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Personal Risk Factors Regarding the Presence of Autism Spectrum Disorders

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Abstract: The current understanding of autism spectrum disorder (ASD) as an alteration of neurodevelopment requires deepening in the causes that originate it. This study aims to investigate the relationship between the presence of ASD in subjects aged 2-22 years and some related biological factors (sex/gender, age, and body mass index). A quasi-experimental study, with a cross-sectional retrospective design, was conducted on 209 subjects (n = 111 with ASD and n = 98 neurotypical) who were applied to the GARS-2 test in three areas: communication, social interaction, and stereotyped behaviours between 2016-2021. The risk factors identified are related to early age (OR = 2.27, 95% CI = 1.30-3.96), being male (OR = 2.67, 95% CI = 1.41-4.68) and having underweight (OR = 2.03, 95% CI = 1.09-3.80). Differences in stereotyped behaviours (OR = 1.10, 95% CI = 1.05-1.14), functional communication (OR = 1.13, 95% CI = 1.08-1.17) and social interaction (OR = 1.11, 95% CI = 1.08-1.15), were found, being at risk as soon as scores related to ASD diagnosis. In sum, rigorous and multidimensional understanding analysis among specialists regarding people with ASD allows to evaluate the development of the set of alterations and key variables to provide support and assistance to their quality of life.

Keywords: *Autism spectrum disorder, early intervention, multidimensional approach, odd ratio, risk factors.*

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Introduction

Autism spectrum disorder (ASD) represents a neurological disorder with a behavioural diagnosis that affects the person throughout life and manifests itself in a delay or abnormal functioning around social interaction, language used in social communication or imaginative play (Arberas & Ruggieri, 2019; García-Franco et al., 2019; Gray et al., 2021; Pino-López & Romero-Ayuso, 2013).

There are many different manifestations of this disorder - hence a spectrum of conditions that vary on a continuum - which may or may not include the presence of intellectual disability or language problems, with various levels of severity. Different influencing factors, of varying weight and degree of evidence, have been proposed as causes of the disorder (Hull et al., 2017; Jiang et al., 2022; Mandy et al., 2018; Montagut et al., 2018; etc.), and require detailed study. In the present study, the relevance of several personal factors (gender, age, and weight) in determining the risk of ASD is examined.

Literature Review

The conceptualisation of ASD has undergone remarkable transformations throughout history, from its consideration as a disease, emotional, affective and general developmental disorder, to the present day, as a neurodevelopmental disorder (Dell'Osso et al., 2016; Martín Martínez & Cuesta Gómez, 2012) and resulting from advances in neuropsychological and neurobiological research (Arnedo Montoro et al., 2018; Carrillo & Martos, 2018; Jiang et al., 2022) allowing an improvement in the understanding of this disorder, of the causes that originate it and, consequently, facilitating decision making, delimitation of responsibilities, proposal of actions.

The DSM-5 (American Psychiatric Association, APA, 2013) refers to *Neurodevelopmental Disorders* as a set of heterogeneous disorders of early onset in child development causing a delay or impairment in the acquisition of skills in a variety of developmental domains including motor, social, language and cognition. The variability of manifestations is highlighted, both in the areas affected and in the degree of impairment, ranging from occasional deficits that do not prevent the person from living a full and independent life, to cases in which lifelong support will be required to survive,

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because they fail to develop the basic skills necessary for an independent existence. Therefore, it can be said that there is no clear clinical profile (Dell'Osso et al., 2016; Young et al., 2021) because, as Vacas et al. (2020) point out, "they do not show all the characteristics associated with a specific disorder but may manifest traits of different pathologies" (p. 36).

In the case of ASD, it is nowadays possible to refer to this disorder as a heterogeneous set of neurodevelopmental disturbances – or a form of neuroatypical psychological development -, which manifest in early childhood (Rødgaard et al., 2021) and which are the result of complex interactions between genetic, environmental, and immunological factors (Jiang et al., 2022; Young et al., 2021). Estimates of ASD prevalence has been steadily increasing from less than 0.4% in the 1970s (Havdahl et al., 2021) to current estimates of approximately 1.5% of the population (Montagut et al., 2018), mainly due to the extension of diagnostic criteria to people without ID and with milder impairments, and the increased awareness and recognition of autistic traits (Havdahl et al., 2021; Rødgaard et al., 2021). Its symptomatology includes, in addition to an alteration of socio-communicative development and a restricted pattern of activities and interests (Burrows et al., 2022; Calderoni, 2023), other types of clinical manifestations that may vary greatly from one individual to another (Carrillo & Martos, 2018; Dell'Osso et al., 2016).

