Literature Review

Parent Reports of Treatments and Interventions Used With Children With Autism Spectrum Disorders (ASD): A Review of the Literature

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With the increasing number of treatment and intervention options for parents of children with autism spectrum disorders (ASD) in recent years, the number and types of interventions that parents are choosing to use has become of interest. In the present paper, the authors review 41 articles (describing 42 studies) presenting quantitative data on intervention choices of parents of children with ASD. Speech therapy was the most commonly reported intervention for both current and lifetime use. Across the studies, parents were reported to be using a variety of interventions, from those with strong empirical support, such as applied behaviour analysis (ABA), to others that lacked such support, such as dietary interventions. Some differences in the data presented across studies may be attributed to the range of different methodologies used to collect the data. Recommendations for future research, including those related to collecting treatment usage data more consistently, are discussed.

Keywords: ASD, autism, interventions, treatments, parent report, review

Autism spectrum disorders (ASD) are a group of lifelong developmental disorders (e.g., autistic disorder, Asperger's disorder) characterised by impaired communication and social interaction skills and a lack of flexibility in interests and behaviours (American Psychiatric Association, 2000). Recently, the American Psychiatric Association revised the diagnostic criteria for ASD, eliminating the individual disorders and replacing them with one diagnosis: autism spectrum disorder (American Psychiatric Association, 2013). This change occurred after the studies reviewed in the present paper were conducted, and therefore the original description of the group of disorders making up ASD has been used in the present paper. The awareness of ASD has increased in recent years and the incidence of ASD has also appeared to increase (Amaral, 2011; Matson & Kozlowski, 2011; Nassar et al., 2009). This apparent increase in incidence has been accompanied by an increasing number of treatment and intervention options for children with ASD, including many unsupported and controversial interventions (Metz, Mulick, & Butter, 2005; National Autism Center, 2009; Odom, Boyd, Hall, & Hume, 2010).

The interventions available include those based on therapy and educational techniques, such as behavioural programs, speech therapy, and early intervention programs;

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conventional medical interventions, such as psychiatric treatment and medications; and complementary and alternative medicine (CAM). CAM is defined as “a group of diverse medical and health care systems, practices, and products that are not generally considered part of conventional medicine” (Barnes, Bloom, & Nahin, 2008, p. 21).

In recent years, resources have been invested in assisting parents of children with ASD to access interventions for their children. In Australia, for example, the federal government funds the *Helping Children with Autism* (HCWA) package. This package includes funding for approved early intervention services for children less than 7 years of age with an ASD diagnosis, the provision of autism-specific playgroups and autism-specific learning and care centres, *Early Days* family workshops, and an ASD website that includes information for parents about available interventions (Australian Government Department of Families, Housing, Community Services and Indigenous Affairs, 2012). In other countries, governments have invested resources into early intervention, and there has also been discussion regarding the funding of ASD interventions more broadly. For example, in the United States there has been controversy regarding whether interventions for ASD, such as applied behaviour analysis (ABA), should be covered by health insurance. This has resulted in both legal action and in state governments mandating the type of coverage that must be provided by insurance companies to those with ASD (Harvey, Harvey, Kenkel, & Russo, 2010; Stuart, 2010).

Given the number of different treatments and interventions available to parents for the treatment of ASD, and the investment by individuals, organisations, and governments that enable children with ASD to access interventions, there has been an increasing amount of research examining the interventions used by parents over the past 15 years. To date, there have been no attempts to review this research or synthesise the findings to determine the degree of consistency, or inconsistency, of reports of the use of interventions by parents of children with ASD. Such information can provide an important baseline for examination of trends in intervention use as our research base develops. Given the current focus, both in Australia and internationally, on the resources to assist children with ASD access interventions, this baseline data could be used in the future to assess whether patterns of intervention use have been influenced by such investments. In the present study, the authors aimed to review the literature on parental reports of the number and/or type of treatments and interventions used with their children with ASD, and specifically examined (a) the methods used to collect the empirical data, and (b) the number and types of treatments/interventions used by parents of children with ASD.

Method

Inclusion and Exclusion Criteria

Studies were included in this review if they included data that were collected from parents of children with an ASD about the number and/or types of treatments/interventions used, and if the results included at least some empirical data about treatment/intervention use. There were no restrictions placed on the age of the children for which the data were collected or on the year of publication of the study. Studies were excluded if (a) data for parents of children with an ASD were not reported separately from data for parents of children with another disability, (b) the data only related to one specific problem associated with ASD (e.g., sleep problems), or (c) the abstract was not available in English.

Search Procedure

The CINAHL®, ERIC, PsycINFO®, Web of Science™, PubMed®, and ScienceDirect® databases were searched using a combination of the descriptors *autis**, *ASD*, *treatment*, *intervention*, *therapy*, *parent*, *famil**, *report*, *survey* and *questionnaire*. No time or publication restrictions were used. The initial search resulted in 844 papers, and the abstracts of these papers were examined independently by the first and third authors using the inclusion and exclusion criteria above. One paper was excluded because the abstract was not available in English. Ninety-eight percent agreement was reached on the papers shortlisted for inclusion in the review, and disagreements were resolved by consensus after looking at the full papers. Ancestral searches were conducted of the shortlisted papers for relevant references, and a further 17 papers were shortlisted for inclusion in the review.

The first and third authors each examined the full papers of the 63 shortlisted articles to confirm that they met the inclusion criteria and reached 90% agreement on the papers for inclusion. All disagreements were resolved by consensus and 41 articles (describing 42 studies) were included in the final analysis.

Data Extraction and Coding Procedures

Each study was coded for (a) whether collection of data about treatment use was a main aim of the study, (b) the sampling strategy used, (c) the number of responses received, (d) the response rate, (e) the geographic location of the participants, (f) the parents' education level, (g) the age of the children, (h) the diagnosis of the children, (i) the source(s) reporting the ASD diagnosis, (j) the instrument design, (k) the interventions reported to be used, (l) the interventions asked about but not used, and (m) the interventions asked about where data on usage was not reported. Once the interventions reported in each study were coded, the most frequently reported interventions (excluding individual prescription medications) were identified. For these interventions, each study was coded for (n) the current, past, and/or lifetime rates of use.

The most frequently reported interventions were defined as those reported to be used in nine or more studies. When extracting data about usage, 'current use' was defined as use within the past year (at the time of data collection) and 'past use' was defined as use prior to this. 'Lifetime use' was defined as use at any point during the individual's lifespan (currently or in the past). Data were extracted by the first author and interrater reliability checks were conducted by the second author on 15 (35.7%) of the studies. The overall interrater reliability for the data extraction was 98.5%, and the occurrence reliability was 90.0%. All disagreements were resolved by consensus.

