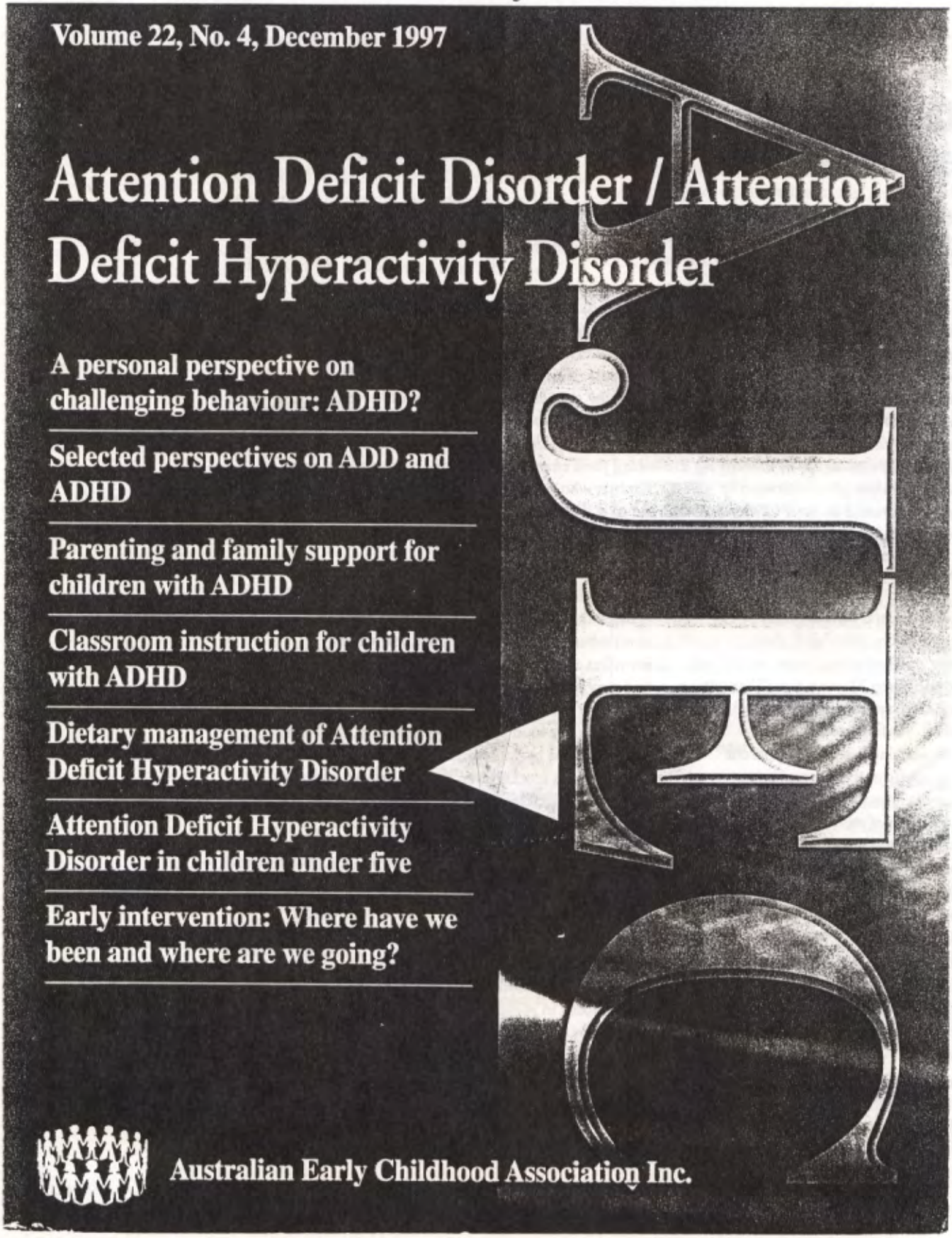
Australian Journal of Early Childhood

Volume 22, No. 4, December 1997

Attention Deficit Disorder / Attention Deficit Hyperactivity Disorder



Australian Early Childhood Association Inc.