An example of this variability is evidenced in the study carried out by Riglin et al. (2021) in which they tried to characterise the heterogeneity of autistic symptoms in a cohort of English population from infancy to the age of 25, and which allowed them to evidence three different trajectories in relation to the development of communication skills, social interaction, and the presence of stereotypies in childhood, adolescence, and young adulthood. It was further highlighted how this variability of symptoms was related to age. It is precisely these variations in each of the dimensions of ASD that give rise to diversity (Baña & Losada-Puente, 2019; Martín Martínez & Cuesta Gómez, 2012) and, with this, to the need to continue delving into its aetiology and the manifestation and evolution of its symptoms at different times in its development, especially in relation to individual variables (Hervás Zúñiga et al., 2017) such as gender, age, or weight.

In relation to gender, there is a wide differentiation in terms of prevalence, which has been maintained over time, and there has been a predominance of up to three to four times more males than females with ratios between 3:1 and 4:1 in recent years (Cheslack-Postava & Jordan-Young, 2012; Gould & Ashton-Smith, 2012; Loomes et al., 2017), currently amounting to 4.3:1 (2.8% in men and 0.65% in women) (Morales Hidalgo et al., 2021) or even, in some contexts, 5.81:1 (Young et al., 2021). This suggests a possible influence of this biological factor on ASD (Havdahl et al., 2021; Jiang et al., 2022) since, as stated by Burrows et al. (2022) the imbalanced sex ratio in ASD may represent a real phenomenon, but it may also stem from the presence of measurement bias in both the clinical criteria used for diagnosing ASD and/or in the measures designed to capture ASD symptoms (p. 654).

Indeed, among the hypotheses put forward in response to these differences is the existence of a male bias in trait identification in the child population (Burrows et al., 2022; Calderoni, 2023; Mandy et al., 2018; Montagut et al., 2018; Ruggieri & Arberas, 2016), camouflage (Dean et al., 2017; Fusar-Poli et al., 2022; Gray et al., 2021; Halsall et al., 2021) or compensation (Hull et al., 2017; Lai et al., 2015; Mandy et al., 2018) in girls and women with ASD. The gender bias in the identification of ASD traits is based on socially constructed expectations about how girls relate, interact and play, attributing traits of quietness or shyness to them. Thus, girls with autistic and potentially diagnosable traits tend to go unnoticed by professionals because they meet these expectations. Reference is also made to a greater ability of girls with ASD to camouflage or compensate for their interaction difficulties as they generally have better social skills.

This camouflage could be also related to age when there is an increase in social demands that can represent a significant challenge for autistic girls (Halsall et al., 2021). At a general level, the developmental disturbances that are associated with the presence of ASD appear (usually present their first signs) in the first years of life (Canal et al., 2010; Rødgaard et al., 2021). More specifically, one study shows that the first suspicions usually appear between 12-24 months of age (Burrows et al., 2022; Fortea Sevilla et al., 2013), although they do so in a progressive manner, allowing assessment and diagnosis for educational and social care (Casey et al., 2004; Mitre, 2015). Recent studies on ASD have found a trend towards improvement in symptoms and functional adjustment with advancing age, even though it is a broad and profound disorder where delayed language onset does not appear to be a key differentiating factor for functional adjustment in adulthood (Brugha et al., 2011; Fortea Sevilla et al., 2015; Hervás Zúñiga et al., 2017; Mitre, 2015). Early attention is an important predictor in the functional education of individuals which, together with the increasing incidence and prevalence of these disorders, makes this subject of study a growing topic of great scientific and theoretical interest (García-Franco et al., 2019).

Another factor of particular interest in relation to the diagnosis of ASD is body weight. For Young et al. (2021), diet is a factor related to the risk of ASD. In addition, it has been noted that children with ASD have a greater tendency to be overweight and obese, as high as 50% of cases (Arberas & Ruggieri, 2019; Hill et al., 2015). Hill et al. (2015) pointed out that a possible reason for the lower levels of physical activity in younger children with ASD is their lower participation in social activities - something that at that age involves vigorous play - and the importance that the family attaches to the child's weight (Elliott et al., 2010), even though their attention is focused on other issues (Pino-López & Romero-Ayuso, 2013).

