J Autism Dev Disord (2007) 37:390–396
DOI 10.1007/s10803-006-0199-6

BRIEF REPORT

Brief Report: Application of the TEACCH Program on Chinese Pre-School Children with Autism—Does Culture Make a Difference?

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Published online: 12 August 2006
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Abstract A longitudinal study was conducted on 34 children with autism to evaluate the usefulness of the Treatment and Education of Autistic and related Communication Handicapped Children (TEACCH) program for Chinese pre-school children in Hong Kong. Eighteen children received full-time center-based TEACCH program training. The control group included 16 children who received different types of individualized or group training but not TEACCH program training. Instruments validated in Hong Kong were used to assess the children's cognitive, social adaptive functioning and developmental abilities before and during the training at 6-month intervals for 12 months. Children in the experimental group showed better outcomes at posttest. They also showed progress in different developmental domains over time. The study provided initial support for the effectiveness of using the TEACCH program with Chinese children.

Keywords Autism · TEACCH · Hong Kong · Chinese children · Intervention · Preschool program training

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Introduction

Autism is a pervasive developmental disorder with generally unfavorable prognosis. However, evidence of improved functional potentials through intensive programs offered early in the child's development has been reported (Schreibman, 2000). A leading treatment program for autism is the Treatment and Education of Autistic and related Communication Handicapped Children (TEACCH) Program developed by Schopler and his team at the University of North Carolina in the 1970s. The TEACCH model anchored on an organic theory of autism, and integrated behavioral, developmental, psychoeducational, psycholinguistic and ecological theoretical perspectives in its program design. Its long-term goal is for the student of autism to fit as well as possible into society as an adult (Mesibov & Sear, 1998).

A number of previous studies have been carried out to examine the effectiveness of the TEACCH model in the West: Schopler, Brehm, Kinsbourne, and Reichler (1971) demonstrated improvement in learning and behavior following the implementation of structure in classroom teaching situations; Panerai, Ferrante, and Caputo (1997) reported that the participants showed significant progress in communication, socialization, self-care, PEP-R (Psycho-educational Profile-Revised) related skills and behavioral control in the participants after twelve months of institutional training using the TEACCH model. The effectiveness of the TEACCH program has also been reported outside North America, including Japan, France, Italy, Sweden, United Kingdom and Kuwait (Schopler, 2000). However, a survey of the available

outcome studies showed that there are four problems of the literature. First, control groups were not commonly employed. Second, the social-cognitive functioning of children with autism was not commonly assessed. Third, there are few longitudinal studies with follow-up at multiple time points. Finally, no Chinese studies have been conducted.

Hong Kong is an international city inhabited mainly by native Chinese. Systematic rehabilitation services for people with autism began to develop in the early 1990s. In 1995, the TEACCH program was identified by a special task force of the Hong Kong Government as a program that held the best promise for Chinese families with autistic members. However, the task force also remarked that ''cultural hurdles have to be overcome before the TEACCH Program can be successfully adapted and transplanted to Hong Kong'' (Health and Welfare Bureau, 1995, p. 10). These hurdles included the adaptation of assessment and evaluation instruments into Chinese, and the development of training and research personnel to establish the evidence on successful application of TEACCH on Chinese people with autism.

Against the above background, Heep Hong Society in Hong Kong (a non-government organization established to provide quality rehabilitation services to pre-school aged special children and their families) began to indigenize the TEACCH program in the late 1990s. Staff trained in the TEACCH training and research system worked to translate and adapt the TEACCH program and launch studies to validate the CPEP-R (Chinese version of the PEP-R; Shek, Tsang, Lam, Tang, & Cheung, 2005) and examine program effectiveness. This paper reports on the initial attempt to evaluate the effectiveness of the Chinese version of the TEACCH program on the learning abilities of Chinese pre-school children with autism. To tackle the identified problems in previous studies, the current design included a control group and repeated post intervention assessments. The social-cognitive functioning of autistic children was also examined.

