

SOCIAL SKILLS TEACHING PROCEDURES IN ASD-HF

**Maria Carla Ricci, Francesca Di Carmine, Antonia Bosco, Agnese Lombardi,
& Alessandro Frolli**

DRC - Disability Research Centre, University of International Studies of Rome, 00147 Rome (Italy)

Abstract

Introduction. Autism Spectrum Disorders (ASD) refer to a heterogeneous group of clinical disorders that share a qualitative alteration of Social/Communication and an atypia of the Repertoire of Activities and Interests with poor cognitive flexibility and a tendency to perseverance (APA, 2013). The Core Deficit is represented by a fall in Social Reference with a consequent alteration of Mentalization Processes and Social Skills.

Materials and Method. In this study, three Social skills teaching procedures are compared: Role Play and Instructional Feedback (RPIF), Self-Videomodeling (SVM) and Virtual Reality Training (VRT). The sample is composed of 45 Subjects with Autism Spectrum Disorder - High Functioning (ASD-HF) who were divided into three groups: the ASD-HF Gr1 trained through RPIF, the GR2 performed training through SVM and the Gr3 which performed a VRT. For the three groups, it was required to learn two social skills: (a) starting and maintaining a conversation for 10 minutes with a peer; (b) starting and maintaining a pleasant activity with a peer.

Results. The evaluation parameter used for both social skills was the time of acquisition. The Gr3 showed faster learning compared to the other two groups; the Gr2 showed, for both tasks, a faster acquisition compared to the Gr1, but slower than the Gr3.

Conclusions. In this study we tried to reduce any differences in stimuli exposures between the three groups. Therefore, VRT has indeed proved to be the best teaching procedure for rapid acquisition. The immersive nature of VRT could actually explain much of the benefits of teaching in Virtual Reality. In fact, this procedure allows an active participation in the learning context so that, even subjects with ASD-HF, can improve their acquisition speed.

Keywords: *Virtual reality, self-videomodeling, role play, instructional feedback, autism spectrum disorders.*

1. Introduction

Asperger's Syndrome (AS) and / or High Functioning Autism (HFA) in DSM-IV-TR (American Psychiatric Association, APA, 2000) and ICD-10 (World Health Organization, WHO, 1993) is included in the more global chapter of Pervasive Developmental Disorders and can only be diagnosed in the absence of an intellectual disability. For these children, deficits in social skills can affect interactions with family, peers, and other adults. In turn, limited social skills can affect their ability to achieve normal developmental milestones and establish satisfying peer relationships (Krasny et al., 2003). Children with this disorder lack in social skills and do not have an adequate behavioral repertoire to be able to interact with others according to social conventions. Unlike children with other subtypes of Pervasive Developmental Disorder, children with HFA also have speech in a normal range of functioning (APA, 2000). In DSM 5 (APA, 2013), the term Asperger's Syndrome disappears to give way to Level 1 Autism Spectrum Disorder. However, the social skills deficits identified in children with Level 1 ASD remain the same as in HFAs and include: lack of orientation towards social stimulation and inadequate use of eye contact, problems in initiating social interactions, difficulty in interpreting both verbal and non-verbal social cues, inappropriate emotional responses and lack of empathy (Weiss & Harris, 2001). Young people with HFA also have difficulty sharing emotional experiences or understanding the point of view of others, two skills that are vital for social reciprocity and the development of friendships (Gutstein & Whitney, 2002). Therefore, subjects presenting a deficit of discrimination and social reference often fail to discriminate socially significant behaviors from self-referential ones. Since the social component is affected, even the learning style turns out to be highly self-referential: the autistic child learns in a self-referential way and therefore learns only what attracts him