Results

Design of Studies

Study aims. The studies included in this review varied greatly in study aims. In 12 of the 42 studies, collecting data on treatment use was not a main aim of the investigation, but the data were collected either as part of a follow-up study of those using an intervention or diagnostic service (Akshoomoff, Stahmer, Corsello, & Mahrer, 2010; Boyd & Corley, 2001; Cassidy, McConkey, Truesdale-Kennedy, & Slevin, 2008), as part of a study of parental beliefs about autism (Harrington, Patrick, Edwards, & Brand, 2006), as part of a study with an aim of collecting data on general service or resource use (Gurney, McPheeters, & Davis, 2006; Kohler, 1999; Levine, Marder, & Wagner, 2004; McLennan, Huculak, & Sheehan, 2008; Robinson, 2008; Thomas, Ellis, McLaurin, Daniels, & Morrissey, 2007;

Thomas, Morrissey, & McLaurin, 2007), or assessing parental satisfaction with services (Renty & Roeyers, 2006; Robinson, 2008). For the remaining studies, at least one of the study aims was to collect data about treatment or intervention use.

Design features. The design features of each of the studies are shown in Table 1. The most common sampling strategy used was the recruitment of parents by widely circulating notices where the number of potential participants was unknown. Other frequently used strategies included recruiting participants that were part of a larger study and recruiting participants through medical and diagnostic services. Narrow parameters were employed to select participants in a limited number of studies. In Smith and Antolovich (2000; Studies 1 and 2) participants were all parents of children who were participating in ABA treatment (the UCLA Treatment Model), and those participating in Carter et al. (2011) were participants in a randomised control trial of autism-specific early intervention service delivery types. Three studies involved a follow-up of those who had used an intervention in the past: an inclusive early intervention program (Akshoomoff et al., 2010), early intensive behavioural intervention in a community setting (Boyd & Corley, 2001), and the *More Than Words®* parent training program (McConachie & Robinson, 2006). The most common forms of data collection were paper or electronic surveys or questionnaires, or a combination of these. Personal and telephone interviews, either alone or in combination, were also used to collect data.

The studies varied in the way that participants were asked to provide information about interventions used. In 23 studies interventions were listed for the parents to select, and in 13 of these parents were also invited to add any interventions not on the list. In some studies parents were required to list interventions used without prompts, and in others parents were asked to list interventions, but they were offered prompts/examples of interventions or also asked about the use of specific interventions. A small number of studies used a combination of these methods. This aspect of the instrument design was unreported in six cases.

The studies also varied in how the child's ASD diagnosis was confirmed. In 15 studies it was required that the participants' children had a clinical diagnosis of ASD. However, the most common source of ASD diagnosis was parent report, either alone or in combination with other indicators (see Table 1).

Sample Characteristics

The sample characteristics for each study are provided in Table 2. The number of participants with children with ASD ranged from 5 to 1538, with a mean of 240.8 participants ($Mdn = 104$, $SD = 306.5$), although the number of participants with ASD was unreported in one study. There was great variance in the ages of the children examined across the studies, ranging from 1 to 82 years. There was also variance across the studies in the way children's ages were reported, including listing the ages or age ranges of participants, providing data about the number of children within certain age ranges, or simply providing the mean age. The parents' education level was reported in 24 of the 42 studies, and generally, where reported, the majority of participants had an education level beyond high school. Details of the education levels of participants for specific studies are shown in Table 2.

The majority of studies had participants either entirely ($n = 26$) or mainly ($n = 4$) from North America. In two studies the sample was entirely from France, and samples entirely from Australia, New Zealand, England, Belgium, Turkey, and Hong Kong were each represented in a single study. In addition, a small percentage of the study participants

TABLE 1
Summary of Study Design Features

Study	Sampling strategy								Form of data collection				Instrument design				Sources of ASD diagnosis						
	Wide distribution of recruitment notices	Participants of a larger study	Via medical/diagnostic services	Follow-up from past intervention use	Via autism societies/associations	Via current service providers	Via registrations at an autism conference	Via database of an autism research centre	Paper survey/questionnaire	Electronic survey/questionnaire	Telephone interviews	Personal interviews	Treatments chosen from a list	Treatments chosen from a list and participants invited to add others	Treatments listed without prompts	Parents list treatments, offered prompts/examples or asked about specific treatments	Parent report	Clinical diagnosis	Receipt of special education services	Membership of autism society	Agency/professional referral	Parent selection of ASD symptoms	Registration with autism resource centre
Total number of studies	14	8	8	4	3	3	1	1	22	10	10	7	25	13	9	5	22	15	4	3	2	1	1
Akshoomoff et al. (2010)				√					√									√					
Al Anbar et al. (2010)	√								√	√			√	√			√						
Aman et al. (1995)					√				√						√		√			√			
Aman et al. (2003)					√				√						√		√			√			
Bowker et al. (2011)	√									√					√		√						
Boyd & Corley (2001)				√					√						√			√					
Carter et al. (2011)		√									√	√			√	√		√					
Cassidy et al. (2008)			√									√						√					
Christon et al. (2010)	√									√			√				√						
Dardennes et al. (2011)	√								√	√			√	√			√					√	
Erba (2000)			√						√				√	√				√					
Goin-Kochel et al. (2007)	√									√			√			√	√						
Goin-Kochel et al. (2009)	√									√			√			√	√						
Green et al. (2006)	√									√			√	√			√						
Gurney et al. (2006)		√									√		√				√						

TABLE 1
Continued

Study	Sampling strategy								Form of data collection				Instrument design				Sources of ASD diagnosis						
	Wide distribution of recruitment notices	Participants of a larger study	Via medical/diagnostic services	Follow-up from past intervention use	Via autism societies/associations	Via current service providers	Via registrations at an autism conference	Via database of an autism research centre	Paper survey/questionnaire	Electronic survey/questionnaire	Telephone interviews	Personal interviews	Treatments chosen from a list	Treatments chosen from a list and participants invited to add others	Treatments listed without prompts	Parents list treatments, offered prompts/examples or asked about specific treatments	Parent report	Clinical diagnosis	Receipt of special education services	Membership of autism society	Agency/professional referral	Parent selection of ASD symptoms	Registration with autism resource centre
Total number of studies	14	8	8	4	3	3	1	1	22	10	10	7	25	13	9	5	22	15	4	3	2	1	1
Hanson et al. (2007)			√						√				√					√					
Harrington, Patrick, et al. (2006)							√		√				√	√			√						
Harrington, Rosen, et al. (2006)			√						√				√	√				√					
Hume et al. (2005)								√	√				√	√			√						√
King et al. (2000)		√							√				√	√			√		√				
Kohler (1999)						√					√				√						√		
Langworthy-Lam et al. (2002)					√				√						√		√			√			
Le Grice & McMenamin (2001)	√											√					√						
Levine et al. (2004)		√									√		√	√					√				
Levy et al. (2003)			√										√[a]			√		√					
Mansell & Morris (2004)			√						√									√					
Martin et al. (1999)		√							√								√						
McConachie & Robinson (2006)				√					√				√								√		
McLennan et al. (2008)				√					√						√		√						
Reffert (2008)	√												√				√						