Method

Participants and Procedures

The experimental group comprised 18 children aged from 3 to 5 years. There were 17 boys and 1 girl. They were randomly drawn from the 63 preschool children with autism studying at Heep Hong Society. The control group comprised 16 children aged from 3 years to 5 years 11 months. There were 12 boys and 4 girls. They were recruited from the Pre-school Parents' Association and the Child Assessment Centres of the Department of Health. Informed parental consent was obtained from all cases.

All children were formally diagnosed according to the Diagnostic and Statistical Manual-IV (DSM-IV, American Psychiatric Association, 1994) as having Pervasive Developmental Disorders (including Autistic Disorder and Pervasive Developmental Disorder Not Otherwise Specified). No child had prior exposure to structured teaching before the study. Problems in recruiting enough consenting cases for the study made it difficult to achieve a perfect match between the experimental and control group subjects. It was noted that the experimental group had lower average intelligence and more educational challenges than the control group.

The study spanned over 12 months and all participants were assessed at Pretest (Baseline), Posttest 1 (after 6 months) and Posttest 2 (after 12 months). During the 12 months, all children in the experimental group received 7 h of TEACCH training per day in Heep Hong Society. Training for the control group children was more varied but none of them received any TEACCH-related training. Four studied in Special Child Care Centres, 10 in Integrated Child Care Centres and two in normal kindergartens, and some received additional non-TEACCH group or individual training depending on assessed need. Comparison of the characteristics of the experimental and manage groups was illustrated in Table 1.

Case dropout was a common threat to most longitudinal studies, including the current one. All 18 children in the experimental group completed the 12-month TEACCH training and assessment at Pretest, Posttest 1 and Posttest 2. For the control group, 16 subjects completed the Pretest and Posttest 1 and only 2 remained for reassessment at Posttest 2.

Instruments

The participants' changes in the various learning domains were measured on the Developmental Scale of the validated Chinese version of PEP-R (CPEP-R; Schopler, Reichler, Bashford, Lansing, & Marcus, 1990; Shek et al., 2005). The Merrill-Palmer Scale of Mental Test (MP; Stutsman, 1948) and the Hong Kong Based Adaptive Behavioral Scales (HKBABS; Sparrow, Balla, & Cicchetti, 1984; Kwok, Shek, Tse, & Chan, 1989) were used to assess their cognitive and social adaptive functioning respectively.

Table 1 Comparison of characteristics of experimental group versus control group

Characteristics	Experimental Group	Control Group
Group size	18	16
Age range	3–5 years	3–5 years
Mean age	M = 4.063 years; SD = 0.529	M = 4.050 years; SD = 0.734
Male to female ratio	17:1	12:4
Mean of IQ (on MP raw scores)	M = 59.966; SD = 11.105	M = 74.225; SD = 18.061
Number of subjects with mental retardation versus limited intelligence or above	14:4	7:9
Selection criteria	No prior exposure to TEACCH mode of training	No prior exposure to TEACCH mode of training
Type of placement	All from Special Child Care Centres (SCCC)	4 from SCCC, 10 from Integrated Child Care Centres (ICCC), 2 from normal Kindergartens (NKG)
Teacher-children ratio	1:6–1:8	1:20–30
Treatment condition	TEACCH curriculum components: structured physical set-up and tasks organization with use of schedule, visual support and Independent work system (IWS)	Non-TEACCH classroom set-up and teaching mode
Curriculum	5 days full-time schooling per week with 30 min individual training on Individualized Educational Plan (IEP) per week and 30 min training per day on IWS	Full-time 5 days schooling per week with 30 min individual training on Individualized Educational Plan (IEP) per week for non-TEACCH mode SCCC. Mainstream curriculum for normal KG; mainstream curriculum with 30 min individual training on Individualized Educational Plan (IEP) per week for ICCC
Other therapies/ treatment received	Individualized or group treatment by speech therapist, occupational therapist, and physiotherapist depending on needs of individual	Individualized or group treatment by speech therapist, occupational therapist, and physiotherapist depending on needs of individual

Results

The results analysis will focus on the differential progress between the experimental and control groups after the first phase of intervention, as well as the effect of time on the experimental group's progress across the two 6-month phases. To address the first issue, the score of CPEP-R Developmental Scale, Merrill-Palmer raw scores, and HKBABS subscales scores at Posttest 1 were entered into a repeated measures multivariate analysis of covariance (ANCOVA). The subjects' age, IQ, as well as pre-treatment CPEP-R developmental scores, Merrill-Palmer raw scores, and HKBABS subscales scores were entered as covariance in the analysis to control for the identified pre-treatment group differences (the experimental group being slightly weaker than the control group in cognitive functioning).

