

Special Education Versus Inclusive Education: The Role of the TEACCH Program

Simonetta Panerai · Marinella Zingale ·
Grazia Trubia · Maria Finocchiaro ·
Rosa Zuccarello · Raffaele Ferri · Maurizio Elia

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Abstract Our study aimed at comparing, over a period of 3 years, the effectiveness of three different educational approaches addressed to children with autism and severe mental retardation. The first one was a treatment and education of autistic and related communication handicapped children (TEACCH) program implemented in a residential center; the second was a TEACCH program implemented at home and at mainstream schools, after a specific parent psychoeducational training; the third approach referred to inclusive education in mainstream schools, in which a nonspecific approach was implemented. Each subject was assessed twice, using the Psycho-Educational Profile-Revised (PEP-R) and Vineland Adaptive Behavior Scale (VABS)-survey form. Effectiveness of TEACCH appeared to be confirmed, showing positive outcomes in the natural setting, and revealing its inclusive value.

Keywords Autistic disorder · Parent-training · Individualized educational program · Inclusion

Introduction

Nowadays it is commonly recognized that autism is not an emotional disorder, but the behavioral expression of a polygenetic developmental neurobiological disorder, which predominantly involves a dysfunction of the central nervous system (Minshew and Williams 2007). It is also clear

that disability is seen not only as a medical or biological dysfunction; the International Classification of Functioning, Disability and Health (ICF; WHO 2001) takes into account the social aspects of disability, including Environmental Factors, in order to record the impact of the environment on the person's functioning and the dynamic interaction between the person with disability and his/her "world". Over the years, according to this point of view and, in a certain way, anticipating it, intervention strategies for autistic disorder (AD) have been progressively oriented towards a psychoeducational approach (Schopler et al. 1980), in which the role of parents has a great importance. Some of the suggestions from the studies of educational treatments, appear to be shared by the majority of the authors; for example, it is now well established that early intervention is the most effective educational program with a significant impact on behavioral problems and abilities; however, adequately structured educational programs are very important to assure a successful treatment (Howlin 1998).

A current ethic assumption is the right to inclusive education for persons with disabilities: inclusive education means that all students in a school, regardless of their strengths or weaknesses in any area, become part of the school community. Students with special needs, who are not responsive to typical regular education, have also the right to specialized educational programs.

In Italy, the Law No. 517/1977 and the following Law No.104/1992 established the right of inclusion for all children with disabilities, as well as some inclusion strategies, such as (a) for the children: the right to be trained by a "support-teacher", a sort of special education teacher specifically trained to work in the field of disabilities by means of a biennial multivalent education course, not specifically designed for children with autism; a "functional

S. Panerai (✉) · M. Zingale · G. Trubia · M. Finocchiaro ·
R. Zuccarello · R. Ferri · M. Elia
IRCCS Oasi Maria SS, via Conte Ruggero 73,
94018 Troina, EN, Italy
e-mail: spanerai@oasi.en.it; rdigiorgio@oasi.en.it

diagnosis” describing the child’s strengths and weaknesses in all developmental domains; the “functional dynamic profile”, written by the Local Health Authority team together with teachers and parents, describing the child’s modification expectation after a first period of inclusion; an “Individualized Educational Plan” (IEP), describing the orientation and the objectives of the educational project; (b) for both the regular and special teachers: the right to be supported by an interdisciplinary team, provided by the relevant Local Health Authority. The inclusive Italian program is a co-teaching model in which general and special education teachers work together to teach students with/without disabilities in the same classroom. The enrolment of a child with disability, even presenting a severe disorder, cannot be refused by Italian schools, furthermore the family can choose among the educational programs offered by national public or private schools, day-centers or residential-centers.

At Oasi Maria SS. Institute (Troina, Sicily), a research center for the diagnosis and treatment of Mental Retardation and Brain Aging, two programs addressed to children with AD and their families have been implemented, namely a residential program and a psychoeducational parent-training program. Both programs are organized on the basis of the theoretical/practical guiding-concept of the treatment and education of autistic and related communication handicapped children (TEACCH). TEACCH is a structured teaching system developed at the University of North Carolina in the 1970s (Schopler 1994). It was defined by Eric Schopler as a global approach based on a close collaboration between parents and professionals. Parents are given the role of “co-therapists”. TEACCH has been specifically designed for children with autism; it takes into account the disorder’s features and tries to minimize the child’s difficulties using structured and continuous interventions, environmental adaptations and alternative-augmentative communication. The guiding-concepts of the TEACCH system have been summarized as: improved adaptation, parents collaboration, assessment for individualized treatment, structured teaching, skills enhancement, cognitive and behavioral therapy, generalist training. The underlying premise for structured teaching is to modify the environment in order to meet the needs of individuals with AD. Four main components are related to this process: (a) physical organization, that refers to the layout or setup of the teaching area for both academic and functional teaching; (b) visual schedules, that show students what activities they will do and when; (c) work systems, that inform students about what and how much activities have to be done; (d) task organization, that informs students on within-task actions (Schopler et al. 1995).

