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Using Photos and Visual-Processing Assistive Technologies to Develop Self-Expression and Interpersonal Communication of Adolescents with Asperger Syndrome (AS)

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Abstract

The purpose of this paper is to examine the use of photographs and assistive technologies for visual information processing as motivating tools for interpersonal communication of adolescents with Asperger Syndrome (AS), aged 16 to 18 years, attending special education school.

Students with AS find it very difficult to create social and interpersonal relationships, express their emotions, understand the feeling and thoughts of others, and to interpret them into social codes. They are also visual learners, so it is important to use a variety of visual tools to develop their communication skills and expression.

Visual assistive technology, such as photographs, video clips, and visual processing software (e.g., Picasa), was used in this research to enhance the students' communication skills.

The findings show that use of photographs and assistive technology tools does indeed create an incentive for dialogue and helps students spontaneously share their memories and emotions. Certain activities motivated dialogue, openness, and sharing, deepened knowledge of each other, encouraged self-reflection and awareness of image and impression of one's surroundings, while also clarifying those communicative difficulties so common among AS students, and providing an opportunity to discuss and treat them.

Although it is not possible to reliably separate the photography sessions from the overall school experience and credit these friendships entirely to classroom meetings, it is clear that such meetings significantly contributed to developing bonds, openness and collaboration, deepened familiarity with classmates, and strengthened self-image. The discourse that formed around the photos

and clip raised awareness and helped each participant identify their strengths.

Keywords: Asperger Syndrome, visual assistive technology, photographs, interpersonal communication, class discourse

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Introduction

The purpose of this paper is to examine the use of photographs and assistive technologies for visual information processing as motivating tools for interpersonal and intrapersonal communication of adolescents with Asperger Syndrome (AS).

In May 2013 the American Psychiatric Association (APA) removed from the Diagnostic and Statistical Manual of Mental Disorders—Fifth Edition (DSM-5) the diagnostic criteria for Autistic Disorder (AD), Asperger Syndrome (AS), and Pervasive Developmental Disorder – not otherwise specified (PDD-NOS). DSM-5 presented a new category called Autism Spectrum Disorder (ASD), which incorporates these previously separate diagnoses (American Psychiatric Association, 2013).

While there are some who would argue that the “Aspergers-like” label which doctors may continue to use when diagnosing ASD should dispel these fears, others still see it as the removal of a condition, which for several decades has had its own unique characteristics, and therefore a negative development which will reduce research funding and affect public perception (Aspergers Advice, 2013).

In our research we include AS as part of the ASD spectrum. The choice to adhere to AS definitions stems from two key reasons: firstly, our research was designed before the publication of DSM-5; secondly, study participants were diagnosed according to the previous professional definitions. Accordingly, the investigative approach was also based on the traditional AS definition, as this was still the current terminology when the study was conducted.

AS is characterized by high cognitive abilities, normal to high intelligence, and normal language function (Bauer, 1996; Graetz & Spampinato, 2008). However, like almost all people on the ASD spectrum, they also typically lack social skills and have more difficulty with identifying emotions through facial expression than their peers without autism (LaCava, Golan, Baron-Cohen, & Smith-Myles, 2007; Lindner & Rosén, 2006). Their poor social skills limit their ability to conduct reciprocal discourse and most prominently present a dogged focus on a small list of conversation topics (Attwood, 2006). These characteristics cause them to be truly authentic when engaging with others as people with AS have no natural instinct for manipulation and habitually say what they believe to be true, a trait that may also cause embarrassment and inadvertent offense (Attwood, 2006).

The varied characteristics of students with AS require differentiated instruction, including interventions that foster interests and strengths while providing strategies to compensate for areas of weakness. School curriculums often focus on the development of communication skills and expression in academic texts centered on selected subject matter, but for AS students special attention must be directed to providing tools to cope with understanding social and personal communication, such as dealing with changes, codes, and hints. Without guidance, these struggles may cause frustration, and manifest in behaviors considered by society to be unsuitable.

Because many students with AS are described as visual learners (Ganz, Earles-Vollrath, & Cook, 2011; Rao & Gagie, 2006) they tend to show improved response to information presented visually. By using a student's visual processing strength, these strategies can help decrease reliance on areas of deficits, such as auditory processing and communication. The use of various visual aids is necessary for teaching and developing communication and expression along with class conversation (Hume, Loftin, & Lantz, 2009; Meadan, Ostrosky, Triplett, Michna & Fettig, 2011; Rao & Gagie, 2006). Photos provide a glimpse into the private world of students, and group viewing can open the door to the child's experiences, hobbies, favorite places, etc. They can also serve as a starting point for interaction with peers (Shalita, Friedman, & Harten, 2011).

Some researchers have attributed the camera with the role of an additional observer to the therapeutic process and its measure of success (O'Reilly, Parker, & Hutchby, 2011). Along with still photography, several researchers have examined the use of video cameras to promote communication skills among children with ASD (Bellini & Akullian, 2007; Holifiel, Goodman, Hazelkorn & Heflin, 2010). It has been shown that photographic self-portraits trigger self-reflection in students with ASD and promote greater accuracy in implementation of assignments (Holifiel et al., 2010).

In this study, many assistive technologies were used to enhance the communication skills of this population, including screening photographs, use of a stills camera, Google Drive, Picasa Web, and a YouTube video clip.

Digital photography was selected as the key means to nurture communication development, as it is readily available in daily life. Mobile phones are accessible at any given moment and digital images can be created instantaneously.

Through photos the students could observe their inner worlds and their surroundings, to include friends in personal stories, hear their stories, and better understand their friend's perspective. Photography is a medium that naturally lends itself to introspection: looking to the personal and private, the social and environmental. Photos may express our thoughts, mirror our reality, reflect our hearts desires, serve as keepsakes of moments, and document not only places we have been to, but also where we may go in the future (Weiser, 1993). Introspection can lead to learning, development and increased awareness of ourselves and our environment.

