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Real world effectiveness of different early intervention programs for children with Autism Spectrum Disorders in Greece

Maria K. Makrygianni[1], Angeliki Gena[2], and Phil Reed[1]

[1]Swansea University, U.K., [2] University of Athens, Greece

Address for correspondence: Phil Reed,

Department of Psychology,

Swansea University,

Singleton Park,

Swansea, SA2 8PP, U.K.

e-mail: p.reed@swansea.ac.uk

Tel.: 0044 (0)1792 602047

Running head: Greek early intervention programmes

Abstract

The effectiveness of several different community-based early intervention programs for young children (2.5 to 6.5 years old) with Autism Spectrum Disorder in Greece was compared with one another. The interventions studied were Applied Behavior Analysis (ABA), type-TEACCH, and an eclectic intervention program. After nine months of treatment, there were few systematic overall differences in changes in child functioning between the programs: although the differences between the programs were small in size, the ABA intervention program was the most effective in improving intellectual functioning. There were few predictors of outcome in terms of the child age at starting the intervention; although children fared better on the ABA program if they had started the program at a younger age, there was little impact of this factor on the outcomes for the other programs. The results suggest that these forms of intervention will be similarly effective for children with ASD, with there being some slight advantage for ABA programs, especially for younger children. This advantage may need to be weighed against the potential costs of the program.

Key words: autism, effectiveness, Greek, intervention

There are many intervention approaches available for children with Autism Spectrum Disorders (ASD). Among the most thoroughly evaluated of these approaches is the Applied Behavior Analytic intervention (ABA; e.g., Eldevik, Eikeseth, Jahr, & Smith, 2006; Ozonoff, & Cathcart, 1998; Reed, Osborne, & Corness, 2007; Sallows & Graupner, 2005). Another widespread intervention approach is the Treatment and Education of Autistic and Communication Related Handicapped Children (TEACCH), for which there is also some efficacy evidence (e.g., Ozonoff, & Cathcart, 1998; Panerai, Ferrante, & Zingale, 2002; Tsang, Shek, Lam, Tang, & Cheung, 2007).

Although there is evidence for the impact of these specific forms of intervention for children with ASD, it should be noted that the majority of schools use eclectic approaches (Jordan, Jones, & Murray, 1998; Wray & Fletcher-Campbell, 2002). Such eclectic approaches combine features of different intervention approaches (see Jordan et al., 1998; Osborne, McHugh, Saunders, & Reed, 2008; Reed, 2015). Despite their widespread use, there are relatively few studies of eclectic intervention as the primary intervention. Overall, these studies give mixed results regarding effectiveness; ranging from small improvements, to deterioration of function, on different developmental abilities (cf. Akstinas, 2006; Gabriels, Hill, Pierce, Rogers, & Wehner, 2001; Osborne et al., 2008; Zachor & Itzchak, 2010).

While there are a large number of studies available on the impact of particular forms of intervention for children with ASD (see Reed, 2015, for an overview), there are few comparisons of the impact of a number of interventions with one another in the same report (see Howard, Sparkman, Cohen, Green, & Stanislaw, 2005; Reed et al., 2007). The relative impact of the above three interventions on the functioning of young children with ASD in a school setting, across a range of functioning domains, was one aim of the current study.

Another limitation of the current literature base is that most of the outcome-effectiveness findings that are available on the impact of early interventions for ASD relate to

programs conducted in the United Kingdom and North America. Despite the growing

amount of literature pertaining to these countries, many such programs for children with ASD

also exist in many other countries around the world (see Makrygianni & Reed, 2010). While

these programs may be based on the same principles as those in the UK and USA, cultural

differences between countries, the different family and social values, perception of

disabilities, and expectations regarding the child, could have significant impact on the

intervention implementation and outcome (see Rogers & Vismara, 2008). These possible

cross-cultural differences in the outcomes could be of international interest, and certainly

need further research. Greece constitutes one country where early intervention programs for

children with ASD have been studied very little (Kaderoglou, 2000). Given this, the current

report investigated the impact of early interventions for ASD on a sample of children in

Greece to develop some outcome effectiveness data from this country.