and which, moreover, does not always have a socially significant value. This determines, even in the presence of a normal IQ, a disharmonious profile with islands of hyper-competence and areas of deficit. From a cognitive point of view, several authors have tried to study the functioning of people with autism and have hypothesized a deficit in the acquisition of the Theory of Mind (ToM) (Rutherford et al., 2002; Pellicano, 2007; Goldstein & Winner, 2012). This deficit is manifested by an inability to recognize one's own and others' mental states, the absence of shared attention, intentional communication and the ability to imitate. A variety of intervention models have been proposed and used for the development of social skills in ASD / HF in order to favor their inclusion (Shin-Yi Wang et al., 2011; 2013): behavior modification techniques, Peer Tutoring strategies, the use of Social Stories, Self-Management / PRT (Pivotal Response Training) strategies, and the use of Videomodeling (Bass & Mulick, 2007; Matson, Matson and Rivet, 2007; Scattone, 2007). Videomodeling is also a tool used by Applied Behavior Analysis (ABA) to teach complex social tasks: acquisition of conversational skills (Charlop & Milstein, 1989; Sherer et al., 2001) and pragmatic skills (Gena et al., 2005), as well as the acquisition and strengthening of the ability to initiate and sustain social relationships (Wert & Neisworth, 2003; Nikopoulos & Keenan, 2004; Buggey, 2005) by exploiting, in particular, the motivation of subjects with ASD towards new technologies: tablets, smartphones, and PCs (Frolli et al., 2020). Further studies also examined the effectiveness of Virtual Reality (VR) as a treatment option for individuals with ASD / HF (Parsons, Leonard & Mitchell, 2006; Mitchell et al., 2007; Wainer & Ingersoll, 2011). Recent research has highlighted the advantages of using VR interventions such as simulations of reality with the use of information technology in which such subjects can practice difficult or individually challenging social interactions (Wainer and Ingersoll, 2011; Kandalaf et al., 2013; Maskey et al., 2014; Didehbani et al., 2016). VR provides a controlled environment to meet the needs of the subject with the real-time feedback option that can enhance the learning experience. Furthermore, computer technology is often highly motivating and rewarding for people with ASD (Parsons & Cobb, 2011). In this study, three Social skills teaching procedures are compared: Role Play and Instructional Feedback (RPIF), Self-Videomodeling (SVM) and Virtual Reality Training (VRT) since there are not many studies in the literature that document the effectiveness of one intervention rather than another for the enhancement of social skills. For the three groups, two social skills were required to be learnt: (a) starting and maintaining a conversation for 10 minutes with a peer; (b) starting and maintaining a pleasant activity with a peer. In particular, the hypothesis tested in the work is that the VRT can allow a faster acquisition compared to the other two procedures.

2. Materials and methods

2.1. Participants

In this study we considered 45 subjects between the ages of 13 and 14 who had received a diagnosis of ASD Level 1 (HFA) (APA, 2013). Participants were divided into three groups based on the type of training Performed: Gr1 trained through RPIF, GR2 trained through SVM and Gr3 performed VRT. All subjects were administered the Wechsler Intelligence Scale for Children (WISC IV) (Orsini, Pezzuti and Picone, 2012) to exclude any participant with impaired intellectual abilities and therefore a comorbidity with intellectual disability. Therefore, the inclusion criteria were as follows: a) aged between 13 and 14 years, b) diagnosis of Level 1 Autism Spectrum Disorder in the absence of nosographically defined comorbidities, c) $IQ \geq 105$ assessed through WISC-IV, d) absence of other neuropsychiatric pathologies. After confirming the diagnosis and the possibility of inclusion in the sample, we divided the subjects into three experimental groups consisting of 15 subjects each. The subdivision was randomized. The three groups were assigned to three different types of treatment, as will be discussed in the next paragraph. The first experimental group was composed of 15 subjects with an average mean age of 13.5 (SD=0.70) and an average mean for IQ of 112.22 (SD=1.20), of which 11 males and 4 females. The second experimental group is composed of 15 subjects with a means age of 13.7 (SD=0.50) and a means IQ of 112.83 (SD=1.10) of which 12 males and 3 females. The third experimental group is composed of 15 subjects with a means age of 13.6 (SD=0.30) and a means IQ of 112.45 (SD=1.05) of which 11 males and 4 females. Finally, there were no significant differences in age or QIT in the three groups. The data were collected at the FINDS Neuropsychiatry Outpatient Clinic by licensed psychologists in collaboration with the University of International Studies of Rome (UNINT).

