



Research report

Clinical differences in children with autism spectrum disorder with and without food selectivity[☆]Valentina Postorino^{a,*}, Veronica Sanges^a, Giulia Giovagnoli^{a,b}, Laura Maria Fatta^a, Lavinia De Peppo^{a,b}, Marco Armando^a, Stefano Vicari^a, Luigi Mazzone^a^a Department of Neuroscience, Child Neuropsychiatry Unit, I.R.C.C.S. Children's Hospital Bambino Gesù, Piazza S. Onofrio 4, 00165, Rome, Italy^b L.U.M.S.A., Libera Università Maria SS. Assunta, Dipartimento di Scienze Umane, Piazza delle Vaschette 101, 00193, Rome, Italy

ARTICLE INFO

Article history:

Received 14 August 2014

Received in revised form 9 April 2015

Accepted 13 May 2015

Available online

Keywords:

Food selectivity

Autism spectrum disorder

Children

Behavioral profile

ABSTRACT

Several studies have described the atypical eating behaviors frequently occurring in children with autism spectrum disorder (ASD), and food selectivity is the most frequent of these problems. The everyday management of mealtime behaviors among children with ASD can have a negative impact on family routines and become a significant stressor for families. However, much remains unknown about why food selectivity is so prevalent among individuals with ASD. The objective of this study was to investigate clinical and behavioral features in individuals with ASD with the aim of identifying distinctive clinical profiles in children with and without food selectivity. A total of 158 children with ASD were enrolled in this study: 79 participants with food selectivity (FS) were age and sex matched with 79 participants without food selectivity (No FS). All participants and their parents completed a battery of psychological tests for a comprehensive evaluation of ASD symptoms, cognitive abilities, adaptive skills, behavioral problems and parental stress level. No statistically significant difference on gastrointestinal symptoms and growth adequacy was found between the FS group and the No FS group. Overall, the FS group showed significantly higher rates of ASD symptoms as compared to the No FS group in the questionnaires completed by parents. Furthermore, parents of the FS group reported significantly higher levels of parental stress and a larger degree of their children's behavioral problems as compared to the No FS group. Finally, there were no differences between the FS and the No FS group on any adaptive skill domain. Our findings suggest that the identification of distinctive clinical and behavioral patterns in children with ASD and food selectivity is a crucial issue for parents and therapists in the daily management.

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Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by impairments in two core domains: social communication and restricted and repetitive patterns of behavior, interests, or activities (American Psychiatric Association, 2013). According to the *Diagnostic and Statistical Manual of mental disorders-5th edition* (DSM-5) criteria, people with ASD fall on a continuum with individuals characterized by the severity of their symptoms in the two core domains. Furthermore, intellectual disability and/or language impairment contribute to the heterogeneous presentation of ASD.

Behavioral problems, such as tantrums, comorbidity with other psychiatric disorders, abnormal sleep patterns and unusual feeding behaviors, are often present in children with ASD and the everyday management of these problems is a challenge for clinicians and families (Dominick, Davis, Lainhart, Tager-Flusberg, & Folstein, 2007). Although not a diagnostic feature of ASD, feeding problems are common in this clinical population, and food selectivity is the most frequent one (Ahearn, Castine, Nault, & Green, 2001; Cornish, 1998; Dominick et al., 2007; Heiss, Moody, Crosley, & Campbell, 2005; Kerwin, Eicher, & Gelsinger, 2005; Nadon, Feldman, Dunn, & Gisel, 2011; Schmitt, Heiss, & Campbell, 2008; Schreck, Williams, & Smith, 2004; Williams, Gibbons, & Schreck, 2005; Williams, Dalrymple, & Neal, 2000).

Literature studies have shown that this atypical eating behavior is more prevalent in children with ASD than in typically developing children. Furthermore, food selectivity is often associated with inadequate nutrient intake (i.e., estimated average requirement [EAR], and adequate intake [AI]) suggesting that a limited diet may put any child at risk for nutritional deficiency (Bandini et al., 2010; Bicer & Alsaffar, 2013; Schmitt et al., 2008).

[☆] Acknowledgements: The authors have no acknowledgement relevant to this article to disclose. Funding: No external funding was secured for this study. The authors have no financial relationships relevant to this article to disclose. Conflict of interest: The authors have no conflicts of interest to disclose.

* Corresponding author.

E-mail address: valentina.postorino86@gmail.com (V. Postorino).

However, studies examining the prevalence of food selectivity in children with ASD have reported highly variable rates, ranging from 13% to 87% (Ahearn et al., 2001; Bandini et al., 2010; Collins et al., 2003; Cornish, 1998; Dominick et al., 2007; Field, Garland, & Williams, 2003; Kalyva, 2009; Klein & Nowak, 1999; Nadon et al., 2011; Schmitt et al., 2008; Schreck & Williams, 2006; Schreck et al., 2004; Suarez, Nelson, & Curtis, 2013; Whiteley, Rodgers, & Shattock, 2000; Williams et al., 2000, 2005). For instance, Whiteley et al. (2000) reported that 83% of parents indicated that their children ate a restrictive repertoire of foods. Similarly, Schreck and Williams (2006) found that 72% of parents reported their children having a limited food repertoire. On the other hand, Klein and Nowak (1999) found that only 53% of their children with ASD were reluctant to try new foods, and Bandini et al. (2010), comparing food selectivity between children with ASD and typically developing children, indicated an even lower rate (41.7%) of this atypical eating behavior in their sample of children with ASD. It is worth noting that these studies included different definitions of food selectivity, distinct methodologies, including rating scales, checklists and interviews, as well as daily food record diaries, and this issue may represent a possible explanation for these discrepancies. Therefore, a degree of variability may disappear if similar assessment criteria and definitions of food selectivity were used. Such a definition was provided by Bandini et al. (2010) to comprise three separate domains: food refusal, limited food repertoire and high-frequency single food intake (Bandini et al., 2010). In more detail, these authors defined food refusal based on the absolute number of foods the parent indicated that the child would not eat, as well as the percentage of foods the child would not eat relative to the number of foods offered. Limited food repertoire was described as the number of unique foods (including beverages) each child consumed over a 3-day period. Finally, high-frequency single food intake (excluding beverages) was delineated as single foods eaten more than 4–5 times daily (Bandini et al., 2010).