Dietary Management of Attention Deficit Disorder

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The effects of diet on ADHD behaviours is reviewed. Early studies failed to eliminate sufficient problem-causing foods, to recognise the validity of parental observations, to rate adequately some of the most common symptoms such as irritability and sleep disturbance rather than hyperactivity, and focused on the effects of sugar, which has been shown not to cause behaviour changes. More recent studies show that additive-free diets alone are of little benefit and broader dietary intervention is required. The mechanism for behavioural reactions to foods is food intolerance, not allergy. A low-chemical elimination diet followed by challenges can assist in identifying provoking food chemicals. Dietary management can be part of multimodal treatment of ADHD. Parents who wish to pursue dietary management should be assisted in their efforts and referred to a dietitian.

Introduction

Scientific attitudes to dietary management of ADHD are changing. The possibility that children's learning and behaviour could be affected by diet was first published 75 years ago (Shannon, 1922). In 1974 American paediatrician Dr Ben Feingold suggested that food additives and salicylates may be associated with an apparent increase in hyperactivity and there was great interest in testing his hypothesis. However, in 1980 the results of a selection of studies, most of which focused on food additives, were judged inconclusive and the Feingold hypothesis was discredited (NACHFA, 1980). This paper reviews more recent studies which show that additive-free diets alone are insufficient to produce behavioural improvements in most ADHD children and broader dietary intervention is required.

The scientific evidence reviewed

The early diets

Researchers test the food-behaviour connection by monitoring children's behaviour while they eat either disguised elimination diets, or an elimination diet plus 'challenge' tests. During challenges, items such as disguised food dyes are eaten under controlled conditions. It is now realised that an elimination diet must be comprehensive because any chemical which provokes a reaction will prevent complete recovery and may result in inconclusive challenge results (Clarke et al., 1996). Early elimination diets which excluded only food additives (Goyette et al., 1978) were criticised by subsequent researchers who found that so few children reacted only to additives that an additive-free diet by itself would be of little benefit (Carter et al., 1993). Similarly, results of studies in which food dyes were disguised in chocolate cookies (Goyette et al., 1978) were questioned by later researchers who found 59% of hyperkinetic children reacted to chocolate (Egger et al., 1985).

Feingold's diet excluded not only food additives but also natural food chemicals called salicylates which occur in some fruits, vegetables, herbs and spices. The negative findings of an early study which used Feingold's diet (Harley et al., 1978) may be accounted for by Feingold's use of German analyses of salicylate content done at the turn of the century. A more recent analysis of salicylate contents showed that some foods permitted on the

Feingold diet, such as pineapple, were high in salicylates (Swain et al., 1985). The original Feingold diet also failed to exclude amines and natural monosodium glutamate (MSG) which were found to provoke adverse reactions in a group of hyperactive patients in a double blind placebo-controlled study (Loblay and Swain, 1986). The importance of natural food chemical exclusion is suggested by these researchers' finding that salicylates were the major provoking food chemical, affecting 74% of the group (See Table 1).

Table 1.
Reactions to challenges among 140 mostly children (72% male) presenting with behavioural symptoms.

Challenge	% reacting
Salicylates	74
Preservatives	67
Nitrates	60
Tartrazine	54
Antioxidants	41
Amines	40
M.S.G.	39
Lactose	18
Gluten	0
Sucrose (placebo)	3

Adapted from Loblay and Swain, 1986, p.173.

Since 1985 the following major studies have shown that observations of change in behaviour made by parents can be reproduced using double-blind methodology and objective assessments. In Canada, 58% of 24 hyperactive boys showed reliable improvement on a disguised restricted diet (Kaplan et al., 1989). In London, 79% of 76 hyperkinetic children responded to the *Few Foods* diet and double-blind trials reliably provoked behavioural problems in a group of responders (Egger et al., 1985). A repeat of this experiment with 78 diagnosed ADD children obtained similar results (Carter et al., 1993) as did a study in the USA where 73% of 26 children meeting the criteria for ADHD responded favourably to an elimination diet (Boris & Mandel,1994).

Value of parental observations

All of the above studies were criticised for their dependence on parental rating scales (Wolraich, 1996). Yet parents were found to be 'reliable observers and raters of their children's behaviour' by researchers who tested the validity of parental ratings in an Australian study. In this study 24 children with suspected hyperactivity displayed clear dose-related responses to tartrazine yellow food dye challenges (Rowe & Rowe, 1994).

Which behaviours?

