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A balanced approach towards healthy eating in autism

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Background: This audit was undertaken to investigate the dietary intake and food-related behaviour of children diagnosed within the autistic spectrum continuum. It was hoped to understand the difficulties faced by parents and carers and to offer a holistic service.
Method: Parents of 17 autistic children aged 42–117 months were interviewed and data collected by 3-day dietary recall and food frequency questionnaire. Weight and height measurements for each child were obtained. South Derbyshire Ethics Committee approval was given.
Results: Nutrient intakes on analysis fell below reference nutrient intake (RNI) levels for 53% (nine) children in one or more of the following nutrients: vitamin C, iron, vitamin D, niacin, riboflavin, vitamin B_6, calcium and zinc. One child fell below the lower reference nutrient intake (LRNI) for iron and three children aged under 4 years did not meet the LRNI for vitamin D from dietary sources. Excessive milk consumption in 13 children raised calcium intake to levels above 200% of RNI levels.
Conclusion: Eating habits were extremely prescriptive. Food preferences were specific for 'dry' or 'wet' forms, colour, shaped retail products and even brand packaging. Food refusal and introduction of new foods were cited as the most difficult problems faced by parents. Oral sensitivity, poor oral motor movements and difficult eating behaviours were identified and an integrated service involving dietitian, speech therapist and paediatric clinical psychologist was advocated.

Key words: autism, eating habits, dietary recall.

Introduction

Autism is a disability that profoundly affects the way a child interacts and communicates with other people around them (National Autistic Society, 1995). Diagnosis is made often in the 2nd or 3rd year of life, since these children appear physically normal and early development may be unremarkable. A triad of impaired development markers characterize children within the autistic spectrum disorder although ranging in degrees of severity: poor social interaction, impaired use of communication skills and the absence of imagination in play. In addition the child always shows a repetitive pattern of activities or behaviour and an obsessive desire to cling to routines and order. Detailed descriptions of early childhood autism are given by Wing (1996).

Autistic children often present with bizarre eating habits, feeding difficulties and restrictive diets. However, relatively little detailed information is known about the nature and severity of these eating difficulties and their effect upon family life. De Meyer (1979) found 94% of parents with children with autism reported feeding difficulties compared to 59% of parents with normally developing preschoolers. Raiten & Massoro (1986) reported a higher incidence of food cravings and pica. The National Autistic Society; Principals Group (1991) identified problems with the amounts of food and drinks eaten,

food refusal or obsession, speed of eating and mealtime behaviour.

In order to provide a more effective and informed service to parents with autistic children in South Derbyshire this audit was undertaken to identify any patterns of nutrient deficiency and eating difficulty emerging from the autistic child's adherence to 'sameness'.

Method

Parents of 17 children with autistic spectrum disorders identified by the Consultant Community Paediatrician were all interviewed by myself, a state-registered dietitian. A further seven clients either failed to attend or cancelled the appointment beforehand. The children included in the audit were aged between 3 years 6 months and 9 years 9 months and all live at home with parents/foster parents within South Derbyshire Health Authority.

The interview questionnaire included a 3-day dietary recall (1 weekend day and 2 weekdays) and a food frequency checklist to assess nutrient intake. Quantities of food eaten were assessed using household measures and food models. All the interviews were conducted within 1 month, so no seasonal variation was represented.

Nutrient analysis for each child was done using the Microdiet 9.1 computer program and results compared to the reference nutrient intakes (RNI) for a child of the same age and sex (Department of Health, 1991). Energy intakes were compared to the estimated average requirements (EAR) for energy (Department of Health, 1991).

Growth records from the child's last clinic visit were obtained from the medical notes by permission. Further general questions were asked to identify eating behaviours, routines and preferences and the parents main concerns, if any.

Ethical approval was sought from Southern Derbyshire Ethics committee.

Results

Food selection and analysis

As in other spheres of life children with autistic spectrum disorders prefer repetitive patterns of food, meals in some cases repeating themselves daily and an individual food item appearing many times in one day, e.g. custard or breakfast cereal. Three children in the audit ate fewer than eight different foods in total, seven children ate between 10 and 19 different foods and seven ate 20 or more different foods. In order to ascertain what effect if any this narrow selection of foods has on nutrient intake, comparisons were made with RNI values. In addition, I used the food groupings recommended in the health education authority's National Food Guide – *The Balance of Good Health* which aims to inform the general public about the variety and relative proportions of food to select from each of five food groups to make a healthy diet (Gatenby *et al.*, 1995). Quantitative guidelines for the consumption of foods within each of the five groups are as follows:

bread, cereals and potatoes	6 portions
fruit and vegetables	5 portions
meat, fish and alternatives	2 portions
milk and dairy foods	2 portions
fatty and sugary foods	occasionally

Recognizing that the recommendations were *not* proposed for those under 5 years (i.e. 50% of the audit sample), the National Food Guide was used to highlight the presence and absence of food types (Table 1).

