

Psychosocial Interventions for Adolescents and Adults with Autism Spectrum Disorder: An Overview

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ABSTRACT

The shift from childhood to adolescence and adulthood is a challenging transition for persons with Autism Spectrum Disorder (ASD). Poor outcomes were generally described in the literature, but few studies have been carried out on interventions to support these individuals. This chapter aims to provide an overview on the psychosocial interventions described in the literature for adolescents and adults with ASD, in order to elucidate common themes in treatment approaches and report any evidence on their effectiveness on autistic symptoms, independence, and quality of life. Psychosocial interventions were categorized into four groups: social, adaptive, cognitive, and vocational outcomes. A total of 35 studies were identified, which met inclusion criteria. The overall advantages of such interventions can hardly be perceived because of the limited number of research studies published. Some useful hints for future studies have been suggested.

Keywords: ASD; Adulthood; Outcomes; Psychosocial interventions; Cognition; Adaptive skills; Socialization; Employment

INTRODUCTION

It is clear that almost all children with Autism Spectrum Disorder (ASD) grow up to be adolescents and then adults with ASD, even though, according to several authors, a small number of early-diagnosed (during childhood) individuals have met criteria for autism in later years [1]. Historically, the prognosis for individuals with ASD has been rather poor: Levy and Perry [2] found that, prior to 1990, only 25% of individuals with ASD were classified as having “good” or “fair” outcomes, based on a operationalized definition of “good” or “fair” outcomes as having achieved formal education, maintaining employment, living independently, and sustaining social relationships. And this situation does not seem to have changed so much in recent years. Only a minority of adults achieve relatively high levels of independence, only few live alone, get married, have close friends, or get permanent employment. Although outcome for adults with ASD has improved over recent years, most of them remain very dependent on their families or other support services. And also within the normal IQ range, outcomes are very variable and neither verbal nor performance IQs proved to be consistent prognostic indicators [3]. It is clear that outcome can crucially depend on the degree and appropriateness of support that is provided at the end of the school years and in adulthood [4]. To date, only a small part of the innumerable publications on ASD have focused on adults; therefore, relatively little is known about effective interventions for adolescents and adults with autism that facilitate positive outcomes [5], but psychosocial interventions appear to be promising for this target [6], although they represent a relatively new area of research. The psychosocial intervention has been given varying definitions: some authors have defined it as having a very specific focus; some others have provided a very broad definition, as any intervention that emphasizes psychological or social rather than biological factors [7]. Dagnan [8] suggested to consider as psychosocial interventions those falling within four ecological levels: interventions with the individuals, interventions in the immediate social context of the individual, interventions aimed at wider social context of the individual, and finally, the service structure through which interventions are designed and delivered.

This chapter aims to provide readers with an overview on the psychosocial interventions described in the literature for adolescents and adults with ASD, in order to elucidate common themes in treatment approaches and report evidence on their effectiveness on autistic symptoms, independence and quality of life. With regard to Dagnan’s levels [8], only psychosocial interventions directly addressed to persons with ASD have been taken into account.

LITERATURE SEARCH

A number of studies relating to psychosocial interventions for adults with ASD have been selected after an extensive search in the literature. Relevant keywords were entered in the Bibliosan Research System, a new Italian network of biomedical libraries, and namely, autism combined with adolescents, adults, interventions, treatments, employment, independent life. Since the main aim of this book chapter was to detect as many outcome studies as possible, exclusion criteria have not been applied. Papers were included on the basis of the following criteria:

- Topic: psychosocial interventions.
- Subjects: adolescents and adults with ASD, with or without Intellectual Disability (ID).
- Outcomes: social abilities, cognitive abilities, vocational abilities and employment, adaptive abilities and independence.
- Language: English.
- Design: experimental (Randomized Controlled Trials – RCT); quasi experimental designs (Controlled Trials – CT – and Uncontrolled trials – UCT), reporting pre- and post-test data; single case designs; presentations of intervention models reporting quantitative information was an additional criterion.
- Journals: all papers had to be published in peer-reviewed journals, in order to guarantee that the minimum requirements for scientific methodology were met.

RESULTS

A total of 35 studies were identified on psychosocial interventions topic, which met inclusion criteria. Studies were categorized into four groups, and a list of studies and their characteristics (authors, study design and duration, intervention type, number and diagnosis of participants, outcomes) are detailed in tables 1 to 4; namely:

Studies with Outcomes on Social Abilities

14 studies (3 RCT, 5 CT, 7 UCT, 2 single case studies) carried out from 1991 to 2015. Three studies evaluated the efficacy of language interventions, 2 studies focused on recognition of emotions and 8 tapped on social abilities. Intervention programs duration was 2-to-14 weeks, 11 out of which were addressed to people with High-Functioning Autism (HFA); only 2 studies introduced interventions on ASD associated with Intellectual Disability (ID). Two studies used computerized programs, and 2 studies used virtual reality softwares; five specific models of intervention were presented.

Table 1: Psychosocial interventions with outcomes on social abilities
(also including communication).