Results shown in Table 2 indicated that after receiving TEACCH training for 6 months, the experimental group subjects demonstrated significantly more improvement than those in the control group in the Perception, Fine Motor, and Gross Motor subtests on the CPEP-R Developmental Scale. On the other hand, the control group subjects showed more progress than the experimental group in the Daily-living domain, as well as the sum of domains standard score of the HKBABS Scale. The improvement of both groups in the M-P Scale of Mental Test was not significant.

To examine the effect of TEACCH training on the experimental group subjects across time, repeated measure analyses of variance were performed on the data collected at Pre-test, Posttest 1 and Posttest 2. Dependent-t tests were also performed between Pretest and Posttest 1, as well as Posttest 1 and Posttest 2 data to examine the effect of time on the subjects' progress in the two phases.

Table 3 showed that during the 12-month exposure to TEACCH training, children in the experimental group showed gradual and significant improvement in the CPEP-R Developmental scores (total and all subscales), the M-P Scale of Mental Tests (total raw scores and mental age) and the HKBABS (all indicators except overall sum of domain standard score). Table 4

Table 2 Group Differences on CPEP-R Scores, M-P scores, and HKBABS Scores at Posttest 1 after controlling for age, IQ and Pretest scores

Scales	Experimental group (N = 18)		Control group (N = 16)		*df*	*F*	*p*
	Adjusted Mean	*SD*	Adjusted Mean	*SD*			
Imitation	8.115	.899	7.558	.961	(1, 34)	.160	ns
Perception	10.067	.693	7.300	.740	(1, 34)	6.708	*
Fine motor	11.091	.729	8.522	.778	(1, 34)	5.195	**
Gross motor	15.425	.915	11.522	.978	(1, 34)	7.497	*
Eye-hand coordination	7.776	.661	8.002	.706	(1, 34)	.049	ns
Cognitive Performance	9.190	1.029	10.723	1.100	(1, 34)	.910	ns
Cognitive Verbal	5.920	1.091	8.423	1.172	(1, 34)	2.039	ns
CPEP-R Developmental Scores	69.698	2.580	72.840	2.775	(1, 34)	.557	ns
Merrill-Palmer (raw scores)	48.106	2.233	51.505	2.387	(1, 34)	.956	ns
Communication (total scores)	49.018	3.746	60.230	4.083	(1, 34)	2.804	ns
Daily Living Skills (total scores)	54.951	2.309	69.680	2.473	(1, 34)	16.297	***
Socialization (total scores)	39.326	2.481	47.509	2.685	(1, 34)	3.735	ns
Motor Skills (total scores)	58.585	1.348	60.404	.736	(1, 34)	.398	ns
Communication (standard scores)	55.937	2.837	62.633	3.079	(1, 34)	1.849	ns
Daily Living Skills (standard scores)	70.011	1.909	75.175	2.043	(1, 34)	2.962	ns
Socialization (standard scores)	62.280	2.810	69.497	3.034	(1, 34)	2.340	ns
Motor Skills (standard scores)	71.101	2.510	76.449	2.685	(1, 34)	1.854	ns
HKBABS Sum of Domains Standard Score	253.425	7.881	284.771	8.513	(1, 34)	5.593	*

* $p \leq .05$

** $p \leq .01$

*** $p \leq .001$

further showed that progress of the experimental group subjects were more remarkable in the first 6 months of TEACCH training, except for the socialization domain which showed more progress from Posttest 1 to Posttest 2 (Table 5).