Many studies have shown the effectiveness of the TEACCH program, which have been implemented in many

different countries and adapted to different situations (home-based, mainstream schools, special schools, residential centers) for a period from 4 to 12 months (Probst and Leppert 2008; Hume and Odom 2007; Tsang et al. 2007; Siaperas and Beadle-Brown 2006; Panerai 1999; Norgate 1998; Ozonoff and Cathcart 1998; Panerai et al. 1997, 1998, 2002). Even so, TEACCH has been considered as a program which can not be implemented in inclusion; however, structured teaching does not define where people with autism should be educated, therefore TEACCH program might be a tool to help inclusion (Mesibov and Howley 2003; Ijichi and Ijichi 2006).

This study, carried out at Oasi Institute, aimed at comparing, over a period of 3 years, the effectiveness of three different educational approaches addressed to children with AD and severe mental retardation (sMR). As far as we know, this is the first comparison study with a long-term follow-up. The first experience was a TEACCH program implemented in a residential center (residential TEACCH; R-TEACCH); the second was a TEACCH program implemented at home and at mainstream schools after a specific parent psychoeducational training (natural setting-TEACCH; NS-TEACCH); the third one referred to inclusive education in mainstream schools, in which a nonspecific approach was implemented (inclusive nonspecific program; INSP).

Methods

Participants

The group was formed of 34 male children with AD and sMR, recruited at Oasi Maria SS. Scientific Institute for Mental Retardation and Brain Aging; the NS-TEACCH group comprised 13 children, the R-TEACCH group included 11 children and the INSP group 10 children. Children were recruited in a consecutive enrolment on the basis of the following criteria: (a) children attending the primary school; (b) all the children evaluated at least for a 3-year period; (c) for all the children the assessment included a repeated evaluation by means of the Psycho-Educational Profile-Revised (PEP-R; Schopler et al. 1990), and the Vineland Adaptive Behavior Scale-survey form (VABS; Sparrow et al. 1994). Individuals in NS-TEACCH group were recruited among the children admitted to parent-training service, individuals in INSP group among the children admitted to the diagnostic service, individuals in R-TEACCH were recruited among the children admitted to the residential center. Children were admitted to the above-mentioned services not on the basis of their specific features, but on the basis of applications for admissions, previously forwarded by parents to the competent office.

AD and MR were diagnosed according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV TR; APA 2000), the Childhood Autism Rating Scale (CARS; Schopler et al. 1988) scores (all children scored from moderate to severe autism level) and the Autistic Diagnostic Interview-revised (ADI-R; Rutter et al. 2003) scores (all children scored above the autism cut-off). The learning profile was accomplished by means of the Learning Accomplishment Profile-Revised (LAP-R; Sanford and Zelman 1981). LAP-R is a criterion-referenced assessment instrument, measuring development in the domains of gross motor, fine motor, pre-writing, cognitive, language, self-help, and social/emotional; normative developmental age is assigned to items, but authors recommend to view them as approximations and not as age-equivalents. Table 1 shows the pre-treatment conditions of the three groups: the means of the chronological and the developmental ages (the latter derived by the total scores of PEP-R), of CARS and ADI-R scores, of LAP-R subscales (approximation in months). No statistical difference was found in the between-groups comparison (nonparametric Kruskal–Wallis ANOVA) in all these measures used for the assessment at pre-treatment time. Different teams were responsible of the clinical activity in the three different services from which the three groups of children were recruited; they generally administered PEP-R, ADI-R, CARS and VABS as a routine protocol for all subjects with an AD or a suspected diagnosis of AD; therefore all the teams staff members were blind to the groups affiliation at pre- and post-test and to the purpose of the present study.

Treatments

Subjects in R-TEACCH received the TEACCH residential program implemented at Oasi Institute (Panerai et al. 2002); they resided in the Institute and went home at

regular intervals, but they did not attend any regular school. The habilitation program was basically implemented by educators with the support of the management team (including a psychologist, an educator coordinator, a neurologist, a pedagogue, that is a doctor specialized in normal and special education) and with the parents' consent; most of the parents continued the program at home after a training provided by the management team, by means of consultations, video-tape analysis and 1 or 2 days of direct observation of all activities performed by their children. Subjects in the R-TEACCH program were divided into small homogeneous groups of three or four children. All the staff members were generalist and were specifically trained on autism (the theoretical and practical training courses were carried out by the Opleidingscentrum Autism staff of Antwerpen). The living places were adapted according to the concept of place-activity correspondence, in order to create a clear and predictable environment; clear areas and boundaries for specific activities were created helping children to effectively function in their environment. Places for the various sessions of activities were adapted, such as: daily living activities, including self-skills, domestic and community activities; motor activities; independent work (during these sessions children worked without guide or supervision by the educators); learning sessions (children learned simple activities with the aid of the educators); functional communication (individualized form of alternative-augmentative communication was used to promote comprehension and request; the form was adapted to the single child developmental level, using objects, pictures drawings, written words, etc.); painting and expressive activities; organized and free leisure time; socialization. Integration activities outside the institute, such as shopping, to go to the restaurant, to go to the weekly town market, to participate in the town-holidays etc., were also carried out. Activities were presented using