Seventy-one per cent of children (12 children) ate two or fewer portions (one portion = 80 g weight) of fruit and vegetables daily. Only one child ate five portions daily and these were all red apples. Vitamin C supplemented squashes were important providers of vitamin C.

Thirty-five per cent (six children) ate no red meat or meat products and thus iron intake was derived entirely from non-haem sources. Iron-fortified breakfast cereals were the major contributor and provided an average of 25% of total daily iron intake. Three children ate no foods classed within this meat, fish and alternative (i.e. egg, pulses or nuts) group and were all under 5 years. Three children ate no or very minimal amounts of dairy foods including milk whilst for six children dairy foods were frequently eaten in large quantities and met over half the child's energy intake. Fromage

Table 1. Number of servings consumed daily in children 5 years and over

	Bread, cereals and potatoes	Fruit and vegetables	Meat, fish and alternatives	Milk and dairy products	Fatty sugary foods
MS	4	2	2	2	2
KH	5	4	2	2	1
TN	5	1	1	4–5	3
JT	10	5	3–4	0–1	2
MH	5	4	3	3	2
NM	4	2	2	3	4
DT	5	1	1	4	3
CT	7	2–3	3	1	7
FQ	8	2	2	5	1

frais, yoghurt, custard and cheese spread were favourites.

Ninety-four per cent of children (16 children) ate foods within the fatty and sugary food group daily with four children having four or more portions daily. There was a tendency towards salty, savoury snacks and heightened taste for salt, vinegar and tomato sauces on meals.

Nine children in the audit, i.e. 53%, had diets which were below the RNI in one or more nutrients, but the pattern and severity of the deficiencies depended on the choice of foods making up the child's selection and the amounts they were able to consume. The most restrictive food choice was found in the younger children and the number of nutrient intakes falling below RNI levels increased as food variety decreased (Table 2).

Table 2. Age and number of different food types eaten by children in the audit with nutrient intakes below standard RNI levels

Initials	Age (months)	Total no. of different food types eaten by child, i.e. Food Variety	No. of Nutrient intakes falling below RNI values
RF	42	4	4
DS	42	19	3
TS	43	6	4
TW	50	8	1
TH	57	13	2
TN	60	17	1
CT	67	15	2
DT	76	12	1
KH	94	>20	1

Protein needed for growth and repair of body tissues was amply provided in the diets of all the children studied and indeed supplied 3–5 times the RNI. There was no child who excluded all animal products from the diet. Dairy products were eaten in large quantities if meat/fish products were refused and vice versa. All the children studied consumed diets providing levels of vitamin A, thiamin, vitamin B_{12}, folic acid, sodium, potassium, magnesium, phosphorus and copper above the RNI values for each nutrient.

Vitamin C intakes fell below the RNI level of 30 mg day^{-1} for three children, although fruit and vegetable consumption was low for 12 children eating two or fewer servings a day. Fruit and vegetables contributed only 35% of the total daily average intake of vitamin C whilst potatoes and potato products provided 32% (crisps = 12.5%), milk provided 10% and vitamin-C-enriched squashes 24% of the total daily average intake.

Vitamin D intakes were very low for the three youngest children included in the audit under 4 years of age (intakes of 0.01–1.42 mg day^{-1}), where dietary intakes are recommended at a level of 7 mg day^{-1}. Indeed dietary sources do not provide the major proportion of total vitamin D needs in older children being derived from the action of the UV irradiation on the skin. However, young children between 6 months and 3 years are particularly vulnerable to vitamin D depletion because of the rate at which calcium is being laid down as bone and limited UV irradiation at this age in Britain. A supplement providing 7 mg day^{-1} is important in preschool children.

Four children in the study had intakes of

niacin which fell below the RNI, of which one child also fell below the RNI for riboflavin, both vitamins involved in the oxidation of food into energy.