Dependent-*t* tests on the control group subjects' Pretest and Posttest 1 data showed that they had significant improvement in the total CPEP-R Developmental scores but not individual subtest indicators. They also showed significant improvement in the M-P

Table 3 Changes in the experimental subjects across Pretest, Posttest 1 and Posttest 2 on the different outcome indicators

Scales	Pretest (N = 18)		Posttest 1 (N = 18)		Posttest 2 (N = 18)		*df*	*F*	*p*
	Mean	*SD*	Mean	*SD*	Mean	*SD*			
Imitation	4.222	3.098	6.500	3.485	7.222	3.874	(2, 34)	10.487	***
Perception	7.278	2.562	8.889	2.541	9.389	2.593	(2, 34)	11.727	***
Fine motor	8.889	1.967	10.056	1.967	10.667	1.609	(2, 34)	14.418	***
Gross motor	13.222	2.881	14.444	2.332	14.444	2.382	(2, 34)	4.077	*
Eye-hand coordination	5.500	2.203	6.500	2.503	7.389	3.051	(2, 34)	10.024	***
Cognitive Performance	5.222	2.647	7.000	3.162	8.278	4.041	(2, 34)	13.962	***
Cognitive Verbal	1.111	1.278	3.500	3.148	5.000	4.419	(2, 34)	17.720	***
CPEP-R Developmental Scores	45.444	13.674	56.889	15.662	62.389	17.800	(2, 34)	36.391	***
Merrill-Palmer (raw scores)	29.222	15.984	40.778	16.795	48.000	19.554	(2, 34)	35.772	***
Merrill-Palmer (mental age)	28.111	6.211	32.778	6.302	35.444	7.382	(2, 34)	33.865	***
Communication (total scores)	20.556	9.401	28.556	12.373	40.111	20.468	(2, 34)	19.440	***
Daily Living Skills (total scores)	42.333	12.889	46.667	12.310	58.556	18.618	(2, 34)	30.158	***
Socialization (total scores)	27.056	8.335	29.611	8.256	35.333	12.088	(2, 34)	12.173	***
Motor Skills (total scores)	49.889	11.861	53.944	10.784	59.111	10.046	(2, 34)	16.846	***
HKBABS Sum of Domains Standard Scores	231.111	22.986	226.389	31.377	232.278	31.863	(2, 34)	0.632	ns

* $p \leq .05$

*** $p \leq .001$

ns, Non-significant

Table 4 Changes in the experimental group subjects across Pretest, and Posttest 1 on the different outcome indicators

Scales	Pretest (n = 18)		Posttest 1 (n = 18)		Mean diff	*SD*	*df*	*t*	*p*
	Mean	*SD*	Mean	*SD*					
Imitation	4.222	3.098	6.500	3.485	–2.278	3.006	(1, 17)	–3.215	***
Perception	7.278	2.562	8.889	2.541	–1.611	1.650	(1, 17)	–4.143	***
Fine motor	8.889	1.967	10.056	1.967	–1.167	1.425	(1, 17)	–3.475	***
Gross motor	13.222	2.881	14.444	2.332	–1.222	1.833	(1, 17)	–2.829	**
Eye-hand coordination	5.500	2.203	6.500	2.503	–1.000	1.940	(1, 17)	–2.187	*
Cognitive Performance	5.222	2.647	7.00	3.162	–1.778	2.102	(1, 17)	–3.588	**
Cognitive Verbal	1.111	1.278	3.500	3.148	–2.389	2.660	(1, 17)	–3.810	***
CPEP-R Developmental Scores	45.444	13.674	56.889	15.662	–11.444	8.959	(1, 17)	–5.420	***
Merrill-Palmer (raw scores)	29.222	15.984	40.778	16.795	–11.556	9.889	(1, 17)	–4.958	***
Merrill-Palmer (mental age)	28.111	6.211	32.778	6.302	–4.667	3.742	(1, 17)	–5.292	***
Communication (total scores)	20.556	9.401	28.556	12.373	–8.000	10.672	(1, 17)	–3.181	**
Daily Living Skills (total scores)	42.333	12.889	46.667	12.310	–4.333	8.409	(1, 17)	–2.186	*
Socialization (total scores)	27.056	8.335	29.611	8.256	2.556	6.519	(1, 17)	–1.663	ns
Motor Skills (total scores)	49.889	11.861	53.944	10.784	–4.056	7.264	(1, 17)	–2.369	*
HKBABS Sum of Domain Standard Score	231.111	22.986	226.389	31.377	4.722	30.440	(1, 17)	.658	ns