Table 1 Features of the three groups under study in the pre-treatment condition

	INSP (<i>n</i> = 10) Mean (SD)	R-TEACCH (<i>n</i> = 11) Mean (SD)	NS-TEACCH(<i>n</i> = 13) Mean (SD)	Kruskal–Wallis ANOVA
Chronological age, years	9.09 (2.07)	9.66 (2.31)	8.66 (2.01)	NS
Developmental age, months	20.4 (6.93)	20.63 (9.52)	23.69 (10.5)	NS
CARS scores (cut-off: 30)	42.9	45.75 (5.23)	42.42 (2.41)	NS
ADI-R social impairment scores (cut-off: 10)	26.4 (2.55)	27.45 (2.8)	24.92 (4.54)	NS
ADI-R Communication scores (cut-off: 8)	13.6 (2.01)	15.18 (2.79)	14.15 (2.76)	NS
ADI-R Repetitive behavior (cut-off: 3)	6.6 (1.78)	7.09 (2.43)	7.2 (2.65)	NS
LAP-R: pre-writing, d.a. in months	26.4 (16.11)	22.36 (14.47)	26.77 (12.79)	NS
LAP-R: emotional and social skills, d.a. in months	20.6 (6.29)	22.55 (9.44)	22.15 (6.96)	NS
LAP-R: self help skills, d.a. in months	27.5 (9.08)	29.64 (13.9)	31.08 (17.69)	NS
LAP-R: language and literacy, d.a. in months	18.7 (6.78)	19.55 (9.76)	20.82 (8.59)	NS

INSP, inclusive non specific program; R-TEACCH, residential TEACCH; NS-TEACCH, natural setting TEACCH; d.a, developmental age

materials, perceptually clear and specifically designed for the single objective, which facilitated a without-errors learning, an independent performance and a reduction of stereotyped behaviors (Panerai et al. 1998). The “where”, “when”, and “how long” of the activities were indicated by visual prompts (e.g., schedules of the daily-program, the number of boxes on the left of the individual work station, the objects indicating how many times a specific exercise had to be done, the transition-card in order to move, in an independent manner, from one place to another. etc.).

Subjects in the NS-TEACCH attended mainstream schools and were trained by the support teacher. Parents were trained on TEACCH program by a specific generalist team (psychologist, pedagogue, educator-coordinator, educator, social worker, psycho-motor and speech therapists).

Collaboration of parents is a crucial guiding-concept of the TEACCH program. The duration of the psychoeducational training was 4 weeks; each week had specific activities and goals; the follow-up included a 2-week stay on a 6-month basis. The principal goals of this training were: (a) to assure the integration of parents in the habilitation process; (b) to define and start the IEP and its specific objectives, taking into account the family’s priority and its life system; (c) to identify any possible implementation of the program within the family and school contexts by providing specific indications for structuring the environment and by organizing work strategies. During the first week, some TEACCH information meetings with families (using didactic materials and videos), a multidimensional assessment, and setting up of the habilitation schedule were performed. A Family Indicators Questionnaire was also administered, including items about general information, prevalent feelings and problems, expectations relative to training, perception of one’s level of competence. The second week included the following activities: arranging the work setting and preparing materials, visual aids and cards for communication system; starting the program, in the presence of family members, who could directly observe their child while performing activities with the staff members. Possible work-sessions were: independent activities; learning, motor, social, and expressive activities; non-structured leisure time; structured communication during meals; self-help basic skills. Videos of the early sessions of the program were recorded and later observed and discussed with the family. In the third week, parents started working with their child on the program goals, with constant support and supervision by the team staff; videos of the sessions were recorded and later discussed with the parents. In the last week parents worked with their child with no constant supervision by the staff; the final assessment and a second administration of the Family Indicators Questionnaire were carried out. Finally, in order to promote the IEP implementation at schools,

families were provided with some sort of aids, such as: video-tapes; a written IEP, which included all the individualized objectives, the description of materials and routines and the structuring of the individual work stations. Thanks to the collaboration of parents it was possible to adopt the structured teaching in natural settings (home and school), as well as the same individualized program. Even if it was impossible to know with certainty to what degree the instructions were followed, it was possible to monitor the effectiveness of the IEP by means of follow-up evaluations on a 6-months basis; in these admissions the staff members verified the attainment of the set goals and updated the IEP, adding some new objectives; moreover, during the admission-intervals, telephone and personalized meetings were possible between parents, sometimes support-teachers and one of the staff members, usually the psychologist.