Twenty-nine per cent of children, i.e. five, had low dietary iron intakes with one child having an average daily intake below the LRNI for her age. Iron deficiency anaemia is diagnosed by measuring blood haemoglobin levels but unfortunately too few children had had blood tests to confirm the presence of anaemia as a result of poor dietary iron intakes. Thirty-five per cent of the audit children ate no red meat whatsoever and iron intakes were entirely made up of non-haem sources, less easily absorbed by the body and requiring the presence of an acid to convert ferric iron to the ferrous form. Two of the children with low iron intakes also had deficient vitamin C intakes.

Calcium intake was low for one child, falling below the RNI and caused by a low consumption of milk and dairy foods. White bread (fortified with calcium) eaten in good quantities compensated for low dairy food consumption in two other children. High intakes of calcium and riboflavin reflect the high milk intakes for 13 of the children resulting in levels 200% above the RNI levels.

Zinc was marginally low for two children.

Energy intakes of the children were compared with the estimated average requirements (EAR) based on average energy intakes obtained from large studies of children aged 3–10 years (Fig. 1) It should be recognized that since the EAR values are averages there will be some children normally requiring above and below the average to meet energy and growth needs. Growth monitoring at regular intervals is the best indicator of satisfactory energy intake. Table 3 shows the percentage contributions of foods to the average energy intake of children in the Audit sample.

Fats contributed an average of 34.8% (range 26–43%) of total food energy in the audit children, close to the level advocated for children over 5 years and for adults. Saturated fat contributed an average 13.3% of this total, although the range between the children was great (7–25%). This relatively low proportion of energy from total fat was largely due to the correspondingly high contribution from sugars. Carbohydrates provided an average of 51.1% of total energy intake (range 35–60%) of which 20.4% was provided by nonmilk extrinsic sugars (range 8–32%) much higher than the COMA recommendation of 10%.

Salt intakes were high in this group of children. Intakes of sodium ranged between 3.5 and 0.9 g daily with an average daily intake of 2.3 g, well above the RNI needed at each age range. This was caused by a generally high consumption of crisps and savoury snacks and convenience prepared foods.

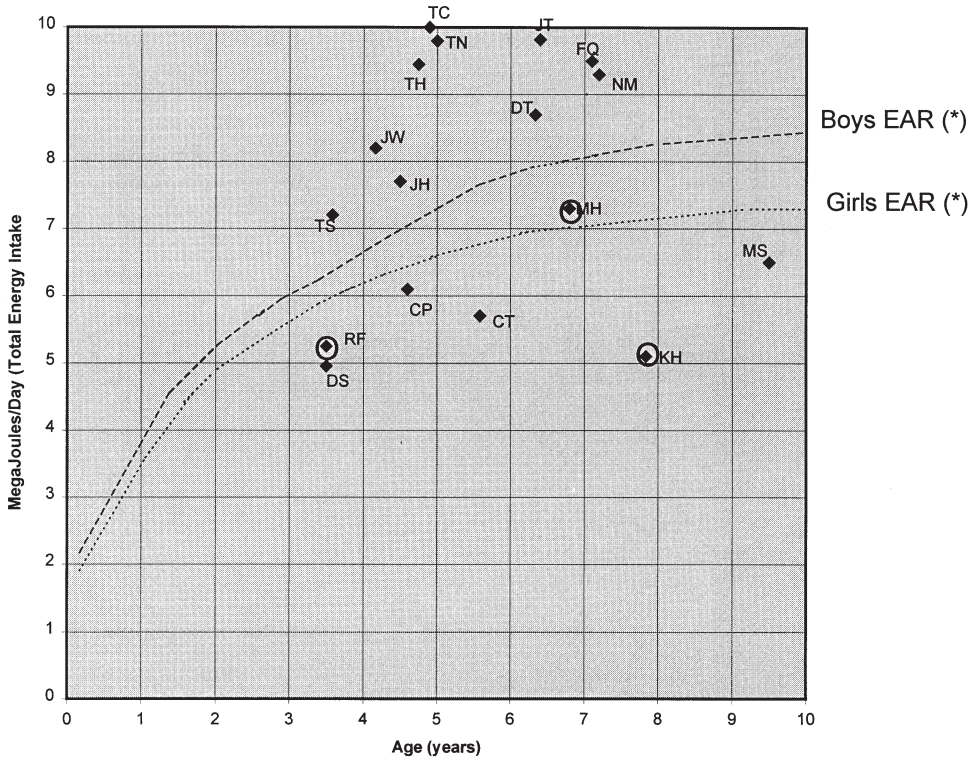
Growth

Each child's most current weight and height was plotted on the Tanner–Whitehouse percentile charts Tanner *et al.* (1996) currently used by the Ronnie MacKeith Child Development Centre, Derby, to show the distribution across the sample. Growth is monitored in an individual child by making serial measurements of weight, length/height and head circumference and compared against reference standards. In general, a child growing normally will follow the same centile curve for weight, length/height and head circumference.