Authors	Study design / Study duration	Intervention type	Diagnosis / Number	Outcomes
Elliot et al. [9]	UCT 4 weeks; three 15-min individual sessions using DTT, and three 45-min group sessions using NET	Language teaching; effectiveness of DTT and NET were compared	Adolescents and adults with ASD and Severe-to-Profound ID EG: 23	Both DTT and NET improved initial and long-term language generalization and retention. None of the two methods was more effective than the other; since NET has many strengths and few drawbacks, it is preferable for people with autism and ID
Bölte et al. [12]	RCT 5 weeks, 120-min individual sessions	Computerized program designed to teach people with ASD to recognize facially expressed emotions	Adolescents and adults with HFA EG: 5 CG (no treatment): 5	EG improved significantly on the emotions recognition tasks
McDonald and Hemmes [15]	Single case multi-probe design two 15-min daily sessions	ABA procedures to enhance social initiation	One adolescent with ASD; no information about the intellectual level	Increased social spontaneous initiating were obtained either in treatment or in probe sessions
Rehfeldt and Chambers [10]	Single case reversal design (BABAB) 10-min sessions	ABA procedure to reduce verbal perseverations	One adult with ASD and mild ID	Decreased verbal perseverations and increased appropriate verbal responses were obtained both during the baseline and the intervention phases
Golan e Baron-Cohen [11]	CT from 10 to 15 weeks Experiment 1: home individual use of the software; Experiment 2: software used in a group format	<i>Mind Reading</i> computerized program to recognize complex emotions in faces and voices	Adults with HFA and AS EG:19 CG 1(people with HFA and AS; social skill training): 22 CG 2 (TD – no treatment): 24	EG improved significantly more than the CGs
Hillier et al. [16]	UCT 8 weeks; 60-min group sessions per week	<i>Aspirations program</i> (social and vocational skills support group)	Young adults with HF-A EG:13	No pre- and post treatment significant differences were found from self-report measures; some improvements were found in empathy and attitude towards peers from structured observations
Tse et al. [17]	UCT 12 weeks; one 1.5-hour meeting per week	Social skills training group, role playing-based	Adolescents with AS and HFA EG: 46	Improvements in social skills were found from parents questionnaires; social skills generalize to settings outside the treatment group

Turner-Brown et al. [14]	CT Feasibility study 18 weeks, 50-min individual sessions per week	<i>Social Cognition and Interaction Training (SCIT)</i>	Adults with HFA EG: 6 CG (classic treatment): 5	Cognition: EG improved in emotions recognition and in ToM. Social Functioning: no statistically significant difference was found between EG and CG, but only trend level improvement in EG
Trepagnier et al., 2011	UCT Feasibility and acceptability study 2 weeks, 2 individual sessions per week	Virtual conversation with an on-screen partner	Adolescents and adults with HFA EG: 16	All participants appreciated virtual conversations and endorsed all 10 positive statements about the conversational experience and the character's realism
Hillier et al. [18]	UCT 8 weeks; 60-min group sessions per week	<i>Aspirations program</i> (social and vocational skills support group)	Young adults with HFA EG:42	Participants self-reported significantly lower depression and anxiety following the Aspiration program. Peer relationships were also improved, although this did not reach significance
Gantman et al. [20]	RCT 14 weeks; 90-min group sessions per week	<i>PEERS</i> (Program for the Education and Enrichment of Relational Skills) for Young Adults	Young adults with HFA EG: 9 CG: 8 (delayed treatment)	Significant improvements in social skills were found in EG, based on self-report measures and teacher questionnaire, namely: to know social rules, cooperative behavior, assertiveness, self-control, empathy, frequency of getting-together.
Kandalaft et al. [13]	UCT Feasibility study 5 weeks, 2 sessions per week	Virtual Reality Social Cognition Training (on Second Life TM platform) focused on enhancing social skills, social cognition, and social functioning	Young adults with HFA EG: 8	Significant improvements were found in social and occupational skills in real life; significant improvements in ToM and emotions recognition. Data come from a battery including measures on social cognition and social skills
Hesselmark et al. [21]	RCT 36 weeks; 3-hour group sessions per week	Cognitive Behavioral Therapy (CBT) compared to Recreational Activities (RA). CBT focused on three theme modules: self-esteem and ASD awareness; social contacts and everyday life; psychological and physical health	Adults with HFA EG (CBT): 34 CG (RA): 34	Both groups reported an increased quality of life at post treatment with no difference between intervention efficacy; group format enabled social interaction and sharing experiences. CBT participants rated themselves as having generally improved, as well as in expression of needs and understanding of difficulties.

Bonete et al. [19]	CT 10 weeks; 75-min group sessions per week and follow-up after three months	IPS-WAP (Interpersonal Problem-Solving for Workplace Adaptation Program)	Adolescents and adults with AS EG: 50 CG (TD; no treatment): 50	Scores were significantly higher at post-treatment in the social problem-solving task and socialization skills, based on reports by parents; differences with the TD group decreased after treatment.
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EG: Experimental Group; CG: Control Group; ID: Intellectual Disability; HFA: High Functioning Autism; AS: Asperger Syndrome; TD: Typical Development; UCT: UnControlled Trial; CT: Controlled Trial; RCT: Randomized Controlled Trial; NET: Natural Environmental Teaching; DTT: Discrete Trial Teaching; ToM: Theory of Mind

Studies with Outcomes on Cognitive Abilities

3 studies (1 CT and 2 UCT) carried out from 2004 to 2013. One study evaluated the efficacy of three procedures facilitating reading; another study evaluated the effect of supported employment on cognitive abilities; a third study was about the effectiveness of Cognitive Enhancement Therapy (CET), a specific comprehensive cognitive rehabilitation intervention. These studies introduced programs having different durations, up to 30 months. All interventions were addressed to people with HFA.