It was also hoped to document how these early interventions for ASD typically

operate in a community-based school setting; that is, it was aimed to evaluate their 'real

world' effectiveness. Although setting up and carefully monitoring an early intervention for

children with ASD will provide many answers about the impact of such programs, as they are

intended to operate, it is the case that many such programs do not necessarily adhere to the

same strictures when they are conducted away from controlled studies (see Mudford, Martin,

Eikeseth, & Bibby, 2001). Given such considerations, it has been argued (see Reed et al.,

2007), that assessing the outcomes of such programs as they actually occur provides just as

important information for educators, as assessing the 'pure versions' of these interventions.

Thus, the overall aim of the present study was to evaluate and compare the

effectiveness of community-based ABA, type-TEACCH, and eclectic, intervention programs

for young children (2.5 to 6.5 years old) with ASD in Greece. The main objectives were the

description of these interventions, and the assessment of their effectiveness in improving

children's performances on a range of different developmental domains, and the explore whether there were any predictors of success and if these would differ across the programs.

Method

Participants

Children had to meet all of the following criteria to be included in the study: (1) a diagnosis of autism or PDD, using the DSM-IV-TR criteria, made by a pediatrician independent from the current study; (2) be between 2:6 and 6:6 years old at the time of intake; (3) to be free of other major medical conditions; (4) be enrolled in either an ABA, type-TEACCH, or eclectic, intervention program at school; (5) not be receiving any other major intervention duration the study; and (6) not having had the intervention for more than 12 months at the start of the study.

Ten schools were approached initially, and eight agreed to send information sheets and consent forms to parents of their pupils. From the parents who were invited, 79% (15 parents) from schools using ABA, 70% (26 parents) from type-TEACCH schools, and 70% (14 parents) from eclectic programs, agreed to participate. Some parents did not complete the baseline or the follow-up questionnaires, some children were not at school when the follow-up assessments were conducted, and some children whose parents agreed and completed the questionnaires had been in school for more than 12 months prior to the study. The final sample consisted of 10 children from ABA programs, 12 from type-TEACCH programs, and 8 children from eclectic programs.

Table 1 about here

Although, due to the nature of the study, participants were not randomly assigned to the three groups, they were matched on almost all measures at baseline. Table 1 shows the baseline scores for the children across the child functioning domains that were assessed. A multivariate analysis of variance (MANOVA) conducted on the five child variables revealed that there was no statistically significant difference between the groups on these measures at baseline, *Wilk's Lambda* = .642, $F(10,46)$ = 1.14, $p > .30$, *partial eta^2* = .199 (the individual analyses of variance for each domain are shown in Table 1, and are all non-significant).

Ethical approval for the study was obtained from the Ethics Committee of the Department of Psychology at Swansea University.

Settings

ABA Intervention Programs were conducted in private schools. The daily program of each child was individualized in order to address their specific deficits and problems. The sessions lasted about 4-5 hours a day for 5 days a week. During a session a number tasks were taught according to ABA teaching principles for about 5-10min, with short (5min) breaks between the tasks. Success in a task was considered to be when the child reached 80% accuracy with generalization across various stimuli and conditions. The intervention goals were updated weekly according to the daily documented data provided by therapists. Initially, intervention was provided in the format of one-to-one sessions, but group sessions were introduced gradually in order to encourage social interaction and communication skills. Augmentative communication (Picture Exchange Communication System) was used when necessary. Speech and language therapy was carried out by the therapists, as part of the daily program under the guidance of speech and language therapists and always using ABA techniques. The ABA programs had an educational director and an executive director in each school, who both were trained professionals with experience in ABA, as well as supervisors,

program managers, and therapists. Most therapists had studied psychology and had received

training and on-going supervision in the use of ABA.

Type-TEACCH Programs were conducted at two psychoeducational centers. All

children received a morning treatment program, which lasted 4.5 to 5.0 hours per day for 5

days a week. The program was divided into 7 'circles of functioning', where the children

were placed according to their level of functioning. It included regular pre-school activities,

as well as routines such as: circle time, brunch, and breaks. The program combined one-to-

one sessions, group work, and independent work, according to the TEACCH framework,

enriched with other approaches for ASD, such as PECS, MAKATON and sensory integration

therapy, when it was necessary. Hence, these programs are referred in this report as 'type-

TEACCH'. The program was under the direction of an experienced child psychiatrist

specializing in ASD. The team consisted of child psychologists, family therapists, clinical

psychologists, school psychologists, psycho-educationalists, SEN teachers, speech therapists,

occupational therapists, drama therapists, and/or a music therapist. The team met every two

weeks to discuss and consult on each child's progress and difficulties. They also determined

treatment goals and the child's educational plan.

