AHCD 499

Dietary Effects on Behavior and Performance for Children with Autism Spectrum Disorder

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Abstract:

With autism spectrum disorder (ASD) becoming more prevalent, the more we are understanding the manifestations correlated with this disorder; one of which being the dietary issues that are common with those with ASD. This is an important topic to discuss with those with ASD, parents and family members of someone with ASD, and medical providers. To further investigate this topic, this paper will highlight background information about what ASD is, what gastrointestinal issues those with ASD typically have, dietary approaches that are commonly used, and the role that nutrition and diet plays for occupational therapists helping to treat those with ASD.
Introduction

With autism spectrum disorder (ASD) on the rise, so does the issue of behavioral issues correlated with diet. Dietary interventions can potentially be a key factor when treating children with ASD. Although there are limited results found from dietary interventions, food and nutrients can impact the symptoms of autism. As referenced by Julie Matthews (n.d.) in her article *Autism Diets: The First Step to Biomedical Intervention and Autism Recovery*, autism is a whole-body disorder, the gut-brain connection; the foods and substances that children eat directly impact what happens in their brain. Temple Grandin supports the idea that dietary alternatives could possibly help improve behavior in children with ASD. She mentions in her autobiography, *Thinking in Pictures*, that often times the foods that causes bad behavior are often the worst foods for children to eat (Grandin, 2006, p. 141). To further investigate the idea of dietary interventions, it is important to have a general idea of what autism spectrum disorder is, what gastrointestinal (GI) issues they may have, alternative diet approaches that can be taken, and understand the role occupational therapists have with diet/nutrition with children with ASD. Although further research needs to be conducted, dietary interventions for children with ASD can potentially have a positive effect on behavior.

What is ASD?

Autism spectrum disorder (ASD) is the diagnostic term for the spectrum of complex disorders of brain development. These disorders are characterized, in varying degrees, by difficulties in social interaction, verbal and nonverbal communication and repetitive behaviors and can be associated with intellectual disability, difficulties in motor coordination and attention and physical health issues such as sleep and gastrointestinal disturbances (What is Autism?, n.d.). Based on the most updated version of the DSM, the DSM-5, all autism disorders are under
the classification of autism spectrum disorder. In previous versions of this diagnostic manual, ASD was classified into subtypes such as autistic disorder, childhood disintegrative disorder, pervasive disorder, pervasive developmental disorder (PDD-NOS) and Asperger syndrome (What is Autism?, n.d.). In order to diagnose a child with ASD, the diagnosis requires at least six developmental and behavioral characteristics that are present before the age of three based off of the criteria laid out in the DSM-5 (Diagnosis, Causes & Symptoms, n.d.).

Around 1 in 68 American children have autism spectrum. It is estimated that 1 out of 42 boys and 1 out of 189 of girls are diagnosed with autism in the United States (What is Autism?, n.d.). According to What is Autism? (n.d), this is a ten-fold increase in prevalence in 40 years. The earlier the detection of ASD, the earlier that children can begin intervention programs that will likely result in better future outcomes for the child to help eliminate or tone down the symptoms of ASD (Smith, 2016). “Many of those on the autism spectrum have exceptional abilities in visual skills, music and academic skills. About 40 percent have average to above average intellectual abilities. Indeed, many persons on the spectrum take deserved pride in their distinctive abilities and “atypical” ways of viewing the world. Others with autism have significant disability and are unable to live independently. About one third of people with ASD are nonverbal but can learn to communicate using other means” (What is Autism?, n.d.).

Although there is no specific cause of autism, just as there is no one specific type of autism, What is Autism? (n.d.) references that scientists have identified several rare gene changes, or mutations, associated with autism. It is found that small number of these are sufficient to cause autism by themselves, however, most cases of ASD appear to be caused by a combination of “autism risk genes” and environmental factors influencing early brain development (What is Autism?, n.d.). “The clearest evidence of these autism risk factors involves events before and
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during birth. They include advanced parental age at time of conception (both mom and dad), maternal illness during pregnancy and certain difficulties during birth, particularly those involving periods of oxygen deprivation to the baby’s brain. It is important to keep in mind that these factors, by themselves, do not cause autism. Rather, in combination with genetic risk factors, they appear to modestly increase risk” (What is Autism?, n.d.). Months before and after conception, some research suggests that women can take prenatal vitamins containing folic acid and/or eating a diet rich in folic acid (at least 600 mcg a day) can reduce the risk of having a child with ASD (What is Autism?, n.d.).

