AUTISM SPECTRUM DISORDER

Introduction

The diagnostic criteria for autism have recently changed. In May 2013, the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) moved to a single overarching Autism Spectrum Disorder (ASD) diagnosis [1]. Previously, DSM-IV had allowed for four separate diagnoses: autistic disorder, Asperger disorder, childhood disintegrative disorder, and pervasive developmental disorder not otherwise specified. Research had suggested, however, that these diagnoses were not being consistently applied [2], and that many clinicians found it difficult to differentiate between these four categories [1]. A single umbrella category was therefore seen as a better reflection of current knowledge [2].

The new DSM-V uses two symptom dimensions to define ASD, with further sub-classifications being based on functional severity [1]. The first dimension is a persistent impairment in reciprocal social communication and interaction. This includes problems with social-emotional reciprocity (e.g. failure of normal back-and-forth conversation); problems with nonverbal communication (e.g. abnormalities in eye contact, body language, and understanding gestures); and problems with developing, maintaining, and understanding relationships (e.g. difficulties adjusting behaviour to suit different social contexts, difficulties with making friends) [3]. The second dimension relates to the presence of restricted and repetitive patterns of behaviour. This includes stereotyped or repetitive movements, use of objects, or speech; the insistence on sameness, including inflexible adherence to routines, and ritualized patterns of behaviour; the presence of highly restricted, fixated interests; and an unusual interest in the sensory aspects of the environment [3].

The current consensus is that early intervention improves outcomes for children with ASD. The aims of treatment are to foster growth in communication, cognitive abilities and social and daily living skills, and to reduce problem behaviours which interfere with learning [4]. Programmes often draw on procedures from special education, behavioural psychology and occupational therapy. While usually seen as adjuncts to other therapies, medications are occasionally used to manage problem behaviours and to enhance participation in educational programmes. [4]. Over time, a large number of alternative treatments have been suggested but the evidence for the efficacy of many is limited, and some are known to have actually caused direct harm [4].

The causes of ASD remain unknown. A genetic basis is supported by research which suggests an average concordance of 88% between identical twins. Siblings of children with ASD are also at an increased risk, as the reported risk of recurrence in families is at least 4–7%. Single gene disorders (e.g. fragile X) have sometimes been diagnosed in people with ASD, and the proportion who have an abnormality on genetic evaluation is increasing, as more sophisticated tests become available. The majority of people with ASD, however, are thought to have idiopathic autism with no identifiable genetic abnormality. While this may reflect the limitations of current testing, the current view is that ASD develops when an array of genetic vulnerabilities, possibly in concert with epigenetic factors, or a gene-environment interaction, affects brain development [4].

At present there is no reliable information on the prevalence of ASD in New Zealand, although an estimate from the Statistics NZ Household Disability Survey suggested that 2,100 children may have ASD (personal communication Phillipa Clark 2006) giving a prevalence of 24.8 per 10,000. Similarly, an estimate from Nelson Marlborough suggested a prevalence of 46 per 10,000 [5]. Some overseas estimates (based on parental report) have placed the prevalence as high as 110 per 10,000 [6].

In the absence of other more reliable data sources, the following section reviews hospital admissions for children and young people with any mention of autism or other pervasive developmental disorders in any of their first 15 diagnoses. Note: Given that DSM-V was only released in May 2013, the analysis uses ICD-10-AM codes based on the earlier definitions of autism and pervasive developmental disorders.

Data Source and Methods

Definition

1. *Hospital admissions for children and young people aged 0–24 years with autism or other pervasive developmental disorders listed in any of the first 15 diagnoses*

Data Source

1. National Minimum Dataset

Numerator: Hospital admissions for children and young people aged 0–24 years with autism or other pervasive developmental disorders (ICD-10-AM F84) listed in any of the first 15 diagnoses.

Denominator: Statistics New Zealand Estimated Resident Population (projected from 2007)

Notes on Interpretation

Note 1: This analysis focuses on hospital admissions for children and young people with autism or other pervasive developmental disorders listed in any of the first 15 diagnoses, rather than on the subset of admissions where a pervasive developmental disorder was the primary reason for admission. The rationale for this wider focus was the fact that the majority of those with these diagnoses were not hospitalised for their pervasive developmental disorder per se, but rather for a range of other conditions, some of which were potentially more likely as a result of their pervasive developmental disorder, and some of which were unrelated.

Note 2: As the majority of children and young people with pervasive developmental disorders are managed in the outpatient or primary care setting, it is likely that this analysis significantly underestimates the number of children and young people with these diagnoses. The rationale for the methodology used however, was the absence of other more reliable sources of information on the number of children and young people with autism or other pervasive developmental disorders in the community.

Note 3: If no mention of a pervasive developmental disorder was made in any of the first 15 diagnoses, then these cases have not been included, even if the patient was diagnosed with a pervasive developmental disorder on a previous admission.

New Zealand Distribution and Trends

Distribution by Primary Diagnosis

In New Zealand during 2008–2012, autism and other pervasive developmental disorders were listed as the primary diagnosis in only 14.3% of hospitalisations for children and young people with a pervasive developmental disorder in any of the first 15 diagnoses. Of those with a pervasive developmental disorder listed as the primary diagnosis, 64.0% had childhood autism, 22.8% had Asperger syndrome and 13.3% had other pervasive developmental disorders. Overall, 23.8% of admissions in children and young people with pervasive developmental disorders were for dental caries or other oral health conditions, while a further 8.5% were for epilepsy or convulsions (**Table 1**).