TABLE 1
Continued

Study	Sampling strategy								Form of data collection				Instrument design				Sources of ASD diagnosis						
	Wide distribution of recruitment notices	Participants of a larger study	Via medical/diagnostic services	Follow-up from past intervention use	Via autism societies/associations	Via current service providers	Via registrations at an autism conference	Via database of an autism research centre	Paper survey/questionnaire	Electronic survey/questionnaire	Telephone interviews	Personal interviews	Treatments chosen from a list	Treatments chosen from a list and participants invited to add others	Treatments listed without prompts	Parents list treatments, offered prompts/examples or asked about specific treatments	Parent report	Clinical diagnosis	Receipt of special education services	Membership of autism society	Agency/professional referral	Parent selection of ASD symptoms	Registration with autism resource centre
Total number of studies	14	8	8	4	3	3	1	1	22	10	10	7	25	13	9	5	22	15	4	3	2	1	1
Regehr & Feldman (2009)		✓								✓	✓		✓	✓				✓					
Renty & Roeyers (2006)	✓								✓									✓					
Robinson (2008)	✓									✓			✓				✓						
Şenel (2010)	✓									✓			✓	✓			✓						
Shattuck et al. (2011)		✓									✓		✓						✓				
Study 1 in Smith & Antolovich (2000)						✓			✓				✓	✓				✓					
Study 2 in Smith & Antolovich (2000)						✓					✓		✓					✓					
Thomas, Ellis, et al. (2007)	✓								✓		✓	✓	✓				✓						
Thomas, Morrissey, & McLaurin (2007)	✓								✓		✓		✓				✓						
Witwer & Lecavalier (2005)		✓							✓							✓			✓				
Wong (2009)			✓									✓	✓	✓				✓					
Wong & Smith (2006)			✓								✓	✓			✓			✓					

Note. Study design was only recorded when it was reported in a study.
[a] Data were collected in personal interviews by hospital staff and later extracted from medical files by the researchers.

TABLE 2
Study Participant Characteristics

Study	Number of responses: Used in analysis (received)	Response rate (%)	Geographic location of participants	Parents' education level	Age of children: Range (*M*)	Diagnoses of children (%)					
						Autism/ ASD	Autistic disorder	PDD-NOS[a]	Asperger's disorder	Other	Not reported
Akshoomoff et al. (2010)	29 (29)	51	California, USA	Not reported	4–12 years (7.2 years)		41.4	20.7		6.9	31
Al Anbar et al. (2010); and	89 (89)	Unknown	France	Mean 17.4 years of education	(13.11 years)	58.4		21.3	15.7	4.6	
Dardennes et al. (2011)	78 (89)	Unknown	France	Mean 16.4 years education (range: 12–32 years)	2.3–44.5 years (13.5 years)	59		21.8	15.4	3.8	
Aman et al. (1995)	838 (859)	53	North Carolina, USA	High school degree or less: 30.9% (fathers), 30.2% (mothers); technical school or some college: 25.3% (fathers), 29.8% (mothers); college degree: 43.8% (fathers), 40% (mothers)	1–82 years (15.96 years)	100					
Aman et al. (2003)	417 (607)	55.8	Ohio, USA	Not reported	2–46 years (13.24)	100					
Bowker et al. (2011)	970 (1034)	Unknown	USA (77.9%); Canada (14.2%); Europe, Australia and others (6.5%)	Not reported	Under 5 years–over 18 years		48.9	39	12.2		
Boyd & Corley (2001)	16 (16)	73	California, USA	Not reported	3 years, 4 months–7 years, 1 month[a]		86.4[b]	13.6[b]			√[c]

TABLE 2
Continued

Study	Number of responses: Used in analysis (received)	Response rate (%)	Geographic location of participants	Parents' education level	Age of children: Range (*M*)	Diagnoses of children (%) Autism/ ASD	Autistic disorder	PDD-NOS[a]	Asperger's disorder	Other	Not reported
Carter et al. (2011)	84 (84)	88.4[d]	Sydney, Australia	Mother's education: 13.7% high school, 38.4% college/post high school, 31.5% bachelor degree, 16.4% postgraduate degree	2.2–5.0 years (3.5 years)	100					
Cassidy et al. (2008)	104 (104)	Unknown	Northern Ireland	54% had O Levels/GCSEs, 33% had attended higher education, and 13% left school aged 15	2–4 years	100					
Christon et al. (2010)	248 (280)	Unknown	USA and possibly other countries with internet access	A mean of 15.6 years of education (*SD* = 3.4)	21 months–21 years (8.6 years)	66		19	15		
Erba (2000)	271 (277)	44	Kansas, North Carolina, and California, USA	30.3% high school diploma or less, 15.9% associate of arts degree, 38% bachelor degree, 15.9% postgraduate degree	4–8 years		79.3	20.7			
Goin-Kochel et al. (2007); and Goin-Kochel et al. (2009)	479 (531)	Unknown	USA (77.5%); Canada, England, Ireland, Australia or New Zealand (16.5%); other countries (6.1%)	A mean of 15.2 years of education (range: 9–26, *SD* = 2.4)	1.7–21.9 years (8.3 years)	59.7		16.7	23.6		

TABLE 2
Continued

						Diagnoses of children (%)					
Study	Number of responses: Used in analysis (received)	Response rate (%)	Geographic location of participants	Parents' education level	Age of children: Range (*M*)	Autism/ ASD	Autistic disorder	PDD-NOS[a]	Asperger's disorder	Other	Not reported
Green et al. (2006)	552 (764)	Unknown	USA (80%) Canada (7%), Australia (5%), New Zealand (2%), 12 other countries (6%)	88% beyond high school, 10% high school diploma or equivalent, and 2% less than high school	Under 5 years–over 15 years				17	√[e]	
Gurney et al. (2006)	483 (85,272)	55.3 (weighted response rate)	USA	Greatest level of educational attainment in household: 2.2% less than high school; 23.2% high school; 72.3% greater than high school (2.3% unreported). (Based on sampling fractions and weighted extrapolation from parent reports of 483 children with autism and 84,789 children without autism.)	3–17 years	100					
Hanson et al. (2007)	112 (112)	35	Boston, USA	Mother's education: 3% less than high school, 35% high school graduates, 34% college graduates, 29% graduate or professional school	Under 5 years–over 10 years	49		48	9		
Harrington, Patrick, et al. (2006)	62 (62)	87	New York, New Jersey, Pennsylvania, and Connecticut, USA	Not reported	2 years–28 years (median 8 years)	100					