It must be stressed that serial measures are needed and thus the single measurements collected cannot be used in this way, but rather show that as a group these children are not typically small in stature, or low in weight or vice versa, but showed a normal distribution across the percentiles.

Eating behaviours

Fifteen children ate their meal in the same place every mealtime when at home. Often meals spanned hours and the child got up and down from the meal and returned frequently to eat some more. Many parents described their child as 'continually eating' rather than having mealtimes. The child would request, point, help him/herself or bring Mum to the food he/she required. Nine children displayed this type of eating pattern and although parents often considered them to be snacking, many of the foods requested on this basis were nutritious nonjunk food, i.e. cheese, ham, toast, crackers, apples, providing valuable contributions to the overall nutrient intake. Some children ate so few foods that parents were relieved if their child would eat these at any time of the day



(*) Estimated Average Requirement

◆ Audit Sample Boys

◉ Audit Sample Girls

Fig. 1. Average daily energy intake of children included in the audit.

Table 3. Percentage contributions of foods to energy intake of children in audit sample

	Children aged 1 to 4 years National Diet and Nutrition Survey*	Audit Survey in Autistic Children 3 to 9 years
Cereal and cereal products	30	22
Milk and milk products	20	28
Egg and egg dishes	1	0.6
Fat spreads	3	3.4
Meat and meat products	10	9.0
Fish and fish products	2	1.5
Potatoes and potato snacks	12	14.5
Fruits and nuts	3	1.4
Sugar, preservatives and confectionery	8	11.4
Beverages	8	2.4

* Source: National Dairy Council (1996).

and therefore would prepare food to suit in order to encourage them to eat, e.g. tray of small sausage rolls for Sunday lunch. Other children would only eat a certain food item if it was contained in specific branded packaging or presented in a prescribed manner.

In all 17 cases interviewed food refusal and the introduction of new foods into the diet was considered the major problem, thus limiting nutrient intake to the contribution made by a narrow range of foods. Some parents could remember the age at which their child started to refuse foods quite suddenly, changing from eating everything as a baby to 'eating hardly anything'. This change occurred at between 12 months and 3 years and often accompanied other developmental delays and loss of skills. It most frequently occurred with the change from baby to family foods or mashed food to solid food. Many parents described improvement in a variety and range of foods being eaten by their child after starting school and food variety was most restricted in the younger children in the study. Seven children would eat only dry foods, e.g. dry breakfast cereals, foods without gravy, sauces or custard. Almost all the children were very prescriptive over the 'form' of an individual food item to be eaten. Typically, meat and fish would only be eaten 'breadcrumbed' or 'shaped' as sold in one specific retail product. Similarly many of the children ate potatoes in one form only, requiring parents to purchase oven-ready foods in large quantities for repeated mealtimes. Colour was an important factor for three children, who would only eat 'red' apples, 'red' jam and vegetables that were 'white'. Three children distinguished brand packaging and refused to eat the same product from a different branded package. (Table 4)

Table 4. Concerns expressed by parents about their child's dietary intake

Little/no fruit and vegetables eaten	6
Little/no meat eaten	3
Lack of fibre – problems with constipation	2
Too much sugar or junk food eaten	2
Doesn't eat at all or diet very restricted	2
Little milk taken	1
No hot food eaten	1
Too many eggs eaten	1
Have to limit amounts eaten to prevent overweight	1

Food preferences of individual children would occur in 'phases' lasting for 1 week to 6 months and then without warning would change completely to another variety or food item without reason and which would be eaten in large quantities instead.

Most parents had tried diligently to introduce new foods to expand their child's diet with varying success. Six parents said that they mixed a new food into a preferred food. In four of these cases mashed potato was the 'vehicle' to hide other mashed vegetables or cheese. Pureed fruit had also been tried in custard and in yoghurt. Many children had become experts in detecting the hidden foods. Five parents had found that their child would taste a new food if it was on Mum or Dad or siblings' plates. Three other parents tried to leave new food around or to allow play contact first before presenting it in a mealtime context. Three parents had given up completely at attempting introduction and felt the reaction evoked was not worth the attempt. Family life was easier if they did not make an issue of eating. Many felt it was better that they ate their preferred food rather than forcing a new food and so rejecting a whole meal.

