

## A review of evidence for interventions for children on the autism spectrum (Summary 2 of 2: Umbrella review)

### Background

There are many interventions available for children on the autism spectrum. It is important that decisions regarding the choice and use of interventions are based on the best available research evidence.

Autism CRC has completed a report, entitled ***Interventions for children on the autism spectrum: A synthesis of research evidence***. The report includes two reviews:

- narrative review, to provide an overview of interventions for children on the autism spectrum and their use in Australia.
- umbrella review, to understand and summarise the evidence base for interventions for children on the autism spectrum.

The review was commissioned by the National Disability Insurance Agency and completed by Autism CRC through the work of a team that included researchers with a diverse range of professional backgrounds.

This community summary provides a brief overview of the umbrella review, which looked at the evidence base for interventions for children on the autism spectrum. A separate summary provides a brief overview of the findings of the narrative review.

You can find the full report, and the summary of the narrative review, at

[autismcrc.com.au/interventions-evidence](https://autismcrc.com.au/interventions-evidence)

### What did the umbrella review examine?

The umbrella review summarised data from systematic reviews of intervention research for children on the autism spectrum, in particular those aged 0-12 years. The umbrella review focused on non-pharmacological interventions and was conducted to international best-practice standards.

To be included in the umbrella review, systematic reviews needed to include at least one study with a controlled group design, and to examine one of the following child and family outcomes:

1. Core autism characteristics
2. Related skills and development
3. Education and participation
4. Family wellbeing

The following categories of intervention were examined for their effect on these outcomes:

1. Behavioural interventions
2. Developmental interventions
3. Naturalistic developmental and behavioural interventions (NDBIs)
4. Sensory-based interventions
5. Technology-based interventions
6. Animal-assisted interventions
7. Cognitive behavioural therapy (CBT)

### Key terms

**Narrative review:** A critical review of information on a topic of interest, drawing on a variety of relevant sources.

**Umbrella review.** A scientific review that uses systematic techniques to provide a comprehensive review of all previously published systematic reviews (including meta-analyses) on a focused topic.

**Controlled group design:**

A type of study that includes both a group of participants receiving an intervention (intervention group), and a group of participants who did not receive the intervention (control group).

**Non-pharmacological interventions:** Interventions that do not involve the use of medications.

8. Treatment and Education of Autistic and related Communication-handicapped CHildren (TEACCH)
9. Other interventions, which did not fit within any other categories.

For further information about these categories please refer to the community summary entitled, ***Interventions for children on the autism spectrum, and their application in the Australian community (Summary 1 of 2: Narrative review)***.

### **How many studies and participants were included in the review?**

A total of 58 systematic reviews were included, which encompassed information from 1,787 unique studies. These reviews examined at least 111 intervention practices across the 9 categories of intervention. There were more than 41,000 individuals identified as study participants. It was not possible to calculate the number of unique participants due to overlapping studies included across the systematic reviews.

### **What was the quality of the included systematic reviews?**

The systematic reviews were of variable quality, and only 4 of the 58 systematic reviews met all indicators of high methodological quality.

### **What was the review able to answer?**

The review summarised the latest research evidence regarding which interventions are more likely to have a positive effect on which child and family outcomes. This information provides a critical evidencebase that can be used to inform decision making for families, clinicians, and policy-makers. This information is presented in Table 1.

### **What was the review unable to answer?**

While the review was able to report findings at a broad level (i.e., *which interventions have a positive effect on which outcomes*), there was insufficient research evidence to understand the

effect of interventions at the individual level (i.e., *which interventions have a positive effect on which outcomes, for which children*).

### **Did the amount of intervention influence the effects of intervention?**

There was no consistent evidence as to whether the amount of intervention children received influenced the effects of intervention.

### **Did the way in which interventions were delivered influence the effects of the intervention?**

There was insufficient evidence to determine whether particular delivery characteristics (e.g., individual or group delivery; clinic, home or school setting) may maximise the effects of intervention and, if so, for which children. Active caregiver involvement in intervention was reported to have a similar, and at times greater, intervention effect on child outcomes compared to interventions delivered by clinical practitioners or educators alone.

### **Were negative effects of interventions examined?**

Only 8 of the 58 systematic reviews included any information on potential harms or negative effects of interventions. Minimal negative effects of interventions were reported.