Briefly, all the subjects included in both R-TEACCH and NS-TEACCH groups were trained on the basis of the same guiding concepts, despite the differences existing in: (a) the physical environment, and namely: in the R-TEACCH the entire facility was adapted according to the concepts of place/activity correspondence, whereas in the NS-TEACCH only partial adaptation of the environment took place (e.g., creation of one work station within the regular classroom, and the adaptation of one/two rooms at home); (b) the social environment: whereas the R-TEACCH groups included children with autism exclusively, the NS-TEACCH groups were made of one child with autism and about 20 children with typical development; therefore, unlike in the R-TEACCH, the NS-TEACCH allowed the child with autism to share many task performances with typically developing children; (c) the educational staff: in R-TEACCH, it was generalist educators who dealt with the implementation of the program (irrespective of the specific kind of activity), whereas in NS-TEACCH, programs were carried out by parents of children with autism, especially mothers (who prevalently dealt with self-care, independent work, communication during meals, and leisure time), and the support teachers (who prevalently dealt with learning and social activities); (d) duration of activity sessions: NS-TEACCH were more variable than the R-TEACCH sessions, this latter being precisely scheduled from 8.00 a.m through 2.30 p.m, and from 2.30 p.m through 8.30 p.m.

Subjects in the INSP group received a 10-day diagnostic protocol implemented at Oasi Maria SS Institute, and several 5-day follow-up protocols; the objectives of these admissions were to diagnose the AD and to monitor the development of the children. No educational program was planned or implemented and parents were provided only with the diagnosis. The children attended mainstream schools and were integrated in a class of about 20 children; each child with autism was trained by a support teacher.

For each student an IEP was defined, including all the learning objectives for the whole length of the scholastic year; these objectives were divided into several areas, such as emotional, language, math, anthropology, science and technology, motor, sensorial-perceptual and self-help. The teaching system was similar to that used with the children with other kinds of mental disabilities and the objectives were generally more academic than functional, principally centered on reading, writing and calculation and their skills prerequisite. Each support teacher, together with the general education teachers (three for each class in the primary school), established teaching methods and effective check procedures. Most subjects had also outpatient treatments, such as psychomotor therapy and speech therapy in the afternoon. Teachers did not use structured teaching or any other specific teaching method for children with autism; no specific or individualized communication form was used; the classrooms and the other places were not adapted to the needs of children with autism; sometimes, individualized activities were performed in another place outside the classroom. The “where”, “when”, and “how long” of the activities were decided by teachers.

Procedure

Each subject was assessed twice, with a three-year interval between evaluations, using the PEP-R and the VABS. Psychologists working at the Oasi Maria SS. Institute administer these instruments as a routine protocol for all subjects with an autistic spectrum disorder. PEP-R offers a developmental approach to the assessment of children with autism; it is divided in seven areas: imitation, perception, fine motor, gross motor, eye-hand coordination, cognitive performances and cognitive-verbal performances. Positive scores can be divided in two categories: “passing” when the item was achieved, and “emerging” when the item was partially achieved, but there was not a failure. In the present study we considered only the passed items. VABS assesses adaptive behavior; it consists of five areas: communication, daily living, socialization, motor skills and maladaptive behavior; each area is divided into two or three subdomains. Item-scores are: 0 (never performed); 1 (sometimes performed without help); 2 (usually performed without help). All the scores have to be included in the total sums, referring to each subscale and to composite scale. Statistical analysis was performed by using the Kruskal–Wallis ANOVA test for between-groups comparisons on all VABS and PEP-R domains. Only when a statistical between-groups difference was found, a comparison was performed for each pair of groups by using the Mann–Whitney *U* test. The intra-group statistical analysis of the differences between pre- and post-treatment results was performed by means of the Wilcoxon test.

Results

With regards to the pre-treatment assessment, no statistical differences were found between the groups, neither in the PEP-R nor in VABS subdomains (Kruskal–Wallis ANOVA test).

Table 2 shows the results obtained after the first and the second assessment for each group, and the statistical significance of the intra-group differences, calculated by means of the Wilcoxon test.

No significance was found in VABS scores for the INSP group; on the contrary, NS-TEACCH and R-TEACCH show a statistical significance in all VABS domains. As far as PEP-R scores is concerned, INSP showed a statistical difference in perception; NS-TEACCH in all domains, except in cognitive verbal performances; R-TEACCH in imitation, gross-motor, eye-hand coordination, cognitive performances, composite scale and developmental age. Table 3 shows the statistical significance of the between-groups comparisons, calculated on the basis of the differences between the first and the second administration of PEP-R and VABS.

