote below represents how a parent described the importance of shared interests.

“I think one of the reasons why the classes work so well, is that the facilitators have the same interests, they like the same stuff, they play the same games... Having that common link is important for teaching.”

- Parent

Consistency

It was identified that when teaching adolescents with ASD, facilitators needed to display consistency in their attendance and behaviour. Some of the programs involved facilitators who volunteered, and consequently, they did not always attend every week. Inconsistent attendance impacted their rapport with adolescents, impacting their ability to teach the adolescents new skills. Consistency was also related to facilitators' behaviour during class. Facilitators who were consistent in their teaching approach and consistent in calmly responding to an adolescent's anger or frustration were able to create a safe environment, build a good rapport and create more opportunities for learning. The quote below represents a facilitator's comment on consistency.

“Students need to know that you are going to be there every week, regardless. They need to see you react the same way each time. For example, every time they get angry and you respond calmly, you will build more trust.”

- Facilitator

Individual and collaborative approach

While facilitators can improve outcomes through the simple act of consistency; they should also apply an individualised and collaborative approach when interacting with adolescents. An individualised approach considers every adolescent as unique with their own individual learning needs, learning preferences, sensory preferences, resilience, knowledge, experiences, goals and strengths. An individualised approach acknowledges that each adolescent has these unique qualities that should be considered when teaching.

A collaborative approach involves mutual respect between the facilitator and the adolescent. Even though the facilitator may have been considered an expert or a teacher, effective facilitators did not exert their 'power' but rather worked collaboratively with adolescents. A strength-based approach should encourage facilitators to use a blend of individualised and collaborative approaches. Below is a parent's comment on how facilitators worked with their son.

"The facilitators don't define him by his autism. They treat him as an individual. You know, rather than just say 'he has autism', they look at what he is good at, there is more to him than just autism. The facilitators also work with them, it is different from other places where teachers tell them what to do, here the students input is valued."

- Parent

Expert facilitators

While it is important to employ a collaborative approach, adolescents also described that they wanted facilitators to be experts. This required mentors to have detailed knowledge in a specific technology field while also working collaboratively with the adolescents. Being collaborative and being an expert were complementary, as facilitators with detailed knowledge of technology were able to share the same language and build a good rapport with the adolescents. Facilitators openly spoke about their background, training and experience in the field of technology, which helped to build rapport with the adolescents. Adolescents also acknowledged that having expert trainers was helpful because they could teach them skills that they could not learn by themselves. Here is what an adolescent said about expert facilitators.

"Some things you just can't learn at home by 'Googling'. I just don't know where to start. The facilitators here know what to search for and can help me."

- Adolescent

Authentic facilitators

While the adolescents valued expert facilitators who could teach them new skills, parents and facilitators valued authenticity. Parents identified that the facilitators in the program were experts in their field and also found enjoyment in the subject matter and teaching others. Parents felt that authenticity was equally important to expert knowledge when trying to teach their children. Facilitators shared a similar belief and team leaders commented on how they sought authentic facilitators. This is what a team leader said about recruiting facilitators.

“Kids know when you don’t want to be there, they pick up on that kind of stuff. It is also pretty obvious for us when mentors don’t want to be here. The passion for technology and wanting to help others is just as important as anything else.”

- Facilitator

Flexible facilitators

While established routines and structure are widely recognised as important in supporting the learning of individuals with ASD, facilitators and parents in this study highlighted the role of flexibility in strength-based programs. Flexible lesson plans enabled facilitators to work with ‘the mood’ of students, motivating them and creating opportunities for autonomous learning. Parents acknowledged that routine was needed for certain things, such as rules and boundaries, expected behaviour, the location of a group, the length of a session and consistent facilitators. However adolescents preferred choice and flexibility for the activities. Facilitators reinforced the importance of this, describing how new mentors had to be trained to balance routine with flexibility. Here is what a team leader had to say about flexibility.

“We often get new facilitators who believe they have to follow a lesson plan every week, or be really strict with the lesson structure, because that is what they have always been told, “kids with autism like routine”, but here we find quite the opposite. Our facilitators need to be really flexible and follow the interests and motivations of the student.”

- Facilitator

Teaching skills

Parents from all organisations praised the authenticity and expert knowledge of the facilitators, however they acknowledged that some facilitators lacked the teaching skills necessary to translate that knowledge to students. Communication deficits typically seen in individuals with ASD also compounded the issue, and therefore facilitators likely need specific training. Here is what one parent said about the facilitators.