### **What are the implications of these findings for clinical practice?**

The findings are a summary of the best available evidence of the effects of a range of interventions for children on the autism spectrum. This information can help to inform clinical and policy decision making regarding the most appropriate clinical supports for children on the autism spectrum and their families. The information also serves an important role in supporting caregivers to make informed decisions regarding the interventions they access to support their child(ren)'s learning and participation in all aspects and activities of their lives.

### What are the implications of these findings for future research?

The review identifies clear gaps in knowledge that can guide future research investment. Future research priorities include an understanding of:

- How child characteristics (e.g., age, core autism characteristics, and communication skills) may influence the effects of interventions.
- How the way an intervention is delivered may influence the effects of interventions, and how this differs between children and families.
- The amount of intervention that may maximise the effects of interventions on outcomes, and how this differs between children and families.
- The costs and benefits of interventions including unintended consequences, negative impacts, and opportunity costs that can occur when time and money is spent on less effective interventions.
- How interventions may improve broader areas of child and family wellbeing, such as quality of life.

### Reading the results in Table 1 (page 4-10)

- Each cell represents evidence for the intervention category or practice (horizontal rows) on various child and family outcomes (vertical columns).
- + means that all available evidence indicated a positive effect of the intervention on a given child or family outcome.
- ? means that there was a mixture of positive and null effects reported for the intervention on a given child or family outcome.
- ○ means that all available evidence indicated a null effect of the intervention on a given child or family outcome.
- H / M / L indicates the methodological quality of the evidence that contributed to the overall intervention effect for a given child or family outcome.
- A blank cell means that there was no evidence available for the effect of a given intervention on a given child or family outcome.

### Find out more

Contact the project team on 07 3377 0600 or [info@autismcrc.com.au](mailto:info@autismcrc.com.au)

Download the full report and additional resources at [autismcrc.com.au/interventions-evidence](https://autismcrc.com.au/interventions-evidence)

#### Full reference of report:

Whitehouse, A., Varcin, K., Waddington, H., Sulek, R., Bent, C., Ashburner, J., Eapen, V., Goodall, E., Hudry, K., Roberts, J., Silove, N., Trembath, D. Interventions for children on the autism spectrum: A synthesis of research evidence. Autism CRC, Brisbane, 2020

Table 1. Summary of intervention effects and quality of evidence relating to child and family outcomes.

Interventions	No. of systematic reviews	Core autism characteristics				Related skills and development								Education and participation				Family wellbeing						
		Overall autistic characteristics	Social-communication	Restricted and repetitive interests and behaviours	Sensory behaviours	Communication	Expressive language	Receptive language	Cognition	Motor	Social-emotional/challenging behaviour	Play	Adaptive behaviour	General outcomes <sup>a</sup>	School/learning readiness	Academic skills	Quality of life	Community participation	Caregiver communication and interaction strategies	Caregiver social emotional wellbeing	Caregiver satisfaction	Caregiver financial wellbeing	Child satisfaction	
Systematic reviews of assorted behavioural practices*	3	+	+	+	+	+			+	+	+	+	+		+	+								
Discrete Trial Training	1		+			+			+		+	+	+		+	+								
Early intensive behavioural intervention	4	o	+			+	+	+	+	+	o		+	+	+	+				o				
Functional Communication training	2		+			+					+	+	+	?	+									
Language Training (production)	1					+																		
Language Training (production and understanding)	1													?										
Picture Exchange Communication System (PECS)	2		+											?										

+ Positive therapeutic effect

? Inconsistent therapeutic effect

o Null effect

Blank cell indicates no evidence available

\*Combines practices for each category not included in the intervention listing below.

L = Low quality

M = Moderate quality

H = High quality

	No. of systematic reviews	Core autism characteristics				Related skills and development								Education and participation				Family wellbeing					
		Overall autistic characteristics	Social-communication	Restricted and repetitive interests and behaviours	Sensory behaviours	Communication	Expressive language	Receptive language	Cognition	Motor	Social-emotional/challenging behaviour	Play	Adaptive behaviour	General outcomes <sup>a</sup>	School/ learning readiness	Academic skills	Quality of life	Community participation	Caregiver communication and interaction strategies	Caregiver social emotional wellbeing	Caregiver satisfaction	Caregiver financial wellbeing	Child satisfaction
<b>Interventions</b>																							
<b>Developmental</b>																							
Systematic reviews of assorted developmental interventions*	2		+			○																	
Developmental relationship-based treatment	1																						
DIR/Floortime	2		+			○				○													
Naturalistic teaching strategies	2		+			+			+	+	+	+		+	+								
			LL			LL			L	L	L	L		LL	L								
<b>Naturalistic developmental behavioural interventions</b>																							
Systematic reviews of assorted NDBIs*	2	○	+	○		+	+	+	+	○	+	○											
Early Start Denver Model	2	○	○	○		+			+			○	+							+	+	+	
Pivotal Response Treatment	3		?	+		○	+						+								?		
			L	L		L	L						L								L		