Eclectic programs were conducted at special centers for children with ASD. All

children attended a morning program of 3-4 hours per day for 5 days a week. The programs

were individualized. Teaching was conducted in accordance with prevalent treatment

approaches and interventions. Specifically, the treatment and educational interventions that

the programs offered were the sensory integration, and sensory relaxation-Snoezelen, special

education, and TEACCH, occupational and speech therapy, PECS and MAKATON,

computer assisted learning, behavioral therapy, and behavior modification, and

psychotherapy. Their aim was the improvement of children's psycho-emotional

development, communication and cognitive abilities ability, and their engagement in social

interaction, the consultative and social support of the families, the participation of the families and the continuation of the program at home, and the collaboration with nursery schools for the inclusion of the children. The programs were under the direction of an experienced clinical psychologist, who coordinated and supervised a multidisciplinary team, consisting of clinical psychologists, child psychologist, social workers, speech therapists, occupational therapists, educators, and special educators, as well as nurse-therapists.

Table 2 about here

Table 2 shows characteristics of the three intervention programs. The mean overall time intensity was similar across the programs, but ABA adopted more 1:1, and type-TEACCH adopted more group-based work. ABA and TEACCH interventions were delivered by 3-4 therapists, who were mainly psychologists, and often they had a postgraduate degree. In contrast, the therapists on eclectic programs had various educational backgrounds. Statistically significant differences were not found amongst the groups in terms of the percentage of parents who continued the intervention program at home and those who did not, and the percentage of parents who had training and those who had not.

Measures

This study used five scales to measure child progress, the: Autism Behavior Checklist(ABC; Krug, Arick, & Almond, 1979); Leiter International Performance Scale (Roid & Miller, 1997); Vineland Adaptive Behavior Scale (Sparrow, Balla, & Cicchetti,1984), Peabody Picture Vocabulary Test (third Edition) (Dunn & Dunn, 1997); Developmental Behaviour Checklist (Einfeld & Tonge, 2002).

Procedure

At baseline, two of the scales (Leiter and PPVT) were administered directly to the children by a trained psychologist blind to group assignment, and the rest of the scales were completed by the parents. Approximately nine months after the baseline assessments, the follow-up assessments were conducted in the same manner.

Results

Figure 1 about here

Figure 1 shows the group-mean change scores for the child outcome variables (follow-up minus baseline) adjusted so that positive score reflect an improvement. Inspection of these data shows that the ABA programs offered an advantage in terms of intellectual functioning (Leiter). A MANOVA conducted on these data revealed a marginally significant and moderate-sized difference between the groups, *Wilk's Lambda* = .550, $F(10,46) = 2.41$, *p* < .08, *partial eta^2* = .199. The individual ANOVAs for each domain were: ABC < 1, *partial eta^2* = .044; IQ = $F(2,27) = 3.18$, *p* < .05, *partial eta^2* = .190; VABS = $F(2,27) = 1.10$, *p* > .30, *partial eta^2* = .076; PPVT = $F(2,27) = 2.46$, *p* > .10, *partial eta^2* = .105; and DBC = $F <$ 1, *partial eta^2* = .020.

Figure 2 about here

Figure 2 shows the percentage of participants in each group who showed a reliable change in the score at follow-up compared to their baseline score. Reliable change (more than the unreliability of the measure would suggest might happen for 95% of subjects) was

calculated by comparing the difference between the follow-up and initial scores to a criterion

level. The criterion level determined by the initial standard deviation of the measure and its

reliability, and is given by: 1.96*SD*sqrt*sqrt(1-rel); where 'SD' is the baseline standard

deviation of the measure, 'sqrt' indicates square root, and 'rel' indicates the internal

reliability of the scale (Jacobson, Follette, & Revenstorf, 1984). Inspection of these data

shows that none of the interventions produced strong level of reliable change for the child

outcomes.

Table 3 about here

Table 3 shows the correlations between the baseline levels of functioning for the

whole sample and the change in functioning after the interventions. Inspection of these data

shows little association between the baseline scores and change. Baseline IQ predicted

change in IQ and behaviour problem, baseline language predicted change in adaptive

behaviour and behaviour problems, and baseline behaviour problems predicted change in

autism symptoms and behaviour problems.

