

# Best Evidence Summaries of Topics in Mental Healthcare

**BEST** *in* **MH** *clinical question-answering service*

## Question

How effective is Applied Behavior(u)r Analysis for people with Autism?

## Clarification of question using *PICO* structure

<i>Patients:</i>	People with Autism
<i>Intervention:</i>	Applied Behavior(u)r Analysis
<i>Comparator:</i>	Any or no intervention
<i>Outcome:</i>	All Patient Outcomes

## Plain language summary

The effectiveness of “Applied Behavioural Analysis” (ABA) for autism compared to any other intervention was inconclusive due to the quality of research evidence available. However one study included in this summary suggests’ ”Pivotal Response Treatment” (PRT) is significantly more effective than ABA for improving communication outcomes for people with Autism.

### **Clinical and research implications**

No definite clinical implications may be made based on the evidence included in this BEST summary. It was highlighted that further high quality studies are required that are appropriately powered, use no treatment controls or match treatment intensity and duration across groups, and that evaluate broader outcomes. We also suggest that any further meta-analyses of studies in this field of research consider evaluating groups of studies that share the same type of comparison group.

### **What does the evidence say?**

#### ***Number of included studies/reviews (number of participants)***

Three systematic reviews (SRs) (Peters-Scheffer et al. 2011; Spreckley and Boyd 2009; Virués-Ortega, 2010), and one randomised controlled trial (RCT) (Mohammadzaheri 2014) met the inclusion criteria for this BEST summary.

#### ***Main findings***

All of the SRs were difficult to interpret as the authors combined studies with different comparison groups into their meta-analyses, thus precluding any conclusions regarding the effectiveness of one type of intervention versus another.

The systematic review by Spreckley and Boyd (2009) evaluated the effectiveness of applied behaviour intervention (ABI) programmes for pre-school children with autism spectrum disorder. The authors stated that 13 studies met their inclusion criteria, but then only presented meta-analyses of three studies (from four publications). These meta-analyses, however, combined studies that compared ABI with less intensive ABI (i.e. dose-response studies), or with eclectic treatment. By examining the effect sizes (presented in forest plots) of the one study (n=25) included in this review that compared ABI with eclectic treatment, it can be seen that there were no significant differences between the groups for cognitive behaviour and receptive language, but there were significant differences in favour of ABI for expressive language and behaviour outcomes.

Two other SRs evaluated the effectiveness of applied behaviour analysis (ABA) for children with autism, but also combined studies with different comparators (including low dose ABA comparators) into their meta-analyses (Peters-Scheffer et al. 2011; Virués-Ortega, 2010). The SR by Virués-Ortega (2010) included 22 studies and the SR by Peters-Scheffer et al. (2011) included 11 studies – both shared some studies. By visually examining the direction and confidence intervals of the studies included in their forest plots, we can see that in both SRs, there were consistent significant effects across the majority of studies in favour of ABA for general IQ, receptive language, expressive language, and the adaptive behaviour domain of communication, but not for nonverbal IQ, or the adaptive domains of daily living skills, and socialisation.

Only one study included in this BEST summary specifically aimed to compare ABA with another type of treatment: Mohammadzaheri (2014) examined the effectiveness of pivotal response treatment (PRT) compared with structured ABA in 30 verbal children with autism. After three months of intervention, those who received PRT had significantly were observed to have better communication scores ( $p=0.01$ ).

**Authors conclusions**

Spreckely and Boyd (2009) concluded that there was inadequate evidence regarding the effectiveness of ABI for children with autism. Virués-Ortega (2010) concluded that long-term, comprehensive ABA interventions resulted in positive effects. The SR by Peters-Scheffer et al. (2011) similarly concluded that their analyses strongly support the effectiveness of EIBI. In contrast, Mohammadzaheri (2014) concluded that PRT was more effective than ABA at improving social communication skills.

**Reliability of conclusions/Strength of evidence**

The SRs by Spreckely and Boyd (2009), Virués-Ortega (2010), and Peters-Scheffer et al. (2011), all had a high risk of bias, so their results are unlikely to be reliable. Spreckley and Boyd's conclusions, however, appear appropriate. The RCT by Mohammadzaheri (2014) was well reported, with the exception that the method of randomisation was not presented. In addition, this study may be underpowered which may possibly exaggerate the magnitude of the effect.

**What do guidelines say?**

No relevant NICE guidelines were identified regarding behaviour analysis. However NICE (CG170) recommends the following for challenging behaviour in children with autism;

“If no coexisting mental health or behavioural problem, physical disorder or environmental problem has been identified as triggering or maintaining the behaviour that challenges, offer the child or young person a psychosocial intervention (informed by a functional assessment of behaviour) as a first-line treatment.