All the sample children drank large quantities of fluid, and milk was still the staple energy provider for the children under 5 years of age. This proves to be a problem as the child tends to increase his or her milk intake to satisfy hunger rather than consume increasing amounts of varied solid foods as weaning progresses. The use of bottles and teats into the 4th and 5th year of life is also common practice.

Conclusion

The audit sample was small but clearly wide differences between children within the autistic spectrum disorders in this sample are reflected. However, all the parents interviewed expressed that they were experiencing (or had in the past experienced) difficulties surrounding food issues with their child. For 12 out of 17 children, the present degree of difficulty was severe as judged by their parents.

Table 5. The balance of good health in autism

Problem: little or no fruit/vegetables eaten
- Try fruit juice – orange, pineapple or grapefruit. One small glass/day provides total daily vitamin C needs. Dilute with water, or sugar-free lemonade to make less 'tart' (+ less cariogenic)
- Use Vitamin-C-enriched sugar-free squash
- Good servings of potato provide a good source of vitamin C
- Try stewed, pureed apple or pear in fruit-flavoured yoghurt or custard
- Mash swede, cauliflower or parsnip into mashed potato
- Try roast parsnips if roast potatoes are liked
- Try Indian vegetable pakoras – eat with fingers
- Coat chunks of partially cooked vegetables, e.g. broccoli, cauliflower, carrot, parsnip in egg and breadcrumbs. Fry or bake until golden brown (if child likes dry breadcrumbs foods)
- Leave chunks of fruit on a party plate on table for nibbling
- Try tomato juice as drink (link with tomato ketchup). Add teaspoon of sugar to sweeten
- Play activity: make vegetable people/animals out of raw vegetables and fruit

Problem: constipation
- Bake your own cakes with wholemeal flour (add a little extra liquid to the recipe). Chocolate cake or gingerbread disguises the 'brown' colour of the finished product
- Try wholemeal bread or high-fibre white bread, e.g. Champion or Mighty White
- Try bran, digestive or Hob Nob type biscuits
- Try wholewheat cereals, e.g. Weetabix, Shreddies or Puffed Wheat are popular
- Increase fluid intake if drinking less than 6 cups per day
- Baked beans, sweetcorn and peas are good sources of fibre

Problems: large quantities of milk taken
- Reduce to 1 pint/day and gradually add water or sugar-free squash
- Give milk only after food is taken
- Use milk in food dishes to encourage child to eat new foods

Problem: little or no meat or fish eaten
- Puree meat into gravy and serve as 'gravy' over potatoes
- Try pate or meat paste on bread or toast
- Try ravioli or hot dogs
- If baked beans are liked, add corned beef in small quantities and cook down
- Look out for breakfast cereals that are fortified with iron or vitamins
- Eat cereals with glass of fruit juice or vitamin-C-enriched squash

Problem: continuous snacking

Useful nutritious snacks to use:
- Fortified breakfast cereals (dry or with milk)
- Cheese cubes or slices
- Fruit chunks on sticks
- Cold sausages or sausage rolls
- Yoghurts or fromage frais
- Pizza or quiche

Problem: little or no dairy products eaten
- Good servings of white bread or tinned fish are alternative sources of calcium
- Try flavouring milk, e.g. strawberry/cocoa milk
- Add milk to jelly, use milk in instant whip custard or sauces
- Add evaporated milk to jelly and whisk to make a mousse
- Try calcium-enriched milk if less than $\frac{1}{2}$ pint milk/day is taken
- Try calcium-enriched cheese if cheese spread is liked
- Add milk powder (with added vegetable fat and vitamins A + D) 2 tblsp to mashed potato to add concentrated nutrients
- 1 Yoghurt or fromage frais is equivalent to $\frac{1}{3}$ pint of milk

It had tended to intensify as the child reached 2–3 years and eased as the child reached 6–7 years. Not all of these difficulties surrounded nutritional deficiencies alone; many involved irrational behaviour with respect to food/meal times and managing selective textures. I caught a glimpse of the strain that families undergo in order to accommodate their child's often forceful desire for sameness and the anxiety that occurs when a child refuses to eat.