Figure 3 about here

The data from the sample as a whole obscures some differences in the extent to which

different variables predict change scores, and the correlations between the baseline variables

and the change scores for the three groups separately are shown in Figure 3. For the ABA

group, the younger the child at intake the better the gain in language; the more severe the

ASD symptoms the greater the improvement in autism severity, but the worse the

improvement in language (based on $p < .01$ for these correlations). For the TEACCH group,

the less severe the ASD symptoms at intake, the greater the improvement in adaptive

behavior (VABS) and in behavior problems; and the greater the IQ at baseline the greater the

improvement in behavior problems (ps < .01). For the eclectic approach, the older at

baseline, the greater the improvement in ASD; and the more severe the ASD symptoms, the

greater the improvement in ASD (ps < .01). It might also be noted that, inspection of Figure

3 shows that, in general, the ABA group tended to fare better for younger and more severe

children, whereas the TEACCH and eclectic groups tended to show the opposite pattern of

results.

Discussion

The present study assessed and compared community-based ABA, type-TEACCH

and eclectic early intervention programs for young children (2.5 to 6.5 years old) with ASD,

in Greece. Participants in all groups had developmental delays associated with ASD: low

intellectual abilities, difficulties in language, adaptive behavior, and behavioral problems.

There were no significant or systematic differences among the participants of the three

groups at baseline, and the children's profile was not different from that of participants in

previous studies conducted in other countries (e.g., Eldevik et al, 2006; Howard et al, 2005;

Sallows & Graupner, 2005). Overall, the interventions showed only small impacts on the

children's functioning: with the ABA intervention programs being the most effective in

improving intellectual functioning. There were few predictors of outcome in terms of the

child age at starting the intervention, although these tended to differ across the interventions,

with ABA being more effective with younger and more severe cases (see also Reed &

Osborne, 2012).

None of the intervention programs produced strong or reliable 'recovery' from ASD

(cf. Lovaas, 1987). Autistic severity decreased for the ABA group, but only one participant

had a reliable change. This finding is consistent with the findings of many previous studies conducted in other countries (e.g. Perry, Cummings, Geier, Freeman, Hughes, LaRose, Managhan, Reitzel, & Williams, 2008; Sallows & Graupner, 2005). The intellectual abilities (IQ) of the participants increased to a greater extent in the ABA group than in the other groups, which is also consistent with previous studies conducted in the UK and USA (e.g., Howard et al., 2005; Reed et al., 2007).

As regards the adaptive (VABS) and challenging (DBC) behaviors of the children, none of the groups demonstrated strong effects, and none of the groups differed from one another. In terms of adaptive behavior, these findings corroborate the results of previous studies (Anderson, Avery, DiPietro, Edwards, & Christian, 1987; Eldevik et al, 2006; Magiati et al, 2007; Remington et al, 2007; Sallows & Graupner, 2005; Smith, Groen, & Wynn, 2000), according to which the adaptive behavior of children with ASD in EIP does not change significantly during the short term of the studies.

The present study had some limitations, which have to be taken into consideration. Firstly, the sample size was relatively small, which is a problem for the statistical power of the outcomes. However, the sample size in the current study was similar to other studies in this field. Secondly, the participants were not randomly assigned to the groups. Nevertheless, the groups were closely matched at baseline, and the study offered an opportunity to investigate some intervention programs in 'natural' conditions. Thirdly, there was not a direct control of the quality of treatment. However, one possible assurance regarding this treatment quality and fidelity is that the directors of the programs are notable scientists on the field of autism in Greece.

In sum, the results from the present study suggest that there are not many statistically significant differences between Greek, ABA, type-TEACCH, and eclectic early intervention programs that specialize in children with ASD. Although the ABA program did show an

advantage relative to the other groups, where an advantage was shown, this was not a strong

effect, and should be weighed against the potential costs of the interventions.

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Table 1: Group-mean baseline scores for the three intervention types on all functioning domains, along with the ANOVA results. ASD = ABC score, IQ = Leiter overall standard score, VABS = Vineland overall standard score, PPVT = Peabody Picture Vocabulary Test standard score, DBC = Developmental Behavior Checklist overall score.