Distribution by Age

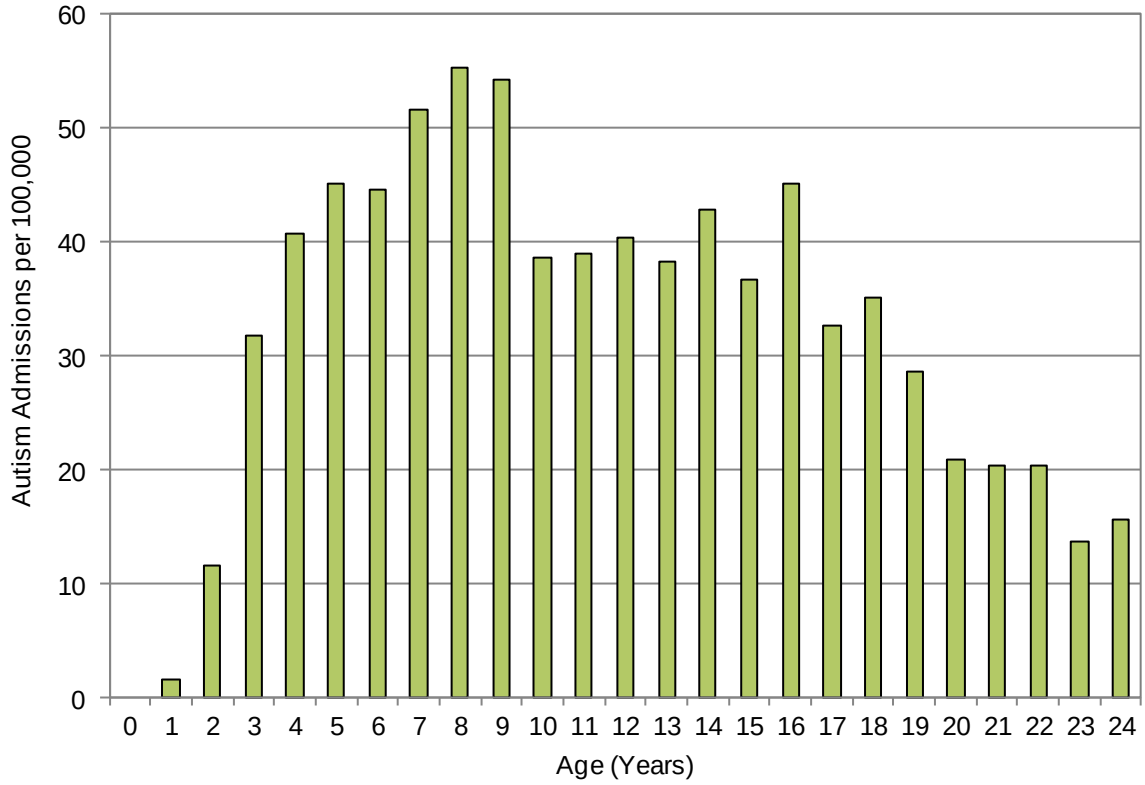
In New Zealand during 2008–2012, hospital admissions for children and young people with pervasive developmental disorders increased rapidly during the preschool years, reached a peak at eight years of age, and then declined (**Figure 1**). During 2006–2010, five children or young people had a pervasive developmental disorder listed as the main underlying cause of death, or as a contributory cause, with all of these deaths occurring in those over ten years of age.

Table 1. Hospital Admissions in Children and Young People Aged 0–24 Years with Autism or Other Pervasive Developmental Disorders by Primary Diagnosis, New Zealand 2008–2012

Primary Diagnosis	Number of Admissions: Total 2008−2012	Number of Admissions: Annual Average	Admission Rate per 100,000 Population	% of Admissions in those with Pervasive Developmental Disorders
Pervasive Developmental Disorders				
Childhood Autism	222	44.4	2.91	9.1
Asperger Syndrome	79	15.8	1.03	3.3
Other Pervasive Developmental Disorders	46	9.2	0.60	1.9
Total Autism and Other Pervasive Developmental Disorders	347	69.4	4.54	14.3
Other Diagnoses				
Dental Caries	454	90.8	5.95	18.7
Other Dental and Oral Health Issues	124	24.8	1.62	5.1
Epilepsy and Status Epilepticus	138	27.6	1.81	5.7
Unspecified Convulsions	68	13.6	0.89	2.8
Mood Disorders	83	16.6	1.09	3.4
Schizophrenia, Schizotypal and Delusional Disorders	81	16.2	1.06	3.3
Other Mental and Behavioural Disorders	116	23.2	1.52	4.8
Respiratory Infections and Diseases	89	17.8	1.17	3.7
Constipation	45	9.0	0.59	1.9
Infectious and Parasitic Diseases	29	5.8	0.38	1.2
Respite Care	27	5.4	0.35	1.1
Other Diagnoses	826	165.2	10.82	34.0
Total Other Diagnoses	2,080	416.0	27.24	85.7
Total	2,427	485.4	31.78	100.0

Source: Numerator: National Minimum Dataset, hospital Admissions by primary diagnosis for children and young people with autism or other pervasive developmental disorders listed in any of the first 15 diagnoses; Denominator: Statistics NZ Estimated Resident Population (projected from 2007)

Figure 1. Hospital Admissions for Children and Young People with Autism or Other Pervasive Developmental Disorders by Age, New Zealand 2008–2012



Source: Numerator: National Minimum Dataset, hospital admissions for children and young people with autism or other pervasive developmental disorders listed in any of the first 15 diagnoses; Denominator: Statistics NZ Estimated Resident Population (projected from 2007)

Distribution by Ethnicity and Gender

In New Zealand during 2008–2012, hospital admissions for those with autism or other pervasive developmental disorders were *significantly* higher for males. Admissions were also *significantly* higher for European/Other > Māori and Asian/Indian > Pacific children and young people (**Table 2**).