“Don’t get me wrong, the facilitators here are fantastic, they give up every weekend to help my son learn something new, they are young, passionate and obviously know what they are talking about, however, I do think they could be taught some different methods for actual teaching.”

- Parent

Facilitator ratio

Finally, adolescents acknowledged that the ratio of facilitators to adolescents was important for their learning. Adolescents preferred to have more facilitators available so that they could ask more questions and receive more timely help in their work. Here is what one adolescent had to say.

“I actually want to learn this stuff, so when I have a question I just really want someone to be able to answer it... it is annoying having to wait and I get frustrated.”

- Adolescent

Recommendations - facilitators

The following recommendations will assist service providers to deliver a strength-based approach by addressing facilitator related components. Facilitator components relating to shared interests, consistency, expert knowledge and authenticity can be addressed during the recruitment of facilitators. When recruiting, organisations should consider the personal interests of facilitators and degree of match with adolescents, emphasise the importance of consistent attendance and openly discuss with potential facilitators how often they can attend the program and how long they plan to commit to the program. Organisations should also implement strategies to support facilitators and increase facilitator retention. Facilitators should be recruited based upon their field of expertise, with organisations trying to match adolescent's areas of interest with expert facilitators. While authenticity is difficult to assess, many facilitators who were praised by parents and adolescents had previous experiences with ASD or disability. The facilitators had either had experience with ASD, such as a family member with a diagnosis, had worked in health previously, or even had a disability themselves. When recruiting, organisations should consider previous experiences with disability and/or ASD as an advantage.

Individual and collaborative approaches, flexibility and teaching skill can all be addressed through facilitator training. Facilitators should receive training in adopting an individualised and collaborative approach in their behaviour and language. Facilitators should be educated in balancing routine and structure, whilst providing flexibility in activities. Education should also be provided on various teaching strategies to engage adolescents with ASD. Finally, organisations may aim to improve their facilitator ratio by partnering with communities to increase the number of volunteer facilitators. For example, CoderDojo WA partnered with Curtin University who were able to increase the number of mentors by recruiting through Curtin's Computer Science and Occupational Therapy courses.

Activities



Activites

The special interests of individuals with ASD are often described as a deficit, as interests may become an obsession and restrict other activities. The organisations observed in this study demonstrated that incorporating special interests into the teaching activity had a positive outcome, which could be used to facilitate learning new technology skills and encourage socialisation.

In addition to using special interests in activities, there are a number of other factors that should be considered when providing a strength-based program. For example, coding activities that were visual were considered strength-based, given the preference of the majority of students for visual learning and strong visual processing skills. Activities should be modified to include or preference visual components. Other activity-related factors include: activity choice, activities based on skill development rather than fixing deficits, activities based on career goals of students, activities with the right level of challenge, activity expectations, opportunity to demonstrate skills and peer mentoring. These components were linked with outcomes including; developing technical skills, improving autonomy, reducing frustration, creating a sense of belonging, providing an opportunity for new activities and improved motivation to participate.

Activities incorporating interests

A strategy that the organisations used as part of a strength-based approach was to modify activities to include the adolescent's interest. For example, if an adolescent has an interest in robots, then a suitable activity may involve making a computer game where the main character is a robot. The student needs to learn technical skills, such as coding, to move the robot character. Here is what one facilitator said about using interests.

“When they first come into class we always ask, “What is your favourite video game character, or anime character, or cartoon character?” because we can then make that the centre of the activity.”

- Facilitator

Visual components

One of the most common strategies incorporated with a strength-based approach for individuals with ASD was focusing visual learning strategies. This included using instruction sheets that had visual components, demonstrating tasks when teaching and activities with inherently had visual outcomes. For example, LEGO robotics is an activity that inherently has a visual outcome; adolescents program a LEGO robotic and they can see how their computer code makes the robot move. Visual learning should be considered as part of a strength-based approach. Here is what a facilitator said about visual learning.

“They [adolescents] respond better when they can see their mistakes. Like, sometimes when you are learning coding you can’t actually see what you did wrong, you just know that the program is not working. But something like LEGO robotics, you can actually see if your code is correct, you wanted the robot to turn left but it turned right, you can see you did something wrong.”