Given the relevance of these three elements for early diagnosis and care in ASD, the aim of the study is to investigate the relationship between the presence of ASD in individuals aged 2-22 years and certain biological factors (gender, age, and body mass index) related to the development of aids and supports for independent and capable living.

Methodology

Research Design

A quantitative study was conducted with a cross-sectional, non-experimental design as the intention was to collect information about the study population without manipulating its characteristics (Kadzin, 2022; Reichardt, 2019). It can be considered a survey-type design (Creswell & Creswell, 2018) given the intention to answer questions regarding the predictive relationship between variables over time.

Sample and Data Collection

For the selection of the sample, a non-probabilistic sampling was used, by convenience (Kadzin, 2022), considering the need to collect information from subjects who met specific characteristics in terms of age, presence or not of ASD and possibilities of participation (express authorisation of the person or their dependent family member).

The participants were n = 209 subjects from the Autonomous Community of Galicia, aged between 2-22 years, of whom n = 111 were diagnosed with ASD in Public Health Services of the Spanish State and n = 98 were neurotypical subjects without recognition of developmental disorder or intellectual disability in the period between 2016 and 2021.

To count on their participation, their families were informed about the object of the study and prior authorisation was requested for the use of the data, giving them anonymous and confidential treatment. In addition, the study obtained the approval of the Bioethics Committee of the University of A Coruña. The selection criteria were the physical presence of the participant and the informed consent of the parent or legal guardian.

The instrument applied was the GARS-2, in its Spanish translated version (Gilliam, 2006; Jackson et al., 2013). It is a quantitative tool that assesses the probability of ASD between the ages of 3 and 22 years in the three dimensions specified in the DSM diagnostic manuals. The Spanish version includes 56 items grouped around three subscales (stereotyped behaviour, communication, and social interaction), evaluated on a 4-point Likert scale (0: "never observed" and 4: "frequently observed") and a section for the evaluation of developmental alterations with a dichotomous response (yes/no). Its interpretation requires the sum of the scores of each of the three subscales and their weighting, to obtain an overall value that provides the ASD index of the person evaluated (85 or higher: high probability; 70 to 84: possible; 69 or lower: low probability). Its validity and reliability have been tested in a sample of 1107 children and young adults aged 3 to 22 years diagnosed with ASD. The test first considered content-description validity, where its three subtests are based on the definitions of autism provided by the DSM-IV-TR and the Autism Society of America (1994, as cited in Gilliam, 2006). Likewise, the validity of the criteria was verified, through the analysis of the discrimination coefficients of each test item (DI > .35), obtaining as a result: DI = .53 for Stereotyped Behaviors, DI = .53 for Communication and ID = .55 for Social Interaction. Concurrent validity was tested by correlating GARS-2 scores with the Autism Behavior Checklist (ABC), obtaining large or very large correlations between all paired subtests. As for the reliability, its consistency (α = .96) and test-retest coefficients (r_{xy} = .92) are high or very high and can discriminate features of severe impairment, as well as people without disorders, indicating a high discrimination coefficient (Gilliam, 2006).

Additionally, identifying information was requested on their residence status, age, sex/gender, weight, height, mode of expression, support, additional difficulties, and health status. The scale was administered over two years. None of the subjects were previously familiar with this tool.

Data Analysis

Data obtained were analysed with the IBM SPSS 27 statistical package. Multivariate linear regression was used. The intention was to relate the independent variables to the dependent variables and to evaluate the influence of the diagnosis on the variables of having or not having ASD, using it as a dichotomous variable. Likewise, based on this variable, the link between the possible independent variables with the dimensions reproduced in the GARS-2 subscales was sought to establish interactions between them. All covariates were assessed for potential confounding by examining associations of each covariate with the primary predictor of interest (group) and with each response variable (dimension scores). Variables with a p-value ≤ .20 for univariable analyses were included in a final multivariable model. Tolerance was calculated to assess collinearity among variables fitted in each model; a tolerance value of < .10 was considered as an indicator for collinearity.