GI Issues

One of the manifestations that typically goes along with ASD is gastrointestinal issues (GI). One of the main roles that the gastrointestinal system (GI system) plays is to be part of the first line of defense for our immune system. If the GI system is weakened, it can lead to disturbances in our physiological and biochemical well-being (Matthews, n.d.). Matthews (n.d.) argues that if we heal our GI system, we will heal our bodies. Some of the common physical symptoms that a child with ASD might have problems with their GI system include: diarrhea, constipation, bloating, GI pain, frequent infections, sleeping challenges, and inflammation (Matthews, n.d.). It has been researched that there is the possibility that children with ASD don’t break down or process nutrients the same way as those without ASD (Vitamins and Supplements, n.d.). A survey supported by Autism Speaks in their article Diagnosis, Causes & Symptoms (n.d.) states, “surveys have suggested that between 46 and 85% of children with autism have problems such as chronic constipation or diarrhea. One study identified a history of gastrointestinal symptoms (such as abnormal pattern of bowel movements, frequent constipation, frequent vomiting and frequent abdominal pain) in 70% of the children with autism” (Diagnosis, Causes & Symptoms
Children with ASD who have GI issues typically result to self-soothing behaviors, such as rocking, aggressive behaviors, or even self-injury. To help treat GI problems, dietary interventions are necessary, such as the gluten-free/casein-free diet (Diagnosis, Causes & Symptoms, n.d.).

**Alternative Dietary Approaches**

**GFCF Diet.** A popular diet that children with ASD will typically try is the Gluten Free/Casein Free diet (GFCF). Gluten, which is the protein in wheat, and casein, which is the protein in dairy, has been found to be problematic for many children with autism spectrum disorder. Eating foods containing gluten and casein can affect their body’s physical and cognitive functions. Eliminating gluten and casein, and ingredients containing these food proteins from your child’s diet, can help improve many symptoms of autism. It can help children feel and learn better by reducing inattentiveness and hyperactivity, improving speech and language, decreasing digestive disturbances, and much more (Matthews, n.d.).

Based on theory, children with ASD process the proteins in gluten and casein differently than people without this disorder. When digesting gluten and casein, the brain preserves these proteins as false opiate-like chemicals leading the child to act a certain way (Gluten-Free/Casein-Free Diets for Autism, n.d.). Information regarding the digestion of gluten and casein are further described by Matthews (n.d):

When ingested by children with a compromised digestive tract, like many children that have autism, these proteins can cause gut inflammation, pain, and digestive problems. If the protein is not properly broken down during digestion, it can form opioids (opiate or morphine-like compounds). Scientists believe that opioids in gluten and casein are toxic for children with autism due to the fact that these children have an abnormal, leaky,
gastrointestinal tract. The properties of gluten and casein can lead to digestive problems such as diarrhea, constipation, gas, bloating, as well as foggy thinking and inattentiveness for many children with autism. Studies and many thousands of parental reports indicate physical symptoms and autistic behaviors decrease on a GFCF diet (Matthews, n.d.)

When following this strict diet, all foods containing gluten and casein are removed from the child's daily food intake. It is common that parents of children with ASD believe that their child has an allergy or sensitivity to gluten and casein. Despite negative allergy test confirmation to gluten and casein, many parents still choose to have their child on a GFCF diet because they believe there are benefits in speech and behavior in their children (Gluten-Free/Casein-Free Diets for Autism, n.d.).

The gluten grains to avoid include: wheat, rye, barley, spelt, kumut, triticale, oats, and GF oats. Some of the ingredients that contain gluten include: semolina, malt, hydrolyzed vegetable proteins, dextrin and maltodextrin, artificial flavors and coloring, soy sauce, potato chips, fries, sauces and gravy, hot dogs, and bologna. Casein products that come from cows, goats, and sheep milk that should be avoided include: milk, cheese, yogurt, butter, cream, ice cream, sour cream, and whey. Some ingredients that may contain casein include: milk chocolate, sherbet, galactose, lactose in seasoning, lactalbumin (artificial butter flavor), cool whip, lactic acid, canned tuna, seasoned potato chips, hot dogs, and bologna (Matthews, n.d.).