- Facilitator

Activity choice

Adolescents expressed that while they liked routine and structure, they also wanted choice. They wanted to participate in activities of their choosing, and wanted a degree of freedom and choice within the activity itself. For example, a website that teaches computer coding may require adherence to rigid instructions, requiring students to progress sequentially through each stage. The student may want to make a website about their favourite video game, however the software program forces them to make a website about animals. In this scenario, there is very little choice within the activity itself. Strength-based programs should allow participants to choose from different activities, often related to interests, while also ensuring the activity encourages autonomy. Here is what an adolescent said about choice in activities.

“I like it here because I get to choose what I learn. At school I don’t have any choice.”

- Adolescent

Skill development goals

Facilitators who applied a strength-based approach placed emphasis on skill development goals rather than deficit-based goals. Skill development goals refer to a focus on what technical skills are learnt, for example, learning a new computer coding language. Whereas, deficit-based goals tend to focus on what an individual cannot do, with the aim of improving that aspect. Strength-based programs should focus on improving existing skills or talents, or develop new skills. Here is one facilitator's comment on skill development goals.

"I think the students find it refreshing that we do not care about their diagnosis, like we don't make a big deal about that. We are not here to try and fix them, we are here to have fun and learn some new computer skills."

- Facilitator

Career goals

Adolescents agreed with facilitators about prioritising skill development goals. However, they provided further feedback, explaining that they wanted to focus on career goals. Adolescents stated that they wanted to learn skills relevant to their career goals, such as working in game design. Adolescents wanted facilitators to understand their career goals and teach them the relevant skills. Adolescents considered the programs as opportunities to gain an advantage in the technology industry and achieve their career goals. Here is what an adolescent said about the program.

"I know game design is really competitive, that is why I come here, so I can start learning the skills before leaving high school."

- Adolescent

Right level of challenge

Parents, facilitators and adolescents all identified that the right level of challenge as facilitating learning during strength-based programs. Parents identified that if the activities were too easy, their child would become bored and not want to return to the program, conversely, tasks that were too challenging for their child would result in frustration. While facilitators stated that identifying the 'just right' level of challenge was key in engaging participants, they also felt there was value in learning to deal with failure. Facilitators recommended that strength-based programs do not remove all possibility of failure, but provide a 'just right' level of challenge. As one facilitator said:

"The students always surprise me. Sometimes I think that an activity will take multiple weeks to complete, and they finish it in like an hour. If we can't think of another activity quickly they can get really bored and distracted."

- Facilitator

Expectations

Parents identified that expectations impacted adolescents' initial attendance at the program. Before attending, adolescents did not know what to expect in regards to the activities available, how many people would be there and what they would be expected to do. Parents reported that not knowing what to expect resulted in increased anxiety and impacted attendance to the program. Parents recommended that strength-based programs provide specific details regarding the program so adolescents know what to expect, working to decrease anxiety and supporting attendance. Here is what one parent had to say about expectations.

“Once we got him here, it was fine, he realised it was all stuff he liked. But getting him here was hard, he didn’t know anything about the program.”

- Parent

Demonstrating skills

Each strength-based program adopted a different method of showcasing the adolescents' work. In showcasing their work, adolescents also demonstrated the new technology skills they had learnt. One program used an end of term “show and tell” event with adolescents presenting their work in front of family and friends, another invited parents into class at the end of each session and facilitated students in displaying their projects, and the last exhibited student projects at a conference. While each strategy was different, the act of displaying or demonstrating their technical skills was considered an important factor in a strength-based approach. The outcomes associated with demonstrating skills were pride and socialisation. Parents were surprised by their child's confidence when showcasing their work and speaking to a group of people. Adolescents also commented on how it made them feel happy and proud to present their work. Below is what one parent had to say about a showcase event.

“I totally did not think he was going to get up there and talk about his work. But he did and it really surprised me.”

- Parent

Peer mentoring

All three programs studied spoke of the importance of peer mentoring in developing technical skills in strength-based programs. Facilitators acknowledged that peers with ASD could be effective in teaching new technical skills to other adolescents, however they need assistance in the peer mentoring process. For example, facilitators may encourage one student to share their knowledge with another student. Adolescents reinforced this opinion, as they commented that they had the knowledge to help others, and were willing to help, but did not always know how to help. Below is what one adolescent said.

“Yeah, I know lots about JavaScript, I just don’t know who in the class wants help and I don’t know if I am any good at helping.”