TABLE 2

Continued

						Diagnoses of children (%)					
Study	Number of responses: Used in analysis (received)	Response rate (%)	Geographic location of participants	Parents' education level	Age of children: Range (*M*)	Autism/ ASD	Autistic disorder	PDD-NOS[a]	Asperger's disorder	Other	Not reported
Harrington, Rosen, et al. (2006)	74 (77)	51	New Jersey and New York, USA	10.4% high school, 18.2% 2-year college, 31.2% 4-year college, and 40.2% graduate school	2 years–19 years (7.2 years)	50		39.2	10.8		
Hume et al. (2005)	195 (198)	33.7	Indiana, USA	Not reported	2–8 years (5.44 years)	72		16	9	3	
King et al. (2000)	25 (494)	Not reported for ASD group[f]	Ontario, Canada	Not reported for ASD group	(7.4 years)	√		√			
Kohler (1999)	25 (25)	83	Allegheny County, Pittsburgh, and Pennsylvania, USA	Not reported	3–9 years	68		32			
Langworthy-Lam et al. (2002)	1538 (1611)	48	North Carolina, USA	Fathers: 23.1% high school degree or less, 22.9% technical school or some college, 25.7% college degree, 23.1% graduate or professional degree, 5.2% not reported. Mothers: 21.1% high school degree or less, 27.5% technical school or some college, 32.8% college degree, 16.8% graduate or professional degree, 1.8% not reported	3 years–56 years (15.62 years)	100					

TABLE 2
Continued

						Diagnoses of children (%)					
Study	Number of responses: Used in analysis (received)	Response rate (%)	Geographic location of participants	Parents' education level	Age of children: Range (*M*)	Autism/ ASD	Autistic disorder	PDD-NOS[a]	Asperger's disorder	Other	Not reported
Le Grice & McMe-namin (2001)	5 (5)	Unknown	Canterbury, New Zealand	Not reported	3–9 years	100					
Levine et al. (2004)	Not reported for ASD group[g]	Not re-ported for ASD group[h]	USA	11.2% head of household not graduated from high school	14 years–18 years (15.9 years)	100					
Levy et al. (2003)	284 (284)	100	Philadelphia, USA	Not reported	(55.5 months)	100					
Mansell & Morris (2004)	55 (55)	55	A home county bordering London, UK	Not reported	2 years–over 10 years of age at diagnosis, current age not reported.	41.8			30.9	√[i]	1.8
Martin et al. (1999)	109 (109)	71.8	26 states across the USA and 1 province in Canada	65% college education or higher	Less than 9 years–older than 16 years (13.9 years)	29.4		12.9	86.2	√[j]	
McConachie & Robinson (2006)	56 (56)	52.8	North-east England	Not reported	(36 months)						√

TABLE 2
Continued

Study	Number of responses: Used in analysis (received)	Response rate (%)	Geographic location of participants	Parents' education level	Age of children: Range (*M*)	Diagnoses of children (%)					
						Autism/ ASD	Autistic disorder	PDD-NOS[a]	Asperger's disorder	Other	Not reported
McLennan et al. (2008)	64 (235)	Not reported for ASD group[k]	Northern half of Alberta, city of Hamilton, southern Ontario, and rural communities of Haldimand–Norfolk, in Canada	Not reported	25 months–more than 61 months (4.9 years)		48	45	5	2[l]	
Reffert (2008)	35 (71)	Unknown	Michigan and Ohio, USA	20.0% a high school diploma, 20% an associate/trade degree, 8.6% a bachelor degree, 11.4% a bachelor plus, 20% a graduate degree, and 20% a graduate plus	3 years–6 years	100					
Regehr & Feldman (2009)	23 (23)	100	USA and Canada	1 mother and 7 fathers did not have at least a college degree or were currently enrolled in a university program; 3 mothers and 5 fathers had postgraduate or medical degrees	(90 months)	100					
Renty & Roeyers (2006)	244 (244)	Unknown	Flanders, Belgium	Not reported	2.69 years–17.81 years (8.87 years)	100					

TABLE 2
Continued

						Diagnoses of children (%)					
Study	Number of responses: Used in analysis (received)	Response rate (%)	Geographic location of participants	Parents' education level	Age of children: Range (*M*)	Autism/ ASD	Autistic disorder	PDD-NOS[a]	Asperger's disorder	Other	Not reported
Robinson (2008)	52 (53)	3.7	USA (mostly Long Island)	1.9% less than high school, 7.7% high school, 26.9% some college (< 4 years), 28.8% college degree, 23.1% master's degree, 11.5% higher degree	26 months–20 years (10.74 years)	53.8			36.5	9.6	
Şenel (2010)	38 (44)	< 11	Turkey	11% less than high school, 18% high school, 55% undergraduate level, 16% graduate level	0–18 years		61	26	8	5[m]	
Shattuck et al. (2011)	410 (680)	83.6 initial response rate from wave 1; and 73.9 retention rate from wave 1 to wave 4	USA	Not reported	19–23 years	100					
Study 1 in Smith & Antolovich (2000)	121 (121)	42	MYAP sites across the USA	Not reported		100					

TABLE 2
Continued

						Diagnoses of children (%)					
Study	Number of responses: Used in analysis (received)	Response rate (%)	Geographic location of participants	Parents' education level	Age of children: Range (*M*)	Autism/ ASD	Autistic disorder	PDD-NOS[a]	Asperger's disorder	Other	Not reported
Study 2 in Smith & Antolovich (2000)	24 (24)	96	Northwest USA	Not reported	(54.09 months)	100					
Thomas, Ellis, et al. (2007); and	383 (383)	91[n]	North Carolina, USA	1% less than high school, 37% high school degree, 35% college degree, 27% graduate degree	Under 4 years–11 years (7 years)	71		8	21		
Thomas, Morrissey, & McLaurin (2007)	301 (301)	95[n]	North Carolina, USA	1% less than high school, 40% high school degree, 34% college degree, 25% graduate degree	Under 4 years–8 years (6 years)	77		9	14		
Witwer & Lecavalier (2005)	353 (353)	57.8	Ohio, USA	52.6% graduated from a college or university	3 years–21 years (9.5 years)	100					
Wong (2009)	98 (430)	Unknown for ASD group	Hong Kong	Mothers: 1% no schooling/kindergarten, 13.3% primary, 63.3% secondary, 22.4% tertiary; and fathers: 11.2% primary, 56.1% secondary, 32.7% tertiary	0–18 years	100					