The purpose of this paper is to examine the use of photographs and assistive technologies for visual information processing as motivating tools for interpersonal communication of five adolescents with AS, aged 16 to 18 years, attending special education school. The use of photography was designed to encourage reflection from several points of view, raise awareness, and establish connection to emotions and sharing of personal experiences. The paper presents a literature providing the basis for this study, then a brief outline of choosing methods, analysis of findings, and discussion of the results relative to the research questions.

A qualitative method was chosen for analysis and the research methodology consisted of open ethnographic interviews and observations of the students.

Literature Review

Asperger Syndrome (AS)

Autism spectrum disorders (ASDs) are one of the most common neurodevelopmental disorders, with an estimated prevalence of 1 in 110 children. While the previous version of the Diagnostic and Statistical Manual for Mental Disorders (DSM) 4th edition included Asperger's as a discrete disorder on the autism spectrum, the newest revision (DSM-5) did not. Instead, all people on the autism spectrum, ranging from those with very low functioning levels of those who would have been diagnosed with Asperger Syndrome, received the new diagnosis of Autism Spectrum Disorder - ASD (American Psychiatric Association, 2013; Miller-Wilson, 2013).

Asperger Syndrome (AS) is characterized by high cognitive abilities, normal to high intelligence, and normal language function. The most prominent trait of AS is the one that makes them unique – their range of special and unusual interests. People with AS have more intellectual areas of interests than people on the lower spectrum of autistic disorders, who have a tendency to focus on objects and their components (Bauer, 1996). Some with AS have high enough intelligence to complete their high school studies and continue to academic achievements (Graetz & Spampinato, 2008).

There are also other differences in language between AS and non-AS children. Beyond generally excellent basic communication skills, AS students struggle with pitch, intonation, tempo, fluency, or any nuanced shift in melody. Their speech often sounds stilted and pedantic, and their articulation peculiarly straightforward and literal, with little or no use of slang or colloquialisms (Attwood, 2006; Bauer, 1996).

Social isolation is one of the most prominent characteristics of people with AS. Although this population may seem to live in their own world and be wholly engrossed in their particular areas of interest, they are not truly disconnected from the world. In fact, the majority of children with AS express a desire to fit in with their surroundings and establish friendships with peers. The problem lies in their struggle to effectively establish such relationships (Bauer, 1996).

Despite the difficulty of understanding non-verbal cues, autistic people are gifted with an excellent ability to discern clear visual cues (in contrast to more nuanced visual cues, such as facial expression and body language). This is why visual strategies are selected to help them better understand their environment, and also why use of visual methodologies in teaching, such as visual aids and technologies, are so necessary in their education (Hume et al., 2009; Tissot & Evans, 2003).

Classroom Conversation and Discourse

School curriculums often focus on the development of communication skills and expression in academic texts centered on selected subject matter, but for AS students special attention must be directed to providing tools to cope with understanding social and personal communication, such as dealing with behavioral changes, codes and hints.

A successful communicator must be able to participate in an ongoing exchange of expressions. People with AS show difficulties with adjusting language use in response to ever-changing contexts within social situations. They don't know when and how to be formal, how much background information to provide, how complex or simple the sentences used should be, and what topics are not appropriate for discussion (Gaus, 2007).

During classroom conversation, there are certain constraints that govern conversation and limit the interlocutors as to what they can say and infer. Grice (1975; 1989) called the overriding principles of conversation "Cooperative Principles." The Cooperative Principles were divided into four categories, or parameters:

- Quantity: Make your contribution as informative as is required.
- Quality: Do not say what you believe to be false or for which you lack adequate evidence.
- Relation: Be relevant.
- Manner: Avoid obscurity of expression; avoid ambiguity; be brief; be orderly (Grice, 1989).

These principles may be used as the cornerstone of investigating the 'ground rules' of classroom discourse to gain an insight into social interaction (Sadeghi, Ketabi, Tavakoli, & Sadeghi, 2012) and were encouraged during classroom discourse in the present research.

Research literature indicates that people with AS can make authentic and candid remarks but these may also be embarrassing and hurtful (Attwood, 2006). People with AS are strictly truthful and generally incapable of attempts at manipulation, saying only what they believe to be true, but their remarks might cause embarrassment. Difficulties in rules of discourse also reveal an impairment in reciprocity as people with AS tend to base their responses on purely personal associations that often seem irrelevant to the general discussion.

As it has been shown that the majority of AS students are visual learners, it is important to use various visual aids to facilitate the development of communication and expression along with class conversation (Rao & Gagie, 2006).

Assistive Technologies for People with AS

Technological developments have greatly expanded the number of options available for nurturing social communication in modern life. For people with AS, assistive technologies can contribute to improving these skills. Software designed to improve emotion identification, or social and communicative interaction, can help autistic children observe faces and learn to read facial expressions (LaCava et al., 2007). For example, one program presents the image of a virtual child that simulates verbal and non-verbal cues, providing children the opportunity to exercise their social skills. This program is not designed to replace real interaction with peers, but rather to facilitate learning so that such skills may later be used in the real world. Another example is socially-designed robots capable of producing facial expressions and maintaining eye contact, thus teaching autistic children basic life skills (Goodwin, 2008). These and many others provide ways for children and adults to learn, function, and become more accessible to their surroundings (Hetzroni, 2007; Tissot & Evans, 2003).

In contrast to the social confusion so common to their daily lives, computers are familiar and predictable and so, ironically, may facilitate learning but also reinforce autistic behaviors, including exacerbate obsession, isolation, and social withdrawal (Jacklin & Farr, 2005).

Photography - A Tool for the Development of Interpersonal Ties

Technology has introduced digital photography to our lives, transforming the documentation of personal events into a routine part of daily life. The availability of digital photography and time reduction between events and their documentation has elevated the use of personal photos to a significant element in activities of communication development. Personal images not only immortalize moments, they also present a glimpse of how we are perceived by others, providing insights into our appearance. However, this reflection does not always provide a true representation of our personalities or the way in which we perceive ourselves (Shalita et al., 2011).