Table 2: Psychosocial interventions with outcomes on cognitive abilities.

Authors	Study design / Study duration	Intervention type	Diagnosis / Number	Outcomes
O' Connor et al. [22]	UCT Within subjects design Variable length	Three facilitation procedures on reading comprehension (answering pre-reading questions, completing cloze sentences embedded in the text, resolving anaphora by identifying relevant antecedents, and control-reading only).	Adolescents with HFA EG: 20	Effects of anaphoric cuing were statistically significant
Garcia-Villamisar and Hughes [23]	CT About 30 months	Supported employment in the community (20 hours of work per week) compared with non-competitive vocational activities in a sheltered setting , with regard to the impact on cognitive development	Adults with HFA EG (supported employment) + CG (vocational activities): 44	The EG experienced improvements over time in 8 out of 12 measures of cognitive functioning (memory and executive functioning tests from CANTAB)

Eack et al. [24]	UCT Feasibility study 18 months; 105 individual and group sessions	Cognitive Enhancement Therapy-CET (computerized and non-computerized comprehensive cognitive rehabilitation interventions; 60 computerized individual sessions on problem solving, attention, and memory + 45 group sessions with cognitive-social objectives)	Adults with HFA EG: 14	Significant effects on: neurocognition (problem solving and processing speed), cognitive style, social cognition profile and social adjustments. Social-cognitive gains generalized to improvements in broader adaptive functions
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EG: Experimental Group; CG: Control Group; HFA: High Functioning Autism; UCT: UnControlled Trial; CT: Controlled Trial.

Studies with Outcomes on Adaptive Skills

7 studies (1 RCT; 3 CT; 2 UCT; 1 single case study) carried out from 1980 to 2010. Studies were focused on different topics: overall and specific adaptive skills; independence in performing functional activities; autistic symptoms and quality of life; maladaptive behaviors. Intervention programs duration was 12 months to 5 years; interventions were mostly addressed to people with ASD associated with ID; only 1 study reported an intervention on ASD at High Schools. One study used a technological devise; in another study, ABA procedures and specific interventions models were adopted.

Table 3: Psychosocial interventions with outcomes on adaptive skills.

Authors	Study design / Study duration	Intervention type	Diagnosis / Number	Outcomes
Nelson et al.[28]	RCT alternating treatment design	Teaching how to lace shoes: color coded as "extra prompt" procedure was compared to a "no extra prompt" procedure	Children and adolescents with ASD and ID G1:10; extra prompt-no extra prompt G2:10; no extra prompt-extra prompt	Ability was learned faster with extra prompts (108 trials vs 137), whereas the transfer of acquired skill to the natural setting was more difficult in the case of extra-prompt (82 trials vs16). Authors recommended avoiding the use of highly salient, non-criterion-related prompts in teaching certain types of adaptive skills to persons with autism.
Garcia-Villamizar et al. [23]	CT Longitudinal study: 3 years	Comparison between supported employment (with job coaches) and sheltered work	Young adults with ASD and mild ID EG: 25; supported employment CG: 26; sheltered work	The EG showed minor autistic symptoms (CARS) and better quality of life after three years; however, difference was not statistically significant with regard to the CG.

Garcia-Villamisar et al. [31]	CT Longitudinal study: 5 years (1996-2000)	Comparison between supported employment (with job coaches) and sheltered work	Young adults with ASD and mild ID EG + CG: 55	The quality of life of individuals in the supported employment improved in a very meaningful way, while the sheltered employment group did not experience any meaningful improvement in their quality of life.
Van Bourgondien et al. [25]	CT 12 months	The Carolina Living and Learning Center (CLLC; residential program based on TEACCH model)	Young adults with ASD; 85% of them presented with moderate to severe ID. EG: 6; CLLC CG1: 10; family home CG2: 10; group home CG3: 6; life in institutions	Adults in the CLLC scored higher than participants in control settings in the following areas: communication, independence, socialization, developmental planning, and positive behavior management. The CLLC program was viewed as a more desirable place to live than the other settings, and the families were significantly more satisfied.
Baker et al. [29]	Single case study AB design 26 months UCT	ABA procedures in a case of coprophagia	1 adult with ASD and ID	Frequency of coprophagia decreased, but by a variable amount, for the first 6 months following initiation of the intervention, and then reduced to zero instances for a period of 26 months.
Gentry et al., 2010	1 initial training session of 90' and 4 training sessions of 60' over 10-15 days. Follow-up 8 weeks after the conclusion of training.	Use of Personal Digital Assistants (PDAs) as task management tools	Adolescents with ASD at High Schools EG: 22	All the participants used the PDA at home on a daily basis. 8 weeks after training, most participants (18 of 22 or 82%) were able to program device software. All participants reported that the device had improved their independence in performing functional activities.
Valenti et al. [26]	UCT longitudinal study 2 years; 3 hours a day, 5 days a week	Semi-residential rehabilitation providing individualized ABA-based educational plans	Children and adolescents with ASD; 72% of them presented with ID. EG: 60	Male adolescents showed an increase in the socialization VABS scores only; female adolescents achieved good results in the domains of daily living, socialization and motor skills. A great level of satisfaction was reported by parents.