**SCD.** In addition to the GFCF diet, the specific carbohydrate diet is another dietary alternative used to help treat children with ASD. Research supports that the specific carbohydrate diet is the best diet for those who have autism spectrum disorder (Introducing SCD, n.d.). The gastrointestinal and neurological problems correlated with ASD are caused by fungi and bacteria in the GI tract which feed off certain starches and sugars. It should not be mistaken, this is not a
low-carb diet, rather, the quantity of carbohydrates aren’t limited as long as they aren’t harmful ones (i.e. starch) (About SCD, n.d.). Eliminating certain foods in the diet starve the microorganisms living in the GI tract, so they leave the body (Introducing SCD, n.d.). Using the SCD can have some very beneficially results for children with ASD. “Children with autism who are implementing SCD are demonstrating remarkable improvements in bowel function, language, eye contact, self-stimulatory behavior, anxiety, and mood…The vicious cycle of malabsorption, maldigest ion, inflammation, and food allergies seen in children with autism can be corrected using this dietary approach and healthy digestion can begin” (Introducing SCD, n.d.). SCD goes beyond the GF/CF diet because the GF/CF diet still allows some starches in the diet such as corn, rice, and soy, which is said to be just as harmful as gluten. Just like the GF/CF diet, the SCD goes beyond the GF/CF by eliminating gluten and starch.

**Vitamin Therapies.** Based on *Nutrition and Autism* (2013), inadequate nutrition is more common among children with autism than in those unaffected by the disorder. The use of vitamins like Vitamin C or B6 and magnesium aren’t fully supported and need further research to be proven as an effective way to treat ASD, but some research suggests that they have a positive effect on behavior (Nutrition and Autism, 2013).

i. **Vitamin C:**

Vitamin C, which is an ascorbic acid, is an essential water-soluble vitamin that can be given to children with ASD. Vitamin C is an antioxidant used to help with the functioning of the brain, production of neurotransmitters (specifically dopamine), and helps regulate the immune system. Additionally, vitamin C also helps protect the body against free radicals (Tanner et al, 2015). Tanner et al (2015), states that some researchers believe that children with ASD have a harder
time managing free radicals compared to children without ASD. Vitamin C, with its anti-oxidant characteristics, can help protect the body against damage to the brain, immune system and the body that free radicals can cause (Tanner et al, 2015). Information provided from the article Vitamins and Supplements (n.d.) provide additional information and description of free radicals and how they are processed in the brain:

It is a fact that children with ASDs have been shown to have increased oxidative stress in a number of studies. Oxidative stress occurs when molecules that do not have a balanced number of protons and electrons called free radicals "steal" an electron from another molecule to achieve balance and stability. Unfortunately, the molecule stolen from now becomes a free radical itself, and will go on to steal an electron from another molecule, and on and on, in what has been called "an electron-stealing frenzy." To some degree, this constant exchange of electrons is natural, and the body can cope. When the process goes out of balance, however, antioxidants like Vitamin C help by "donating" electrons to molecules that lack one in a non-damaging way that stops the chain-reaction. The central nervous system, which includes the brain, is thought to be more sensitive to free radical attack than other systems in the body. It is therefore not surprising that free radicals have been implicated in a variety of neuropsychiatric conditions. In theory, children with autism suffering from oxidative stress might be helped by receiving Vitamin C or other antioxidants. No studies have yet been done to test this specific theory with regard to autism, however (Vitamins and Supplements, n.d.)

It is also said that some children with ASD have a vitamin C deficiency. For children with ASD, the intake of vitamin C has found to have a calming effect due to the brains response to the
neurotransmitter dopamine. Even though vitamin C is supposedly harmless, parents should look for signs of upset stomach and diarrhea because each child’s tolerance to vitamin C can vary. “Unfortunately, it is not clear what the proper dose for children with autism should be, but one research report used a dose of 8 grams/70 kg/day (or about 2 grams daily for a 40-pound child) divided into two or three doses. Vitamin C can be helpful even for children with normal levels of vitamin C” (Tanner et al, 2015). It is best to check with the child’s pediatrician before giving your child this vitamin.

ii. Magnesium and Vitamin B6:

During the 1960’s, large amounts of vitamin B6 was initially given to children with ASD because it was reported that this vitamin helped improve speech and language. Over the next three decades, it was found that there was significant improvement if vitamin B6 was combined with magnesium. Magnesium was used to counter the negative effects of irritability, hypersensitivity to sound, and bed wetting that were reported when children took high doses of vitamin B6 by itself (Vitamins and Supplements, n.d.).