Despite the Feingold emphasis on hyperactivity, one of the features of children's behaviour problems first associated with food reactions was irritability (Randolph, 1947) and recent researchers again suggest that mood, especially irritability, is the symptom most affected by diet (Breakey, 1997). Children became 'more manageable and more amenable to reasoning rather than less active or better able to concentrate' in a London study (Carter et al., 1993). As the frequently-used Conners Abbreviated Parent-Teacher Questionnaire places little emphasis on irritability and contains no measure of sleep disturbance, previous studies using this scale may have missed identifying some reactors, according to researchers who found irritability, restlessness and sleep disturbance were the most commonly reported responses to tartrazine (Rowe & Rowe, 1994).

Effects of sugar

Since the early Feingold studies, the majority of American researchers turned their attention to possible behavioural effects of sugar. In a meticulous study of 25 normal preschool children and 23 school aged children described by their parents as sensitive to sugar, researchers removed all food from their households and provided all the food on three different diets for nine weeks. Disguised experimental diets contained either sugar, aspartame or saccharine. No significant difference was found in the children's behaviour on any of the diets (Wolraich et al., 1994). Despite a strong public perception that sugar is related to hyperactivity, a meta-analysis of 23 studies did not find any significant behavioural or cognitive effects from sugar (Wolraich et al., 1995). Parents who blame sugar may have misinterpreted the child's

reaction to food chemicals such as additives or salicylates which are also present in many sweetened foods (Swain et al., 1991).

Changing scientific attitudes to dietary management of ADHD

Experts disagree on the role of diet in the management of ADHD. Dietary treatment is not recommended by such internationally recognised authorities as American psychologist Russell Barkley, who refers to the negative results of sugar studies. Barkley (1990) also cites the review by Conners (1980) as evidence for negative findings on the effects of food chemicals, although in a more recent review Conners (1989, p.184) concludes, 'I have to admit that I have changed my mind about the Feingold idea since the 1970s'. He recommends that the evidence is strong enough for a broad range of unnecessary and possibly harmful ingredients to be eliminated from these children's diets, at least for preschoolers and especially for those with confirmed 'allergic' symptoms.

The mechanism of behavioural reactions

According to Bernard Weiss, Professor of Toxicology at Rochester University, studies consistently show that some children respond adversely to food dyes and that the most sensitive children seem to be the youngest. Neurobehavioural reactions have been observed during the early stages of many toxic episodes and serve as early warning signals of toxicity (Weiss, 1983). Behavioural reactions to food additives are not a true allergic response —characterised by the production of measurable immunoglobulin E antibodies—but an intolerance reaction like the response to a drug. Food intolerance is dose-related and there are variations in individual susceptibility (Weiss, 1983; Loblay & Swain, 1986). Reactions can be cumulative, can be caused by many foods, can be delayed for up to 48 hours and are difficult to detect for these reasons (Loblay & Swain, 1986).

Psychologist Joseph Sargeant at the University of Amsterdam states that at least a few children with hyperactive behaviour react badly to food, but that an elimination diet will help only a minority (Taylor et al., in press). His opinion is based on a community survey in which 7.4% of more than 18,000 respondents to a questionnaire assessed themselves as food intolerant. After studying 132 of these respondents, researchers decided that the true prevalence of food additive intolerance was less than 0.1 % (Young et al., 1987). This study used the same flawed method which produced inconclusive results in the original Feingold studies, that is, an additive-free diet followed by food colouring or preservative challenges. Other researchers propose that the prevalence of food intolerance is unknown but is estimated to occur in perhaps 10% of the population (Clarke et al., 1996). The difficulty of obtaining a representative sample and methodological disagreements suggest that the true prevalence of food intolerance is not yet known.

Symptoms of food intolerance

According to the Dietitians Association of Australia review paper on management of food intolerance (Clarke et al., 1996), a low-chemical elimination diet is used for manifestations of food intolerance such as urticaria and eczema; gastro-intestinal symptoms such as abdominal pain, flatulence and diarrhoea; respiratory symptoms including nasal congestion, sinusitis, some cases of asthma with bronchial hyperreactivity; and neurological symptoms like headaches, tinnitus, impairment of memory and concentration, and lethargy, as well as for hyperactivity.

Researchers have noted that hyperactive children who have a personal or family history of one or more symptoms such as migraine, skin rashes, stomach aches, asthma or nasal congestion have been seen to improve on diet (Kaplan et al., 1989; Rowe & Rowe, 1994; Carter et al., 1993; Conners, 1989). Another study found that those without 'allergic' symptoms did as well as those with them (Egger et al., 1985).