To a great extent, photography has expanded our memory. Through photos we can build a biographical narrative that suits us, a continuum of happy events, and moments of harmony with the people around us, experiences, love, belonging, and friendships. The captured moments are always those we wish to remember and display, while less pleasant memories are undocumented or discarded (Shalita et al., 2011).

Children with AS react more rapidly to visual cues than verbal ones; this is why video clips inspire motivation and provide more positive reinforcements (Corbett & Abdullah, 2005; Tissot & Evans, 2003). Photos provide a glimpse into the private world of students, and group viewing can open the door to the child's experiences, hobbies, favorite places, etc. They can also serve as a starting point for interaction with peers: one child presents a photo and then others react to it, ask questions, and try to understand the significance of the photo to its subject (Shalita et al., 2011).

Study Goals and Study Question

The primary aim of the present study is to develop the interpersonal communication skills and personal expression of adolescents with AS through use of photographs and visual processing assistive technologies.

The research question is the following: In what way can use of photographs and assistive technologies for visual information processing facilitate the development of communication, as well as personal and interpersonal expression, among adolescents with AS?

Research Methodology

A qualitative method was chosen for analysis as this method serves the current research objectives. Qualitative research involves collecting information about personal experiences, introspection, childhood stories, interviews, observations, historical interactions, and visual texts which are significant moments and meaningful in peoples' lives (Guba & Lincoln, 1994). In addition, the special education setting includes small classes of students while each of them has a different and unique function profile, thus a qualitative method can give the tools to examine and learn about the uniqueness of the special education population.

In our research, students with AS expressed their personal stories from their individual perspective. We then developed a curriculum on the basis of these accounts that constituted an additional communication channel for them.

Ethnographic researchers experience the world of their subjects and incorporate themselves in the studied circumstances. Their involvement must be reflective, continuously and critically reexamining and reprocessing the insights gleaned from the study (Shkedi, 2003). Our objective as researchers and class teacher was to become part of the students' worlds. This close affinity, particular interest in each student, in their personal stories, worldviews, opinions, thoughts and feelings, as well as the many hours spent with them, meet the requirements of qualitative research.

Participants

The research population included adolescent students aged 16 to 18 years of average intelligence, diagnosed with Asperger Syndrome and studying in special education schools.

The students are from average socioeconomic backgrounds and from supportive families. All five were transferred from their regular schools and began studying in a special education school. This change stemmed from crises, experiences of rejection, and social isolation. Before the transfer, some spent several months at home without attending any educational framework.

Data Collection

The chosen research methodology consisted of open ethnographic interviews and observations of the students.

Interviews: The purpose of the interviews was to deepen familiarity with the students' past, areas of interest, their private worlds, and hobbies. These were documented with a video camera and transcribed by the researcher.

Observations: A teaching assistant attended each class to objectively document the exchange and write down remarks of class participants. The observations focused on the methods of communication deployed by the students during weekly classes over a five-month period.

The technological tools used for research included a stills camera, computer, projector, YouTube video clip, Picasa web software, and Google Drive.

Methods of Data Analysis

Data analysis in qualitative research is often complex and challenging. Researchers must walk the fine line between their desire to express intuitive impressions, to be close, involved, and emphatic

to their subjects, while also maintaining distance, reflective and critical thought and rational examination (Shkedi, 2011).

Analysis of this study's findings was conducted using Narralizer software, specifically designed to facilitate qualitative data analysis. This program enables the division of data into categories, indicating correlations between various data and relevant categories and presenting the analyzed data according to chosen categories, but it has no automatic analyzing mechanisms. This study adhered to the principle by which researchers determine the division and assignment of categories or analysis parameters, and the software served only as a tool to do this (Shkedi, 2011).

Research Procedure

Meetings were conducted during weekly classes over a five-month period. They were usually held in the school computer lab. Participants were asked to perform tasks in order to create dialogue and expand knowledge and interest in each other through sharing personal photos. This was done by sharing personal photos uploaded onto the communal class database on the Picasa Web and displaying it for viewing. Some of the photographs were childhood photos provided by the participants, and some were taken throughout the year during school or class activities. Participants addressed questions, such as, what story does this photo reflect? What memories arise from viewing the photo? What thoughts or feelings does it evoke?

Meetings

Meetings were held throughout the school year according to the following events.

Meetings focused on childhood photos: The purpose of these meetings was to provide more familiarity between students, create a motive for discourse, and encourage interpersonal communication. Students brought in their childhood photos so that others could hear some of the memories associated with them. These meetings were conducted in the school computer lab with students seated on sofas watching images displayed on the wall. Technological aids included a computer and projector.

Purim holiday meetings: (Purim is a Jewish holiday in which children often wear masks and costumes.) In these meetings students were asked to arrive in costume, their pictures were taken (individual and class photos), and these were then displayed using Picasa. The purpose of this activity was to allow students to take on another character, to express their feelings, and to discuss issues that come up regarding their new image. Does the outfit "make" the person? What message or statement is my clothing sending?

Field trip meetings: The purpose of these meetings was to deepen their relationship while sharing experiences from the class field trip. They included preparations for the school trip conducted in paired teams working with a computer and searches for information and images on the internet. Photographs were also taken during the trip itself, and then another activity after returning from the trip was to display images and a collaborative assignment to create a clip or presentation of trip photos. Technological aids included a camera, internet connection, Picasa, a computer, projector, and Google Docs.

Meeting on self-image: The purpose of such meetings was hearing from classmates their perceptions of what each individual transmits to their environment. The meeting started by watching a YouTube video of a personal story of a girl with AS who talked about the strong attributes of people with AS. After watching the clip, we had a class discussion about the strengths of each participant. We also used Google Docs for writing shared references regarding the strengths of various students. They were held in the classroom and included "mood" playing cards and a camera. At first the students were asked to choose a mood card from the pack and try to convey the emotion stated on the card. This was photographed and projected immediately in order to see

whether they had been successful in their acting and if their expression was accurate. After they heard feedback from their classmates they were given the opportunity to act out another role, projecting an image of their choice and being photographed in this “new” self. Some students chose to add these new photos to the strengths presentation created in the previous meeting. Technological aids included a camera, computer, Picasa and Google Docs.