Significance was obtained in PEP-R domains: imitation, gross motor, cognitive performances, composite scale and developmental age, by means of the Kruskal–Wallis test; in all these areas a statistical significance was also obtained in the comparison between INSP and NS-TEACCH by means of Mann–Whitney *U*; in the comparison between INSP and R-TEACCH a statistical significance was obtained in gross-motor and cognitive performances. As far as VABS scores are concerned, a statistical significance was found in daily living skills (total scores and personal), socialization (total scores and interpersonal relationship), composite scale 2 and maladaptive behaviors; statistical significance was also obtained in the comparison between INSP and NS-TEACCH for daily living skills-total scores and personal, socialization-total scores and interpersonal relationship, composite scale 2 and maladaptive behaviors, and in the comparison between INSP and R-TEACCH for socialization-total scores, interpersonal relationship and maladaptive behaviors; no significant differences were found between NS-TEACCH and R-TEACCH, neither in PEP-R nor in VABS scores.

Discussion

The results of this study seem to confirm higher effectiveness of the TEACCH program than another individualized and inclusive program not specifically designed for children with autism (Panerai et al. 2002). The results obtained by the children in R-TEACCH and NS-TEACCH are greater than those obtained by the children in INSP. As already stated,

Table 2 Means and standard deviation of the first and the second administration of PEP-R and VABS and statistical significance of the intra-group differences (Wilcoxon test)

Outcome	R-TEACCH		p value	NS-TEACCH		p value	INSP		p value
	Pre mean (SD)	Post mean (SD)		Pre mean (SD)	Post mean (SD)		Pre mean (SD)	Post mean (SD)	
PEP-R developmental age (months)	20.64 (9.52)	25.82 (12.03)	.02	23.69 (10.55)	29.15 (10.01)	.022	20.04 (6.93)	21.5 (8.36)	
PEP-R composite scale	43.36 (24.36)	57.45 (29.76)	.02	54.15 (26.46)	69.54 (22.54)	.022	46.4 (21.9)	49 (25.24)	
PEP-R sub-scales scores: imitation	3.45 (4.86)	5.9 (6.12)	<.05	5.77 (4.81)	8.69 (4.4)	.018	4.1 (3.69)	4.3 (4.14)	
Perception	8 (2.76)	9.54 (3.17)		9.54 (2.47)	11.31 (1.75)	.02	7.9 (3.66)	8.8 (3.85)	<.05
Fine motor	8.54 (4.18)	9.82 (4.17)		9.61 (3.69)	11.46 (2.44)	.024	9.3 (3.8)	9.3 (3.9)	
Gross motor	11.45 (3.14)	14.1 (4.66)	<.05	13.23 (4.64)	15.8 (3.24)	.018	13.4 (4.03)	13.8 (4.49)	
Eye-hand coordination	4.82 (2.89)	6.09 (3.11)	.02	5.54 (3.53)	7.85 (2.82)	.018	4.6 (2.95)	5.9 (4.77)	
Cognitive performances	4.82 (5.47)	8.09 (6.59)	.032	7.61 (6.2)	10.46 (5.62)	.018	6.5 (6.04)	5.9 (6.04)	
Cognitive verbal performances	2.09 (4.99)	3.91 (5.72)		2.85 (4.08)	4 (5.07)		0.6 (0.7)	1 (1.63)	
VABS composite scale	100.72 (42.92)	127.81 (45.07)	.02	109.69 (33.83)	155.23 (39.89)	.02	94.8 (27.89)	109.6 (33.52)	
VABS sub-domains scores: communication	15.9 (14.9)	22.1 (16.5)	.05	19.46 (11.24)	28.92 (16.43)	.02	18.1 (10.48)	21.4 (11.01)	
Daily living skills	33.1 (12.9)	42.2 (14)	.02	31.92 (11.62)	44.85 (10.95)	.02	27.8 (11.14)	31 (12.9)	
Socialization	16.1 (11.6)	25.5 (12.2)	.02	16.23 (7.45)	27.46 (10.89)	.018	16 (5.29)	16 (6.14)	
Motor skills	37.5 (7.79)	42.1 (6.41)	.02	42.15 (10.94)	54.08 (13.9)	.02	33.9 (8.99)	39.4 (11.28)	
Maladaptive behaviors	16.18 (7.33)	12.27 (7.04)	.02	17.92 (6.57)	17.23 (7.35)	.02	18.5 (7.38)	24.1 (9.69)	