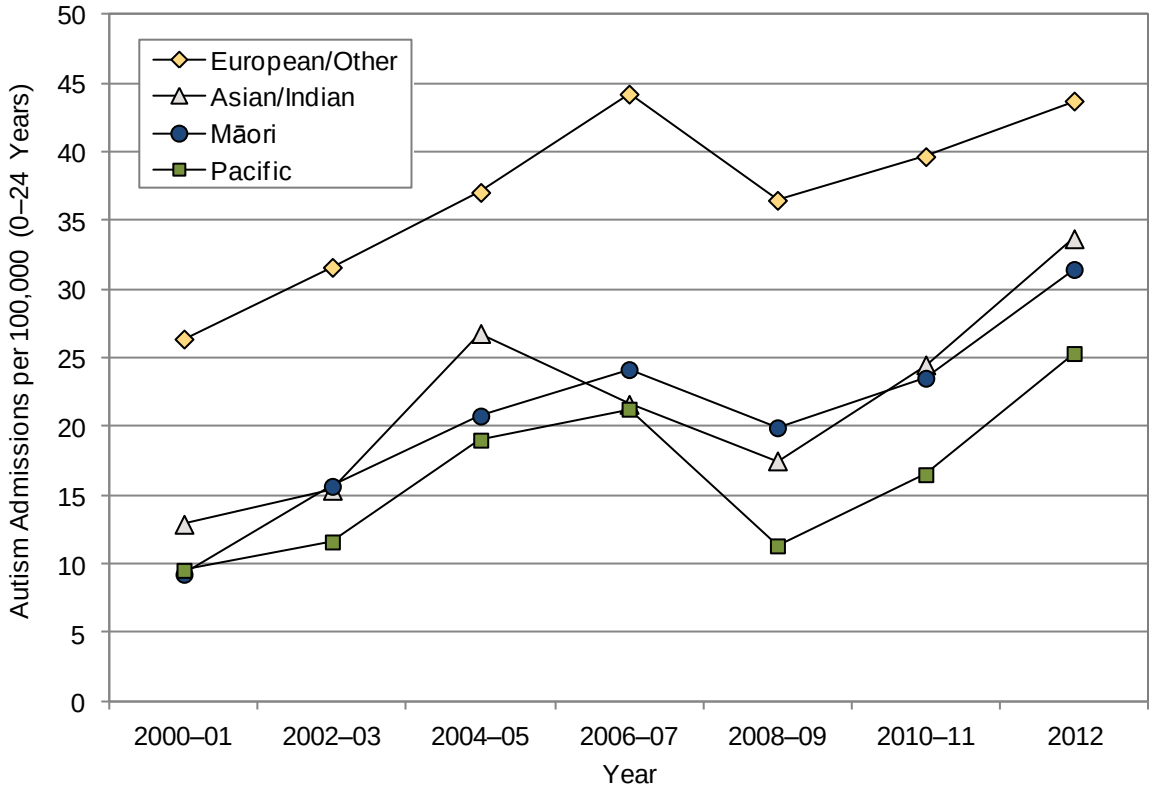
Similarly during 2000–2012, admission rates for European/Other children and young people with autism or other pervasive developmental disorders were consistently higher than for Asian/Indian, Māori and Pacific children and young people, although rates for all ethnic groups increased during this period (**Figure 2**).

Table 2. Hospital Admissions for Children and Young People Aged 0–24 Years with Autism or Other Pervasive Developmental Disorders by Ethnicity and Gender, New Zealand 2008–2012

Variable	Rate	Rate Ratio	95% CI	Variable	Rate	Rate Ratio	95% CI
Autism or Other Pervasive Developmental Disorders							
Prioritised Ethnicity				Gender			
Asian/Indian	23.71	0.61	0.52–0.70	Female	19.19	1.00	
European/Other	39.17	1.00		Male	43.75	2.28	2.09–2.49
Māori	23.70	0.61	0.54–0.67				
Pacific	16.29	0.42	0.34–0.50				

Source: Numerator: National Minimum Dataset, hospital admissions for children and young people with autism or other pervasive developmental disorders listed in any of the first 15 diagnoses; Denominator: Statistics NZ Estimated Resident Population (projected from 2007); Note: Ethnicity is Level 1 Prioritised; Rate is per 100,000

Figure 2. Hospital Admissions for Children and Young People 0–24 Years with Autism or Other Pervasive Developmental Disorders by Ethnicity, New Zealand 2000–2012



Source: Numerator: National Minimum Dataset, hospital admissions for children and young people with autism or other pervasive developmental disorders listed in any of the first 15 diagnoses; Denominator: Statistics NZ Estimated Resident Population (projected from 2007); Note: Ethnicity is Level 1 Prioritised

South Island DHBs Distribution and Trends

South Island DHBs Distribution

South Island Distribution

In the South Island during 2008–2012, 78 Nelson Marlborough, 14 South Canterbury, 116 Canterbury, 12 West Coast, 58 Otago and 18 Southland children and young people were hospitalised with a diagnosis of autism or other pervasive developmental disorders. Admission rates per 100,000 in Nelson Marlborough were *significantly* higher than the New Zealand rate, while in Canterbury, Otago and Southland rates were *significantly* lower. Rates in the remaining DHBs were not *significantly* different from the New Zealand rate (**Table 3**).

South Island Trends

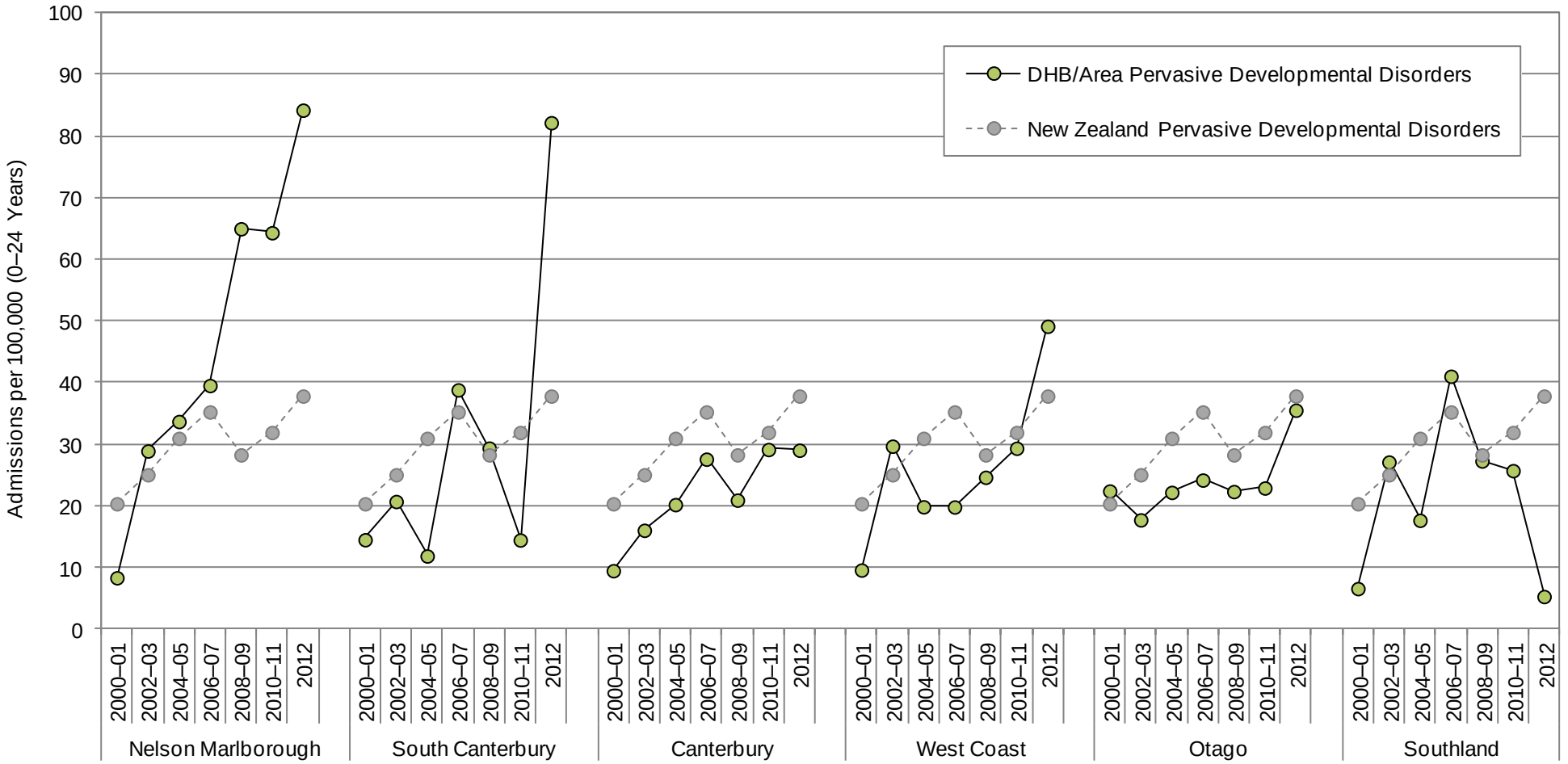
In the South Island DHBs during 2000–2012, large year to year variations (likely as a result of small numbers) made some DHB's trends in admission rates difficult to interpret. However, in Nelson Marlborough, Canterbury and the West Coast there was a general upward trend (**Figure 3**).