First, quantitative variables were summarised as mean and standard deviation. Independent variables and whether they had ASD were tested using logistic regression, creating two statistical models: in the first, personal variables were included using crude analyses and subsequently adjusted for all other variables; in the second, the influence of variables related to the GARS-2 in its three subscales with being a person with ASD or neurotypical was assessed by adjusting for potentially confounding personal variables. Those with p < .20 were considered confounders that in addition to the

analysis produced a change in the coefficient (in odds ratio) greater than 10% expressed as Odds Ratio (OR) with 95% confidence intervals. This would indicate an increase/decrease in the probability of being responsible for an increase in the visual analogue scale. For those ORs that represented values less than unity, the inverse IqOR was calculated which interprets the increase in the probability of having ASD when moving from P_{75} to P_{25} in the sample.

Findings / Results

Of the total number of valid ASD cases (*n* = 111), 17 cases (15.3%) were found to have secondary diagnoses of visual impairment (*n* = 1; 0.9%), brain injury (*n* = 1; 0.9%), intellectual disability (*n* = 11; 9.9%) or physiological disease (*n* = 4; 3.6%). There were more boys (*n* = 74, 66.7%) than girls (*n* = 37, 33.3%). Table 1 presents the socio-demographic characteristics of participants with ASD and neurotypicals, together with the overall results of the GARS-2 application.

Table 1. Socio-Demographic Characteristics of the Respondents and Main Results of the Applied Tests

Personal characteristics	**Individuals with ASD (N = 111)**				**Neurotipic individuals (N = 98)**			
	X	**S.D.**	**Min**	**Max**	**X**	**S.D.**	**Min**	**Max**
Age	9.11	4.14	2	20	11.43	5.28	3	22
Height	129.32	30.57	11	190	139.57	28.57	77	190
Weigh	36.60	1.33	3	75	43.02	19.96	13	80
BMI	35.51	14.16	19.94	64.30	21.08	5.27	11.83	38.15
GARS-2 results	**X**	**S.D.**	**S.S.**	**P**	**X**	**S.D.**	**S.S.**	**P**
Stereotyped behaviour	27.41	7.62	13	84	12.23	7.40	7	16
Communication	29.76	8.19	14	91	11.61	8.37	7	16
Social interaction	32.49	8.32	14	91	13.73	9.27	6	9
Total Gars-2	89.67	21.21	124	95	37.57	23.34	79	8

Note: S.S.: Standard score; P: percentile; BMI: Body Mass Index

Regarding Table 1, it should be noted that the GARS-2 results allowed us to identify a high probability of ASD in all subjects, with the greatest affectation in the case of communication and social interaction (both located at the 91st percentile) and, to a lesser extent, stereotyped behaviours (located at the 84th percentile).

To test whether there were differences between the socio-demographic characteristics of the participants, specified in Table 1, a comparison of means was performed assuming equal variances (Levene's test >.05). A t-value = 23.158 (p < .001) was obtained, and it was possible to conclude the presence of statistically significant differences between subjects of different ages with ASD (mean difference = 9.108, 95% Confidence Intervale, CI). Likewise, statistically significant differences were obtained, assuming equal variances (Levene's test > .05), in the variables' height (t = 44.556, p < .001; diff. M = 129.32) and weight (t = 22.92, p < .001; diff. M = 36.61).

To test whether risk factors might be related to the development of ASD, Odds Ratios (OR) were calculated. Overall, differences were found in the dimensions of stereotypic behaviours (OR = 1.10, 95% CI = 1.05-1.14), functional communication (OR = 1.13, 95% CI = 1.08-1.17) and social interaction (OR = 1.11, 95% CI = 1.08-1.15), being risky as soon as scores related to ASD diagnosis are indicated. Table 2 presents the results of the calculation of OR and OR adjusted for sex/gender, age, and Body Mass Index (BMI), the latter extracted from information on the weight and height of each child.

Table 2. Crude and Adjusted Odds Ratios by ASD, Sex, Age and Weight, and Confidence Interval for ASD Diagnosis.