Forty-seven per cent of the audit sample met the RNI levels for all nutrients, and levels below the RNI occurred for between one and four

nutrients in the remaining 53% (nine) of children. Surprisingly perhaps, most of the children, despite having selective and unvaried diets, do not suffer nutrient intakes as low as they might at first be expected to suffer. Quantities of foods chosen by the child as preferred tend to be eaten in large amounts and often throughout the day (in a continuous snacking pattern), thereby making up nutrient intakes from unusual sources, e.g. calcium – white bread, iron – breakfast cereals, vitamin C – milk.

This is reassuring for parents coping with a multiplicity of problems that despite what they may consider and indeed professionals may consider a poor diet, it is not greatly deficient in a whole range of different nutrients. Moreover, to make up the shortfalls where they exist, foods that are not typically identified as a major source of the nutrient may be an appropriate substitute acceptable to their child as above, whilst working on expanding food variety in the long term. Fortified foods may also be of use to improve nutrient intakes where food variety is limited, e.g. vitamin-C-enriched squashes or calcium-enriched cheese spread.

A knowledge of the nutritional make up of different foods, alternative substitutes and means of supplementing different nutrients is the expertise that the dietitian can bring and so offer reassurance and advice to parents.

Generally children eating regularly less than 20 different foods and those under the age of 5 years appear to be the most vulnerable and would benefit from individual assessment and advice. Children below 5 years tended to have more restricted diets and, without school support, cause parents most anxiety surrounding food issues. Reassurance and advice during these critical years of growth and adjustment to more solid food textures would be a valuable use of dietetic human resources.

An integrated service involving dietitian, clinical psychologist and speech therapist is needed to co-ordinate, advise and support parents. This is preferable to offering individual approaches and treatments which may conflict and contradict each other. Elements of poor development in oral motor control and extreme oral sensitivity were identified during the audit and Speech Therapists able to assess clients and assist parents with their child to progress from sucking stage through to chewing would be of enormous benefit. A Paediatric Clinical Psychologist whose skill is to support parents through difficult eating behaviours and to work with them to change behaviours and push back the boundaries of routines and restrictions is also needed. This is important as much for the parents as for the child him/herself to relieve the stress caused by persistent difficult eating habits and to allow more normal family life of their choosing to occur, i.e. to eat outside the home or to join social occasions which revolve around a meal.

The use of the United Kingdom's National Food Guide (NFG) *The Balance of Good Health* is often used as a guide for medical staff, schools and the public to highlight the variety and balance of food in the individual older child's selection.

The guide has limitations, however, if it is to be used as a nutrition education resource for children with autistic spectrum disorders. Firstly the NFG should not be used for children under 5 years of age, since they require a higher fat intake to meet energy needs (e.g. calorie-dense foods) and provide fat-soluble vitamins. Secondly, confronting parents with this 'ideal' plan may not be initially helpful with children whose total diet comprises just 8–10 foods. Their starting point of concern is that their child is eating at all. Most had a fair understanding of foods they would like their child to eat more, but were unable to do anything about it since new foods were reluctantly received. It may act as a long-term guide for expanding a limited diet into a more balanced one low in fat and high in starchy carbohydrate for older children, but should be used in conjunction with individual dietetic advice to expand the information and adapt it to the individual's situation.

Certainly many of the children in this audit were managing adequate nutrient and energy intakes despite falling far short of the guide's recommendations to eat five servings of fruit and vegetables and two servings of meat/fish/alternatives group daily. Cereal and dairy servings were generally high as were high fat and sugary foods and significantly contributed to total nutrient and energy intakes.

Setting small goals in stages for the autistic child will allow them step by step to reach the larger goal, e.g. to eat fruit and vegetables.

Staged change or introduction does not place the child overwhelmingly out of the 'order' and familiarity he/she is secure within. Perseverance is necessary and the best attitude is one of calm control, positively presenting a meal. It is important that the child does not perceive that the parent is doubtful or reticent about a new food. Often the creative use of language to describe food in favourable terms may be necessary, perhaps linking it to a food item already preferred, e.g. milk – added to jelly termed 'cloudy jelly'. During the course of interviewing I advised parents where appropriate to try to address the deficiencies of foods, and Table 5 is a compilation of ideas which may help other parents. Some of the ideas come from parents themselves who have found them to work for their child. Not all will work for everyone, but choose some appropriate to the child, and some may work for a few. I hope that information gathered from the parents will act as a catalyst to launch more comprehensive dietetic service for autistic children with eating difficulties within Southern Derbyshire.

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