+

?

○

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<b>Interventions</b>																							
<b>Sensory-based interventions</b>																							
Systematic reviews of assorted sensory-based interventions*	3					○ M								○ LL									
Auditory integration Therapy	3					○ M								○ LL									
Ayers Sensory Integration (ASI)	4	? L	? LL		? LM	? LL		+ L	+ LM	+ L	○ L	? LL	? M		+ L		+ L						
Environmental enrichment	1						○ M	+ M															
Music therapy	4		+ M			+ M			+ L	+ L	+ L	? LL	? L	+ L		+ M			+ M				
Sensory diet	1												○ L										
<b>TEACCH</b>																							
Systematic review of TEACCH*	1		○ M																				
Structured teaching	1												? L										

+ Positive therapeutic effect

? Inconsistent therapeutic effect

○ Null effect

Blank cell indicates no evidence available

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		Overall autistic characteristics	Social-communication	Restricted and repetitive interests and behaviours	Sensory behaviours	Communication	Expressive language	Receptive language	Cognition	Motor	Social-emotional/challenging behaviour	Play	Adaptive behaviour	General outcomes <sup>a</sup>	School/learning readiness	Academic skills	Quality of life	Community participation	Caregiver communication and interaction strategies	Caregiver social emotional wellbeing	Caregiver satisfaction	Caregiver financial wellbeing	Child satisfaction
Systematic reviews of assorted technology-based interventions*	5		O M			+			+	+	O M	+	+	?	+	+					?		
Apps	2		O H			O H	O H	O H	+	+													
Augmentative and Alternative Communication (AAC)	3		? LM			+				+	+	+		?		+					?		
Computer-based instruction	2		+													?							
Facilitated communication	1													O L									
Robots	1		? L																				
Sign instruction	1													?									

+

L = Low quality

?

M = Moderate quality

O

H = High quality

Blank cell indicates no evidence available

\*Combines practices for each category not included in the intervention listing below.

	No. of systematic reviews	Core autism characteristics				Related skills and development								Education and participation				Family wellbeing					
		Overall autistic characteristics	Social-communication	Restricted and repetitive interests and behaviours	Sensory behaviours	Communication	Expressive language	Receptive language	Cognition	Motor	Social-emotional/ challenging behaviour	Play	Adaptive behaviour	General outcomes <sup>a</sup>	School/ learning readiness	Academic skills	Quality of life	Community participation	Caregiver communication and interaction strategies	Caregiver social emotional wellbeing	Caregiver satisfaction	Caregiver financial wellbeing	Child satisfaction
<b>Interventions</b>																							
<b>Animal-assisted interventions</b>																							
Systematic reviews of assorted animal-assisted interventions*	2												○ LL										
Canine-assisted intervention	2		? LM																				
Equine assisted therapy	3		○ L		+	○ L		○ L	? L	? L		○ L	? LM			? L	? L						
<b>Cognitive behaviour therapy</b>																							
Systematic reviews of cognitive behavioural therapy	4	? M	+		+	+		+		+		+		+	+								
Exposure package	1												? L										

+

L = Low quality

? Inconsistent therapeutic effect

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○ Null effect

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Interventions	No. of systematic reviews	Core autism characteristics				Related skills and development								Education and participation				Family wellbeing						
		Overall autistic characteristics	Social-communication	Restricted and repetitive interests and behaviours	Sensory behaviours	Communication	Expressive language	Receptive language	Cognition	Motor	Social-emotional/challenging behaviour	Play	Adaptive behaviour	General outcomes <sup>a</sup>	School/learning readiness	Academic skills	Quality of life	Community participation	Caregiver communication and interaction strategies	Caregiver social emotional wellbeing	Caregiver satisfaction	Caregiver financial wellbeing	Child satisfaction	
Imitation based training	1												?											
Multi-component package	1												?											
Reductive package	1												?											
Social behavioural learning strategy	1												o											
Social cognition intervention	1												o											
Social communication intervention	1												?											
Social skills training	1		+			+		+		+	+	+		+										
Social thinking intervention	1												o											
Theory of Mind training	1												?											