	ABA	TEACCH	Eclectic	$F(2,27)$	*Partial eta^2*
ASD	67.00 (22.56)	60.50 (21.08)	47.75 (22.71)	1.74	.114
IQ	69.10 (16.68)	85.08 (25.52)	64.13 (23.69)	2.48	.155
VABS	51.08 (8.52)	62.67 (20.13)	56.63 (7.95)	1.59	.105
PPVT	51.40 (11.43)	61.42 (23.85)	46.50 (16.10)	1.72	.113
DBC	56.20 (13.47)	43.17 (17.86)	49.25 (19.39)	1.85	.121

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 2. Characteristics of the intervention programs

| INTERVENTION		ABA	Type-TEACCH	Eclectic	F
Hours / week		23.82 (3.42)	21.79 (4.46)	20.00 (3.33)	2.988
Hours / day - 1-to-1 sessions		3.02 (1.19)	1.23 (0.47)	1.69(0.69)	15.811**
Hours / day - group sessions		1.62 (0.72)	3.19 (0.40)	1.85 (0.28)	39.687**
Therapists per child		3.75 (1.50)	3.71 (0.47)	4.69 (1.18)	2.77
STAFF					**Statistics**
staff qualifications:	psychology	8	10	2	12.057^{2}*
	education	0	2	4	
	other	1	2	5	
level of degree:	BA	3	8	8	4.757^{2}
	MA, MSc or 2 BA	5	6	2	
	PhD	1	0	1	
years of educational experience		5.00 (3.74)	8.21 (5.60)	8.45(3.62)	1.050^{1}
years of experience with ASD		4.67 (3.44)	5.00 (4.15)	3.27(2.87)	0.738^{1}
age of therapist		30.63 (7.61)	33.43 (5.79)	33.64(4.25)	0.750^{1}
intervention at home	yes	5	5	3	0.592
	no	3	4	4	
parent training	yes	5	9	2	3.922
	no	4	4	6	

* $p<0.05$,   ** $p<0.01$ 1= *F value*   2=*Pearson chi-square (x^2)*

Table 3: Correlations between baseline measures and outcomes. ASD = ABC score, IQ = Leiter overall standard score, VABS = Vineland overall standard score, PPVT = Peabody Picture Vocabulary Test standard score, DBC = Developmental Behavior Checklist overall score.
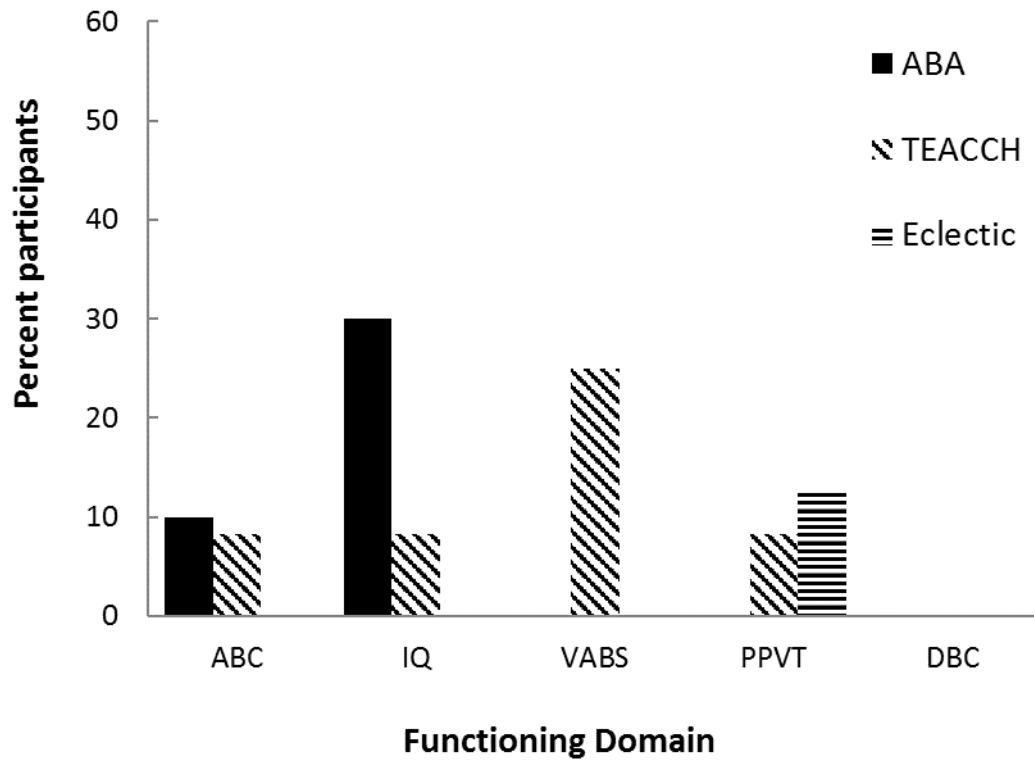
Baseline	Change				
	ASD	IQ	VABS	PPVT	DBC
ASD	.375*	.002	-.260	-.326	-.044
IQ	.169	-.307*	.294	.115	.421*
VABS	.172	-.279	.142	.119	.159
PPVT	.107	-.069	.421*	-.131	.423*
DBC	.364*	.293	.000	- .087	.392*