In Temple Grandin’s (2006) autobiography, Thinking in Pictures, she touches on the research that has been done with vitamin B6 and magnesium and how they affect those with ASD. She notes:

Studies in France have shown that these supplements improve behavior and help normalize brain electrical activity in hospitalized patients with autism. They appear to be most effective for people who have epileptic-like symptoms, such as sudden outbursts of rage or laughing one minute and crying the next. They have also been effective in young
children who start to develop normal language and then lose their ability to speak and understand speech (Grandin, 2006, p. 136)

Role of Diet/Nutrition in Occupational Therapy (OT)

**Eating Difficulties.** Sensory processing difficulties among those with autism spectrum disorder can be a predictor of feeding behaviors. Selective eating, according to Tanner et al (2015), is defined as accepting only a limited variety of foods and refusing many foods. Selective eating is a common problem for children with ASD because it opens the risk to having nutritional defects (p. 1-8). Many children with ASD have simple food preferences; their diets are limited in variety. They may also reject new foods by displaying strong avoidance towards the new stimuli because of the taste/texture of the new food. Those with ASD tend to refuse food, have specific presentation of goods, use specific utensils while eating, limit the amount of textures they will eat, and eat a very small variety of foods compared to children who do not have ASD (Smith, 2016). Children with ASD may have mealtime behaviors such as having extreme attachment to routines/patterns and will resist change when these patterns are disrupted (Smith, 2016).

Determining the best feeding intervention for a child with ASD is very difficult because feeding problems are also linked with aggression, internalizing behaviors, externalizing behaviors, repetitive behaviors, anxiety, and sensory reactivity (Tanner et al, 2015).

Based on article published by Smith (2016), children with ASD are almost twice as likely to experience feeding and eating difficulties compared to neurotypical children (p. 1-11). In Smith’s (2016) article, he references a study that was one by Suarez, Nelson, and Curtis (2012) that found that children who were more selective in the number of foods that they would eat had
higher sensory over-responsivity. They found tactile was the most sensitive (Smith, 2016). Knowing that tactile is the most sensitive sense for children with ASD, interventions to help desensitize tactile responses would be appropriate to help manage eating difficulties.

**Occupational Therapy Intervention.** To help improve behavioral issues that are correlated with eating problems, occupational therapists can play a huge role in investigating the underlying problems associated with feeding. As mentioned before, the main senses that children have a hard time with when it comes to food is tactile (Smith, 2016). The reason for this is because the child is experiencing sensory defensiveness/sensory over-responsivity, in this case, tactile defensiveness. “Tactile defensiveness is an over-reaction to certain experiences of touch, often resulting in an observable aversion or negative behavioral response to certain tactile stimuli that most people would find innocuous” (Cermak et al, 2010). Cermak et al (2010) then continues by giving the example that children with ASD have a hard time with cuddling or will pull away from touch. Their tactile defensiveness could contribute the issues that children with ASD face with certain food textures. If it is suspected that a child may have difficulty eating because of sensory reasons, an occupational therapist will start the treatment by administering a questioner to the parent about their child’s sensory limitations (i.e. The Sensory Profile). Occupational therapists can incorporate programs and strategies to help reduce the child’s sensory defensiveness. Further intervention methods for treating sensory defensiveness are further described by Cermak (2010):

- Occupational therapy using a sensory integration approach can provide activities that incorporate deep touch pressure and proprioception, which have been reported to decrease sensory defensiveness. The therapist can also develop social stories, sensory
stories, mealtime stories, or written charts to help prepare the child to anticipate different foods. The occupational therapist can make suggestions to modify the environment such as dimming the lights or playing soft music; which can help reduce the child’s general arousal levels and facilitate his/her ability to tolerate the sensory stressors presented by food (Cermak et al, 2010)

Finding the best dietary approach for treating ASD will greatly vary among different children with ASD. However, the more desensitized an occupational therapist can get the child, the less sensitive the child will be to trying different foods with different textures.

Conclusion

With autism spectrum disorder becoming more prevalent in today’s society, the more people need to be educated regarding the different manifestations that are apparent. Diet and GI issues are arguably two important factors that have an influence on behavior. Diets such as the gluten free/casein free diet and the specific carbohydrate diet are two very common dietary interventions for those with ASD. Along with these diets, vitamins are also an alternative that can also be added into a child’s diet. Occupational therapists and other medical professionals have to take a holistic stance when determining what is the most effective and appropriate approach to incorporate into the child’s diet. Further investigation into this topic of dietary interventions has a promising future to help treat children with autism spectrum disorder.
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