Findings

Research findings were based on references and verbal responses of participants to photographs and footage of themselves or their classmates. Content analysis was conducted on each response, either made privately or within general class discourse.

Analysis of findings examined the impact of using photos and various assistive technologies on the communication of adolescents with AS. These were conducted according to the following categories:

1. Use of photos and assistive technologies as a motive for interpersonal communication and the development of social skills.
2. Photographs and assistive technologies to stimulate intrapersonal communication.
3. Exposing and highlighting the difficulties of interpersonal communication through use of photos and assistive technologies.

The following sections include quotes from students that illustrate the findings under these headings.

Use of Photos and Assistive Technologies as a Motive for Interpersonal Communication and the Development of Social Skills

Social deficits are complex, persistent, and a core feature of AS, which impact their interactions with their teachers and classmates. The use of photos during class activities opens a new opportunity for social interactions, effective dialogue, and provoked statements regarding facial expressions seen in photos.

Childhood memories activity

In the activity focused on childhood memories, students were asked to bring childhood photographs that were then uploaded to Picasa and projected in the classroom. It was found that the photos served as a motivational factor to prompt students to share their memories and provide a glimpse into their personal worlds. Sharing included expressing feelings, the ability to listen to one another, referencing matter-of-factly the subject matters raised in discussion, and developing a collaborative discourse around a theme. For example, Niv, one of the participants, stated about himself: *“That’s me, as you can see I had light hair that got darker over the years, this is from the pool ...most of the pictures of me when I was little. I chose this one because I had a cast on my leg ...I remember working in the cowshed in Gat. I was born there and live there”*.

It is apparent that Niv’s presentation of the photo provided an opportunity for him to share memories about his childhood; he begins with the most salient visual details and moves to describing his memory of the time and place depicted in the photo. Ido then remarked about the photo from his own perspective: *“He looks just like a kid on holiday with his parents, not really sure he’s having fun”*.

Why did Ido choose to remark that the childhood image of Niv seems unhappy? Was it truly Niv's facial expression in the photo that evoked this sense of dissatisfaction? Was Ido perhaps hinting that he himself didn't enjoy vacations with his parents? It is clear that Ido related to the emotions raised by the image from his own personal point of view. Yonatan continued Ido's line of thought: *"As if he's smiling but his eyes are crying"* There is a direct reference to Niv's facial expression; it seems that for both Ido and Yonatan the image evoked a similar feeling of dissatisfaction. Shir then joined the conversation and asked a question that revealed his interest: *"When did you leave there?"* Shir is particularly interested in geography and frequently looks up places on Google Earth; this is probably the reason why he chose to ask about location rather than continuing the discussion about Niv's expression. Niv answered his question and then added a few additional details: *"We moved to T [the first letter of the town] and then to M...my dad is from the kibbutz...my mum is from Jerusalem"*.

Showing Niv's childhood picture pointed the spotlight on him and gave him a chance to include the class in details of his past and his extended family, a sharing that deepened his relationship with his classmates.

The ability to provide feedback about activities is not a natural skill for people with AS. The use of photographs and the opportunity to react verbally (either orally or in writing) allowed students to provide encouraging remarks regarding the photos they had seen. For example, Ido's response to a picture of Yonatan with a cat perched on his shoulders: *"I see Shanti [the cat] is enjoying herself on your shoulders and that you two really bonded"*. Despite the fact that Ido is very attached to Shanti the cat, he chose to encourage Yonatan as well.

Another example of this attitude can be seen in Erez's response to a Purim photo of both Yonatan and Niv, sitting side by side, smiling and happy. Erez said: *"I see real friendship here. You seem like brothers, best buddies"*.

Evidently the photograph provided the motivation for sharing and social interaction that could serve as fertile ground for developing and deepening relationships. The sharing skills that came to the fore when discussing the childhood image allowed for a candid conversation among participants, and in the second conversational stage also provided a chance to write down their impressions. Students were asked to write their responses to the photos of others and also to their own.

Identifying facial expressions through childhood photos

Friendship is a painful subject, and all of the students experienced rejection and social isolation throughout the school year. One characteristic of people with AS is their difficulty in reading facial expressions (Ashwin, Baron-Cohen, Wheelwright, O'Riordan, & Bullmore, 2007; Lindner & Rosén, 2006). Our study indicates that presentation of photos prompted several remarks from the students about facial expressions. Ido, with a childhood photo from his days in kindergarten, chose to include the others in a personal memory: *"This is from the time before my parents' divorce, when they decided on a divorce I was in the first grade"*. The teacher remarked that Ido seems happy and smiling in the picture. Shir then responded: *"It's a forced smile"*. Thus, Shir's remark continued the discussion about Ido's facial expression. It is possible that his belief that Ido was not smiling sincerely in the photo is connected to Ido sharing about his parents' divorce. Erez joined in and provided his own opinion: *"It's not forced, that's how he looks when he is smiling, when we recognized his picture, he gave us the same smile"*.

Yonatan's childhood image also stirred remarks about facial expressions. Ido said: *"He looks happy and cute"*. Erez added: *"His eyes are happy but his mouth isn't"*. Erez distinguished between the eyes and mouth; this may be why he is confused regarding Yonatan's genuine emotion. Niv also revealed his doubts about Ido's facial expressions: *"It looks like he was asked to pose"*

especially for the picture". Erez answered: *"You can't tell people to smile, there are people who can't do it, I know that about myself"*.

Clearly childhood images created the motivation for conversation and debate of facial expressions, while addressing the emotional aspects of the photos and each participant's personal emotional connection to the viewed image.