EG: Experimental Group; CG: Control Group; G1: first group; G2: second group; G3: third group; G4: fourth group; ID: Intellectual Disability; ASD: Autism Spectrum Disorder; HFA: High Functioning Autism; UCT: UnControlled Trial; CT: Controlled Trial; RCT: Randomized Controlled Trial; VABS: Vineland Adaptive Behavior Scale.

Table 4: Psychosocial interventions with outcomes on vocational and job skills.

Authors	Study design / Study duration	Intervention type	Diagnosis / Number	Outcomes
Keel et al. [32]	UCT TEACCH supported employment models. Programs started in 1989; report on results obtained up to 1997	TEACCH supported employment (Individual Placement; Dispersed Enclave; Mobile Crew)	Adults with ASD (over 100 individuals)	96 individuals got a job (72% Individual Placement; 21% Dispersed Enclave; 7% Mobile Crew) A retention rate of 89% demonstrates the success of the program which is largely due to the broad array of long-term support services provided to each person.
Mawhood and Howlin [34]	CT Longitudinal study: 2 years	Supported Employment Program	Adults with HFA or AS EG: 30; supported employment CG: 20	Adults included in the supported employment program got a job more easily than controls (63% vs 25%) and received significantly higher wages.
McClannahan et al. [36]	UCT Longitudinal study Data provided on the progression of 15 adults with ASD known to authors for 15-to-25 years	Princeton Child Development Institute program (PCDI: Adult life-skills program): supported employment model which also provides instructions on an array of home and community-living skills and delivers services in multiple settings.	15 adults with ASD EG:15; adult life-skills program	11/15 got a job, 4 full-time and 7 part-time; level of satisfaction with the PCDI program: 6.9/7; high satisfaction of employers.
Howlin et al. [35]	UCT Longitudinal study: 2 years	Supported employment program (NAS Prospects)	Adults with ASD or AS with IQ >60 G1: 19; supported employment for 8 years G2: 89; supported employment for 2 years	68% from the G1 found and retained job, in many cases a permanent position (most involved administrative, technical, computing work). Most of individuals in G1 were characterized by high-level education, high IQ and good language skills. In the G2, employment was obtained by 54% to 70% of individuals.
Lattimore et al. [41]	Single cases study / Multiple baseline across participants	Comparison between two job training procedures: on-job training and simulation + on-job training; use of task analysis for abilities to be learned	Adults with ASD and severe-to-profound ID 4 subjects	On-the-job-site + simulation trainings resulted into higher- level skills or more rapid skill acquisition than did on-the-job-site only training.
Hillier et al. [37]	UCT Longitudinal study: 2 years	Vocational support program	Young adults with HFA EG: 9	6 participant got a job for one year, adequately paid. 7 participants retained their initial job placements over the 2-year period. Most frequent difficulties in the jobsite: social and communication difficulties and emotional vulnerability.

Lawer et al.[44]	UCT Retrospective study based on the analysis of medical records, which were closed in 2005	Use of the Vocational Rehabilitation Services by people with ASD in comparison with individuals with other disabilities (mental retardation, specific learning disability and others)	Adolescents and adults with ASD (aged 18 to 65) EG: 1707	Few individuals received vocational services, because of their severe level of impairment; when served, adults with ASD received the most expensive set of services. The percentage of competitive employment did not differ from that of MR and SLD, and was much higher than those of people with other impairments; this was due to the presence of on-the-job supports (including job coaching, follow-up and follow-along, and job retention services).
Allen et al. [42]	Single case study Multiple baseline across participants 4 months	Effects of video-taped modeling on job behavior (entertain customers and promote products in a retail setting while wearing an inflatable costume)	1 adolescents and 2 young adults with HFA	All participants learned to use the skills in combination or sequence, after watching the video model. The skills generalized to an actual job opportunity.
Burke et al. [47]	Single case study Multiple baseline across participants	Evaluation of two instruction methods, behavioral skills training (DVD and Script trainings) and a “Performance Cue System” (PCS; iPhone application adapted for the study) to perform a complex chain of workplace behaviors (to wear an inflatable firefighter costume and perform 63 scripted behaviors)	Young adults with HFA Study 1:3 participants were exposed to behavioral skills training Study 2:3 additional participants received the performance cue system only	5 out of 6 participants reached criterion only after introducing the PCS, while the sixth participant reached criterion with behavioral skills training alone. The program received high satisfaction ratings from participants, their parents, and consumers.
Cimera et al. [38]	CT Data from national database (2002-2006)	Effects of sheltered workshops to prepare individuals with ASD for competitive employment within the community	Adults with ASD G1: 215; supported employees who were in sheltered workshops prior to entering supported employment G2: 215; supported employees who were not in sheltered workshops	Results showed no differences in rates of employment between the two groups. However, individuals in G1 earned significantly less and cost significantly more to serve, than their in G2.
Taylor et al. [40]	UCT Longitudinal study: data collected over 12 years	Post-secondary education and employment	Young adults with HFA EG: 73	2/3 of the sample had work experience during the school period, only 25% of these (12 subjects) maintained the job (full or part time, continuously or with interruptions); women appeared most disadvantaged; more advantaged were individuals at high socioeconomic familial level. Maladaptive behaviors, social/ communication impairments and repetitive behaviors were the typical features of those who had never worked.

EG: Experimental Group; CG: Control Group; G1: first group; G2: second group; ID: Intellectual Disability; HFA: High Functioning Autism; AS: Asperger Syndrome; UCT: UnControlled Trial; CT: Controlled Trial.