* $p \leq .05$

** $p \leq .01$

*** $p \leq .001$

ns, Non-significant

Scale of Mental Tests (total raw scores and mental age) and the HKBABS (domain total scores) (Table 6).

Discussion

This longitudinal evaluative research has yielded initial empirical evidence supporting the applicability of the TEACCH principles on Chinese children with autism. The between-groups (i.e., experimental group vs. control group) and within-group (i.e., changes of experimental group subjects across time) analyses on standardized intellectual and developmental assessment results indicated that the program promoted such children's pivotal learning abilities like imitation, perception, fine motor, eye-hand coordination and gross

Table 5 Changes in the experimental group subjects across Posttest 1, and Posttest 2 on the different outcome indicators

Scales	Posttest 1 (n = 18)		Posttest 2 (n = 18)		Mean diff	*SD*	*df*	*t*	*p*
	Mean	*SD*	Mean	*SD*					
Imitation	6.500	3.485	7.222	3.874	–7.222	3.045	(1, 17)	–1.006	ns
Perception	8.889	2.541	9.389	2.593	–5.000	2.007	(1, 17)	–1.057	ns
Fine motor	10.056	1.967	10.667	1.609	–6.111	1.614	(1, 17)	–1.607	ns
Gross motor	14.444	2.332	14.444	2.382	.000	2.000	(1, 17)	.000	ns
Eye-hand coordination	6.500	2.503	7.389	3.051	–.889	1.605	(1, 17)	–2.350	*
Cognitive Performance	7.000	3.162	8.278	4.041	–1.278	2.740	(1, 17)	–1.979	ns
Cognitive Verbal	3.500	3.148	5.000	4.419	–1.500	1.689	(1, 17)	–3.768	**
CPEP-R Developmental Scores	56.889	15.662	62.389	17.800	–5.500	8.618	(1, 17)	–2.708	*
Merrill-Palmer (raw scores)	40.778	16.795	48.000	19.554	–7.222	9.534	(1, 17)	–3.214	**
Merrill-Palmer (mental age)	32.778	6.302	35.444	7.382	–2.667	3.597	(1, 17)	–3.145	**
Communication (total scores)	28.556	12.373	40.111	20.468	–11.556	13.518	(1, 17)	–3.627	**
Daily Living Skills (total scores)	46.667	12.310	58.556	18.618	–11.889	9.845	(1, 17)	–5.123	***
Socialization (total scores)	29.611	8.256	35.333	12.088	–5.722	7.952	(1, 17)	–3.064	**
Motor Skills (total scores)	53.944	10.784	59.111	10.046	–51.67	5.393	(1, 17)	–4.064	***
HKBABS Sum of Domain Standard Score	226.389	31.377	232.278	31.863	–6.889	24.781	(1, 17)	–1.179	ns

* $p \leq .05$

** $p \leq .01$

*** $p \leq .001$

ns, Non-significant

Table 6 Changes in the control group subjects across Pretest, and Posttest 1 on the different outcome indicators