TABLE 2
Continued

						Diagnoses of children (%)					
Study	Number of responses: Used in analysis (received)	Response rate (%)	Geographic location of participants	Parents' education level	Age of children: Range (*M*)	Autism/ ASD	Autistic disorder	PDD-NOS[a]	Asperger's disorder	Other	Not reported
Wong & Smith (2006)	50 (100*) *50 with ASD, and 50 without	92.6 (91 for ASD group; 94 for control group)	Ontario, Canada	**For ASD group:** Mothers: 13% less than high school, 24% high school, 33% college/trade school, 23% university, and 8% postgraduate. Fathers: 9% less than high school, 31% high school, 29% college/trade school, 20% university, and 11% postgraduate. **For control group:** Mothers: 14% less than high school, 22% high school, 40% college/trade school, 22% university, and 2% postgraduate. Fathers: 7% less than high school, 28% high school, 41% college/trade school, 11% university, and 13% postgraduate	9 years (2–17 years)	100					

Note. Samples overlapped in the following studies: Al Anbar et al. (2010) and Dardennes et al. (2011); Goin-Kochel et al. (2007) and Goin-Kochel et al. (2009); Thomas, Ellis, et al. (2007), and Thomas, Morrissey, and McLaurin (2007).

[a] Pervasive developmental disorder not otherwise specified. [b] In target population, unknown for participant group. [c] For participant group. [d] Of those expressing interest in the control trial. [e] 61% with mild/high-functioning autism, and 22% with severe autism. [f] 77% of those expressing interest overall. [g] 9230 overall. [h] 81.9% overall. [i] 20% autistic spectrum disorder not otherwise specified (ASD-NOS); 1.8% mild autism; 1.8% mild Asperger's disorder; 1.8% mild ASD-NOS. [j] 29.6% Asperger's disorder and autistic disorder. [k] 20% overall. [l] With Rett's disorder. [m] With developmental delays and attention-deficit/hyperactivity disorder (ADHD). [n] Of those who initially expressed interest in participating.

were identified as being from Australia in three studies, from New Zealand in two studies, and from England, Ireland, and Europe each in a single study.

The diagnoses of the children were reported as ASD or autism for the entire sample in 19 of the studies. In one study, the diagnosis of the children was not reported for the entire sample; in an additional three studies, the diagnosis of the children was not reported for some of the participants. In the remaining studies, children were grouped into two or more categories of diagnoses, including autism/ASD, autistic disorder, pervasive developmental disorder not otherwise specified (PDD-NOS), and Asperger's disorder.

Response Rates

As noted above, the number of participants varied considerably across the studies (and was unreported in one study). The response rates also varied across studies. They could not be calculated in 11 of the studies, were not available for the participants with children with ASD in four studies, and ranged from 3.7% to 100% in the remaining studies.

Types of Interventions Used

The interventions reported in each study varied from broad categories or groups of interventions (e.g., physiological, relationship-based treatments, and medications; Bowker, D'Angelo, Hicks, & Wells, 2011; Green et al., 2006), through to specific individual interventions (e.g., casein-free diet, Buspar®, and discrete trial training; Green et al., 2006; Smith & Antolovich, 2000). Where different names were used in different studies for interventions that were clearly describing the same intervention (e.g., speech therapy, speech-language therapy, and speech pathology), or that were identified by the authors of the original study as being the same as an intervention known by another name (e.g., medications with more than one name, and ABA and behaviour therapy), the interventions were coded as the same intervention. This also occurred for groups of interventions that were described as including the same kind of interventions even if different labels were used (e.g., alternative/complementary therapy; complementary and alternative therapies; CAM; biological therapies).

Four hundred and seventy-five interventions (including both individual treatments and categories or groups of interventions, as reported in the original studies) were examined across the studies. Eleven interventions were asked about in at least one study but were not reported to be used by any parents, and 51 interventions were asked about in at least one study but the data did not reveal whether or not they were used. There were, therefore, in total 413 interventions and groups/categories of interventions that were confirmed to be used by at least one parent in at least one study. It is of note that some studies presented data for both larger categories of interventions and individual interventions (e.g., Green et al., 2006), and that in these cases interventions have been double-counted in the total above, reflecting the structure of the original data. Full details of the reported interventions are available in supplementary materials available from the authors on request.

Table 3 provides descriptive statistics of interventions (excluding individual prescription medications) most commonly reported across the studies (in nine or more studies). Included in the table for each intervention are both the number of studies where usage rates could be extracted (and the descriptive statistics based on these data), and the number of studies where use of the intervention was reported but data on the rates of use were not available. In studies where rates were given for use of interventions in different environments (e.g., in school and outside of school) and where no overall rates were available (Akshoomoff et al., 2010; Reffert, 2008; Thomas, Ellis, et al., 2007; Thomas, Morrissey,

TABLE 3
Current, Past and Lifetime Rates of Intervention Use

		Number of studies: reporting:		Reported rates of use (%)			
Intervention		Rates of use	Use (rates unavailable)	*Mdn*	*M*	Range	*SD*
Speech therapy[a]	Current	15	2	72.0	70.2	9.1–92.2	19.6
	Past	3	1	42.9	40.7	23.2–56.0	16.5
	Lifetime	10	0	84.6	79.9	40.0–90.4	15.3
Occupational therapy	Current	11	1	52.6	49.2	13.0–78.0	18.1
	Past	2	0	35.7	35.7	21.4–50.0	20.2
	Lifetime	9	0	69.7	59.0	4.1–92.2	59.0
CAM[b]	Current	2	3	45.9	45.9	40.8–51.0	7.21
	Past	0	0				
	Lifetime	5	2	71.0	64.1	31.7–92.0	23.0
Medication[c]	Current	10	0	46.2	42.1	14.6–68.0	19.7
	Past	1	1	19.9	19.9	N/A	N/A
	Lifetime	5	0	53.0	40.1	3.7–68.8	27.1
TEACCH	Current	7	1	38.2	33.7	11.9–62.0	20.3
	Past	1	0	14.9	14.9	N/A	N/A
	Lifetime	4	0	19.7	24.3	18.4–39.4	10.1
Applied behaviour analysis (ABA)[d]	Current	12	1	36.7	39.1	7.5–100.0	31.0
	Past	3	0	12.1	12.8	3.6–22.7	9.6
	Lifetime	5	0	47.0	40.1	0–80.0	29.5
Social skills training	Current	6	0	31.0	31.2	19.2–46.0	11.1
	Past	0	0				
	Lifetime	4	0	50.9	54.8	44.3–73.1	12.6
Sensory integration (therapy)	Current	6	0	29.2	27.2	12.0–42.5	13.8
	Past	2	0	22.6	22.6	12.0–33.2	15.0
	Lifetime	11	0	50.0	45.3	3.0–60.5	15.5
Picture Exchange Communication System (PECS)	Current	6	0	25.1	23.8	10.0–31.9	7.4
	Past	1	0	31.1	31.1	N/A	N/A
	Lifetime	4	0	46.6	37.3	8.0–48.2	19.6
Antidepressant medication	Current	6	0	21.4	19.7	6.1–32.1	8.5
	Past	0	0				
	Lifetime	4	0	25.2	26.8	19.8–37.0	7.7
Vitamins[e]	Current	8	3	20.8	21.8	8.7–42.6	11.2
	Past	1	1	13.2	13.2	N/A	N/A
	Lifetime	5	2	45.8	40.4	12.5–45.8	20.2
Dietary restrictions[f]	Current	7	1	15.1	15.8	2.5–26.8	7.4
	Past	1	1	19.2	19.2	N/A	N/A
	Lifetime	8	1	43.8	48.2	29.2–79.0	18.7
Gluten-free diet	Current	6	0	14.0	15.0	1.7–31.0	11.1
	Past	2	0	16.8	16.8	12.0–21.7	6.9
	Lifetime	3	2	52.7	45.2	17.0–66.0	25.3
Physical therapy[g]	Current	7	1	14.0	13.9	6.0–25.7	6.6
	Past	0	0				
	Lifetime	6	0	27.4	21.7	1.7–30.5	11.9
Casein-free diet	Current	6	0	12.0	14.6	0.8–29.8	11.5
	Past	2	0	13.2	13.2	8.0–18.5	7.2
	Lifetime	4	2	34.6	34.0	6.6–60.0	25.2