Several hypotheses have been drawn to explain food selectivity in ASD. Some studies have observed that gastrointestinal (GI) problems are common in ASD and, even though the results are contrasting, food selectivity may contribute to GI problems in a portion of these individuals (Chaidez, Hansen, & Hertz-Picciotto, 2014; Gorindo et al., 2012; Horvath & Perman, 2002; Ibrahim, Voigt, Katusic, Weaver, & Barbaresi, 2009; Maenner et al., 2012; Mazefsky, Schreiber, Olin, & Minshew, 2014; Mazurek et al., 2013; Mouridsen, Isager, & Rich, 2013; Nikolov et al., 2009; Valicenti-McDermott, McVicar, Cohen, Wershil, & Shinnar, 2008; Whitehouse, Maybery, Wray, & Hickey, 2001). Furthermore, it has been suggested that sensory processing problems, such as sensory sensitivity, which are common among individuals with ASD, could be possible mechanisms underlying food selectivity (Cermack, Curtin, & Bandini, 2010; Mazurek et al., 2013; Suarez et al., 2013). In fact, determining factors of food selectivity are often associated with texture, taste, temperature, smell preferences and consistency (Williams et al., 2000). Highlighting the clinical importance of this issue, one of the criteria for the diagnosis of ASD in the new DSM-5 concerns hyper- or hypo-reactivity to sensory input or unusual interests in sensory aspects of the environment (American Psychiatric Association, 2013).

Although it has been demonstrated that food selectivity is a chronic problem unlikely to change without treatment, much remains unknown about why food selectivity is so prevalent among individuals with ASD. Finally, to our knowledge, no previous study has investigated if food selectivity is associated with distinctive clinical features in children with ASD. Thus, the objective of this study was to investigate clinical and behavioral features in individuals with ASD with the aim of identifying distinctive clinical profiles in children with and without food selectivity. Specifically, we hypothesize that individuals with food selectivity exhibit higher levels of clinical symptoms and behavioral and emotional problems compared

to children without food selectivity. Moreover, given that the atypical eating behaviors may become a significant stressor for families, we hypothesize that the level of parental stress would be higher in parents of children with food selectivity compared to parents of children without food selectivity. Finally, considering that restricted intakes of food may lead to growth problems and cause GI symptoms, we expect that children with food selectivity would report higher levels of these problems relative to children without food selectivity.

Materials and methods

Participants

Study participants included 158 children with ASD, all Caucasians of Italian descent (aged 3 to 12 years; mean age $\pm$ SD: 7.16 ± 2.046). At entry into the study, ASD had to be diagnosed by an expert clinician using DSM-IV-TR criteria (American Psychiatric Association, 2000). All of these children were referred to the Child Neuropsychiatry Unit of the Children Hospital Bambino Gesù' of Rome (Italy) between December 2012 and December 2013. Exclusion criteria for all children included the presence of specific genetic disorders, other medical disorders and epilepsy. The parents of all participants provided written informed consent. Data were collected in our outpatient service throughout a multidisciplinary team (i.e., pediatric neuropsychiatrists and psychologists, pediatricians and speech therapists). Given the extensive assessment battery in order to reduce testing burden and control for fatigue in children and caregivers to complete we divided the evaluation into three separate two hour sessions completed in separate visits by the same administrator.

Of the 158 participants, 79 participants with food selectivity (FS) (67 males and 12 females, aged 4 to 12 years; mean age $\pm$ SD: 7.22 ± 2.042) were age and sex matched with 79 participants without food selectivity (No FS) (69 males and 10 females, aged 3 to 12 years; mean age $\pm$ SD: 7.10 ± 2.061). Participants were included in the FS group if, on the revised Food Frequency Questionnaire (FFQ), parents indicated that their child had issues with one of the following food selectivity criteria: food refusal and/or high frequency single food intake (Bandini et al., 2010).

Assessment of atypical eating behaviors

All parents of children with ASD included in the study completed a specific questionnaire about their child's dietary habits and use of special diets. We defined food selectivity as comprising two separate domains: food refusal and high frequency single food intake. We used a modified version for parents of the Youth/Adolescent Food Frequency Questionnaire (YAQ) in order to assess food refusal and high frequency single food intake (Field et al., 1999). The revised Food Frequency Questionnaire (FFQ) contains 131 food items, and asks parents to write in foods that were not included on the FFQ if the child ate them at least once per week on average over the past year (Bandini et al., 2010). We assessed food refusal based on the absolute number of foods the parent indicated that the child would not eat, as well as the percentage of foods the child would not eat relative to the number of foods offered (Bandini et al., 2010). We defined high frequency consumption as single foods the child ate more than 4–5 times daily. Beverages were not included in this measure, because it is not uncommon to consume a beverage 4 or more times a day (Bandini et al., 2010).

Furthermore, all parents of the FS group, were interviewed about the types and sensory factors linked to food selectivity (i.e. "texture", "form", "color", "smell", "taste", "temperature", "quantity", "brand or packaging", "rituals surrounding eating", "unspecified").

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