	Crude		**Adjusted***					
			Communication		**Social interaction**		**Stereotyped Behaviour**	
	OR	**IC95%**	**OR**	**IC95%**	**OR**	**IC95%**	**OR**	**IC95%**
Sex/gender	2.67	1.52-4.68	2.24	1.22-4.12	1.81	0.94-3.5	2.03	1.05-3.92
Age	0.90	0.85-0.96	2.02	1.11-3.70	1.61	0.84-3.09	2.06	1.07-3.94
BMI (underweight vs. normal)	2.03	1.09-3.80	1.53	0.72-3.26	2.57	1.08-6.12	2.23	0.94-5.27
BMI (overweight vs. normal)	1.75	0.85-3.62	1.46	0.63-3.37	1.55	0.63-3.80	1.42	0.59-3.41

Note: * adjusted by the presence of ASD; BMI: Body Mass Index

The results in Table 2 show the GARS-2 regression analysis, in which it was possible to identify a high probability of ASD in the subjects as a whole, with the greatest affectation in the subscales of communication and social interaction (both located at the 91st percentile). Likewise, the results of the univariate analysis of the variables of the subject and those obtained through the GARS-2 are reflected. A statistically significant difference was observed between the variables of age, weight (underweight) and gender (p < .001).

Specifically, Table 2 shows the probability of exposure to personal risk factors in subjects with ASD versus those without ASD, showing that gender acted as a risk factor, with a greater predominance in males, being significant both in terms of communication and stereotypical behaviour, although not in social interaction (where the 95% CI contains the value 1). With respect to age, it was again found that this represents a risk factor in terms of communication and stereotyped behaviours at an early age, in addition to showing in a differential analysis that the value of ASD as age increases (>10 years) decreases in significance, with an OR = 0.33 (0.15-0.74) compared to ASD at <10 years (OR = 2.27, 95% CI = 1.30-3.96). This indicates that with increasing age, the differences with respect to neurotypical individuals are minimised, especially in terms of communication and stereotyped behaviours. The differences were also significant in relation to BMI (p = .01) given that people with ASD were underweight compared to the neurotypical sample, this being a risk ratio (2.03).

With respect to the relationships between the variables, there were no differences that could indicate risk in terms of the relationship between the different variables with respect to having or not having ASD.

Discussion

The results of the present study show the relationship between the presence of ASD in the individuals and certain variables such as gender, age, or weight of the individual, suggesting that some individual risk factors should be considered due to their influence on the possible treatment of all or some of the elements of Wing's triad that characterises ASD: communication, social interaction, and stereotyped behaviours.

Although ASD does not describe the person, it does delimit the demand and need that differentiates them from the neurotypical population (Canal et al., 2010). The results of this study allow us to observe this difference in terms of its dimensions – stereotyped behaviours, functional communication, and social interaction – with respect to the different variables, being at risk as soon as scores related to the diagnosis of ASD are indicated. Significant relationships are observed with respect to age, gender, and weight, acting as protective values in terms of more presence related to the variables susceptible to ASD.

Thus, the risk factors identified were related to age (OR = 2.27, 95% CI = 1.30-3.96), being male (OR = 2.67, 95% CI = 1.41-4.68) and being underweight (OR = 2.03, 95% CI = 1.09-3.80), which can be situated as risk or protective elements depending on how they are approached from early childhood and which, consistent with previous studies, have relevance in understanding and intervening with people who present these disorders from an early age, taking into account their individualities (Martín Martínez & Cuesta Gómez, 2012; Mitre, 2015), as well as the peculiarities in terms of the forms of presentation of the symptomatology that could lead to intermediate forms of presentation of ASD in individuals (Dell'Osso et al., 2016).

Multiple studies confirm a higher prevalence of ASD in the male population compared to the female population (Gould & Ashton-Smith, 2012; Mandy et al., 2018; Ruggieri & Arberas, 2016). The historical male preponderance in the prevalence of ASD has had an impact on the scientific knowledge about this disorder in women in terms of its clinical presentation, its genetic architecture, and the structural basis of the brain (Calderoni, 2023), and it has continued to our day. There is a predominance of males who have been diagnosed with ASD, a fact that is reinforced in this study, which shows that this personal factor represents a risk and from which several conclusions could be drawn: (a) a possible under-diagnosis or under-representation of the female population in the diagnosis of this pathology (Gould & Ashton-Smith, 2012; Mandy et al., 2018); (b) a better early development of women with ASD at a linguistic level (Fortea Sevilla et al., 2015; Ruggieri & Arberas, 2016) and (c) the need to provide more focused and earlier attention to the male population as a sector at greater risk of experiencing this pathology (Brugha et al., 2011).