TABLE 3
Continued

Intervention		Number of studies: reporting: Rates of use	Use (rates unavailable)	Reported rates of use (%) *Mdn*	*M*	Range	*SD*
Music therapy	Current	10	0	7.4	9.3	2.0–16.0	4.6
	Past	3	0	2.0	7.2	1.2–18.5	9.8
	Lifetime	7	0	20.0	16.8	3.3–26.9	9.7
Floortime[h]	Current	6	0	7.5	8.2	2.9–15.0	5.1
	Past	2	0	8.7	8.7	1.2–16.3	10.7
	Lifetime	5	0	20.5	18.6	8.7–26.9	8.9
Homeopathy[i]	Current	4	0	6.0	6.1	2.0–10.2	3.4
	Past	2	0	7.0	7.0	2.0–12.1	7.1
	Lifetime	5	0	5.5	7.3	1.5–16.2	6.0
Chelation[j]	Current	6	0	5.8	5.2	2.0–7.4	2.1
	Past	1	0	7.8	7.8	N/A	N/A
	Lifetime	7	0	8.1	13.8	1.5–50.0	16.3
Auditory integration training[k]	Current	5	0	4.0	5.0	3.0–9.1	2.4
	Past	1	0	21.0	21.0	N/A	N/A
	Lifetime	10	1	29.8	15.2	2.0–29.8	8.8
Dimethylglycine (DMG)	Current	4	1	3.9	5.9	1.7–14.0	5.6
	Past	1	0	27.4	27.4	N/A	N/A
	Lifetime	2	2	31.3	31.3	25.5–37.0	8.1
Melatonin	Current	5	0	3.4	5.6	2.8–10.8	3.6
	Past	2	0	11.3	11.3	8.0–14.6	4.7
	Lifetime	2	2	12.3	12.3	3.0–21.6	13.1
Secretin	Current	6	0	0.2	0.8	0–2.8	
	Past	1	0	11.3	11.3	N/A	N/A
	Lifetime	8	2	9.7	12.7	6.0–34.0	9.1

Note. Current use of speech therapy, excluding Shattuck et al. (2011), *Mdn* = 73.3, *M* = 74.6, *SD* = 10.2, range: 61.4–92.2. Interventions were also reported as:
[a] Speech-language therapy and speech pathology. [b] Alternative/complementary therapy, complementary and alternative therapies, and biological therapies. [c] Medicine, pharmaceuticals, drugs, and medical agents. [d] Behaviour therapy. [e] Vitamin therapy, vitamin supplements, and special vitamins. [f] Elimination diets, diets, special(ised) diets, change in diet, modified diets, and alternative diet. [g] Physiotherapy. [h] Greenspan model. [i] Homeopathic remedies. [j] Chelation for lead or mercury, detox (chelation), and detoxification (chelation method). [k] Auditory integration therapy.

& McLaurin, 2007), the higher rate was used to calculate the descriptive statistics. The data presented in Thomas, Ellis, et al. (2007) included both the data reported in Thomas, Morrissey, and McLaurin (2007) for children aged 8 years or younger and new data for children aged 9–11 years. Therefore, for calculation purposes only the new data for children aged 9–11 years was used in the present analysis. Usage rates presented in individual studies can be found in the supplementary material.

The intervention with the highest average rates of current use was speech therapy, with a mean of 70.2% and median of 72.0% (range: 9.1–92.2%) across the 15 studies reporting current rates of use. In addition to the high average rates of use, speech therapy was the most commonly used current treatment reported in a number of the studies (Akshoomoff et al., 2010; Carter et al., 2011; Green et al., 2006; King et al., 2000; Kohler, 1999; Levine et al., 2004; McLennan et al., 2008; Reffert, 2008; Thomas, Morrissey, & McLaurin, 2007).

Another therapy-based intervention, occupational therapy, had the second highest average rates of current use, with a mean of 49.2% and a median of 52.6% (range: 13.0–78.0%) across 11 studies.

CAM interventions had a mean current usage rate of 45.9% and median of 45.9% (range: 40.8–51.0%) across two studies, medication a mean of 42.1% and median of 46.2% (range: 14.6–68.0%) across 10 studies, TEACCH a mean of 33.7% and median of 38.2% (range: 11.9–62.0%) across seven studies, and ABA a mean of 39.1% and median of 36.7% (range: 7.5–100.0%) across 12 studies. Social skills training had a mean of 31.2% and median of 31.0% (range: 19.2–46.0%) across six studies, and sensory integration therapy, a specific therapy delivered by occupational therapists, a mean of 27.2% and median of 29.2% (range: 12.0–42.5%) across seven studies.

When lifetime use was reported, speech therapy was again the intervention with the highest average rates of use, with a mean of 79.9% and median of 84.6% (range: 40.0–90.4%) across 10 studies. Other interventions with high average lifetime rates of use were CAM interventions, with a mean of 64.1% and median of 71% (range: 31.7–92.0%) across five studies, occupational therapy, with a mean of 59.0% and median of 69.7% (range: 4.1–92.2%) across nine studies, and social skills training, with a mean of 54.8% and a median of 50.9% (range: 44.3–73.1%) across four studies. These were followed by sensory integration, with a mean of 45.3% and median of 50.0% (range: 3.0–60.5%) across 11 studies, gluten-free diet, with a mean of 45.2% and median of 57.2% (range: 17.0–66.0%) across three studies, medication, with a mean of 40.1% and median of 53.0% (range: 3.7–68.8%) across five studies, and ABA, with a mean of 40.1% and median of 47% (range: 0–80.0%) across five studies.