Management issues

Indications for the use of dietary management of ADHD

Researchers assent that dietary management may be used to control symptoms of ADHD (Boris & Mandel, 1994); particularly in younger children or those with a history of 'allergy' (Weiss, 1983; Kaplan et al., 1989; Conners, 1989); if parents notice some effects of diet (Weiss, 1983; Egger et al., 1985; Carter et al., 1993); as part of multimodal treatment including medication and behaviour managment (Connors, 1989; Breakey,

1997); or if conventional treatments fail (Wolraich,1996). In addition, it is recommended that a dietitian be consulted before any strict elimination diet is attempted (Clarke et al., 1996; Breakey, 1997; Taylor, in press).

The Australian low-chemical diet

Elimination diets differ in their difficulty of application. The Few Foods diet from Britain is typically two meats (often lamb and turkey), two carbohydrate sources (rice and potato), two fruits (often banana and pear), a range of root and green vegetables, bottled water, sunflower oil and milk-free margarine. It is criticised by researchers as expensive, complicated and difficult to carry out (Carter et al., 1993; Taylor et al., in press). Researchers recommend that the mode of administration of the diet needs to be simplified to make it more easily applicable (Carter et al., 1993).

By comparison, the Australian low-chemical elimination diet excludes more than 50 food additives, a comprehensive list of salicylates, amines, monosodium glutamate, and, when indicated, dairy foods and wheat. Permitted foods include: one fruit (pear), 20 vegetables; a range of fresh meats, seafood and eggs; a range of cereals, grains and flours; various sugars, syrups and confectionery; several oils and margarines; a range of dairy foods for most individuals; and many of the packaged foods available in supermarkets. A patient's request is considered sufficient reason for a trial of a low-chemical elimination diet. Refusing to help usually results in patients seeking advice from unorthodox practitioners or altering their diet on the basis of misconceptions about food allergies. The diet is regarded as appropriate for use when supervised by an informed dietitian who should seek advice from a specialist clinic in difficult cases (Clarke et al., 1996).

In the long-term

Following up after two years on families using the Feingold diet, researchers found 13 out of 14 mothers described their children's behaviour as having improved since the end of the study. Typically, they reported a steady, gradual increase in self-control and a marked improvement in schoolwork (Conners, 1980). In a study which had used the Few Foods diet, 92% of children in the study were still continuing with the diet when last seen. Researchers commented that being on an acceptable diet did seem to make a remarkable difference in the lives of many of these families (Egger et al., 1985).

The need for support for the child and parent

Although compliance is acknowledged as a problem (Feingold, 1974), there is little mention of behaviour management in the majority of diet studies. Families where there were discordant marital relations were less likely to report a change in behaviour associated with diet (Carter et al., 1993). Behaviour management and support for parents may be important factors in the success of dietary management (Dengate, 1994).

Australian dietitian Joan Breakey provided management strategies for families during a trial of a low additive, low salicylate diet in the treatment of 516 children aged 2–16 who were referred to a metropolitan child psychiatry clinic for learning or behavioural problems (Breakey et al., 1991). A positive response was obtained in 80% of the children, with a normal range of behaviour achieved in 54%. Of the 25% of children in whom diet was necessary but not sufficient, half also required stimulant medication. The role of the dietitian in this study included helping families with social occasions, peer pressure, difficult teenagers and behaviours typical of the presenting problem such as sneakiness and stubbornness. Children were encouraged to become 'diet detectives', to keep diaries and to manage their own food intolerance. Breakey (1997) suggests that diet therapy involves printed support material, a minimum of two hours contact time and phone support as required over a period of three months. The dietitian should be familiar with the diet and its management in children with behaviour problems.

Conclusion

Since 1985, studies have shown diet to affect a significant number of children in double-blind placebo-controlled trials. The mechanism of behavioural reactions to food is intolerance, not allergy. Contrary to popular opinion, sugar has been shown not to cause behaviour changes, and additive-free diets alone seem to be of little benefit. Broader dietary intervention, with challenge tests

after a low-chemical elimination diet, can help to identify which food chemicals provoke adverse reactions. Dietary management is seen as part of multimodal treatment of ADHD. Families should be referred to a dietitian if parents wish to pursue dietary management or if conventional methods of treatment are unsuccessful.

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