INSP, inclusive nonspecific program; R-TEACCH, residential TEACCH; NS-TEACCH, natural setting TEACCH

support teachers were trained by mean of a specific biennial multivalent course, but they were not trained on the special needs of persons with autism, therefore they did not know the specific instruments useful for the assessment and the intervention strategies for AD. Even though, in INSP, programs were individualized for each child, the teaching system was similar to that used with the children with other kinds of disabilities; moreover, the program generally included more academic than functional objectives, with a negative influence on adaptive skills (not significant results in VABS scores referred to intra-group analysis); a statistical significance was found only in PEP-R perception. On the contrary, TEACCH stresses the importance of an appropriate environmental organization and the use of clear visual cues to circumvent communication difficulties. Moreover it highlights the need to develop individually based learning programs, including academic and functional objectives. Both R-TEACCH and NS-TEACCH, the latter in particular, showed a significant intra-group difference between the first and the second evaluation; moreover, the between-groups analysis showed statistical significant differences in many areas of PEP-R and VABS. No statistical difference was found in the comparison between R-TEACCH and NS-TEACCH, probably because of the adoption of the same guiding-concepts. This is probably due to the fact that in NS-TEACCH there was a strict collaboration between

parents and support- and regular education teachers; a great coordination between home- and regular school-based programs; shared objectives and the same work system. The differences were minimized and the program became a natural part of the child’s life. Furthermore, this natural setting offered a great deal of normal daily events as opportunities to practice communication, social and daily living skills (Benson et al. 2008).

The intra-groups analysis showed no statistical significance in PEP-R verbal performances, differently from VABS communication. This could be (a) partly due to the peculiar characteristic of the children, all presenting autism associated with sMR (non verbal or minimally verbal subjects); (b) partly due to the items of the tools used, particularly centered on verbal communication. In a previous study (Panerai et al. 1998), thanks to structured observations in various moments of the daily life, positive changes were found in non-verbal communication by means of objects, photos, pictures and written words. In each case, the result confirmed a setting-dependent verbal communication: in the natural set (VABS) verbal comprehension and expression were greater, compared to the non-contextual trials (PEP-R).

Regarding maladaptive behavior, a significant difference in the between-groups analysis was found: this result could probably due to the fact that TEACCH does not face behavioral problems directly, but works on the behavioral

Table 3 Statistical significance of the differences between the first and the second administration of PEP-R and VABS in the between-groups analysis

	INSP vs. R-TEACCH vs. NS-TEACCH (<i>p</i>) ^a	INSP vs. NS-TEACCH (<i>p</i>) ^b	INSP vs. R-TEACCH (<i>p</i>) ^b	NS-TEACCH vs. R-TEACCH (<i>p</i>) ^b
PEP-R				
Imitation	.013	.004	NS	NS
Perception	NS	NS	NS	NS
Fine motor	NS	NS	NS	NS
Gross motor	.031	.032	.026	NS
Eye hand coordination	NS	NS	NS	NS
Cognitive performances	.006	.002	.034	NS
Cognitive-verbal performances	NS	NS	NS	NS
Composite scale	.009	.001	NS	NS
Developmental age	.005	.005	NS	NS
VABS				
Communication: total scores	NS	NS	NS	NS
Daily living skills: total scores	.033	.009	NS	NS
Daily living skills: Personal	.049	.022	NS	NS
Socialization: total scores	.009	.006	.017	NS
Socialization: Interpersonal relationship	.017	.008	.035	NS
Motor skills: total scores	NS	NS	NS	NS
Composite scale 1 (including motor skills)	NS	NS	NS	NS
Composite scale 2 (without motor skills)	.038	.01	NS	NS
Maladaptive behaviors	.038	.044	.032	NS

NS, not significant; INSP, inclusive no-specific program; R-TEACCH, residential TEACCH; NS-TEACCH, natural setting TEACCH

^a Kruskal–Wallis test

^b Mann–Whitney *U* test

causes, especially through the physical adaptations and the training in order to increase skills, communication and socialization. Some studies have already demonstrated that intensive skills-training and functional communication training are preventive measure to the develop or increase of behavioral problems (Carr and Durand 1985; Dunlap et al. 1990; Reeve and Carr 2000); a study by Norgate (1998) showed effectiveness of TEACCH in reducing self-injurious behaviors; a previous study (Panerai et al. 1998) at Oasi Institute reported how maladaptive behaviors tended to decrease during structured activities and to increase during non-organized leisure time.

Some final considerations arise from the results of this study:

1. TEACCH appeared to be an effective program for children with autism; in our case, it confirmed its effectiveness particularly in that sub-group of AD, which is at the lowest place of the autistic continuum.
2. TEACCH appeared to produce positive outcomes in the natural setting and it showed its inclusive value; opposite to the opinion that TEACCH could not be implemented in an inclusive context, our results show that TEACCH and “inclusion” are not in contrast, but they seem to strengthen each other if they are used together.
3. In order to increase the abilities of children with autism and to decrease their maladaptive behaviors, their inclusion in a regular class is not sufficient. The Italian inclusion Law is a very good and effective Law, as reported by an interesting study by Cecchini (1989). However, in the case of children with AD, inclusion itself did not seem to be really effective: mainstream schools need an effort to adopt structured teaching and flexibility with the aim of creating the appropriate conditions for an optimal development of children with AD. Inclusive school has not to ask itself: “how does this student have to change?”, but “how do we have to change?”.
4. The final consideration is about parent-training programs and parents’ role. The importance of parent participation in the education of children with autism is well documented (Moes and Frea 2002; Koegel et al. 1996). Parents’ involvement constitutes a “best practice” in the education of children with autism (National Research Council 2001). In our study