Achieving greater and better early identification and diagnosis in individuals with ASD may contribute to improving the chances that children will benefit from intervention and lessen the burden on concerned parents (Zwaigenbaum et al., 2013). Precisely, an important part of the interventions derived from this early diagnosis must consider the family, as parents play a central role in recognising the signs of the disorder and detecting their children's special educational needs, especially those that can be addressed by educators at school (Gray et al., 2021; Halsall et al., 2021), as well as in attending to their children's needs at home (Estes et al., 2019) provided they have adequate family guidance and professional support (Halsall et al., 2021).

However, a considerable gap has been found in the detection of the support needs of girls with ASD and in the understanding and support within educational settings (Gray et al., 2021). Moreover, the existence of certain biological bases for the explanation of differences between males and females may be behind this gender divergence in ASD diagnosis (Arberas & Ruggieri, 2019; Ruggieri & Arberas, 2016). Studies by Baron-Cohen and colleagues suggest that the male brain is better defined for systemising while the female brain is significantly better defined for empathy (Lai et al., 2015), while other authors point out that differences in ASD expression in boys and girls are not significant and do not differ from differences in typically developing boys and girls (Hull et al., 2017), so gender differences in prevalence may be due to diagnostic bias. As an example, the results of the recent study by Burrows et al. (2022) evidenced inherent biases in the ASD diagnostic process due to the use of baseline measures influenced by generations of predominantly male ASD samples. After removing this gender bias, as well as age bias, they obtained a balanced 1:1 ratio in subgroups

of children based on longitudinal scores of communication skills and stereotypic behaviours, concluding that the use of data corrected for measurement bias across multiple assessment time points may better identify impairments in young females more likely to develop ASD, and supported the fuzzy nature of the ASD diagnostic boundary, especially in females.

Likewise, girls tend to be more likely to have accompanying intellectual disability (Arberas & Ruggieri, 2019), suggesting that it may not be recognised in girls without intellectual impairment (Fusar-Poli et al., 2022). In this regard, a recent study by Rødgaard et al. (2021) found that females were more likely than males to have ASD comorbidities and that the occurrence of these comorbidities was associated with age at first diagnosis of autism. In addition, it is possible that women manifest their social disorders less clearly and this behaviour is assumed to be a personal characteristic (Ruggieri & Arberas, 2016), making necessary promote early diagnosis and intervention in the group of girls (Morales Hidalgo et al., 2021). Indeed, Fusar-Poli et al. (2022) explained the differences between males and females in the under-diagnosis of the latter and relate it to the possible "camouflaging" of their difficulties in social situations, presenting less visible symptoms, and contributing to better language skills and social imitation. This would also help to explain the results of the present study regarding the absence of differences in social interaction.

This represents a further disadvantage for girls with autism if the age factor is also considered. Research evidence that, as the social demand in the school context increases in adolescence, the differences between girls and boys with autism increase, to the detriment of the former. This is due to the fact that the support strategies and resources provided to them from the adult world (parents, educators) can be lower due to the camouflage of their real needs (Halsall et al., 2021), which highlights the need to recognise and deepen in the camouflage strategies that hide the needs of girls with ASD of different ages, in order to facilitate the knowledge and recognition of their real needs and provide them with the supports and aids that adapt to their individual needs.

Nevertheless, on the positive side, and although the present study found that age represents a risk factor in terms of communication and stereotypical behaviours at an early age, a decrease with increasing age was evidenced. This decrease in risk invites us to conclude the importance of early diagnosis to facilitate the development of actions as early as possible (Canal et al., 2010; Casey et al., 2004), thus minimising the impact that the development of stereotypical behaviours and difficulties in communication and social interaction may have in the future.