Number of Interventions Used

The use of multiple interventions by individual children was commonly reported across the studies. The number of interventions reported to be used ranged from a mean of 2.6 tried (Le Grice & McMenamin, 2001), 5.2 used currently and 8 used in the past (Goin-Kochel, Myers, & Mackintosh, 2007), 7 used currently and 8 in the past (Green et al., 2006), and 7 tried in addition to an ABA program (Study 1 in Smith & Antolovich, 2000). In Bowker et al. (2011) it was reported that although 27.6% of the sample reported never using any interventions, 54% of the sample used 2 or more, and 12% used 5 or more. It is of note that additional studies reported the mean numbers of services accessed and professionals seen, and that these included multiple interventions, but because these data did not include the number of interventions alone they were excluded from the current analysis (Akshoomoff et al., 2010; Hume, Bellini, & Pratt, 2005; King et al., 2000; Kohler, 1999; McConachie & Robinson, 2006; McLennan et al., 2008; Regehr & Feldman, 2009; Thomas, Ellis, et al., 2007; Thomas, Morrissey, & McLaurin, 2007).

The number of CAM interventions being used ranged from a mean of 1.0 currently used and 1.9 used in the past for an overall sample of parents, and 1.3 currently used and 2.7 used in the past for the subset of parents (71%) who had tried at least 1 CAM (Christon, Mackintosh, & Myers, 2010), to 2.46 ever tried (Erba, 2000), and 5 ever tried (Şenel, 2010). Two studies reported the rates of CAM use and medication use together, with 1.6 CAM interventions or medications currently being used reported in Carter et al. (2011), and a median of 6 CAM interventions or medications ever tried reported in Harrington, Patrick, et al. (2006). Other studies reporting rates of medication use reported one medication being used by the largest percentage of parents (24.7%, 22.1%, 25.7%, and 18.7%, respectively; Aman, Lam, & Collier-Crespin, 2003; Aman, Van Bourgondien, Wolford, & Sarphare, 1995; Martin, Scahill, Klin, & Volkmar, 1999; Witwer & Lecavalier, 2005), but multiple medications being used by a subset within each of the studies. Two medications were used by 9.8%, 6.4%, 22.9%, and 14%, respectively, three by 7.7%, 1.7%, 4.6%, and 8.1%, respectively, and four by 2.4%, 0.4%, 1.8%, and 3.1%, respectively (Aman et al., 2003; Aman et al., 1995; Martin et al., 1999; Witwer & Lecavalier, 2005).

Discussion

Literature on parental reports of the number and/or type of treatments and interventions used with their children with ASD have been examined in the current review with specific focus on the methods used to collect data and the number and types of treatments/interventions used. These two issues will be examined seriatim, followed by limitations of the review, and recommendations for future research.

Methodological Issues

In some studies interventions were examined individually, whereas in others interventions were grouped and data were presented for the overall group as one intervention. It was common for the use of both individual interventions and groups of interventions to be reported in one study. In addition, data were presented on current, past, or lifetime use, or a combination of these across the studies; as a result, the amount of data available for comparison varied from intervention to intervention (see Table 3).

The range of methodologies used may explain some of the differences in usage rates reported. Not all interventions were targeted across all studies, and only very general data were presented in some studies where the main study aims did not relate to collecting data about treatment use (Cassidy et al., 2008; Gurney et al., 2006; Levine et al., 2004). In addition, a list of interventions was provided for parents in some studies, and in others, parents were asked to list the interventions used. There is a possibility of parents not including all interventions used when provided with a list, even when parents are invited to add interventions not listed. An example was reported in the Green et al. (2006) study when occupational and physical therapy were both mistakenly excluded from the list and only 9.1% of participants added one or both of these to the list of interventions used. Given that occupational therapy had the second highest mean current and past usage rates across all studies, the Green et al. (2006) data suggest that the use of unlisted interventions may be underreported. An additional potential problem with the provision of a list of interventions is that parents may misunderstand what the researchers are asking about. Erba (2000) reported that this occurred when a number of parents misinterpreted, and therefore overreported the use of, music therapy.

The populations sampled become important when comparing data presented across studies. The very small sample size in Le Grice and McMenamin (2001) can account for the high lifetime usage rate of ABA compared to other studies, as four out of the five parents reported using it. This sample is much too small to attempt to generalise to any population, so it is not surprising that the usage rates were unique. It is also important to note that in some of the studies the sample was defined by the interventions used. For example, in Smith and Antolovich (2000; Studies 1 and 2) the participants were recruited through an ABA program, therefore all participants were using ABA in both of these studies.

Generally, the studies with larger samples tended to rely on parent report for confirmation of ASD diagnosis, and it was often impossible to calculate the response rate or define the target population, particularly where the internet was used to widely recruit participants from a potentially very large target population. On the other hand, some of the smaller, more controlled studies offered data for very specific groups of participants, using a tightly defined target population.

It is possible that the use of some interventions may have been underrepresented in the results of the studies. For example, the Hanen Program® (Sussman, n.d.) was reported to be used in only one study (Carter et al., 2011), apart from the follow-up study for the *More Than Words* training program that used the Hanen method (McConachie & Robinson, 2006); similarly, pragmatics training was also only reported to be used in one study (Robinson, 2008). These interventions may be implemented under the auspices of speech therapy, and it is very possible that a larger percentage of parents were using them but reported the use of speech therapy alone rather than what they may have regarded as individual strategies or approaches within this treatment. Similarly, sensory integration therapy is almost exclusively delivered by occupational therapists, so it is very likely that those reporting having used sensory integration therapy also used occupational therapy and vice versa. It is possible that some parents reported the use of occupational therapy alone when they also used sensory integration therapy as part of the occupational therapy program. This also has implications for the reported number of interventions used, because some interventions may have been double counted in some studies (e.g., occupational therapy along with sensory integration, or PECS/AAC along with speech therapy).

Number and Types of Treatments/Interventions Used

Although the reports of intervention use varied from study to study, overall a pattern of a variety of interventions being used emerged with robust evidence for the widespread application of some interventions. Speech therapy was the most commonly used intervention, both for current use and lifetime use, which is not surprising given that ASD is characterised by deficits in communication and related social skills (American Psychiatric Association, 2000). The relatively widespread use of speech therapy is illustrated in the large ratio of the mean percentage of use across studies to the standard deviation. For example, for current use, the mean was 70.2 and the standard deviation was 19.6. The use of speech therapy was generally consistent across geographic location and age groups; however, Shattuck, Wagner, Narendorf, Sterzing, and Hensley (2011) reported that only 9.1% of the children, who had all recently left school, were using speech therapy. This was significantly lower than all other reports of speech therapy use. It is of note that the rate of private speech therapy use was lower than speech therapy received at school in all studies reporting school and private use (Akshoomoff et al., 2010; Reffert, 2008; Thomas, Morrissey, & McLaurin, 2007; Williams, MacDermott, Ridley, Glasson, & Wray, 2008). This suggests that parents may be choosing to access speech therapy services in school environments rather than to begin or continue using private speech therapy.