parents, especially mothers, had not only the role of co-therapists, but also that of TEACCH-mediator, with the aim of promoting the implementation of their child's TEACCH program at school; they had not been asked by the school to participate in school program, but they actively pressed teachers to be involved in the TEACCH program. When parents take upon themselves the responsibility of their child educational program, they are able to promote many positive changes at home and in their life-milieu, to foster their children's learning and development. In our case parents were the promoters of important changes in the school. The comparison between INSP and NS-TEACCH showed a better efficacy of NS-TEACCH; both the programs were carried out in regular schools and the support-teachers had the same professional formation, but in NS-TEACCH, thanks to parents engagement and also teachers availability, it was possible to adopt TEACCH program in the classes, and to work with a new functional approach.

This study presents, however, some limitations: (a) the small size of the sample; (b) all participants presented autism associated with sMR, therefore the results might not be valid to the other sub-groups of AD; (c) we did not insert a specific documentation about academic skills, therefore the study lacks of comprehensive measures; (d) as far as group assignment is concerned, assignment procedure was not random, but rather based on consecutive enrolment, taking into consideration the applications for admissions previously forwarded by parents to the competent office; preferences by families about children's placement are suggestive of their way of approaching their child's disability; consequently, their approach might have influenced the outcomes of programs as an uncontrolled element; (e) we did not use specific measures of parents and teachers compliance with the instructions given in NS-TEACCH; (f) we used only a parent-training outcome measure, such as the children progress; measurement of the efficacy and effectiveness of parents' involvement in educational programs for their children should also include: parent-child interaction pattern, parents' knowledge, attitudes and stress levels, family functioning and cost-benefit analysis (McConachie and Diggle 2007). The cost-benefit analysis might also be used for the other two approaches, R-TEACCH and INSP.

Future studies on educational treatments should involve more subjects from all the subgroups of the autistic continuum and include a long term follow-up and an economic evaluation.

We hope that this kind of studies and their results might influence the different national policies for the implementation and development of services and activities addressed

to people with autism and their families, with particular focus on the adoption of such a program in schools.

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References

- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders, TSM-IV-TR*. Washington, DC: Author.
- Benson, P., Karlof, K. L., & Siperstein, G. N. (2008). Maternal involvement in the education of young children with autism spectrum disorders. *Autism, 12*(47), 47–63. doi:10.1177/1362361307085269.
- Carr, E. G., & Durand, V. M. (1985). Reducing behaviour problems through functional communication training. *Journal of Applied Behavior Analysis, 18*, 111–126. doi:10.1901/jaba.1985.18-111.
- Cecchini, M. (1989). Sviluppo intellettuale e sociale nella sindrome di Down: Fattori rilevanti. In R. Ferri & A. Spagnolo (Eds.), *La sindrome di Down*. Roma: Pensiero Scientifico.
- Dunlap, G., Johnson, L. F., & Robbins, F. R. (1990). Preventing serious behavior problems through skill development and early intervention. In A. C. Repp & N. N. Singh (Eds.), *Perspectives on the use of nonaversive and aversive interventions for persons with developmental disabilities*. Sycamore, IL: Sycamore Publishing.
- Howlin, P. (1998). Practitioner review: psychological and educational treatments for autism. *Journal of Child Psychology and Psychiatry and Allied Disciplines, 39*(3), 307–322. doi:10.1017/S0021963097002138.
- Hume, K., & Odom, S. (2007). Effects of an individual work system on the independent functioning of students with autism. *Journal of Autism and Developmental Disorders, 37*(6), 1166–1180. doi:10.1007/s10803-006-0260-5.
- Ijichi, N., & Ijichi, S. (2006). TEACCH should be inclusive. *Autism, 10*(5), 526. doi:10.1177/136236130601000509.
- Koegel, R. L., Bimbela, A., & Schreibman, L. (1996). Collateral effects of parent training on family interactions. *Journal of Autism and Developmental Disorders, 26*(3), 347–359. doi:10.1007/BF02172479.
- McConachie, H., & Diggle, T. (2007). Parent implemented early intervention for young children with autism spectrum disorder: a systematic review. *Journal of Evaluation in Clinical Practice, 13*(1), 120–129. doi:10.1111/j.1365-2753.2006.00674.x.
- Mesibov, G., & Howley, M. (2003). *Accessing the curriculum for pupils with autistic spectrum disorders: using the TEACCH programme to help inclusion*. London: David Fulton.
- Minschew, N. J., & Williams, D. L. (2007). The new neurobiology of autism. *Archives of Neurology, 64*(7), 945–950. doi:10.1001/archneur.64.7.945.
- Moes, D. R., & Frea, W. D. (2002). Contextualized behavioral support in early intervention for children with autism and their families. *Journal of Autism and Developmental Disorders, 32*(6), 519–533. doi:10.1023/A:1021298729297.
- National Research Council. (2001). *Educating children with autism*. Committee on educational interventions for children with autism. In C. Lord & J. P. McGee (Eds.), *Division of behavioral and social sciences and education*. Washington DC: National Academy Press.