Studies with Outcomes on Vocational and Job Skills

11 studies (0 RCT; 2 CT; 6 UCT; 3 single case studies) carried out from 1997 to 2015. Four studies were focused on supported employments, 3 on support programs to facilitate the access to job placements in the community (one of them tapped on the relationship between post-secondary education and employment), 3 evaluated the effectiveness of specific behavioral procedures, and 1 was a retrospective study about the use of the Vocational Rehabilitation Services by people with ASD. Intervention durations in each study largely varied, up to 12, 15 and 25 years; about half of the studies were addressed to people with HFA.

A brief summary of results will be provided separately in the following paragraphs.

Studies with Outcomes on Social Abilities

Studies as reported in this paragraph are about interventions on language, interpersonal skills and recognizing emotions and Theory of Mind (ToM). As far as language abilities are concerned, increased language generalization and retention were reported by Elliott et al. [9] by means of ABA models, namely DTT and NET sessions; authors suggested that NET procedures, having many strengths and few drawbacks, seemed preferable in teaching language to persons with ASD and ID. ABA procedures seemed to be effective also in decreasing verbal perseverations and increasing appropriate verbal responses [10]. Virtual conversation with an on-screen partner seemed to represent a new pleasant and well-accepted method to enhance conversational abilities. Emotions recognition and ToM seemed to be facilitated by computerized and virtual programs [11-13] and by the Social Cognition and Interaction training as well [14]. Only in the case of virtual reality platform, some improvements in social abilities in real life were shown. With regard to interpersonal skills, increased social spontaneous initiating [15], some improvements in empathy and attitudes towards peers [16], some improvements in general social abilities [17,18] and social problem-solving tasks [19] were demonstrated. The PEERS program [20] seemed to be effective in improving social rules knowledge, cooperative behavior, assertiveness, self-control, empathy and frequency of get-together. Only two studies [13,17] described improvements in social skills in real life, outside the treatment setting. Diminished depression and anxiety symptoms were also reported by Hillier et al. [18] after the ASPIRATION program; and finally, fewer differences with normal controls were found following IPS-WAS program application [19]. Cognitive Behavioral Therapy is worth specific mention [CBT; 21], a manualized group therapy, focused on three theme modules (self-esteem and ASD awareness; social contacts and everyday life; psychological and physical health) which use psycho-education (e.g. lectures and discussions on ASD and psychiatric symptoms), social training (e.g. skill building such as practicing phone calls and asking for help) and cognitive behavioral techniques (e.g. setting goals, role-playing,

exposure exercises and conducting behavior analysis). The enhanced quality of life probably came from the sessions format (group), which enabled social interaction and shared experiences; CBT also determined, in adults with ASD, a greater understanding of their own difficulties and improved their ability to express needs and receive support (and this is the core point of psycho-education and social training).

A few remarks

Studies included in the paragraph above on psychosocial interventions introduced differing methodologies and types of interventions; these latter typically consisted of short intervention durations, lack of follow-ups and enrollment of persons with HFA almost exclusively; moreover, results obtained from the experimental setting were only reported and information on the ecological validity of each intervention have not been reported. It might be advantageous to adapt the above described procedures to natural settings, in order to assess their effectiveness in the daily life of persons with ASD.

A new trend of interventions, namely the use of computerized trainings, especially virtual reality settings, seemed to begin to take shape, but, to date, no studies have succeeded in demonstrating their greater effectiveness than traditional procedures.

Studies with Outcomes on Cognitive Abilities

The study by O' Connor et al. [22] stems from the poor reading comprehension of people with ASD, frequently combined with good decoding; effects of three types of reading comprehension facilitations are reported, namely: answering pre-reading questions, completing cloze sentences embedded in the text, and resolving anaphora by identifying relevant antecedents. The last procedure turned out to be more effective than the others, thus indicating important educational implications.

Results from the study by Garcia-Villamizar and Hughes [23] suggested that vocational rehabilitation programs, beside enabling persons with ASD to work and contribute to society, have a beneficial impact upon their cognitive performances as well. The study provided an ecological demonstration that executive functions are directly related with real life of individuals with autism, and that vocational programs also have non-vocational outcomes (such as cognitive performance).

The Cognitive Enhancement Therapy [CET; 24] seems to be a feasible, acceptable and potentially effective approach to the treatment of cognitive impairments in adults with ASD, conferring benefits also to social and adaptive functioning. It is a comprehensive cognitive rehabilitation intervention, including both either computerized individual sessions tapping on problem-solving, memory, and attention, or non-computerized group sessions with cognitive-social aims. The group session offered participants the opportunity to practice cognitive abilities in vivo; each session included a Welcome Back introduction to the session; a Homework Presentation, that was

chaired by one of the group members; a Cognitive Exercise, designed to facilitate the development of social-cognitive abilities; Feedback from group members and therapists/coaches on the performance of individuals participating in the exercise; a brief Psychoeducational Lecture on a new social-cognitive topic; and a Homework Assignment based on the lecture. CET specifically addresses those cognitive abilities that underlie successful interpersonal interactions and daily life problem solving, which can be applied to novel, unrehearsed social exchanges.

A few remarks

Only three studies were included in this paragraph, that are relatively more recent than the previous ones. And this is suggestive of the increasing attention in this domain. Once more, studies were lacking follow-ups, enrolled people with HFA exclusively, and did not report information about interventions appreciation by persons with ASD; all cognitive trainings were computer-based. It is worth noting the effect of supported employment on memory and executive functioning of adults with HFA; this indicates that the aforementioned cognitive functions are likely to take advantage not only from specific training but also from “doing”.