- Adolescent

Recommendations - activities

When creating activities for individuals with ASD using a strength-based approach, the following is recommended. Facilitators should modify activities to include the special interest of the adolescent. Facilitators should receive education on how they can incorporate adolescent interests into teaching activities. The organisation should provide flexible hardware and software resources that allow facilitators to customise the activities to the adolescents' interests. Facilitators should be educated on how to incorporate visual components into activities, goal setting techniques and how to grade activities in order to set the right level of challenge. Strength-based programs should provide a range of activities including both specific and broad interest areas to increase activity choice and autonomy. When selecting activities to include in the program, they should be assessed for the level of autonomy. For example, some software programs only allow students to follow rigid instructions, rather than providing opportunities to exercise creativity. Implementing these recommendations in programs with adolescents with ASD will ensure activities are underpinned by a strength-based approach.

Service providers can prepare adolescents for attending a program by providing short video links that can be accessed from home. The videos can demonstrate some of the activities available during the program. Also, families can be given a tour of the strength-based program to better understand if they would like to attend. Giving adolescents the opportunity to see the program running, the available activities and to meet other adolescents attending can work towards reducing anxiety, providing an opportunity for parents to identify any concerns.

When creating strength-based programs, service providers should provide opportunities for informal and formal presentations of participants' work, celebrating technology and participants' skills. Informal strategies may include adolescents sharing their work with the person sitting next to them, while formal strategies may involve a 'showcase day', where family and friends are invited to see the adolescents' work.

Service providers looking to provide strength-based programs should consider peer mentoring as a way to facilitate learning. Education should be provided to facilitators based on peer mentoring strategies and adolescents who complete the program should be invited back to assist new participants.

Environment



Environment

The strength-based programs observed in this study all shared a similar cultural environment. The focus groups and interviews revealed that this culture was underpinned by the following factors: acceptance of diagnosis, reduced pressure to change, and groups exclusive to adolescents with ASD. The outcomes resulting from these factors included building a good rapport with facilitators and creating a safe environment.

The strength-based programs studied shared similarities in the institutional environment including the factors: rules and boundaries, opportunity for home learning and duration and frequency. Institutional environmental factors impacted anxiety and frustration, and learning new technical skills.

Finally, physical environment factors were identified and included: overcrowding, noise, hardware and software failure. Addressing physical environment factors can reduce anxiety and frustration for adolescents with ASD.

Acceptance

The facilitators of the strength-based programs enforced a culture of acceptance, where adolescents were not defined by their diagnosis, but rather defined by their personalities and strengths. Parents, who also felt that facilitators never made a “big deal” about their child’s diagnosis, also noted this culture. This culture helped to build rapport between adolescents and facilitators, while creating a safe environment. Below, is how one facilitator described the culture of strength-based groups.

“I think they [adolescents], when they first come here, think that we are going to make a big deal about their diagnosis, that everything is going to centre around them having autism, but really we don’t care if they have autism or not, we want to get to know them.”

- Facilitator

No pressure

While facilitators did not judge adolescents based on their diagnosis, they still accommodated their needs and preferences relating to their ASD. Parents and adolescents described a “no pressure” environment, where adolescents did not have to complete any activities if they were feeling overwhelmed. Facilitators reinforced how they did not pressure adolescents into completing activities, and this fostered a safe learning environment. Adolescents “felt safe” being able to control how much work they did or did not do. One adolescent gave the example of having a bad day at school but still wanting to attend the program after school because he could relax without any pressure to complete activities. Below is what one adolescent had to say.

“I like coming here because I know, if I want to do some coding I can, but if I don’t feel like it, I don’t have to. No one is going to bug me to do work, I can just relax if I want to.”

- Adolescent

Everyone has autism

Finally, there was one additional cultural factor that helped reinforce a strength-based approach and create a safe environment; everyone in the group had a diagnosis of ASD. Parents reported that they felt comfortable with their child attending the group because they knew that there would be other children with ASD, and that this would assist their child to feel safe. Adolescents also identified that their shared diagnosis was considered a strength of the group, saying that they felt safe because everyone had the same diagnosis. Adolescents often compared this to school where they described being bullied because of their diagnosis. The adolescents were also asked if they would allow other people without ASD to join the program, they reported that adolescents who had similar experiences to them could join. One student noted a friend who was dyslexic and had also experienced bullying at school could join the group. Below is what one parent said about the strength-based group.