The functional assessment should identify:

- factors that appear to trigger the behaviour
- patterns of behaviour
- the needs that the child or young person is attempting to meet by performing the behaviour
- the consequences of the behaviour (that is, the reinforcement received as a result of the behaviour).

Psychosocial interventions for behaviour that challenges should include:

- clearly identified target behaviour
- a focus on outcomes that are linked to quality of life
- assessment and modification of environmental factors that may contribute to initiating or maintaining the behaviour
- a clearly defined intervention strategy that takes into account the developmental level and coexisting problems of the child or young person
- a specified timescale to meet intervention goals (to promote modification of intervention strategies that do not lead to change within a specified time)
- a systematic measure of the target behaviour taken before and after the intervention to ascertain whether the agreed outcomes are being met
- consistent application in all areas of the child or young person's environment (for example, at home and at school) agreement among parents, carers and professionals in all settings about how to implement the intervention.” (pp.21-22)

**Date question received:** 03/11/15  
**Date searches conducted:** 12/11/15  
**Date answer completed:** 07/12/15

## References

### *Systematic reviews*

1. Peters-Scheffer, N., Didden, R., Korzilius, H., & Sturmey, P. (2011). A meta-analytic study on the effectiveness of comprehensive ABA-based early intervention programs for children with autism spectrum disorders. *Research in Autism Spectrum Disorders*, 5(1), 60-69.
2. Spreckley, M., & Boyd, R. (2009). Efficacy of applied behavioral intervention in preschool children with autism for improving cognitive, language, and adaptive behavior: a systematic review and meta-analysis. *The Journal of pediatrics*, 154(3), 338-344.
3. Virués-Ortega, J. (2010). Applied behavior analytic intervention for autism in early childhood: Meta-analysis, meta-regression and dose–response meta-analysis of multiple outcomes. *Clinical psychology review*, 30(4), 387-399.

### *Randomised controlled trials*

4. Mohammadzaheri, F., Koegel, L. K., Rezaee, M., & Rafiee, S. M. (2014). A randomized clinical trial comparison between pivotal response treatment (PRT) and structured applied behavior analysis (ABA) intervention for children with autism. *Journal of autism and developmental disorders*, 44(11), 2769-2777.

### *Guidelines*

National Institute of Health and Care Excellence. (2013). *Autism in under 19s: support and management*. London: National Institute of Health and Care Excellence.  
<https://www.nice.org.uk/guidance/cg170/resources/autism-in-under-19s-support-and-management-35109745515205>

## Results

### Systematic reviews

Author (year)	Search date	Inclusion criteria	Number of included studies	Summary of results	Risk of bias
Peters-Scheffer et al. 2010	April 2009	<p><b>Participants:</b> Children aged 10 years or younger with a diagnosis of Autism Spectrum Disorder (ASD), Autistic Disorder, (AD) or Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS), according to DSM-III, DSM-III-R DSM-IV or ICD</p> <p><b>Intervention:</b> Early intensive behavioural intervention (EIBI)</p> <p><b>Comparator:</b> Less intensive EIBI, eclectic treatment, parent-directed ABA or treatment as usual.</p> <p><b>Outcome:</b> IQ, non-verbal IQ, expressive and receptive language and adaptive behaviour.</p> <p><b>Study design:</b> Meta-analysis</p>	11 studies (N=344)	By viewing data presented in forest plots, it can be seen that there were consistent significant effects across the majority of individual studies in favour of EIBI compared with controls for full-scale IQ, receptive language, expressive language, the adaptive behaviour domain of communication, but not for nonverbal IQ, or the adaptive domains of daily living skills, and socialisation. The results of the meta-analyses were not extracted due to methodological concerns.	High
Spreckley and Boyd (2009)	Nov 2007	<p><b>Participants:</b> Children between the age of 18 months and 6 years with a diagnosis of ASD or PDD according to DSM-IV.</p> <p><b>Intervention:</b> Interventions included those that focused on ABI approaches to behavioural management. These included direct behaviour management for the child, parent education and</p>	13 (including 6 RCTs or quasi-RCTs)	<p>The authors reported that four studies (2 RCTs and 2 quasi-RCTs) had adequate data for meta-analyses [actually it appears that two of these were the same study with different follow-up periods].</p> <p>By examining effect sizes (presented in</p>	High