Table 3. Hospital Admissions for Children and Young People Aged 0–24 Years with Autism or Other Pervasive Developmental Disorders, South Island DHBs vs. New Zealand 2008–2012

DHB/Area	Total Number of Individuals 2008−2012		Total Number of Admissions 2008−2012	Average Number of Admissions per Individual per Year	Admission Rate per 100,000 Population	Rate Ratio	95% CI
	A*	B*					
Autism and Other Pervasive Developmental Disorders							
Nelson Marlborough	78	78	146	0.37	68.68	2.16	1.83–2.55
South Canterbury	14	14	29	0.41	34.05	1.07	0.74–1.54
Canterbury	113	116	216	0.37	25.97	0.82	0.71–0.94
West Coast	11	12	16	0.27	31.56	0.99	0.61–1.62
Otago	56	58	85	0.29	25.33	0.80	0.64–0.99
Southland	18	18	41	0.46	22.37	0.70	0.52–0.96
New Zealand	1,528		2,427	0.32	31.78	1.00	

Source: Numerator: National Minimum Dataset, hospital admissions for children and young people with autism or other pervasive developmental disorders listed in any of the first 15 diagnoses; Denominator: Statistics NZ Estimated Resident Population (projected from 2007); Note: A*: Each individual only counted once in DHB in which they first reside (i.e. DHB total = NZ total); B*: Each individual counted once in each DHB in which they reside (i.e. the sum of DHB totals exceeds New Zealand total); Rate Ratios are compared to New Zealand rates and have not been adjusted for population demographics

Figure 3. Hospital Admissions for Children and Young People Aged 0–24 Years with Autism or Other Pervasive Developmental Disorders, South Island DHBs vs. New Zealand 2000–2012



Source: Numerator: National Minimum Dataset, hospital admissions for children and young people with autism or other pervasive developmental disorders listed in any of the first 15 diagnoses; Denominator: Statistics NZ Estimated Resident Population (projected from 2007)

Local Policy Documents and Evidence-Based Reviews Relevant to Autism Spectrum Disorder

In New Zealand there are a number of guidelines relevant to autism spectrum disorder and these are summarized in **Table 4**, along with a range of publications which consider ASD in the overseas context.

Table 4. Local Policy Documents and Evidence-Based Reviews Relevant to Autism

Ministry of Health and Ministry of Education Documents
McClintock J M, Fraser J. 2011. **Diagnostic instruments for autism spectrum disorder**. Wellington: New Zealand Guidelines Group. http://www.health.govt.nz/system/files/documents/pages/asd_instruments_report.pdf This document, intended as a resource for practitioners in the health, disability and education sectors, contains a brief review of the available validated diagnostic instruments for autism spectrum disorder. It describes their basic characteristics including appropriate use and setting, statistical properties, requirements in terms of user qualifications and training, and licensing arrangements. It also sets out some potentially preferable combinations of instruments for screening and diagnosis of autism, and for screening for Asperger disorder.
Ministries of Health and Education. 2008 **New Zealand Autism Spectrum Guideline.** Wellington: Ministry of Health http://www.health.govt.nz/publication/new-zealand-autism-spectrum-disorder-guideline This guideline provides evidence-based information for all those involved in providing services for people with autism and their families including health, disability and education professionals. The eight parts of the guideline cover Diagnosis and initial assessment of Autism Spectrum Disorder (ASD), Support for individuals, families and carers, Education for learners with ASD, Treatment and management of ASD, Living in the community, Professional learning and development, Māori perspectives and Pacific peoples' perspectives. Recommendations in the guidelines are graded using NZ Guidelines Group Grading System. Grades are based on the quality, quantity, consistency, applicability and clinical impact of the studies forming the relevant body of evidence. The information in the guidelines should be read in conjunction with the supplementary papers produced by the Living Guidelines group to update the recommendations in the Guidelines according to new evidence. These reviews are: Broadstock Marita. 2013. **New Zealand autism spectrum disorder guideline: supplementary evidence on gastrointestinal problems in young people**. Christchurch: INSIGHT Research. http://www.health.govt.nz/system/files/documents/pages/gi-issues-asd.pdf New Zealand Guidelines Group. 2012. **New Zealand autism spectrum disorder guideline: supplementary evidence on supported employment services**. Wellington: New Zealand Guidelines Group. http://www.health.govt.nz/system/files/documents/pages/asd-guideline-supplementary-evidence-supported-employment-v10.pdf The Living Guideline Group. 2011. **Supplementary paper on three pharmacological interventions for the New Zealand autism spectrum disorder guideline**. New Zealand Guidelines Group. http://www.health.govt.nz/system/files/documents/pages/lgg_supplementary_paper_on_3_pharmacotherapies_final.pdf The Living Guideline Group. 2010. **Supplementary paper on applied behaviour analysis for the New Zealand autism spectrum disorder guideline**. New Zealand Guidelines Group. http://www.health.govt.nz/system/files/documents/pages/supplementary_paper_to_nz_asd_guideline_applied_behaviour_analysis_final.pdf Other Ministry of Health resources relating to autism can be found here: http://www.health.govt.nz/our-work/disability-services/disability-projects-and-programmes/autism-spectrum-disorder-guideline/asd-publications .