Photographs and Assistive Technologies to Stimulate Intrapersonal Communication

Self-reflection and feedback during Purim's photos

In preparation for the Purim holiday we photographed the students after they added various clothes to their usual attire, such as jackets, suits, and ties. The photos were uploaded to Picasa and provoked positive reactions. The students voiced their satisfaction from the images, often so different from their usual dress. Niv, usually a boy who emotes fatigue and melancholy, remarked: *"I never looked so impressive, especially wearing that suit"*. Erez, who habitually refers to himself as "nothing", said: *"I feel important"*. Ido said: *"Here I look serious and sophisticated"*. Niv added: *"I never felt so relaxed like I did in this picture"*. The students addressed images of themselves positively and described themselves using complementary adjectives: "impressive", "important", "sophisticated", "calm". Ido added his own interpretation of the importance of appearance in society: *"Sometimes changing [physical appearance] changes the way people see you"*.

The students' self-reflection on the photos showing them particularly well dressed stirred good feelings about themselves, in contrast to the more negative emotions they usually experience in their daily lives. Use of technological methods allowed them to examine their image on a computer screen and to memorialize their emotions at that specific moment, something that would not have been possible without uploading to Picasa and would have subsequently been forgotten.

Niv got feedback about his photo from his classmates; he is a boy who usually seems tired, morose and sleepy. Erez said: *"He looks depressed, tired...he looks like Niv"*. Thus, Erez stressed that this image of Niv is one he is used to seeing, that the photo did not catch anything out of the ordinary. Ido added: *"Looks sleepy"*. Niv was surprised from the others reactions, he had no idea this was what they thought of him: *"I'm listening to your remarks, but even though that's how I look, it's not really me, it's a wrong image. I want to look happy"*

It is clear Niv listened attentively to what his classmates had to say, and that this discussion contributed to his awareness of how others perceive him, an impression he was unaware of previously and does not feel truly represents him. We suggested to Niv that we retake his photo after he had a chance to mentally enter that positive image he wanted to portray to his surroundings. Niv "got into" his new character and within seconds could see himself differently, and then hear his classmates make new comments. Shir said: *"It's so weird to see him laughing like that"*. In this way, Shir reaffirms the new experience of seeing Niv so cheerful. Erez added: *"He looks normal, alert, happy"*. Erez used the word "normal" and emphasized the difference in Niv. The use of "normal", although possibly offensive, provoked no reaction from the students and established how direct their communication had become. Shir said: *"Full of life, vital"* Ido added: *"He looks pleased"*.

The immediacy of photography meant that within the same class Niv received double feedback from his classmates, one negative and the second positive. Furthermore, he could view himself and see how he had the ability to create change. Later Niv added his comments to Picasa and shared his feelings regarding the two images: *"This picture represents how I want to be, I look*

happier here, more connected to people, not daydreaming, I have a bad habit – daydreaming everywhere, this photo shows people that I’m not some lame person”.

Remarks of this nature led to examination of the significance of the group in Niv’s life - the discussion about his image, the personal reference from each classmate, the sincerity in which remarks were made. Findings indicate that now Niv is aware of the image he provokes, and moreover, now understands how he can change that unrepresentative image and create a new one altogether. Additionally, use of a camera opened the way to a profound discussion and linked the participants as they gained a better understanding of interpersonal communication difficulties.

Raising awareness competencies using YouTube clip

Gaining self-awareness usually entails working to understand how one derives and makes meaning of the world based on introspective self-reflection (Gardner, Avolio, Luthans, May, & Walumbwa, 2005). One of the methods selected to raise self-awareness and develop positive self-image was to show the students a short YouTube clip. The clip presented a beautiful girl with AS talking about her advantages and disadvantages as someone living with the disorder.

After viewing a discussion was held; this revealed that some students referred in the third person to the AS population (use of the word “them”), and thus distanced themselves from belonging to that group. Shir’s response: *“They’re [persons with AS] nice to each other”*. Erez said: *“My assumption was right: Aspies are kind people”*. Niv addressed the social aspect of the clip: *“I could relate to them being real friends, it’s really hard for me to get a friend, but when it does happen I commit to it”*.

Niv also used the word “them”, but then shared with the others his difficulty in connecting with people. He also stated that he knows how to be a good friend, thereby establishing awareness of his strengths.

Sharing competencies using Google Drive

After viewing and discussing the YouTube clip, we asked the students to upload one photo they thought truly represented them and to add a written comment about their strong attributes and those of their classmates. Their comments were included in the joint presentation on Google Drive; this collaborative document made it easier for them to write candidly and caused joy and pleasure while sharing their comments. It seems that all the references made by the students were supportive. Erez commented on Niv’s photo: *“A friendly person, helps when he’s asked, makes me laugh a lot! He reminds me Rowan Atkinson”*. Erez’s remark had a humoristic tone. Niv, seeing this remark on Google Drive, immediately replied: *“A good friend, very funny and lots of fun to play with. I like your remark regarding Rowan Atkinson”*. Niv understood Erez’s sense of humor and even enjoyed it. Ido remarked on Shir’s photo: *“Avoids violence and helps others avoid it too, listens and participates in class well, helps in school and a really nice guy”*. Erez remarked on Yonatan: *“Very talented person (knows a lot, a master at drawing, photography and editing computer images). When Yonatan and Niv are together in class there are always funny moments because of Yonatan’s punch lines”*. Erez expressed his awareness of the fact that class dynamics shift according to the combination of participating students. Watching the YouTube clip helped them all develop awareness regarding their strengths. Shir wrote of his own strengths: *“Kind, empathetic, honest and reliable, able to learn and understand interesting subjects to the smallest detail”*. Niv wrote: *“I feel that I can learn new things very quickly. When I get serious about something I go all the way with it. Try to be honest with everybody, doesn’t matter who”*.