*p < .05, ** p < .01, *** p < .001*

Figure 1: Group-mean change scores across the five child outcome measures. ASD = ABC score, IQ = Leiter overall standard score, VABS = Vineland overall standard score, PPVT = Peabody Picture Vocabulary Test standard score, DBC = Developmental Behavior Checklist overall score.
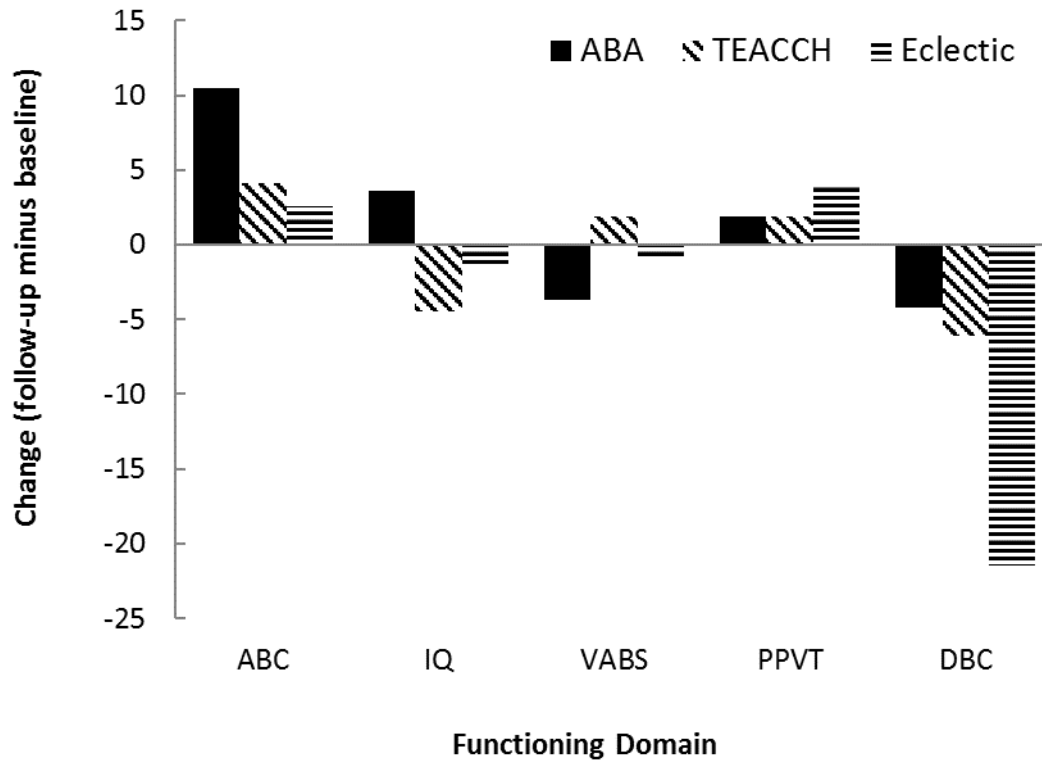
Figure 2: Percentage of participants in each group showing a reliable change in their score. ASD = ABC score, IQ = Leiter overall standard score, VABS = Vineland overall standard score, PPVT = Peabody Picture Vocabulary Test standard score, DBC = Developmental Behavior Checklist overall score.

Figure 3: Impact of child baseline scores (age, ASD severity, and IQ) on change scores across the five functioning domains, for the three interventions