3. Results

Data analyzes were performed using SPSS 26.0 statistical survey software (2019). Significance was accepted at the 5% level ($\alpha < 0.05$). We compared the acquisition times of the two social skills tasks between the three training groups, using the Analysis of Variance (ANOVA) test, a parametric test that allows to compare two or more groups of data comparing the variability within these groups with the

variability between groups. The relationship between these variances follows the Fisher F distribution, which allows us to examine the hypotheses on the significance of the difference between the variability due to the treatment and the residual one. In this study we performed a one-way ANOVA to compare the scores between group 1 (RPIF), group 2 (SVM) and group 3 (VRT) and to evaluate the acquisition times of the two tasks. We called Acquisition 1 (ACQ 1) the task of starting and maintaining a conversation for 10 minutes with a peer and Acquisition 2 (ACQ 2) the task of starting and maintaining a pleasant activity with a peer. Specifically, in the comparison between the three groups, a significant effect emerged for both ACQ 1 [F (2,44) = 249.053, $p < 0.05$] and ACQ 2 [F (2,44) = 212.815, $p < 0.05$] (table 1). To understand the differences between the groups and verify our hypothesis, we performed the Post Hoc tests (Bonferroni). From these analyzes it emerged that the scores of group 2 differ significantly from those of group 1 both for ACQ 1 [F (2,44) = - 2.133, $p < 0.05$] and for ACQ 2 [F (2,44) = - 2,200 $p < 0.05$] (table 2). The comparison between group 3 and group 1 revealed significant differences both for ACQ 1 [F (2,44) = - 4,000, $p < 0.05$] and for ACQ 2 [F (2,44) = - 4.067, $p < 0.05$] (table 3). The comparison between group 3 and group 2 showed significant differences both for ACQ 1 [F (2,44) = - 1.867, $p < 0.05$] and for ACQ 2 [F (2,44) = - 1.867, $p < 0.05$] (table 4).

3.1. Tables and figures

Table 1. Comparison of the three groups to the two social skills activities.

	Group1		Group2		Group3		F	p
	Means	SD	Means	SD	Means	SD		
ACQ 1	7.40	0.507	5.27	0.458	3.40	0.507	249.053	<0.05*
ACQ 2	9.47	0.516	7.27	0.458	5.40	0.632	212.815	<0.05*

Table 2. Comparison between group 2 and group 1 to the two social skills activities.

	Group 2		Group 1		Difference in Means	p
	Means	SD	Means	SD		
ACQ 1	5.27	0.458	7.40	0.507	-2.133	<0.05*
ACQ 2	7.27	0.458	9.47	0.516	-2.200	<0.05*

Table 3. Comparison between group 3 and group 1 to the two social skills activities.

	Group 3		Group 1		Difference in Means	p
	Means	SD	Means	SD		
ACQ 1	3.40	0.507	7.40	0.507	-4.000	<0.05*
ACQ 2	5.40	0.632	9.47	0.516	-4.067	<0.05*

Table 4. Comparison between group 3 and group 2 to the two social skills activities.

	Group 3		Group 2		Difference in Means	p
	Means	SD	Means	SD		
ACQ 1	3.40	0.507	5.27	0.458	- 1.867	<0.05*
ACQ 2	5.40	0.632	7.27	0.458	- 1.867	<0.05*