+

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o

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<sup>a</sup>Combines practices for each category not included in the intervention listing below.

### Combined practices for each category

#### Behavioural

Behavioral Parent Training; Behavioural early intervention programmes; Discrete Trial Training with Motor Vocal Imitation Assessment; Early Intensive Behavioral Treatment; Functional Behavior Skills Training Home-based behavioral treatment; Home-based Early Intensive Behavioral Intervention (EIBI); Intensive ABA; Intensive Early Intervention; Low Intensity Behavioral Treatment; Managing Repetitive Behaviors; Peer-Mediated Intervention; Picture Exchange Communication System (PECS); Rapid Motor Imitation Antecedent; Regular Intensive Learning for Young Children with Autism; Schedules, Tools, and Activities for Transitions (STAT); Social Skills Group; Stepping Stones Triple P Positive Parenting Program; Strategies for Teaching Based on Autism Research (STAR).

#### Developmental

Child Talk; Developmental Individual-Difference Relationship-Based (DIR)/Floortime; Hanen More Than Words; Joint Attention Mediated Learning (JAML); Milton and Ethel Harris Research Initiative Treatment (MEHRIT)-DIR based; Parent-Mediated Communication Focused Treatment; Parent-mediated intervention for autism spectrum disorder in South Asia (PASS); Pediatric Autism and Communication Therapy (PACT); Play and Language for Autistic Youngsters (PLAY) project - DIR based; Scottish Early Intervention Program; Social Communication Intervention for Children with Autism and Pervasive Developmental Disorder; Social communication, emotion regulation, transactional support (SCERTS); Video-feedback Intervention to Promote Positive Parenting adapted to autism (VIPP-AUTI).

#### Naturalistic developmental behavioural interventions

Advancing Social-Communication and Play (ASAP); Caregiver-based intervention program in community day-care centers; Denver Model; Early Social Interaction Project (ESI); Early Social Interaction Project (SCERTS); Early Start Denver Model (ESDM); Focus parent training program; Home-based Building Blocks Program; ImPACT Online; Interpersonal Synchrony; Joint Attention, Symbolic Play, Engagement, and Regulation (JASPER); Joint Engagement Intervention with Creative Movement Therapy; Joint Engagement Intervention; Learning Experiences Alternative Program (LEAP); Parent-Early Start Denver Model (P-ESDM); Pivotal Response Treatment (PRT); Reciprocal Imitation Training (RIT); Social ABCs.

#### Sensory-based

Alternative seating; Blanket or “body sock”; Brushing with a bristle or a feather; Chewing on a rubber tube; Developmental Speech and Language Training through Music; Family-Centered Music Therapy; Joint compression or stretching; Jumping or bouncing; Music Therapy; Playing with a water and sand sensory table; Playing with specially textured toys; Qigong (QST) Massage Treatment; Rhythm Intervention Sensorimotor Enrichment; Sensory Enrichment; Swinging or rocking stimulation; Thai Traditional Massage; Tomatis Sound Therapy; Weighted vests.

#### Technology-based

ABRACADABRA; Apps; Computer-based interventions; FaceSay; Gaming Open Library for Intervention in Autism at Home (GOLIAH); Gaze-contingent attention training; Robot-based interventions; Serious games; Social Skills Training using a robotic behavioral intervention system; The Transporters animated series; Therapy Outcomes By You (TOBY) App; Transporters DVD; Transporters Program for Children with Autism; Videoconferencing; Virtual environment with playable games; Web-based cognitive behavioural therapy (CBT) intervention.

#### Animal-assisted

Not specified

#### TEACCH

Not specified

#### Cognitive behaviour therapy

Building Confidence Family Cognitive behaviour therapy (FCBT); Cool Kids; Coping Cat CBT program; Facing your fears; Group Cognitive Behaviour Therapy (CBT); Social Skills Training for Children and Adolescents with Asperger Syndrome and Social-Communications Problems; Thinking about you, thinking about me.