Studies with outcomes on Adaptive Skills

Two studies adopted a comprehensive psychoeducational intervention [25,26]. One of them is the Carolina Living and Learning Center (CLLC), a farm-like residential program based on TEACCH model (or Structured Education), in which the following principles are applied: individualized assessment, using individuals’ strengths and interests to facilitate learning of adaptive skills, family involvement, generalist training model, organization of the physical environment, sequential organization activities, visual schedules, routines, work system, and tasks and materials organization [for a summary [27]. Results after 12 months of treatment showed higher communication, socialization, and independence, and lower maladaptive behaviors than in participants of control groups, some of them living in family homes, or in group homes or institutions. The CLLC program was viewed as a more desirable place to live than the other settings, and families were significantly more satisfied. The other comprehensive intervention is described in Valenti et al. [26]: it was an intensive semi-residential rehabilitation program based on ABA principles and procedures, utilizing individual plans that clearly defined, in observable terms, those skills to be enhanced and problem behaviors to be decreased, which were measured by direct observations. The collaboration between families and professional teams was also an essential element in the treatment. Differences were shown between males and females as for the efficacy level of the program for adolescents: females achieved good results in daily living, socialization and motor skills domains, whereas males performed well in socialization only. Results from questionnaires administered to parents showed a high degree of satisfaction with the treatment.

ABA procedures have also proven to be successful in other studies. They were used by Nelson et al. [28] for teaching how to lace shoes: in this case, the “no extra-prompt” procedure turned out

to be more effective in transferring acquired skill to the natural setting; in fact, transferring the learned ability to the natural context in individuals who used “extra prompt” (different colors of laces) turned out to be more difficult and long-lasting.

Finally, ABA procedures were used by Baker et al. [29] in a single case study about coprophagia. An assessment was completed, which identified self-stimulation as the function of behavior; during the intervention, the person was given meals and snacks, together with highly spiced, flavorful foods. Maladaptive behaviors gradually decreased to completely disappear within 26 months.

Two studies by Garcia-Villamisar et al. [30,31] were included in this paragraph, although they did not directly address adaptive skills. Authors evaluated how two types of interventions (supported and sheltered employments) impacted on the reduction of autistic symptoms and the improvement in quality of life of adults with ASD and ID. These two domains are strongly related to adaptation, and result from the perception of increased personal well-being and decreased autistic-like behaviors that are often a barrier to social interaction. In both studies, supported employment was more effective than sheltered employment in reducing autistic symptoms and increasing quality of life.

Only one study included individuals with HFA, and it was the sole study having used a technological support (Personal Digital Assistant – PDA) as a task management tool. After 8 weeks of training, more than 80% of participants were able to program the software to perform their daily schedule of functional activities. All participants then reported improved independence in daily-life activities management.

A few remarks

Studies included in this paragraphs have been published by the year 2010, and no more recent studies have been found. This might be suggestive of a decreasing interest of researchers in this topic. Unlike the two previous paragraphs, these studies are primarily addressed to persons with autism and ID, probably because high-functioning individuals show not only better cognitive skills, but also better adaptive skills than the low-functioning. In the literature, studies on Low Functioning Autism (LFA) are much less numerous than those on individuals with HFA, probably due to greater difficulties in evaluating and educating persons with LFA.

ABA procedures showed their effectiveness not only in reducing inappropriate behaviors and increasing specific skills, but also in determining improvements in a broader array of adaptive skills when included in a comprehensive approach. The comprehensive approach based on the TEACCH model also proved to be effective in increasing adaptive skills and it was well-accepted by both families and participants.

As remarked in the paragraphs above, the use of digital devices was appreciated and turned out to be particularly motivating in these studies as well.

Studies with outcomes on Vocational and Job skills

Studies focused on supported employment introduced some specific models. Division TEACCH designed three main different models of supported employment: Individual Placement Model (or one-to-one model), Dispersed Enclave Model (or group shared support sites), and Mobile Crew [32]. Also, there was the Independent Placement for individuals with the most independent work skills and minimal needs for support [33]. In each of these models, emphasis is put on identifying and utilizing individual's strengths and interests, finding appropriate jobs, providing necessary long-term support services as well as using adaptive techniques that increase individual's understanding of the world, independence, and social skills. The Individual Placement Model consists of a job coach working with an individual with autism to locate a job in the community; the coach has also to provide on-job intensive training, slowly fading out of the job setting. In the Dispersed Enclave Model, one job coach is assigned to several individuals with autism who work for the same business. The Mobile Crew Model involves a job coach working with 2-3 individuals providing a service within the community. The Independent Placement consists of one job coach every 10-15 persons with ASD, who work independently at their respective places of employment; the job coach travels from job site to job site, providing support to both individuals with ASD and their employers. In about 8 years, Division TEACCH has served over 100 persons through its programs, placing 96 of them in jobs across the State [32]. During the first 13 years of TEACCH Supported Employment Program, 218 individuals were placed in 298 jobs within the community [33]. A job retention rate of 89% demonstrates the success of the program, which is mainly due to the broad array of long-term support services provided to each person and based on individual needs [32].