International Guidelines

National Institute for Health and Care Excellence. 2011. **CG128 Autism in children and young people: NICE guideline**. London: National Institute for Health and Care Excellence.
http://www.nice.org.uk/nicemedia/live/13572/56428/56428.pdf

This abbreviated guideline covers the recognition, referral and diagnosis of autism in children and young people from birth up to 19 years. It does not cover the management of the condition. Its recommendations are listed under the following headings: Local pathway for recognition, referral and diagnostic assessment of possible autism, Recognising children and young people with possible autism, Referring children and young people to the autism team, After referral to the autism team, Autism diagnostic assessment for children and young people, After the autism diagnostic assessment, Medical investigations, Communicating the results from the autism diagnostic assessment, and Information and support for families and carers. There are also research recommendations relating to training professionals, gathering information in schools or nurseries, additional assessments and comparative genomic hybridisation array.

The full version of the above guideline is:

National Collaborating Centre for Women's and Children's Health (Commissioned by the National Institute for Health and Clinical Excellence). 2011. **Autism: recognition, referral and diagnosis of children and young people on the autism spectrum** London: National Institute for Health and Clinical Excellence.
http://www.nice.org.uk/nicemedia/live/13572/56424/56424.pdf

This guideline is intended for people working in, or using, the NHS in England and Wales, including professionals, service commissioners and planners, and children, young people and parents going through the referral and diagnosis process for autism. The guidelines address a series of clinical questions relating to the following main outcomes: signs and symptoms of autism, specificity and sensitivity of tools to identify an increased likelihood of autism and diagnostic tools, yield of medical and diagnostic tests, differential diagnoses, coexisting conditions, and children's and young people's views and the views of their parents and carers of the process of referral, assessment and diagnosis, and their support and information needs. For each clinical question there is an overview of the evidence and a table listing the relevant studies, and providing, for each study, a quality assessment and a summary of findings which includes numbers of cases and controls, and results with 95% confidence intervals. The evidence chapters are entitled: recognition, following referral, diagnostic assessment differential diagnosis, assessment of coexisting conditions, medical investigations and information and support. The last chapter covers service descriptions and resource use.

The appendices for the above guideline can be found here:
http://guidance.nice.org.uk/CG128/Guidance/Appendices/pdf/English

Academy of Medicine, Singapore. 2010. **Autism Spectrum Disorders in Pre-School Children**. Singapore: Ministry of Health, Singapore.
http://www.moh.gov.sg/content/dam/moh_web/HPP/Doctors/cpg_medical/current/2010/ASD%20book%20Apr%2010.pdf

These evidence-based guidelines from the Singapore Ministry of Health are intended for all practitioners who are involved in any of the following: surveillance, screening and early identification, referral for assessment, diagnosis and interventions for children with ASD. They cover definition and diagnostic classification; surveillance, screening assessment and prognosis; aetiology and investigations; early intervention; family and caregiver support; pharmacological treatment and complementary and alternative therapies. Recommendations in the guidelines are accompanied by a level of evidence (ranging from 1: meta-analyses or systematic reviews of RCTs) to 4: expert opinion) and a grade of recommendation (ranging from A to D, or 'good practice point').

Guidelines from the James M. Anderson Center for Health Systems Excellence at Cincinnati Children's Hospital
http://www.cincinnatichildrens.org/service/j/anderson-center/default/

The Anderson Center at Cincinnati Children's Hospital has published a number of "Best Evidence Statements" related to care issues for children with autism. They contain brief details of studies relevant to the clinical questions addressed and care recommendations. Guidance on the following topics (with year of publication) can be found at these links:

- Craniosacral Therapy for Children with Autism and/or Sensory Processing Disorder (2011)
- Use of motor and self-care assessment tools for children with autism spectrum disorder (ASD) (2009)
- Outcomes assessment tool for children with Autism Spectrum Disorder (ASD) (2009)
- Use of Sensory Assessment Tools with Children diagnosed with Autism Spectrum Disorder (ASD) (2009)
- Speech Therapist Directed Use of Video Modeling for Patients with Autism Spectrum Disorder (2012)
- The use of Video-Based Modeling in Teaching Daily Living Skills to Children with Autism (2012)
- Use of a Weighted or Pressure Device to Modify Behavior in Children with a Sensory Processing Disorder (2012)
- Adding home based services to complement center based intervention for children with autism (2013)

Scottish Intercollegiate Guidelines Network. **Assessment, diagnosis and clinical interventions for children and young people with autism spectrum disorders A national clinical guideline**. Edinburgh: Scottish Intercollegiate Guidelines Network, 2007. http://www.sign.ac.uk/pdf/sign98.pdf

This Scottish guideline aims to provide the evidence base and recommendations to inform clinical service provision, especially in regard to assessment, diagnosis and clinical intervention. It considers the evidence for working in partnership with children and young people and their parents and carers. It also considers the evidence relating to how multidisciplinary and multiagency working can best address the needs of people with ASD at all levels of care provision. It considers educational interventions which may influence clinical outcomes but does not examine educational and social opportunities offered to those with ASD which may add value to their lives and promote social inclusion.