The rate of use of occupational therapy was also high, which may reflect concerns about sensory issues associated with ASD. The use of occupational therapy was generally consistent across geography and age groups, and differences in studies appeared to reflect differences in individual samples. For example, the rate of lifetime use reported in Study 1 in Smith and Antolovich (2000) was significantly lower (4.9%) than most of the other lifetime, current, and past usage rates. This may be reflective of this particular sample in that all used an ABA program at the time that they were recruited to the study, although it should be noted that 56.2% of this sample reported the lifetime use of sensory integration.

As previously discussed, sensory integration is commonly delivered by occupational therapists. Another possible explanation for the difference in reported rates of occupational therapy use is that parents in this sample were likely to have been using occupational therapy but reporting it as the specific type of therapy used (e.g., sensory integration). There was a moderately high ratio between the mean percentage of occupational therapy use across studies and the standard deviation (for current use, 49.2–18.1).

The use of another commonly reported intervention, social skills training, may be associated with impaired social interaction skills, which are also a characteristic of ASD (American Psychiatric Association, 2000). Additionally, it should be noted that the interventions such as speech therapy, occupational therapy, and social skills training are all broad and may encompass a range of other more specific interventions. The high rates of use may partially reflect the breadth of interventions delivered under the labels of each of these.

The interventions most commonly reported to be used across studies, either currently or in the past, ranged from those with strong empirical support, such as ABA (National Autism Center, 2009; Odom et al., 2010), to those that appear promising, such as social skills training (National Autism Center, 2009), those that lack empirical support, such as sensory integration therapy (National Autism Center, 2009; Prior, Roberts, Rodger, & Williams, 2011), and therapies such as speech therapy and occupational therapy for which levels of empirical support are unknown because they are professional disciplines in which a range of different specific interventions may be employed. Interestingly, the standard deviation for the ABA interventions approached the mean, indicating a much higher level of variability across studies than for social skills training and sensory integration therapy. It should be noted that in two of the studies the current usage rates of ABA were 100%, reflecting the samples who were parents of children using an ABA program (Studies 1 and 2 in Smith & Antolovich, 2000). Excluding these two studies, however, the current usage rates of ABA ranged from 7.5% to 40.4%, with a mean of 26.9% ($SD = 13.74$), which still indicates a high level of variability across studies. This may well reflect the relatively high cost and intensive nature of this intervention.

Even though the data examined in detail in this paper were limited to the most commonly employed interventions, substantial diversity was evident in the range of interventions used by parents. Attempts to estimate the number of interventions employed should be treated with extreme caution, as these figures are very much dependent on the way interventions are classified and grouped by researchers. Nevertheless, several authors reported concurrent use of an average of more than five interventions at the time of the survey (Goin-Kochel et al., 2007; Green et al., 2006; Study 1 in Smith & Antolovich, 2000), suggesting the use of multiple interventions, including many without strong empirical evidence, may be the rule rather than the exception for many parents. There is little doubt that there has been an increasing interest in evidence-based practice in ASD over recent decades, and it is hoped that this will lead to clearer and more comprehensive guidelines for parents regarding effective and ineffective intervention strategies. It is certainly possible that this information could lead to rationalisation of the average number of interventions being accessed by parents in the future.

Limitations

A number of limitations of the present review should be reiterated. The studies examined varied considerably in terms of goals, methods and the way in which interventions were grouped. Further, some samples were purposive and restricted. Nevertheless, some robust findings were evident across methodologies and samples.

A variety of interventions were used by parents, and this was the case even where restricted samples were used. For example, in Smith and Antolovich (2000; Study 1), where the entire sample used ABA at the time of recruitment to the study, there were reports from this population of the use of a range of interventions within the children's lifetimes, including other types of ABA therapy, medication, auditory integration, dietary restrictions, Floortime, music therapy, occupational therapy, speech therapy, physical therapy, sensory integration, and other CAM interventions. Additionally, the interventions with the highest average rates of current and lifetime use were identified in a large number of diverse studies, suggesting their widespread use across different populations.

Recommendations for Future Research

While the present review has provided some insights into the range and types of interventions employed by parents of children with ASD, it has more importantly highlighted some of the interpretative problems with this research with implications for future research. It should be noted that studies included in this review date back to only 1995, reflecting a lack of historic data on intervention use for children with ASD. Due to the different interventions reported across the studies, it was difficult to identify strong trends or changes in intervention use over time. Although some studies reported current and past or lifetime usage rates, none of the studies presented longitudinal data reflecting changes in current use of interventions over time. Asking parents about past or lifetime use of interventions is reliant on memory, and more accurate data would be available if parents were systematically followed-up over time to report current intervention use.

As noted above, in many of the larger studies participants were recruited from populations of unknown size. In these cases response rates could not be calculated and the representativeness of the sample was also unknown. Future research about intervention use would benefit from defining the samples and reporting response rates and, where practical, also obtaining confirmatory evidence of diagnoses.

Potential problems related to the instrument design were reported above. Asking the participants to list interventions themselves, or providing clear descriptions of definitions of interventions, may prevent misreporting of intervention use due to misunderstanding in future research. Collecting data on specific interventions rather than classes of interventions would help to form a solid research base moving forward because categorisation of interventions may vary from study to study or change over time. Collecting data about current and past rather than lifetime usage would allow for changes to be tracked consistently over time.

Much of the data regarding treatment and intervention choices have come from populations based either entirely or mainly in North America. There is therefore a possibility that they are more representative of North American populations than others around the world. The possibility of differences in intervention use in populations from different geographic locations was explored in three studies (Bowker et al., 2011; Erba, 2000; Wong, 2009), but further research would be beneficial to explore the relationship between intervention use and geographic location. Additionally, research into decision-making factors related to intervention choices may help to develop a better understanding of why parents choose certain interventions, and to develop resources to aid them in making informed decisions.

Conclusion

Although the studies reviewed in the present paper varied considerably in design, they revealed a consistent pattern of the use of multiple interventions, including both empirically supported and unsupported interventions. Speech therapy was the most frequently used intervention reported across a robust number of the studies, and other common interventions included occupational therapy, CAM interventions, ABA, social skills training and sensory integration. Future research focusing on the systematic collection of longitudinal data about intervention use would add to the research base.

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