- Norgate, R. (1998). Reducing self-injurious behaviour in a child with severe learning difficulties: enhancing predictability and structure. *Educational Psychology in Practice*, *14*, 176–182. doi: [10.1080/0266736980140304](https://doi.org/10.1080/0266736980140304).
- Ozonoff, S., & Cathcart, K. (1998). Effectiveness of a home program intervention for young children with autism. *Journal of Autism and Developmental Disorders*, *28*(1), 25–32. doi: [10.1023/A:1026006818310](https://doi.org/10.1023/A:1026006818310).
- Panerai, S. (1999). Importanza ed efficacia dell'insegnamento strutturato e degli ausili visivi: presentazione di un caso clinico con diagnosi di autismo associato a ritardo mentale grave. *Ciclo evolutivo e disabilità*, *2*(2), 269–285.
- Panerai, S., Ferrante, L., & Caputo, V. (1997). The TEACCH strategy in mentally retarded children with autism: a multidimensional assessment. *Journal of Autism and Developmental Disorders*, *27*(3), 345–347.
- Panerai, S., Ferrante, L., Caputo, V., & Impellizzeri, C. (1998). Use of structured teaching for treatment of children with autism and severe and profound mental retardation. *Education and Training in Mental Retardation and Developmental Disabilities*, *33*(4), 367–374.
- Panerai, S., Ferrante, L., & Zingale, M. (2002). Benefits of the treatment and education of autistic and communication handicapped children (TEACCH) programme as compared with a non-specific approach. *Journal of Intellectual Disability Research*, *46*(4), 318–327. doi: [10.1046/j.1365-2788.2002.00388.x](https://doi.org/10.1046/j.1365-2788.2002.00388.x).
- Probst, P., & Leppert, T. (2008). Brief report: Outcomes of a teacher-training program for autism spectrum disorders. *Journal of Autism and Developmental Disorders* (in press).
- Reeve, C. E., & Carr, E. G. (2000). Prevention of severe behavior problems in children with developmental disorders. *Journal of Positive Behavior Interventions*, *2*, 144–160. doi: [10.1177/109830070000200303](https://doi.org/10.1177/109830070000200303).
- Rutter, M., Le Couteur, A., & Lord, C. (2003). *ADI-R: Autism diagnostic interview—revised*. Los Angeles, CA: Western Psychological Services.
- Sanford, A. R., & Zelman, J. G. (1981). *The learning accomplishment profile (revised edition)*. Winston Salem (CA): Kaplan Press.
- Schopler, E. (1994). A statewide program for the treatment and education of autistic and related communication handicapped children (TEACCH). *Psychoses and Pervasive Developmental Disorders*, *3*, 91–103.
- Schopler, E., Mesibov, G. B., & Hearsey, K. (1995). Structured teaching in the TEACCH system. In E. Schopler & G. B. Mesibov (Eds.), *Learning and cognition in autism*. New York, NY: Plenum Press.
- Schopler, E., Reichler, R. J., Bashford, A., Lansing, M. D., & Marcus, L. M. (1990). *Individualised assessment and treatment for autistic and developmentally disabled children, vol. I: Psycho-educational Profile Revised (PEP/R)*. Austin, TX: Pro-Ed.
- Schopler, E., Reichler, R. J., & Lansing, M. D. (1980). *Individualised assessment and treatment for autistic and developmentally disabled children, vol.2: Teaching strategies for parents and professionals*. Baltimore, MD: University Park Press.
- Schopler, E., Reichler, R. J., & Renner, B. (1988). *The childhood autism rating scale (CARS)*. Los Angeles, CA: Western Psychological Services.
- Siaperas, P., & Beadle-Brown, J. (2006). A case study of the use of a structured teaching approach in adults with autism in a residential home in Greece. *Autism*, *10*(4), 330–343. doi: [10.1177/1362361306064433](https://doi.org/10.1177/1362361306064433).
- Sparrow, S., Balla, D., & Cicchetti, D. (1994). *Vineland adaptive behaviour scale (survey form)*. Circle Pines, MN: American Guidance Service.
- Tsang, S. K., Shek, D. T., Lam, L. L., Tang, F. L., & Cheung, P. M. (2007). Brief report: Application of the TEACCH program on Chinese pre-school children with autism. Does culture make a difference? *Journal of Autism and Developmental Disorders*, *37*(2), 390–396. doi: [10.1007/s10803-006-0199-6](https://doi.org/10.1007/s10803-006-0199-6).
- World Health Organization. (2001). *International classification of functioning, disability and health (ICF)*. Geneva, Switzerland: Author.