“When you hear the phone ring, and it is the school, you are always thinking, ‘what has he done this time?’. But I don’t have that with these classes, I know all the other kids have autism, so they are in the same boat, and I know all the parents understand. No one is judging me.”

- Parent

Rules and boundaries

Parents identified that having well established rules and boundaries was necessary for facilitating learning. The rules and boundaries may relate to the overall program itself, such as the protocol for leaving class or using the Internet, or it may relate to the activity itself. Adolescents also identified how rules and boundaries were linked to learning. Some adolescents noted that when students did not follow the rules, for example speaking when a facilitator was teaching, their learning was inhibited and they became frustrated.

Rules and boundaries were also designed specifically to give adolescents more control and to help create a safe environment. Parents explained how the rules and boundaries empowered students by create a safe environment, with one parent giving the example of how her child knew what he could and could not do if he became overwhelmed. The adolescent knew that he was allowed to crawl underneath a table if he felt overwhelmed, but he was not allowed to run away or leave the centre. The rules and boundaries gave control to the student, supporting them to independently manage their behaviour. Here is what a parent had to say.

“I felt comfortable with the group leaders, as they asked my opinion for what would work to manage his tantrums. We created a plan for what he could and couldn’t do if he felt overwhelmed.”

- Parent

Opportunity for home learning

Facilitators, parents and adolescents identified the importance of participants continuing their learning while at home. Parents expressed their difficulties in increasing their knowledge and skills in computer-related tasks. Facilitators spoke about the importance of educating parents and providing support to enable continued learning at home, with adolescents expressing how much they valued working on projects at home. All three groups agreed that the ability to continue projects at home was linked with developing new technical skills. Service providers should consider the home environment of adolescents and how their activities and programs can support continued learning outside of the program. Below is what one parent had to say.

“He really wants to learn this stuff, and he wants to keep working at home, but I just don’t know how to help him.”

- Parent

Duration and frequency

Out of the three strength-based programs observed, two programs were weekly long-term programs, with no end-date, with adolescents deciding if they wanted to continue attending. The third strength-based program was a 4-day intensive program, held for 6-hours per day. Parents identified that the duration of each session during the 4-day intensive program was too long, resulting in fatigue and not being able to continue with the activities, even though the students did enjoy themselves. Parents recommended shorter session times (duration) spread over a longer period (frequency), for example, weekly 2-hour sessions for six months rather than a six-hour session every day for a week. Below is what one parent had to say.

“He really enjoyed it [the intensive program], but he was also exhausted. The days were a bit too long. I think we would prefer it once a week spread over a school term, rather than just an intensive week during school holidays.”

- Parent

Overcrowding and noise

Both parents and adolescents identified that overcrowding was a source of frustration for individuals with ASD. The strength-based programs conducted in computer laboratories, while convenient for teaching technology skills, had limited physical space. Parents and adolescents recommended providing more physical space to prevent frustration and sensory overload. Alternatively, the program could reduce the number of participants per class. While overcrowding, or physically being around many people, was directly linked with increased anxiety and frustration, it also impacted the level of noise. Parents, facilitators and adolescents from each program identified that increased noise lead to increased frustration, anxiety and difficulty concentrating. Parents, facilitators and adolescents identified that each child had their own sensory needs and if there was too much noise, either from noisy students or overcrowding, adolescents became frustrated and unable to participate in the activity. Below is what one parent had to say.

“My son said that there was one student that was really loud and distracting everyone. He didn’t get much work done that day.”

- Parent

Hardware and software failure

Facilitators, parents and adolescents all identified that hardware failure (i.e. computer turning off without reason) or software failure (i.e. computer program closing without saving) caused anxiety and frustration for adolescents. While this is the unfortunate nature of working with technology, and hardware/software failures often cannot be avoided, some sources of frustration can be managed. For example, a student gave an example of the limited availability of computers with a required application installed, limiting his opportunity to learn a specific coding technique. One parent said this regarding the hardware and software available.

“He [adolescent] told me he wanted to do some of the coding for LEGO robotics, however they didn’t have enough computers, or he had to share, so he just didn’t do it. I don’t think he said anything at the time.”