4. Discussions

This study was created with the aim of comparing three types of training for the acquisition of social skills in subjects with ASD-HF. In particular, we have chosen to compare the procedures of RPIF, SVM and VRT as, to the best of our knowledge, literature presents only few studies regarding their use. Mainly, each of these procedures is documented to have good results in improving social skills, but it has not yet been documented which of these procedures is the most effective in terms of speed of acquisition, in particular referring to subjects with ASD-HF. Our analyzes have shown, in line with previous literature studies (Bellini & Akullian, 2007; Delano, 2007; Dillon, & Bates, 2010) that both the RPIF, the SVM, and the VRT guarantee rapid acquisition of social skills; more specifically, our work highlights how the SVM guarantees faster acquisition than the RPIF. This could be explained by the fact that, subjects with ASD may need to reviewing the task performed with the consequence of speeding up the acquisition of the task compared to the classic role play. However, what was most evident is that the use of VRT has proved to be even more effective than SVM. This could be explained by the fact that VR environments can offer individuals with ASD the freedom to make social mistakes without the anxiety or fear of rejection, which is commonly associated with social interactions. Furthermore, this practice can be carried out in different VR contexts, facilitating the generalization of social skills learned to contexts of everyday life (Bellani et al., 2011; Parsons and Cobb, 2011; Tzanavari et al., 2015). In addition, the use of environments in VR allows the involvement of different cognitive, affective and bodily systems, also favoring the Embodied Cognition, by involving the motor system and favoring the sense of Embodiment (the possibility of acting within the virtual environment and promoting the active involvement of children in the first person).

5. Limits and conclusions

This study represents a preliminary work that demonstrates the effectiveness of using VRT among subjects with HFA. VRT provides an interactive and visually stimulating approach capable of simulating multiple social scenarios which allow participants to practice meaningful social exchanges in a safe and socially non-threatening platform. We hope that future research may replicate the present study by implementing a larger sample and a follow up design, with the wider purpose to extend the protocol to clinical practice and implement the technology that better helps each individual.

References

- American Psychiatric Association (APA). (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., Text Revision). Washington, DC: APA.
- American Psychiatric Association (APA). (2013). *Diagnostic and statistical manual of mental disorders* (5th ed., Text Revision). Arlington, VA: APA.
- Bass, J. D., & Mulick, J. A. (2007). Social play skill enhancement of children with autism using peers and siblings as therapists. *Psychology in the School*, 44, 727–734.
- Buggey, T. (2005). Video self-modeling applications with students with autism spectrum disorder in a small private school setting. *Focus on autism and other developmental disabilities*, 20(1), 52–63.
- Charlop, M. H., & Milstein, J. P. (1989). Teaching autistic children conversational speech using video modeling. *Journal of applied behavior analysis*, 22(3), 275–285.
- Corp, IBM (2019). *Statistiche IBM SPSS per Windows, versione 26.0*. Armonk, NY: IBM Corp.
- Delano, M. E. (2007). Video modeling interventions for individuals with autism. *Remedial and Special Education*, 28(1), 33–42.
- Didehbani, N., Allen, T., Kandalaft, M., Krawczyk, D., & Chapman, S. (2016). Virtual reality social cognition training for children with high functioning autism. *Computers in human behavior*, 62, 703–711.
- Frolli, A., Ricci, M. C., Bosco, A., Lombardi, A., Cavallaro, A., Operto, F. F., & Rega, A. (2020). Video Modeling and Social Skills Learning in ASD-HF. *Children*, 7(12), 279.
- Gena, A., Couloura, S., & Kymissis, E. (2005). Modifying the affective behavior of preschoolers with autism using in-vivo or video modeling and reinforcement contingencies. *Journal of autism and developmental disorders*, 35(5), 545–556.
- Goldstein, T. R., & Winner, E. (2012). Enhancing empathy and theory of mind. *Journal of Cognition and Development*, 13(1), 19–37.
- Gutstein, S. E., & Whitney, T. (2002). Asperger syndrome and the development of social competence. *Focus on autism and other developmental disabilities*, 17(3), 161–171.