The possibility of seeing in real time comments made on Google Drive by fellow classmates proved to be an experience that contributed to reciprocity and their ability to respond and connect

to each other. A supportive and bonding communication formed, and the students were left feeling empowered and uplifted.

Highlighting Difficulties through Use of Photos and Assistive Technologies

Thus far, analysis of study findings revealed that photography often constitutes a motive for interaction that bonds some or all participants through “real” dialogue, discussion, or debate on a common subject. Concurrently, the communicative difficulties were also highlighted, and at times the dialogue remained limited to random chatter, where each participant reacted to the photo from their own perspective, without addressing previous remarks. Furthermore, there was evidently much focus on visual elements and informative/external details alongside deeply candid sharing of personal or emotional thoughts.

Exposing the difficulties of empathy

Ido remarked on his own appearance wearing a suit and tie during the Purim activity: *“Here I look serious and sophisticated”*. He then immediately compared this photographed image to his current social status and shared his feelings with the group: *“I would like people to understand me, people think I’m weird, I want them to think that I’m normal. The girls don’t care at all, they think I’m stupid”*.

Ido demonstrated awareness of his social situation and seeing his “other” image in the photo only exacerbated his sense of frustration and fueled his desire to share with the group. Despite making a profoundly personal and painful admission and despite the fact that most of the other students could identify to some degree with the sentiment, Ido did not receive any response from his classmates. It is possible that this issue is too distressing to address and that the other participants deliberately avoided developing the conversation. The rest of the dialogue was utterly unrelated to the last remark and further indicated that this topic is too uncomfortable to discuss.

Yonatan remarked: *“I hate my hands”* Erez replied: *“What’s wrong with your hands? And anyway, you’re supposed to look for good things”*. Erez obviously tried to get Yonatan back to the conversation topic, but Yonatan responded by making a random and unrelated comment: *“It’s hot today”*.

It seems Yonatan felt uncomfortable dealing with this subject and tried to deflect and redirect the conversation to something else. Erez did not receive any response from the group and no bonding dialogue was formed.

The presentation of Niv’s childhood photo obviously provoked a debate in which each participant related to the image from their individual perspective. Niv said: *“That’s me, as you can see I had light hair that got darker over the years, this is from the pool of kibbutz...”* Niv provided a relatively lengthy remark containing informative details, but did not wait for questions or responses, as if he were talking to himself and was alone in the room.

Not one of the other participants chose to question why most of Niv’s childhood photos show him with a cast on his leg. Apart from Shir’s question asking about where Niv had lived, the other reactions did not continue the conversation and showed no interest in hearing more from Niv. Rather, they conveyed various individual interests in the photos visual elements: *“The colors are nice”*, *“The composition isn’t very pleasant”*, and then also added their personal interpretation: *“Just like a kid on holiday with his parents, not really sure he’s having fun”*, *“As if he’s smiling but his eyes are crying”*. The personal, emotional references were manifest alongside a limited ability for reciprocal conversation.

In another case, the group viewed Erez's childhood photo of himself and his younger brother, and he very candidly shared details of their relationship. This prompted a "dialogue" between Erez and Niv, with each describing their own brothers and not addressing each other's remarks. Deficient social skills and limited ability for reciprocal conversation were apparent. Erez shared a memory regarding his relationship with his brother when referencing a childhood photo of them wearing costumes: *"I'm the sun and he's the moon. I was the sun, the Sun King. I chose to bring this one because it's one of the happy ones"*. Niv said: *"I have a picture with my brothers"*. Niv thus shifted the conversation to himself; he did not listen to Erez's story, express interest in his relationship with his brother, or ask why this photo is one of Erez's happiest. The other students also refrained from responding, and the conversation between Erez and Niv continued; Erez: *"The relationship with my brothers is sometimes hard"*. Erez was making a frank admission of his life, and Niv continued to shift the conversation: *"My little brother argues with himself, tries to hurt himself"*.

Despite the lack of reciprocal reference between the participants, Erez and Niv spoke very openly of their sibling relationships. The photograph obviously served as motivation for sharing and social interaction, but there was still evident difficulty in responding to statements made by others, or showing interest and empathy.

Comparing informative talk with social discussion

Despite the students' rich vocabulary and high intelligence, their difficulty in understanding verbal cues and expressing themselves verbally was apparent. The following example focused on a childhood photo of Yonatan. Participants all addressed the same image, each providing their own outlook but without directly responding to each others remarks. Yonatan: *"Why are you calling me a redhead? This is a photo from Tel Aviv, we lived there until I was three and a half..."*

Yonatan finds it hard to focus and tends to jump from one subject to another. Ido related to the topic of hair color: *"I remember I used to be blond, and babies are beautiful depending on how you look at them"*. Then Yonatan again "jumped" to another subject, addressing the artistic elements of the photo: *"In this one I like the flash, you can see the baby really pop up"*. Ido expressed interest in Yonatan: *"You were still crawling on the floor?"* Ido's question was left unanswered. Shir then addressed other elements altogether: *"You can see they have it set up for a baby, there are toys and a bin for diapers"*. Clearly, the students did not react to Yonatan's childhood story; they chose instead to reference visual elements, such as hair color, use of flash, toys and diaper bin. Each pupil focused on those elements that attracted his attention, they did not relate to previous remarks, and as a result the dialogue about the photo remained limited and impaired.

Summary

The difficulty of people with AS in developing friendships with their peers stems from, among other things, the lack of a spontaneous need to share their experiences with others and a lack of social and emotional reciprocity. Findings show that the use of photography and assistive technologies creates an opportunity for students to include others regarding personal issues they normally avoid discussing. Furthermore, this lack of sharing has been shown to derive from an absence of interest and not from lack of openness. When a trigger is created, the subsequent sharing experience is open and sincere.

We learn from the findings that, with suitable mediation, certain activities (including photographs and assistive technology) did indeed motivate dialogue, openness and sharing, deeper knowledge of each other, self-reflection, and awareness of image and impression of one's surroundings,

alongside clarifying those communicative difficulties so common among AS students, and providing an opportunity to discuss and treat them.