- Parent

Recommendations – environment

When considering the cultural environment of programs for individuals with ASD, the following recommendations can be taken to reinforce a strength-based approach. Facilitators should be educated on a client-centered approach, which places the person before the disability. Facilitators should be educated on balancing a “no pressure” environment, while achieving teaching and learning goals. Service providers should consider facilitators who have lived experiences with disability, as they have previously demonstrated a natural response of acceptance. Service providers should consider limiting programs to adolescents who have an ASD diagnosis, are in the process of receiving a diagnosis or demonstrate diagnostic criteria similar to that of ASD. Alternatively, adolescents may be accepted into the group without an ASD diagnosis via a personal invitation from a current group member. Allowing adolescents to choose group members gives control and allows them to create a safe environment.

When considering the institutional environment service providers should: collaborate with parents to set rules and boundaries which support adolescents control and self-management and, provide an opportunity for parents to receive technology training. In regards to duration and frequency of strength-based programs it is recommended to conduct weekly sessions (two-hours long) over a longer period, such as a school term.

When considering the physical environment service providers looking to deliver a strength-based program should consider the following recommendations. Service providers need to accommodate the sensory preferences of individuals with ASD. This can be achieved by providing environmental options, such as, one noisy computer laboratory where students can interact and speak about their interests with one another, and another computer laboratory for quiet work. Adolescents then have the opportunity to choose an environment that has more noise or less noise. This also provides a quiet space for adolescents to access if they become overwhelmed. Also, when selecting the physical location for the programs, service providers should consider that individuals with ASD require more space than standard room capacity recommendations. This will prevent overcrowding.

Previous recommendations have prioritised facilitators with backgrounds in technology and education, however health professionals should also be involved when setting up strength-based classes. Ideally, a combination of mentors with technology experience and disability experience is recommended. To better accommodate the needs and preferences of adolescents, health professionals should consult with parents and adolescents before attending, and provide feedback to service providers on the suitability of the environment.

Whilst hardware and software failure is unavoidable when working with technology, service providers can limit failures by completing the following: 1) updating hardware and software prior to every session, 2) requesting students save their work regularly, 3) requesting students bring in a USB to save their work, and 4) matching hardware and software to student goals.

Discussion

and conclusion



Discussion and conclusion

This study aimed to provide recommendations for delivering strength-based programs to adolescents with ASD by identifying the essential components of a strength-based approach. Three community programs were observed, with interviews and focus groups conducted with parents, adolescents and facilitators from each program. The data produced three essential areas that should be considered when delivering a strength-based approach with individuals with ASD: 1) facilitators, 2) activities and 3) environment (Table 1).

When supporting strength-based approaches, service providers should consider facilitator factors. Facilitator factors include shared interests, facilitators showing consistency with their attendance to the program and behaviour towards adolescents, applying an individual and collaborative approach, selecting facilitators with expert technology skills, prioritising authenticity, encouraging flexible teaching practices, improving facilitators teaching skills and ensuring an optimal facilitator-adolescent ratio.

Many of the facilitator factors can be addressed during the recruitment of facilitators. When recruiting facilitators emphasis should be placed on their personal interests, expert knowledge of technology and their ability to commit to the program over a long period. Facilitators with a lived experience of disability or ASD should be highly considered. The remaining facilitator factors should be addressed through education sessions. Facilitators should be educated on how to apply an individual and collaborative approach, being flexible in teaching styles and up-skilled in teaching practices. Finally, costs and resources often restrict the facilitator-adolescent ratio, however volunteers should be considered as a means of increasing the number of facilitators to adolescents. Addressing the previously mentioned facilitator factors can improve rapport, help teach specific computer skills, create a safe environment and improve autonomy.

While facilitators play a crucial role in teaching adolescents technology skills, the activities themselves can support a strength-based approach. Within a strength-based program, activities should consider incorporating interests, increasing visual components, providing activity choice, focusing on skill development goals and career goals, achieving the right level of challenge, managing expectations, providing opportunity to demonstrate skills and incorporating peer mentoring.

The interests of the adolescents should be identified and incorporated into activities by the facilitators. Activities should include visual components and visual instructions. Service providers should also provide a wide range of activities for adolescents to participate in, allowing activity choice. The activities should also encourage autonomy, providing opportunity for adolescents to experiment and exercise their creativity. Activities should not be based on trying to improve a deficit or weakness of the adolescent, but rather on developing specific technical or career-related skills. Finally, by understanding the individual strengths of adolescents, facilitators can grade the activity, ensuring the right level of challenge for adolescents.