Myers SM, Johnson CP, et al. **Management of children with autism spectrum disorders**. Pediatrics 2007; 120(5):1162-82. http://pediatrics.aappublications.org/content/120/5/1162.full.pdf

This clinical report from the American Academy of Pediatrics reviews the educational strategies and associated therapies that are the primary treatments for children with ASD. It aims to assist paediatricians in educating parents and helping them to choose empirically supported interventions for their children. It also covers important health care issues including management of associated medical problems, pharmacologic and non-pharmacologic intervention for challenging behaviours or coexisting mental health conditions, and use of complementary and alternative medical treatments.

National Initiative for Autism: Screening and Assessment, Le Couter Anne (Chair, working group). 2003. **National Autism Plan for Children**. London: The National Autistic Society. http://www.autism.org.uk/~/media/NAS/Documents/Extranet/Autism-library/Magazines-articles-and-reports/Reports/Other-reports/National%20Autism%20Plan%20for%20Children%20full%20report.ashx

These guidelines address identification, assessment, diagnosis and access to early interventions for pre-school and primary school age children with ASD. The recommendations are A, B, or C as follows: Grade A (at least one RCT), Grade B (well conducted clinical trials but no RCTs) and Grade C (expert NIASA Working Group recommendation).

Recent Systematic and Other Reviews

Cheuk KLD, Wong V, Chen XW. 2013. **Acupuncture for autism spectrum disorders (ASD)**. Cochrane Database of Systematic Reviews(7).

This review assessed the effectiveness of acupuncture for people with ASD in improving core autistic features, as well as communication, cognition, overall functioning and quality of life, and to determine if it has any adverse effects. The authors identified ten trials involving 390 children with ASD in Hong Kong, mainland China and Egypt. The children's ages ranged from three to 18 years and the lengths of treatment from four weeks to nine months. The authors concluded that current evidence does not support the use of acupuncture for ASD since the trials in children have been inconclusive and there have been no RCTs in adults with ASD.

Williams K, Brignell A, Randall M, et al. 2013. **Selective serotonin reuptake inhibitors (SSRIs) for autism spectrum disorders (ASD)**. Cochrane Database of Systematic Reviews(8).

This review considered whether treatment with an SSRI: 1. improves the core features of autism (social interaction, communication and behavioural problems); 2. improves other non-core aspects of behaviour or function such as self-injurious behaviour; 3. improves the quality of life of adults or children and their carers; 4. has short- and long-term effects on outcome; and 5. causes harm. Nine RCTs (320 participants in total) were included, evaluating four different SSRIs: fluoxetine (three studies), fluvoxamine (two studies), fenfluramine (two studies) and citalopram (two studies). Five studies included only children and four, only adults. The studies varied in their inclusion criteria relating to diagnosis and IQ and also in their outcome measures so meta-analysis of study results was not possible except for the outcome 'proportion improvement'. One large, high-quality study in children found no evidence of positive effect of citalopram. Three small studies in adults showed positive outcomes for Clinical Global Impression and obsessive-compulsive behaviour; one study showed improvements in aggression, and another in anxiety. The authors concluded that here is no evidence of beneficial effect of SSRIs in children and emerging evidence of harm and also that there is limited evidence of the effectiveness of SSRIs in adults from small studies in which risk of bias is unclear.

Oono IP, Honey EJ, McConachie H. 2013. **Parent-mediated early intervention for young children with autism spectrum disorders (ASD).** Cochrane Database of Systematic Reviews(4).

Young children with autism have impairments in social interaction and communication and often also exhibit repetitive and/or non-compliant behaviour. These characteristics are difficult for parents so helping parents develop interaction and behaviour management strategies are a common focus for early interventions in ASD. This review assessed the effectiveness of parent-mediated early interventions in terms of the benefits for both children with ASD and their parents and to explore some potential moderators of treatment effect. It included 17 studies (all RCTs) involving 919 children with ASD in six countries (USA, UK, Australia, Canada, Thailand and China). The studies differed in the theoretical basis underpinning interventions, the duration and intensity of interventions, and the way outcomes were measured but meta-analyses were possible for subsets of data from ten studies that evaluated interventions to enhance parent interaction style and thereby facilitate children's communication. The authors concluded that there was some evidence for the effectiveness of parent-mediated interventions, especially in proximal indicators within parent-child interaction such as improvement in parent-child synchrony in observed interactions, but also in more distal indicators of child language comprehension and reduction in severity of autism characteristics. The effect sizes were generally small but the authors stated that for a serious disorder like ASD, even small gains could serve as pointers to potentially effective approaches for managing early childhood autism. The evidence on whether such interventions may reduce parent stress was found to be inconclusive.

Tan LM, Ho JJ, Teh HK. 2012. **Polyunsaturated fatty acids (PUFAs) for children with specific learning disorders.** Cochrane Database of Systematic Reviews(12).

The authors of this review had hoped to assess the effects of polyunsaturated fatty acids (PUFAs) supplementation on learning outcomes for children with specific learning disorders (including those with co-existing developmental disorders such as ADHD and autism) but they were unable to find any relevant RCTs or quasi-RCTs. They concluded that there was insufficient evidence from which to draw any conclusions about the effectiveness of PUFAs for these children.

Reichow B, Barton EE, Boyd BA, et al. 2012. **Early intensive behavioral intervention (EIBI) for young children with autism spectrum disorders (ASD)**. Cochrane Database of Systematic Reviews(10).

Early intensive behavioural intervention (EIBI) is one of the more well-established treatments for ASD. It is a treatment based on the principles of applied behaviour analysis and delivered for multiple years at an intensity of 20 to 40 hours per week. This review systematically reviewed the evidence for the effectiveness of EIBI in increasing the functional behaviours and skills of young children with ASD. The authors identified one RCT and four controlled clinical trials (203 participants in total) which met their inclusion criteria. They conducted meta-analyses using a random effects model on the four CCTs for the outcomes adaptive behaviour composite (behaviours that increase independence and the ability to adapt to the environment), IQ, communication and language skills, social competence, and daily living skills. The results (expressed as standard mean difference effect size) provided evidence that EIBI improves adaptive behaviour (SMD ES 0.69; 95% Confidence interval 0.38 to 1.01), IQ (SMD ES 0.76; 95% CI 0.40 to 1.11), expressive language (SMD ES 0.50; (95% CI 0.05 to 0.95) receptive language (SMD ES 0.57; 95% CI 0.20 to 0.94), everyday communication skills (SMD ES 0.74; 95% CI 0.30 to 1.18), everyday social competence (SMD ES 0.42; 95% CI 0.11 to 0.73), and daily living skills (SMD ES 0.55; 95% CI 0.24 to 0.87) for this population. The authors noted that the overall quality of the evidence was low as there as a high risk of bias due to the studies being non-randomised. They concluded that there was some limited evidence that EIBI is an effective behavioural treatment for some young children with ASD.