Ido's remark impressively captures the process the group underwent during photography meetings:

"I learned that with a good photograph you can really show how you feel. That I can succeed too despite how hard it is. It makes me understand myself better, that I can smile sometimes"

"I learned about my friends that they have their own strengths and weaknesses, just like me. Photography helped me know them better, helped to read if their expressions are positive or negative, there were new things I learned the others thought of me, and I learned they are good friends that listen to me and help me, we said nice things to each other, we told each other personal stuff and general stuff. I learned they can give me compliments, that they know a lot about topics I know and topics I don't know".

Discussion

Analysis of study findings indicates that use of photographs motivates participants to share childhood memories and emotions that would not have arisen spontaneously. It appears the students trusted and felt safe in the group. They discussed their emotions and even their difficulties, honestly and candidly, and it seems this sharing was authentic and without concern of peer reactions.

Interpersonal Expression

While showing childhood photos, students shared information regarding the relations with their family, and this in turn motivated their classmates to examine their own family relationships. Talking about various life issues may create closeness and intimacy between students. Shalita et al. (2011) found that a visual strategy that employs photography can expand a student's horizons, and allows a group to become familiarized with their classmates' families and the significant figures in their lives.

One diagnostic attribute characteristic of people with AS is the lack of any spontaneous need to share their experiences, interests, or achievements with others, and lack of emotional and social reciprocity (American Psychiatric Association, 2000). Spontaneous sharing of experiences and emotions does not come naturally and is mostly elicited. Accordingly, the current study demonstrates that group sharing included a range of statements, from visual and artistic elements of the photo: "*The colors are nice*", "*The composition isn't very pleasant*", through to informative details: "*... as you can see I had light hair that got darker over the years*", and the sharing of personal thoughts and feelings: "*The girls don't really like me...*".

The most significant contribution of using visual demonstration and analysis technology is that it provides a means to encourage sharing, in the intimate, personal, and family exposure that it produces, as previously the students' natural tendency was to only discuss their fields of interest.

People with AS tend to base friendships on shared areas of interest and intellectual pastimes, and not on personal considerations. Discussion of assignments and meeting topics allowed the group to demonstrate their intellectual strengths, alleviated the stress of social interaction, and empowered them.

In this study format, personal photos do not allow the students to automatically retreat back to theoretical discussion, to areas where they feel comfortable and safe, and instead force them to cope with the difficult task of conducting social conversation.

Facial Expressions

Our findings reveal that use of photos provoked statements regarding facial expressions seen in photos and, additionally, motivated a discussion about them and provided a chance to develop this important social skill.

Technological advancements have meant that more and more tools are being developed to assist people with AS to read and interpret facial expressions, such as a device that identifies expressions and can classify six different and complex combinations of emotions: agreement, concentration, disagreement, interest, reflection, and doubt. Use of this device has been proven effective in improving identification of complex facial expressions in children with AS (El-Kaliouby & Robinson, 2005). This study shows that use of students' photographs facilitates and expands the range of emotions and sensations conveyed in photos, a range that goes beyond 'happy', 'sad', 'angry', and so forth. This option is an opportunity to demonstrate more complex, and often more confusing, emotions: *"It's a forced smile"*, *"His eyes are happy but his mouth isn't"*. What emotion is conveyed through this combination of "happy" eyes and an "unhappy" mouth? What emotion is conveyed when the smile looks forced? Moreover, the advantage of using personal photos lies in the fact that these images reveal the students' past and present, and so are more naturally linked to the emotions and facial expressions relevant to the story and personal context of the photo subject.

Intrapersonal Interaction

Personal identities are formed over time by the reflection resulting from the interaction with others (Sadeghi et al., 2012). In that research, the benefit of using and presenting personal photos to the group, as well as employing various technologies, encouraged students to discuss their personal image – and served as a significant means for reciprocal mirroring.

The phenomenon of mirroring manifests when several people meet. The group constitutes an important arena for seeing and reflecting on the events of their daily lives. Most frequently, the repressed aspects of individual personalities come up in interaction with others, through which they learn about themselves, their effect on others, and the group's perception of them (Toder & Weinberg, 2006).

Photography enables us to reflect on the way we appear to others and provides insights about our appearance in the eyes of others (Shalita et al., 2011). However, the external image captured in the photo does not always truly represent our inner natures, the one we experience in ourselves. Use of photographs addressed this gap, as the availability of digital technology reduces the time gap between an event and its documentation, and allowed students to "dress up" in a way they would like to be perceived by their surroundings and to be photographed in that attire. Ido provided an example of this after creating an image that he believed better reflected his "true" self: *"I like this photo because my gaze and posture make me feel authoritative"*. The positive image that students created within moments using cameras will remain as a memory they can recall and reflect on again. It seems using photography facilitates the development and strengthening of self-reflection, as in "one image is worth a thousand words". The mirroring process and interaction with peers form the self-reflection which is linked to self-awareness (Gardner et al., 2005).

Adolescents with AS need help in adapting to the world around them, so that they may utilize their special abilities more constructively, further expand their particular interests without clashing with others, and possibly gain the greatest measure of independence in their adult lives and establish positive relationships in the future (Attwood, 2006).

Activities that encourage students to consider what makes a good friend must become part of the school curriculum for children with AS (Attwood, 2006). Study findings show that use of photo-

graphs and visual aids brings out the strengths of the AS population, raises awareness regarding their competencies, encourages them to recognize their own power, and helps them verbally discuss this process. The backing from the group improved the way they felt about themselves and raised their self-confidence.

Dialogue raises awareness regarding the relationships of people with themselves, others, and their environment (Aloni, 2008). During their time in school, it is important to provide students the necessary support in a way that allows them to deepen their familiarity with themselves, accept others as they are, cope with differences, as well as empower strengths that help them develop and succeed. For students with AS, learning and exercising the rules of dialogue are of paramount importance; it is essential to their survival in and out of school. Interpersonal interaction skills in school, and later with work and relationships, are crucial to their incorporation in society, sense of belonging, and ability to succeed.