Many of the activity related factors could be addressed through assessing activities for visual components, level of choice and alignment with the adolescents' goals. Activity related factors could also be addressed through educating facilitators in goal setting techniques and how to initiate conversations around career goals or

skill development goals with adolescents. Anxiety related to expectations can be addressed by providing more information to adolescents and families, such as providing videos of the activities provided or providing a tour of the facilities before starting class. Strength-based programs should provide opportunities for adolescents to display their work for example one program used a “show and tell” event, while another requested adolescents show their work to family members. The strength-based programs used a mix of formal and informal opportunities for adolescents to showcase their projects and demonstrate the skills they used to create their project. Providing an opportunity for adolescents to demonstrate their skills and talents increased feelings of pride and socialisation.

Strength-based programs should consider the use of peer mentoring to develop technical skills. While this was recommended, it was observed to have challenges, as many adolescents had a specific set of skills and knowledge that would be useful to other peers, yet they had trouble conveying that knowledge. Peer mentoring should be encouraged by facilitators, however more research is required to understand peer mentoring strategies for individuals with ASD. By addressing activity related factors, service providers can improve learning of technical skills, improve autonomy, reduce frustration, creating a sense of belonging, provide an opportunity for new activities and improve motivation to participate.

The environment can be divided into culture, institution and physical. The data revealed three cultural factors: acceptance, no pressure, and everyone having autism. Acceptance referred to adolescents not being defined by their diagnosis, but rather accepted for their individuality. No pressure referred to not forcing adolescents to participate in activities. Adolescents had autonomy in their level of participation. Everyone had autism, referred to all the adolescents having a diagnosis of ASD. The adolescents consider this created a safe environment as they all had one thing in common, their diagnosis. Culture related factors could be addressed through facilitator education and recruitment protocols. Facilitator education should focus on a client-centered approach, which places the person before the disability. Recruitment of adolescents should focus on a commonality in diagnosis, or personal invitation via a current group member. Primarily, focusing on cultural factors helps to foster a safe environment for adolescents with ASD.

The institutional environment should also be considered when facilitating a strength-based approach. The data identified three factors: 1) rules and boundaries, 2) opportunity for home learning and 3) duration and frequency. Rules and boundaries are often used to restrict students, however within a strength-based approach rules and boundaries can be used to empower adolescents. For example, facilitators can set rules and boundaries in relation to self-management of their behaviour if they become overwhelmed, such as removing themselves from the class and finding a quiet place to relax. Organisations should also consider how they could support home learning. This may involve ensuring that software and hardware is accessible at home, giving students the option to save their work to take home, and also providing education to parents to improve their technology skills. In regards to duration and frequency, strength-based programs are recommended to run over long periods, such as a school semester, or even throughout the year, as this supports previous strength-based factors, such as consistency and opportunity to work at home.

The physical environment included two factors: 1) overcrowding and noise and, 2) hardware and software failure. Overcrowding and noise can be addressed by providing different workspaces, for example, a “quite workroom” and a “social room”. Also, service providers should allow more physical space than room capacity recommendations. Hardware and software failures cannot always be avoided, however service providers should ensure adequate time to set up hardware and software prior to class, while also encouraging opportunities to learn when technology fails. When creating strength-based programs the cultural, institutional and physical environment should all be considered.

This report outlined three essential areas that should be considered when developing a strength-based ICT program for adolescents with ASD. Recommendations were provided for each factor to help service providers adopt a strength-based approach when delivering ICT programs. Future research aims to deliver new strength-based programs for adolescents based upon these recommendations and evaluate its effectiveness in building skills for employment.

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Finally, we would like to thank all of the young individuals with ASD and their families for their openness and willingness to participate in this study. We look forward to collaboratively working with more individuals with ASD and their families in the future to help improve the outcomes of individuals with ASD.

Table 1 Three components of strength-based programs

Facilitators	Activities	Environment
Shared interests	Activity incorporates interests	Acceptance
Consistency	Visual component	No pressure
Individual and collaborative approach	Activity choice	Everyone has autism
Expert facilitators	Skill development goals	Rules and boundaries
Authentic facilitators	Career goal	Opportunity for home learning
Flexible facilitators	Right level of challenge	Duration and frequency
Teaching skills	Expectations	Overcrowding and noise
Facilitator ratio	Demonstrate skill	Hardware and software
	Peer mentoring	

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