Williams K, Wray JA, Wheeler DM. 2012. **Intravenous secretin for autism spectrum disorders (ASD)**. Cochrane Database of Systematic Reviews(4).

In 1998 secretin, a gastrointestinal hormone, was suggested as an effective treatment for autism spectrum disorders (ASD), based on anecdotal evidence. This review considered data from 14 RCTs of intravenous secretin compared to placebo involving over 900 children. The trials reported on twenty-five established standardised outcome measures and no more than four studies used any one outcome measure similarly. Outcomes were reported at between three and six weeks. The authors concluded that these trials provide no evidence that single or multiple dose intravenous secretin is effective and therefore at present it should not be recommended or administered as a treatment for ASD.

Reichow B, Steiner AM, Volkmar F. 2012. **Social skills groups for people aged 6 to 21 with autism spectrum disorders (ASD)**. Cochrane Database of Systematic Reviews(7).

Social skills groups led by therapists aim to improve the social competence of people with ASD. They typically meet once per week over 12 or more weeks. Common topics covered include emotional recognition and regulation, social competence, social problem solving, and social communication This review assessed the effectiveness of these groups for people with ASD. The authors found five relevant RCTs, all conducted in the U.S. There were 196 participants ranging in age from six to 21 years and, across all the studies, participants had a mean IQ in the average range. The authors conducted random-effects meta-analysis where this was possible and reported the results as standardized mean difference effect sizes (ES). They reported that there is some evidence that social skills groups improve overall social competence (ES = 0.47, 95% confidence interval (CI) 0.16 to 0.78) and friendship quality (ES = 0.41, 95% CI 0.02 to 0.8) for this population. Data from two studies indicated no differences between treatment and control groups in relation to emotional recognition (ES = 0.34, 95% CI −0.20 to 0.88) and data from one study indicated no differences in social communication as related to the understanding of idioms (ES = 0.05, 95% CI −0.63 to 0.72). Two additional quality of life outcomes were evaluated, and results of single studies suggested decreases in loneliness (ES = −0.66, 95% CI 1.15 to −0.17) but no effect on child or parental depression. The authors concluded that there is some evidence that social skills groups can improve social competence for some children and adolescents with ASD but more research is needed.

Ching H, Pringsheim T. 2012. **Aripiprazole for autism spectrum disorders (ASD)**. Cochrane Database of Systematic Reviews(5).

Anti-psychotic drugs have been used to treat irritability associated with ASD. Aripiprazole, a third generation atypical antipsychotic, is a relatively new drug that has a unique mechanism of action different from other antipsychotics. This review examined the efficacy and safety of aripiprazole for people with ASD. There were two RCTs that had evaluated the use of aripiprazole in 316 children with ASD over a period of eight weeks. These trials were considered to be at low risk of bias. Meta-analysis of study results indicated a mean improvement of 6.17 points on the Aberrant Behavior Checklist (ABC) irritability subscale, 7.93 points on the ABC hyperactivity subscale, and 2.66 points in the stereotypy subscale in children treated with aripiprazole compared to children treated with a placebo. Adverse effects were a greater increase in weight (mean increase of 1.13kg relative to placebo) and a higher risk ratio for sedation (RR 4.28) and tremor (RR 10.26). The authors concluded that the evidence suggests that aripiprazole can be effective in treating some behavioural aspects of ASD in children, in particular irritability, hyperactivity, and stereotypies (repetitive, purposeless actions), but that the benefits need to be weighed against significant side effects such as weight gain, sedation, drooling and tremor. They stated that longer term studies are needed.

Hurwitz R, Blackmore R, Hazell P, et al. 2012. **Tricyclic antidepressants for autism spectrum disorders (ASD) in children and adolescents**. Cochrane Database of Systematic Reviews(3).

Tricyclic antidepressants (TCAs) block noradrenaline and serotonin reuptake, thereby increasing the availability of these neurotransmitters in the central nervous system. They have been used as in the treatment of autistic symptoms and comorbidities, especially anxiety and obsessive-compulsive type behaviours, in people with ASD. This review considered whether treatment of people with ASD using tricyclic antidepressants: 1. improves the core features of autism, including restricted social interaction, restricted communication and stereotypical and repetitive behaviours; 2. improves non-core features such as challenging behaviours; 3. improves comorbid states, such as anxiety and depression; and 4. causes adverse effects. The authors found three small RCTs, with between 12 and 32 participants, most of whom had significant intellectual disability. Two trials assessed clomipramine and one, tianeptine. One trial (of clomipramine) included both adults and children, the other two trials only children. Meta-analysis of study results was not possible due to the differences between trials in participant characteristics, medications investigated and outcomes measured. The authors concluded that clinicians contemplating prescribing these medications for people with ASD need to be aware of the limited and inconsistent evidence for the effectiveness of these drugs and the possibility of adverse effects, including interference with cardiac conduction, drowsiness and reduced activity levels.

James S, Montgomery P, Williams K. 2011. **Omega-3 fatty acids supplementation for autism spectrum disorders (ASD)**. Cochrane Database of Systematic Reviews(12).

It has been suggested that deficiency of omega-3 fatty acids may partially explain the impairments associated with ASD and that people with ASD may benefit from Omega-3 supplementation. This review assessed the efficacy of omega-3 fatty acids for improving core features of ASD (such as social interaction, communication, and stereotypies) and associated symptoms. It included two RCTs involving 37 children with ASD who received either omega-3 fatty acids supplementation or a placebo. These trials did not indicate that omega-3 supplements had an effect on social interaction (mean difference (MD) 0.82, 95% confidence interval (CI) −2.84 to 4.48, I^2 = 0%), communication (MD 0.62, 95% CI −0.89 to 2.14, I^2 = 0%), stereotypy (MD 0.77, 95% CI −0.69 to 2.22, I^2 = 8%), or hyperactivity (MD 3.46, 95% CI −0.79 to 7.70, I^2= 0%). The authors concluded that there was no high quality evidence omega-3 fatty acids supplementation is effective for improving core and associated symptoms of ASD.