- Kandalaf, M. R., Didehbani, N., Krawczyk, D. C., Allen, T. T., & Chapman, S. B. (2013). Virtual reality social cognition training for young adults with high-functioning autism. *Journal of autism and developmental disorders*, 43(1), 34-44.
- Krasny, L., Williams, B. J., Provencal, S., & Ozonoff, S. (2003). Social skills interventions for the autism spectrum: Essential ingredients and a model curriculum. *Child and adolescent psychiatric clinics*, 12(1), 107-122.
- Maskey, M., Lowry, J., Rodgers, J., McConachie, H., & Parr, J. R. (2014). Reducing specific phobia/fear in young people with autism spectrum disorders (ASDs) through a virtual reality environment intervention. *PloS one*, 9(7), e100374.
- Matson, J. L., Matson, M. L., & Rivet, T. T. (2007). Social-skills treatments for children with autism spectrum disorders an overview. *Behavior Modification*, 31,682-707.
- Mitchell, P., Parsons, S., & Leonard, A. (2007). Using virtual environments for teaching social understanding to 6 adolescents with autistic spectrum disorders. *Journal of autism and developmental disorders*, 37(3), 589-600.
- Nikopoulos, C. K., & Keenan, M. (2004). Effects of video modeling on social initiations by children with autism. *Journal of applied behavior analysis*, 37(1), 93-96.
- Orsini, A., Pezzuti, L., & Picone, L. (2012). WISC-IV: Contributo alla taratura Italiana (WISC-IV Italian ed.). Florence, Italy: Giunti O. S.
- Parsons, S., & Cobb, S. (2011). State-of-the-art of virtual reality technologies for children on the autism spectrum. *European Journal of Special Needs Education*, 26(3), 355-366.
- Parsons, S., Leonard, A., & Mitchell, P. (2006). Virtual environments for social skills training: comments from two adolescents with autistic spectrum disorder. *Computers & Education*, 47(2), 186-206.
- Pellicano, E. (2007). Links between theory of mind and executive function in young children with autism: clues to developmental primacy. *Developmental psychology*, 43(4), 974.
- Rutherford, M. D., Baron-Cohen, S., & Wheelwright, S. (2002). Reading the mind in the voice: A study with normal adults and adults with Asperger syndrome and high functioning autism. *Journal of autism and developmental disorders*, 32(3), 189-194.
- Scattone, D. (2007). Social skills interventions for children with autism. *Psychology in the Schools*, 44, 717-726.
- Sherer, M., Pierce, K. L., Paredes, S., Kisacky, K. L., Ingersoll, B., & Schreibman, L. (2001). Enhancing conversation skills in children with autism via video technology: Which is better, "self" or "other" as a model?. *Behavior modification*, 25(1), 140-158.
- Tzanavari, A., Charalambous-Darden, N., Herakleous, K., & Poullis, C. (2015, July). Effectiveness of an Immersive Virtual Environment (CAVE) for teaching pedestrian crossing to children with PDD-NOS. In 2015 IEEE 15th International Conference on Advanced Learning Technologies (pp. 423-427). IEEE.
- Wainer, A. L., & Ingersoll, B. R. (2011). The use of innovative computer technology for teaching social communication to individuals with autism spectrum disorders. *Research in Autism Spectrum Disorders*, 5(1), 96-107.
- Wang, S. Y., Cui, Y., & Parrila, R. (2011). Examining the effectiveness of peer-mediated and video-modeling social skills interventions for children with autism spectrum disorders: A meta-analysis in single-case research using HLM. *Research in Autism Spectrum Disorders*, 5(1), 562-569.
- Wang, S. Y., Parrila, R., & Cui, Y. (2013). Meta-analysis of social skills interventions of single-case research for individuals with autism spectrum disorders: Results from three-level HLM. *Journal of autism and developmental disorders*, 43(7), 1701-1716.
- Weiss, M. J., & Harris, S. L. (2001). Teaching social skills to people with autism. *Behavior modification*, 25(5), 785-802.
- Wert, B. Y., & Neisworth, J. T. (2003). Effects of video self-modeling on spontaneous requesting in children with autism. *Journal of Positive Behavior Interventions*, 5(1), 30-34.
- World Health Organization. (1993). *International classification of diseases (10th ed.)*. World Health Organization.