Two studies [34,35] examined the success of Prospects model, the dedicated supported employment program by the National Autism Center (NAC), including programs of work preparation, job finding and support in the workplace; moreover, it focused on obtaining jobs that are appropriate to individuals' intellectual ability and educational background. The results of the initial 2-year pilot study [34] indicated that the scheme resulted into significantly higher rates of employment amongst its clients than for a closely matched control group who had access only to generic disability employment services. Only 25% of these latter found a job, whereas the reported employment rate for the supported group individuals was 63%. Even more important, the types of jobs (predominantly administrative or computing work) were far more appropriate to clients' intellectual and educational levels than was the case in the comparison group. No-one involved in the program was dismissed from his/her job during the pilot study, despite previous frequent difficulties in finding and retaining jobs. Salaries and job satisfaction were higher in the supported group as well, and the service provided was also viewed very positively amongst the employers involved. This scheme has expanded significantly, and currently, new centres are being established in UK. The second study [35] examined the success of the NAS program in a period of 8 years and investigated how effective the scheme had been in finding a job and supporting

employed individuals. Like in the pilot study, most of the jobs were administrative, professional or technical in nature, and therefore well suited to the educational and intellectual capabilities of the individuals involved. The client group remains more representative of HFA, although the scheme is evidently beginning to meet the needs of those with lower levels of ability (for example, 8% of the current sample had a non-verbal IQ below 80). The financial costs of running the program was high. Authors concluded that equal job opportunity within the workplace for ASD individuals could only be achieved with the on-going contribution of government funding to such program.

The other model is the Adult Life-Skills Program of the Princeton Child Development Institute [PCDI; [36]. Authors suggested that preparation for adulthood should be started in early childhood, and the intervention curriculum should be just as comprehensive and evaluation criteria just as rigorous in programs for adults as in programs for children; they also suggested that close examination of adults' repertoires may lead to key modifications of programs delivered to children. PCDI Adult Life-Skills Program is a supported employment model which also provides instructions in an array of home and community-living skills. Therefore, services are delivered in multiple settings, including community workplaces, learners' own homes, recreation and entertainment facilities, banks and automatic teller machines, restaurants, and shopping malls, as well as at PCDI. Preparation for adulthood begins long before learners arrive at age 21 and all persons with ASD continue to receive instruction in several key areas that are common threads in the curriculum from early childhood to adulthood. Self-care, language, social competencies and community participation, and leisure skills are such areas of emphasis, but also instruction on generic work skills that require an increasing duration of the work to be performed. Some of them, for example community participations skills, are initially taught in the intervention setting, in a person's home, or in a comparatively private setting; this preserves learners' dignity by minimizing the public use of prompts. The Adult Life-Skills Program showed good outcomes: 11 out of 15 recruited individuals got a job (full or part-time). The level of satisfaction was high, both for participants and for employers. These latter overtly indicated their interest in participating in future supported employment opportunities.

Three studies in this paragraph introduced interventions aiming to facilitate job placements in the community. Hillier et al. [37], in their longitudinal study, evaluated the impact of a vocational support program on employment rates and incomes. Individuals recruited and their parents completed interviews regarding participant strengths and challenges; participants then received pre-placement services, such as how to conduct a job search, develop a resume, complete a job application, and navigate a job interview; then, they completed videotaped practice interviews, from which they received feedbacks on ways to improve skills. Once a job was found, a program coordinator initially visited the site to evaluate the environment and assess for potential supports needed for job success. Upon starting the job, the coordinator also provided onsite job coaching, which was slowly faded, but could be reactivated as needed. Employment rates and income increased for the participants after the introduction of a job coach. Employers rated the job

performance of program participants positively and the employees indicated high job satisfaction. However, most participants reported that they were not sufficiently prepared for work prior to enrollment in the program and thus they had unrealistic expectations of what the job entailed. Participants also encountered difficulties in social aspects of working, including communication with supervisors and co-workers.

Cimera et al. [38] investigated whether sheltered workshops prepare individuals with ASD for competitive employment within the community. Authors compared 215 supported employees who were in sheltered workshops with 215 supported employees who were not in sheltered workshops prior to entering supported employment. Results showed that there were no differences in rates of employment; however, individuals who participated in sheltered workshops earned significantly less, and cost significantly more to serve than their non-sheltered workshop peers. These results were similar to those obtained by Cimera [39] in a study comparing two cohorts of supported employees with various disabilities (4,904 supported employees who participated in sheltered workshops and 4,904 supported employees that didn't participate in sheltered workshops). It was found that supported employees from the non-sheltered workshop group were just as likely to be employed as supported employees from sheltered workshops. Further, non-sheltered workshop supported employees earned significantly more, worked more hours, and cost less to serve. Sheltered workshops appeared to be a "negative added-value": in fact, participating in sheltered workshops diminished the future outcomes achieved once individuals became competitively employed. It is possible that the sheltered employees were more difficult to place and train as a result of their workshop experiences, in which they developed work behaviors that might be acceptable in the sheltered setting but unacceptable in competitive positions. The study by Taylor et al. [40] investigated the relationship between post-secondary education and employment. This is a longitudinal study over 12 years, which highlighted not only difficulties to get and retaining a job, but also some advantageous or disadvantageous factors to the final achievement. Maladaptive behavioral characteristics, the fact of being female, and family socioeconomic position are all important factors that can favor or not favor obtaining and retaining employment.

Specific behavioral procedures were also investigated by Lattimore et al. [41], Allen et al. [42], and Burke et al. [43].