Jesner OS, ArefAdib M, Coren E. 2009. **Risperidone for autism spectrum disorder**. Cochrane Database of Systematic Reviews(4).

Risperidone is an atypical antipsychotic drug, commonly used to treat schizophrenia, which has been used for symptom relief and improvement of problem behaviours, such as self-injury or aggression, in people with autism. This review aimed to evaluate the efficacy and safely of risperidone in people with ASD. The authors identified three short-term (three months or less) RCTs comparing risperidone to placebo. Numbers of participants ranged from 31 to 101. One study involved adults only and the others 5–17 year olds and 5–12 year olds. Two studies had a high proportion of participants leaving the study (20% to 25%). Meta-analysis was possible for three outcomes: Clinical Global Impression Scale, Aberrant Behavior Checklist and weight gain. The authors found that there was some evidence for the benefits of risperidone in irritability, repetition and social withdrawal but there were also adverse effects, most notably weight gain (in the two studies of children, 2.7kg (95% CI 1.15 to 2.41) in the treatment group).

Sinha Y, Silove N, Hayen A, et al. 2011. **Auditory integration training and other sound therapies for autism spectrum disorders (ASD)**. Cochrane Database of Systematic Reviews(12).

Auditory integration therapy, and the similar therapies, the Tomatis Method and Samonas Sound Therapy, are techniques for improving abnormal sound sensitivity in individuals with behavioural disorders including ASD. This review evaluated the effectiveness of auditory integration training and similar therapies in people with ASD. The authors identified six RCTs of auditory integration therapy and one of Tomatis therapy, involving a total of 182 individuals aged three to 39 years. Five trials had fewer than 20 participants and allocation concealment was inadequate in all of the studies. Across all the studies 20 different outcome measures were used and only two outcomes were measured in three or more studies. Meta-analysis was not possible due to the heterogeneity of the studies. Three small studies reported improvements at three months for the auditory integration therapy group based on the Aberrant Behaviour Checklist, but the authors noted that they used a total score rather than subgroup scores, which is of questionable validity (it is an incorrect use of the checklist according to the checklist's developer), and that the results of one of these studies did not reach statistical significance. Another study also reported improvements at three months in the auditory integration therapy group for the Aberrant Behaviour Checklist subgroup scores. The one small cross-over study of Tomatis therapy described an improvement in language that was similar in the treatment and placebo groups. The authors conclude that there is no evidence that auditory integration therapy or other sound therapies are effective as treatments for ASD but also not sufficient evidence to prove they are ineffective due to the disparate outcome measures between studies.

Gold C, Wigram T, Elefant C. 2009. **Music therapy for autistic spectrum disorder**. Cochrane Database of Systematic Reviews(4).

Music therapy for people with autism spectrum disorders aims to enhance communication and expression using music and its elements. This review assessed the effect of such therapy. The authors identified three very small studies (four to ten participants in each, 24 in total) meeting their inclusion criteria, all from the U.S. Two were RCTs and the other called itself "counterbalanced". The trials were all very short, lasting from one to four weeks and the duration of treatment was only one week (with one session per day) in each study. Music therapy was found to be superior to "placebo" therapy with respect to verbal and gestural communicative skills (verbal: 2 RCTs, n = 20, SMD 0.36 CI 0.15 to 0.57; gestural: 2 RCTs, n = 20, SMD 0.50 CI 0.22 to 0.79). Effects on behavioural problems were not significant. The authors concluded that the studies included in their review were of limited applicability to clinical practice but their findings indicated that music therapy may help some children with ASD to improve their communication skills.

Millward C, Ferriter M, Calver SJ, et al. 2009. **Gluten- and casein-free diets for autistic spectrum disorder**. Cochrane Database of Systematic Reviews(4).

It has been suggested that peptides from the dietary proteins casein and gluten may have a role in the origins of autism and that gluten and/or casein free diets may be beneficial for people with ASD. This review identified only two small RCTs of a gluten and casein free diet vs. a normal diet, one with 15 children (lasting 12 weeks, with cross-over at six weeks) and one with 20 (lasting 12 months). Meta-analysis was not possible. The results of the longer study indicated a beneficial effect of the diet on reduction in autistic traits (mean difference (MD, intervention − control) = −5.60; 95% CI −9.02 to −2.18; z = 3.21; p=0.001), communication and interaction (MD = 1.70; 95% CI 0.50 to 2.90; z = 2.77; p=0.006) and social isolation (MD = −3.20; 95% CI −5.20 to −1.20; z = 3.14; p=0.002). The shorter study found no significant differences between the intervention and control groups. The authors noted that the outcome 'social isolation' was a component of the outcome 'autistic traits' (implying that these two outcomes are not independent). They pointed out that gluten and casein-free diets are costly to the family both in monetary terms and in convenience and they concluded that these diets could not be recommended on the basis of the limited evidence available.

Nye C, Brice A. 2009. **Combined vitamin B6-magnesium treatment in autism spectrum disorder.** Cochrane Database of Systematic Reviews(4).

For several decades, large doses of vitamin B6 and magnesium have been reported to be beneficial for people with ASD. This review assessed the efficacy of vitamin B6 and magnesium (B6-Mg) for improving behaviour in the areas of social interaction, communication, and behavioural responses to environmental stimuli in children and adults with ASD. Although there have been many published studies of this therapy which were not RCTs, the authors of this review identified only three small RCTs, with a total of 33 participants aged 3–18 years and intervention periods which varied from four to 20 weeks. They concluded that, due to the small number of studies, the methodological deficiencies of the studies, and the small sample sizes, no recommendations can be made based on their review regarding the use of B6-Mg as a treatment for autism. They stated that here is insufficient evidence to demonstrate efficacy of B6-Mg.

Other Relevant Publications

Bevan-Brown J. **Māori Perspectives of Autistic Spectrum Disorder**. Wellington Ministry of Education, 2004. http://www.educationcounts.govt.nz/publications/special_education/5479

This study reported on interviews with the parents and whānau of 19 Māori children with ASD who shared their experiences of raising their children. It includes information on significant areas of unmet needs.

Note: The publications listed were identified using the search methodology outlined in Appendix 1 (Search Methods for Policy Documents and Evidence-Based Reviews)

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