Finally, it can be mentioned that, in general, intervention programmes with children with ASD focus on addressing the key elements of functional communication adapted to different contexts, attention to problem behaviours and improvement of interactions (Salvadó-Salvadó et al., 2012). This is to be expected in light of the results of the present study which show that communication and social interaction were the most affected dimensions in subjects with ASD. However, although these areas determine the basis and the system of support and help for these individuals (Fortea Sevilla et al., 2013; Fusar-Poli et al., 2022; Mulas et al., 2010), the importance of working with basic daily living skills should not be overlooked. In this regard, the results of the present study revealed the presence of a risk relationship in relation to underweight in people with ASD. This finding is consistent with the conclusions reached by Young et al. (2021), who pointed out, among other factors, difficulties in weight gain as a risk factor - especially in girls - for ASD. Once again, Estes et al. (2019) highlighted the role of the family in achieving better outcomes in interventions with children with ASD through specific functions related to interaction with the child, facilitation of family experiences, as well as attention to the child's health and safety, including eating, dressing and medical care.

Conclusion

The present study has allowed a greater approximation to the understanding of factors that, although they have a biological basis, are undoubtedly rooted in the socio-cultural environment in which they are contextualised. Gender, age, and weight are seen as relevant elements when it comes to understanding the characteristics associated with ASD and, above all, to provide these people with an intervention that takes these factors into account. The differences between boys and girls reveal the social concealment that occurs in girls, perhaps unintentionally, but worrying for early detection and specific stimulation. Along with this, age is revealed as a decisive factor for the development of stereotypical behaviour and communication, with a lower incidence observed at later stages. Hence, early action and concern for possible differential signs in males and females are aspects that derive from this study. Last but not least is the weight of the child, an element to which less attention seems to be paid in favour of other more notorious aspects such as communicative disturbances, stereotypies, and interactions.

What this study raises is the relevance of considering all individual elements and their impact on the development of the individual with ASD in a socio-ecological environment. In this sense, it should be remembered that a person with ASD does not live in another world, he/she sees the world differently. Given that each person requires attention focused on their real demands and needs, in order to help them and provide them with the stimuli and support adapted to their particular case, the collaboration of all the people involved in their education and development (specialists, families and educators) is essential (Fortea Sevilla et al., 2013), thus facilitating their learning and a quality, independent and autonomous life (Fortea Sevilla et al., 2015; Mulas et al., 2010; Salvadó-Salvadó et al., 2012). The aim of their education is, like that of all people, to improve their quality of life, so that they can learn and develop and be included in all areas of society (Baña & Losada-Puente, 2019).

Recommendations

In line with the contributions gathered throughout the discussion and conclusions, it is evident that the socio-ecological perspective is the one that should guide research studies and interventions with children with ASD. From this perspective, it is understood that any process of rigorous, collaborative and multidimensional analysis between specialists in relation to people with ASD will allow us to evaluate both the development of the set of impairments, as well as the relationships with determining variables in the development of support and help for their quality of life (Baña & Losada-Puente, 2019; Canal et al., 2010; Jiang et al., 2022; Pino-López & Romero-Ayuso, 2013). Although there are studies on the co-occurrence of ASD, having a comprehensive theoretical framework that analyses the roles played by certain factors such as gender, weight, physical exercise, etc. in the construction of the person's identity and, therefore, their personality, helps to better understand the clinical understanding and guides the meaning of the support and help they may need and/or demand. It is precisely the line of further studies that should continue this focus on the protective and risk factors that, both at the individual and contextual level, such as the family characteristic and parental educational styles, the school wellbeing and context adequacy, among others, are at the basis of the potential for improvement of the child with ASD through educational intervention.

Limitations

Despite the great interest aroused by this study as it offers interesting results that complement and broaden the field of study on ASD, it is not without its limitations. The first limitation relates to the size of the sample, as it is a small proportion of the population with a specific geographical location. Future studies would need to increase the sample size to analyse in detail the effect of the variables studied on the risk of ASD. The second limitation observed focuses on the difficulties in controlling for the potential influence of other variables and their joint and contribution to the disorder. It is necessary to broaden the field of study by introducing the influence of not only personal but also contextual factors.

Finally, and in relation to the above, one element to highlight is the relevance of incorporating, together with the quantitative study of these factors centred on the person, others related to their immediate environment (family, support professionals, etc.) to verify, not only those factors that are at the origin of the disorder, but to go further, investigating the course of development of the people who suffer from it. In this way, the objective of preventing the disorder would be extended to improving the quality of life of sufferers and their families.

Authorship Contribution Statement

Manoel Baña: Conceptualization, data acquisition, drafting manuscript, supervision. Luisa Losada: Design, data analysis and interpretation, drafting manuscript, editing/reviewing, final approval.

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