Lattimore et al. [41] investigated the use of supported work training at community-based job sites in combination with simulation-based training. The enhanced training condition was compared to only-jobsite training without simulation, for its impact on the acquisition of new work skills. In 3 out of 4 measures considered, adults with ASD were able to acquire work skills more quickly when jobsite training was augmented by simulation training.

In the study by Allen et al. [42], the use of videotaped modeling of work behaviors, as a supporting method to young adults with ASD, was investigated. Participants received vocational

instructions that featured videotaped demonstrations of skills necessary to execute a work activity, such as how to promote products in a retail setting while wearing an air-inflated mascot costume. Over a four-month period, participants were observed before and after watching a video in which a model performed the various skills in the costume in both scripted and natural scenes. All participants learned the required skills after watching the video model. The skills learned from the video instruction process generalized to an actual paid job opportunity, in which they wore the inflated suit for promotional activity. Participants reported that they enjoyed the work, and comments from supervisors were positive.

Burke et al. [43] examined the use of personal digital assistant tools (PDAs, an adapted iPhone application) to prompt students in completing work tasks. The article included two studies, in which participants were employed to assist in the delivery of a fire safety training session. In the first study, three participants completed the company's training program and were exposed to the PDA performance cue system only if it was required in order to meet criteria. The second study involved different participants who accessed only the PDA performance cue system to learn the same work behaviors. Results indicated that 5 out of 6 participants achieved the desired work behaviors only after the introduction of the performance cue system. The combined trainings or solitary PDA intervention provides hope for increasing job opportunities for individuals with ASD; moreover, people with ASD using this technology demonstrated high rates of social responding in the workplace. For these reasons, it would be recommended to evaluate the PDA-based assistive technology also in other work settings.

The study by Lawer [44] about individuals with ASD benefiting from Vocational Rehabilitation Services (VRS) included 1707 persons (84% males). Nearly 56% of this sample was not employed. Using the VRS as a repository of information, researchers examined individuals' access to services, cost of services, and employment status. Results indicated that adults with ASD were more likely to be denied service because of the severity of their disability, and that more money for rehabilitation services was spent on individuals with ASD than those with other impairments. Competitive employment rates for individuals with ASD did not differ from those with other impairments. Successful competitive employment for people with ASD may depend on the presence of on-the-job support.

A few remarks

An estimated 25-75% of adults with ASD do not participate in any productive work [45]. In Europe, the percentage ranges from 76 to 90 [46].

What do people with autism think about? They have reported long periods of unemployment, employments not appropriate to their capabilities and educational level, many difficulties in career advancement, poor wages, insufficient time to learn work behaviors, insufficient supports on the jobs and experiences of social interaction problems [47,48]. These findings confirm and expand the existing evidence that adults with HFA, despite their capability and willingness to

work, have to face significant disadvantages in the job market and lack of understanding and support in employment settings.

By way of summary, the kind and extent of participation in work and, consequently, in the social life, seemed to depend on different factors. For example, high-level education, IQ within the normal range, good language skills, high socio-economic status of the family, consistent appropriate interventions from childhood to adulthood, and the presence of on-job support seem to be facilitating factors. A special interest or a talent is also a good basis for a suitable job [45]. The presence of maladaptive behaviors, the fact of being female, low IQ and low-level education might be considered as barriers. In some instances, the long waiting list to have access to vocational services might also be a barrier.

Some of the procedures described above (video-modeling, simulations, on-job training, especially in ASD associated with ID, and PDAs) seemed effective in enhancing appropriate work behaviors; however, further studies are needed in order for procedures to become evidence-based. Some models of supported employments, such as TEACCH and Prospects models, have been long used and ended up in good outcomes; once more, further high-quality research studies are required.

It's very hard for a person with ASD to get a job: finding the most appropriate work settings and placements, receiving effective support on the job, need for long-term support services for the employer and employee, and the costs of support might all be veritable challenges.

In this paragraph, most of the studies mentioned were UCT, and their overall quality appeared to be rather low. This is a fundamental, albeit emerging, area of research. Further research studies are needed to evaluate the effectiveness of such programs and how they positively affect individuals with ASD, their families, the employers, and society at large.

CONCLUSIONS

The transition from childhood to adolescence and adulthood is challenging for individuals with ASD. Nonetheless, few research studies have addressed social, cognitive, adaptive, vocational and employment needs in this population. Therefore, it is too early to recommend some types of interventions rather than some others, but this does not mean that good practices have not been already implemented. A stronger evidence base has to be developed and individual differences need to be understood, such as the severity of ASD symptoms, the severity of intellectual and language levels, the socio-demographic factors, and comorbidities, that may affect the shift to adulthood as well as the life-span treatments.

Preparing to adult life should start in childhood; that's why it is very important to create children-oriented consistent services and customized programs (especially school programs), in view of future independence and vocational outcomes.

A field for future studies might be that of comprehensive and inclusive treatments, which might integrate cognitive, adaptive, recreational, and vocational trainings aimed to improve quality of life, and promote self-awareness and adaptation to the life environment.

Another promising area might be the identification of interventions which so far have turned out to be appropriate in developing treatment manuals, thus encouraging further applications of this approach.

The use of digital tools, especially virtual reality, also turned out to be a promising area, that though still in its infancy, is worth being investigated, either for the good results so far described, or for its being so well-accepted by persons with ASD.

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