		<p>training, and consultation with caregivers in the community. Interventions were delivered to the parents/caregivers and/or directly to the child, by special educators, teachers, speech pathologists, psychologists, or other allied health professional students.</p> <p><b>Comparator:</b> Any (Comparisons included eclectic treatment, or ABI interventions of less intensity).</p> <p><b>Outcome:</b> Outcomes included cognitive, language, or adaptive behaviour outcomes.</p> <p><b>Study design:</b> Systematic reviews, randomised controlled trials (RCT), quasi-randomised controlled trials, or controlled trials.</p>		<p>forest plots) of the one study (n=25) included in this review that compared ABI with eclectic treatment, no significant differences are evident between the groups for cognitive behaviour and receptive language, but there were significant differences in favour of ABI for expressive language (SMD 0.97 [95% CI 0.14 to 1.81]) and behaviour outcomes (SMD 1.16 [95% CI 0.30 to 2.02]). The results of the meta-analyses were not extracted due to methodological concerns.</p> <p>Results from the other 9 studies were not presented in the paper.</p>	
Virués-Ortega et al (2010)	April 2009	<p><b>Participants:</b> Children with autism and pervasive developmental disabilities not otherwise specified, with a formal diagnosis of autism according to the Autism Diagnostic Interview-Revised, Autism Diagnostic Observation Schedule, DSM or a combination of any of these methods.</p> <p><b>Intervention:</b> Long-term, comprehensive applied behaviour analytic (ABA) intervention (no specific behaviour or behaviour procedure could be contemplated as an inclusion criterion in the assumption that they were many throughout the treatment process). The duration was at least 10 weekly hours and no less than 45 weeks.</p> <p><b>Comparator:</b> No delivery of ABA intervention,</p>	22 (including 6 RCTs or quasi-RCTs)	<p>By viewing data presented in forest plots, it can be seen that there were consistent significant effects across the majority of individual studies in favour of ABA compared with control groups for general IQ, receptive language, expressive language, composite language and the adaptive behaviour domain of communication, but not for nonverbal IQ, or the adaptive domains of daily living skills, and socialisation. The results of the meta-analyses were not extracted due to methodological concerns.</p>	High
















		irrespective of the concurrent use of other treatments and the alternative intervention. <b>Outcome:</b> IQ, language skills and adaptive behaviour. <b>Study design:</b> All study types.			
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### *Randomised controlled trials*







<b>Author (year)</b>	<b>Inclusion criteria</b>	<b>Number of participants</b>	<b>Summary of results</b>	<b>Risk of bias</b>
Mohammadzaheri et al (2014)	<p><b>Participants:</b> Thirty children, 18 boys and 12 girls, ranging in age from 6 to 11 years diagnosed with autism according to the DSM-IV-TR.</p> <p><b>Intervention:</b> Structured Applied Behavioural Analysis (ABA) conducted twice weekly for 60 min per session over a 3 month period.</p> <p><b>Comparator:</b> Pivotal Response Treatment (PRT) again conducted twice weekly for 60 min per session over a 3 month period.</p> <p><b>Outcome:</b> Verbal communication measured as a Mean Length of Utterance (MLU) and as a general outcome using the Children's Communication Checklist (CCC)</p>	30 (15 in each group)	After 3 months, scores for general communication using the CCC were 120.3 (SD 6.99) in the ABA group and 133.70 (SD 5.73), in the PRT group ( $p=0.01$ ). In regard to one targeted behaviour (MLU), mean scores were also significantly better in the PRT group ( $p=0.01$ ): (3.20 (SD 0.78) vs 2.79 (0.5) in the ABA group).	Low based on criteria below – but small sample size

## Risk of bias


### Systematic reviews


Author (year)	RISK OF BIAS				
	Inclusion criteria	Searches	Review process	Quality assessment	Synthesis
Peters-Scheffer et al. (2010)					
Spreckley & Boyd (2009)					
Virués-Ortega et al (2010)					

### Randomised controlled trials

Study	RISK OF BIAS					
	Random allocation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Selective Reporting
Mohammadzaheri et al (2014)						

 Low risk

 High risk

 Unclear risk

## Search details



Source	Search Strategy	Number of hits	Relevant evidence identified
<b>Guidelines</b>			
NICE	Child Autism	23	
<b>Systematic Reviews</b>			
MEDLINE	1 exp Autistic Disorder/ 17365 2 "autis* spectrum disorder*".ab,ti. 11337 3 ASD.ab,ti. 11269 4 Autism.ab,ti. 25409 5 1 or 2 or 3 or 4 34518 6 exp Behavior Therapy/ 57737 7 "applied behavio* analysis".ab,ti. 353 8 "behavio* modification".ab,ti. 3185 9 6 or 7 or 8 59721 10 5 and 9 1215 11 - 30 <b>Systematic Review Filters applied</b> 922915 31 limit 30 to yr="2010 -Current" 440732 32 10 and 31 74	74	
EMBASE	1 "autis* spectrum disorder*".ab,ti. 14659 2 ASD.ab,ti. 16014 3 Autism.ab,ti. 32572	110	