Scales	Pretest (n = 16)		Posttest 1 (n = 16)		Mean diff	*SD*	*df*	*t*	*p*
	Mean	*SD*	Mean	*SD*					
Imitation	8.188	6.585	9.375	6.428	–1.188	5.879	(1, 15)	–.808	ns
Perception	8.875	4.485	8.625	5.525	.250	5.721	(1, 15)	.175	ns
Fine motor	9.500	4.872	9.688	5.606	–1.875	6.263	(1, 15)	–.120	ns
Gross motor	12.875	5.508	12.625	7.089	.250	6.952	(1, 15)	.144	ns
Eye-hand coordination	7.063	4.654	9.438	5.808	–2.375	5.415	(1, 15)	–1.755	ns
Cognitive Performance	10.500	7.466	13.188	8.961	–2.688	8.072	(1, 15)	–1.332	ns
Cognitive Verbal	8.438	7.554	11.125	8.269	–2.687	6.641	(1, 15)	–1.619	ns
CPEP-R Developmental Scores	75.625	32.031	87.250	30.679	–11.625	10.582	(1, 15)	–4.394	***
Merrill-Palmer (raw scores)	49.625	28.021	59.750	22.141	–10.125	10.099	(1, 15)	–4.010	***
Merrill-Palmer (mental age)	36.063	10.945	40.125	8.640	–4.063	4.123	(1, 15)	–3.942	***
Communication (total scores)	66.625	30.923	83.250	34.418	–16.625	12.617	(1, 15)	–5.271	***
Daily Living Skills (total scores)	62.625	24.418	79.000	23.455	–16.375	12.900	(1, 15)	–5.708	***
Socialization (total scores)	48.813	15.984	58.438	19.103	–9.625	10.651	(1, 15)	–3.615	**
Motor Skills (total scores)	61.500	12.198	65.625	12.016	–4.125	3.500	(1, 15)	–4.714	***
HKBABS Sum of Domain Standard Score	290.688	444.733	315.188	60.005	–24.500	33.590	(1, 15)	–2.918	**

** $p \leq .01$

*** $p \leq .001$

ns, Non-significant

motor skills (i.e., CPEP-R scores), as well as cognitive functioning. Such improvement is important because the early development of such potentials is normally indicative of better prognosis for achieving greater independence and better integration into society (Mesibov & Sear, 1998; Schopler, 1997).

The lack of significant difference between the experimental and control group subjects in terms of communication is disappointing but not unexpected. Communication is the core deficit of autistic children and can be reflected according to their receptive, expressive and written scores on the HKBABS. However, given just 12 months of intervention and such a small sample size, it is difficult if not impossible to achieve statistically significant results on improvement (Sparrow et al., 1984).

As an initial and small scale evaluative study, this research is vested with a few notable limitations. First, some practical and ethical constraints made it impossible to randomly assign the subjects into the experimental and control groups, but possible threats to the internal validity of the study had been controlled to some extent by using analyses of covariance. Second, the small sample size limited the generalizability of the findings. It is recommended that larger samples should be used in future studies. Third, as the number of professionals eligible for TEACCH training and research was still limited in Heep Hong, it was not possible to achieve total blindness in assessment and progress evaluation, and systematic biased results could not be completely ruled out. Finally, although the research team considered that the home-TEACCH philosophy (Cathcart & Ozonoff, 1998) is most compatible with the Chinese culture of high parental involvement in children training, resource constraints made it impossible to examine home-TEACCH coordination in this study. Despite these limitations, the present study had enriched the literature on how Chinese children with autism could be helped. By 2005, 52 TEACCH pre-school classrooms in Hong Kong had been set up and served around 1500 children and their families. The research team members actively shared their experience in the practice and research of the TEACCH approach in major Chinese communities like Taiwan, Shanghai and Guangzhou. To further address the cultural hurdles, more studies should be conducted to study the implementation of TEACCH in the form of community and home-based adaptive skills training across different Chinese communities; its effectiveness with children with autism at different levels of functioning; and its usefulness beyond childhood.

Acknowledgements The authors have contributed equally to the development of this paper. They would like to thank the Providence Foundation Limited (major sponsor) and the Committee on Conference and Research Grants, The University of Hong Kong for their financial support for the implementation of the project, and the Research Grants Council of the Hong Kong Special Administrative Region (Grant CUHK4293/03H) for its financial support for the preparation of this paper. The authors would also like to thank Amy A.M. Chow and Natty S.Y. Chan for their assistance in collecting the data.

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