Using Photos and Visual Processing Assistive Technologies

People with AS are considered to have a good visual perception (Ganz et al., 2011; Rao & Gagie, 2006,) and generally find processing visual cues easier than verbal cues (Hume et al., 2009). Our study shows that the use of photos through projector or Picasa and use of video clips encourages and helps develop a class discussion. The discourse that formed around the photos and clip raised awareness and helped each participant identify his strengths. These findings are consistent with the literature that promotes the use of visual aids for teaching and developing communication along with class conversation while teaching students with AS (Hume et al., 2009; Meadan et al., 2011; Rao & Gagie, 2006).

Assistive technologies provide a means for students to observe themselves, to share, open up, and communicate about personal issues they are not used to and naturally disinclined to discuss. Use of a projector to present the photos to the whole class allowed each, if for just a brief while, to be the center of attention and was an invitation to develop group discourse skills.

Digital cameras provide a view of a resulting image with one press of a button and the choice to erase or keep it. Image processing technologies enable editing and altering images as we see fit, representing us in a manner that makes us feel good with the end result. Providing students the opportunity to choose images that truly portray them, whether from photos taken during group activities or brought from home, eases concerns and reduces anxiety regarding misrepresentation. Use of the digital camera allowed them to observe a documented moment of their lives, and opened the door to developing self-awareness with the assistance of the group.

The study findings reveal that use of photographs and visually assistive technologies, designed to appeal to AS students' strongest perception, successfully highlights their strengths and helps them identify strengths and express themselves verbally. The encouragement from classmates contributed to their positive wellbeing and raised self-confidence. Use of various visual technologies in a way that touched on their personal worlds created an opportunity for introspection about themselves and their friends from an initial starting point of respect, understanding, and acceptance; it created group dialogue around the photos and the clip helped raise awareness and in findings the strengths of each individual.

Conclusions

Our study demonstrates the effectiveness of using photographs and assistive technologies for visual information processing as motivating tools for interpersonal and intrapersonal communication of adolescents with AS.

Qualitative research involves collecting information about personal experiences, introspective testimonials, and childhood stories, conducting interviews, observations, notes of historical interactions, and also visual texts which are significant and meaningful moments in people's lives. Although it is not possible to reliably separate the photography sessions of our study from the overall school experience and credit these friendships entirely to our meetings, there is no doubt that they significantly contributed to developing bonds, openness, and collaboration, deepened familiarity with classmates and strengthened self-image.

Qualitative research findings are also dependent to some degree on the studied population's measure of cooperation and the researcher's flexibility, attentiveness, and willingness to adapt planned procedures. In this study the researchers were required to make changes and reconstruct the research plan during its implementation in response to the study participants' reactions, measure of cooperation and willingness, and their emotional state. This flexibility was essential for working with this population but does require consideration of the subjectivity of situation assessments.

However, the learning process required to create and develop interpersonal communication is long and time-consuming and necessitates a well-designed and incremental curriculum. The implementation process in this research study was dynamic and often changed in response to the students' measure of cooperation and their reactions and to our own interpretation and understanding of the field. Although in the beginning we had a structured conceptual plan, the majority of it was not implemented and it was restructured throughout the work process.

The difficulties of implementation can be divided into two categories: firstly, the practical-application problem and, secondly, the emotional problem. The latter manifested in little or no cooperation by the students in any activity outside classroom hours: uploading photos to Picasa, bringing cameras to class, taking photos in the afternoons or on family trips, etc. During meetings most of the students did cooperate but their emotional difficulties (and for some also psychiatric problems) were evident, including fatigue, disquiet, melancholy, or the difficulties that stemmed from lack of interest or connection to the social and emotional assignment. These tasks required intense self-examination and addressing others in a personal and intimate way.

Another limitation stemmed from the researcher's own personal conflict: maintaining fidelity to qualitative research while also as an educator trying to find the right boundaries for making students face their difficulties in social interaction, their emotional state, and measure of introspection.

The subjects incorporated into the study meetings constitute a minor part of the overall curriculum provided by the school, and so study findings and conclusions cannot be separated from this range of activities. However, any attempt to create "laboratory conditions" would not have reflected the daily life of a class environment. Our understanding was that a broad holistic approach that connects between study activities and the various areas of life of each student could provide a more credible environment for a qualitative study.

For students with AS the study and exercise of dialogue rules is enormously important and essential for their survival in school and out of it. The ability to conduct interpersonal interactions, first in school and later in the workplace, romantic relationships and all associations, is vital for fitting in, feeling a sense of belonging and succeeding in society.

Additional research is needed to answer questions regarding the measure of assimilation of the lessons learned using photography and varied assistive technologies; these skills should be assessed in various social frameworks, in the students' lives outside school and also later on, in their personal and professional lives.

A longitudinal research study is essential to examine the measure of assimilation of these tools in terms of initiation and, also, as a daily coping strategy for dealing with social situations after school. This is necessary in order to examine whether students with AS indeed use the camera and other visual assistive technologies as an automatic strategy to express their feelings and to facilitate easier interpersonal communication in their lives.

It is important to note that this study focused on the AS population. According to the newest revision of the Diagnostic and Statistical Manual for Mental Disorders (DSM-5), it appears that this population will henceforth be diagnosed as the highest-functioning level of Autism Spectrum Disorder - ASD (American Psychiatric Association, 2013; Miller-Wilson, 2013). Thus, future studies should take into account the new diagnostic indications of assessment presented in the DSM-5 along with a new and broader perspective of that population.

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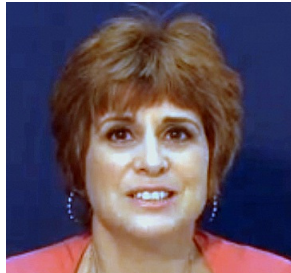
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