	4	exp Behavior Therapy/	39383		
	5	"applied behavio* analysis".ab,ti.	365		
	6	"behavio* modification".ab,ti.	4203		
	7	4 or 5 or 6	42967		
	8	exp Autism/	43309		
	9	"AUTIS* disorder*".ab,ti.	1904		
	10	1 or 2 or 3 or 8 or 9	54697		
	11	7 and 10	1530		
	12 - 41	Systematic Review Flter applied	507959		
	42	limit 41 to yr="2010 -Current"	233786		
	43	11 and 42	110		
PsycINFO/CINAHL	1	"autis* spectrum disorder*".ab,ti.	12801	38	1
	2	ASD.ab,ti.	9016		
	3	Autism.ab,ti.	28906		
	4	exp Behavior Therapy/	10752		
	5	"applied behavio* analysis".ab,ti.	1253		
	6	"behavio* modification".ab,ti.	1793		
	7	4 or 5 or 6	13541		
	8	exp Autism/	21232		

	9 "AUTIS* disorder*".ab,ti.	1608		
	10 1 or 2 or 3 or 8 or 9	32321		
	11 7 and 10	877		
	12 (Cochrane\$ or review or overview or (review adj2 literature) or (synthes\$ adj3 (literature\$ or research or studies or data))).ti.	107551		
	13 (meta analysis or literature review or systematic review).md.	111733		
	14 (pooled analys\$ or ((data adj2 pool\$) and studies) or ((hand or manual\$ or database\$ or computer\$ or electronic\$) adj2 search\$) or ((electronic\$ or bibliographic\$) adj2 (database\$ or data base\$))).ab,ti.	9145		
	15 exp Meta Analysis/	3482		
	16 12 or 13 or 14 or 15	192933		
	17 (comment reply or editorial or letter or review book or review media).dt.	226220		
	18 (electronic collection or dissertation abstract or encyclopedia).pt.	300154		
	19 (rat or rats or mouse or mice or hamster or hamsters or animal or animals or dog or dogs or cat or cats or bovine or sheep).ab,sh,ti.	204935		
	20 17 or 18 or 19	691782		
	21 16 not 20	120877		
	22 limit 21 to yr="2010 -Current"	49540		
	23 11 and 22	38		
<b>Primary Studies</b>				
MEDLINE	1 exp Autistic Disorder/	17365	92	1

2	"autis* spectrum disorder*".ab,ti.	11337		
3	ASD.ab,ti.	11269		
4	Autism.ab,ti.	25409		
5	1 or 2 or 3 or 4	34518		
6	exp Behavior Therapy/	57737		
7	"applied behavio* analysis".ab,ti.	353		
8	"behavio* modification".ab,ti.	3185		
9	6 or 7 or 8	59721		
10	5 and 9	1215		
11	"randomized controlled trial".pt.	416797		
12	(random\$ or placebo\$ or single blind\$ or double blind\$ or triple blind\$).ti,ab.	898241		
13	(retraction of publication or retracted publication).pt.	8402		
14	11 or 12 or 13	994251		
15	(animals not humans).sh.	4055258		
16	((comment or editorial or meta-analysis or practice-guideline or review or letter or journal correspondence) not "randomized controlled trial").pt.	3609510		
17	(random sampl\$ or random digit\$ or random effect\$ or random survey or random regression).ti,ab. not "randomized controlled trial".pt.	56589		
18	14 not (15 or 16 or 17)	739308		
19	10 and 18	92		

EMBASE	1 "autis* spectrum disorder*".ab,ti.	14659	69	
	2 ASD.ab,ti.	16014		
	3 Autism.ab,ti.	32572		
	4 exp Behavior Therapy/	39383		
	5 "applied behavio* analysis".ab,ti.	365		
	6 "behavio* modification".ab,ti.	4203		
	7 4 or 5 or 6	42967		
	8 exp Autism/	43309		
	9 "AUTIS* disorder*".ab,ti.	1904		
	10 1 or 2 or 3 or 8 or 9	54697		
	11 7 and 10	1530		
	12 (random\$ or placebo\$ or single blind\$ or double blind\$ or triple blind\$).ti,ab.	1150124		
	13 RETRACTED ARTICLE/	7858		
	14 12 or 13	1157796		
	15 (animal\$ not human\$).sh,hw.	3968151		
	16 (book or conference paper or editorial or letter or review).pt. not exp randomized controlled trial/	4289846		
	17 (random sampl\$ or random digit\$ or random effect\$ or random survey or random regression).ti,ab. not exp randomized controlled trial/	67983		
	18 14 not (15 or 16 or 17)	890610		
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PsycINFO/CINAHL	1 "autis* spectrum disorder*".ab,ti.	12801	41	
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	11 7 and 10	877		
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	13 (animals not humans).sh.	3310		
	14 exp Clinical Trials/	9124		
	15 random*.mp.	131571		
	16 14 not 15	3921		
	17 12 not (13 or 16)	146975		
	18 11 and 17	41		

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