

Association between autistic traits and home nurture environment: A community-based study

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Research article

Keywords: autistic traits; home nurture environment; parenting

Posted Date: April 7th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-18754/v1>

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Abstract

Background: Increasing attention has been directed toward understanding the ways in which social environmental factors influence children's behavior, in physical and mental health domains. Autistic traits are continuously distributed in general population and children with autistic traits have great risk of additional mental diseases. However, no literature has demonstrated the relation between autistic traits and home nurture environment. **Methods:** Caregivers of 408 kindergarten children (68% male) were recruited to complete a series of survey measures in China. The measures used were the Clancy Autistic Behavior Scale and the Home Nurture Environment Scale. Multivariate logistic regression analysis was used to examine the associations. **Results:** Frequent language/cognition stimulation (aOR 0.520, 95%CI 0.302-0.896), high level of parental warmth (aOR 0.596, 95%CI 0.392-0.905) and high quality of physical living environment (aOR 0.332, 95%CI 0.196-0.561) were the protective factors of autistic traits after controlling the confounding factors. Results were generally not moderated by the child's gender or birth order. **Conclusions:** These findings highlight the importance of high levels of home nurture environment for autistic traits and indicate that public health programs should focus on guidance of parents for developing more adequate parenting skills and favorable home nurture environment.

1. Background

Autistic traits are characterized by difficulties in interpreting social information, deficits in understanding those feelings of others, lessened desire to interact with others, repetitive and rigid behavior patterns.[1] Extensive evidence demonstrates that autistic traits are continuously distributed in general population.[2, 3] Assessing autistic traits in children is crucial because of the potential mental health implications they may have. Several studies have proved that children with a high level of autistic traits has a greater risk of additional mental diseases.[4] Social and communicative deficits characteristic of autistic traits have also been demonstrated to occur at elevated rates among children with other psychiatric conditions including mood disorders[5], anxiety [6], depression[7], conduct/oppositional defiant disorders[8] and even an early precursor of psychotic experiences.[9] In addition to this, Children with autistic traits have social interaction needs for peer problems [10–12] as well as higher risk for interpersonal victimization. [13]

In recent years, increasing attention has been directed toward understanding the ways in which social environmental factors influence children's behavior, in physical and mental health domains.[14, 15] Parental guidance and family support are critical to the development of children's psychological quality and health-related behaviors. [14, 16] Children living in chaotic households (e.g., lack of organization, confusing and unpredictable schedules and loud noise) reveal more behavioral problems. [17] Thus, to the extent that parents with low quality parenting would lead to poor nurture environment, the child may also exhibit poorer mental and physical health.[18]

However, most studies are limited by a focus on specific domains of autistic traits (e.g., theory of mind) or by the limited areas of parenting styles. On the best of our knowledge, as yet, no literature has demonstrated the relation between autistic traits and home nurture environment. In China, there are

concerns that the concurrence of the only-child policy and the tradition of respect for elders, filial piety and obedience would result in increased stress of children, which may lead to behavior problems. [19, 20] Thus, it has practical significance to carry out relevant research. Given this, the aim of this study was to investigate the association between children aged 3 to 6 years with autistic traits and their home nurture environmental factors in China.

2. Methods

2.1 Participants and data collection

We identified the positive screening result of Clancy Autism Behavior Scale[21] as the specific outcome. We run the test on the 2600 children age 3–6 years from 6 kindergartens in Taicang District, Suzhou from May to June, 2019. If the result turned to positive, then we consider the child was with autistic trait. Then we used Home Nurture Environment Scale[22] to evaluate the circumstance of the home nurture environment. Meanwhile, demographic data was collected including gender, parental education level, birth order, separation period with mother and the primary caregiver. Children with pre mental disease and acute medical illness were excluded from the study. The primary caregiver of children gave informed consent prior to entry into the study first and then fulfilled the questionnaires. The study adhered to the Declaration of Helsinki and ethics approval was obtained from the Institutional Review Board of Soochow University. Ultimately, a total of 204 children who satisfied the inclusion and exclusion criteria formed the screening positive group. (Fig. 1 shows) In consideration of gender as a proven risk factor[23] as well as birth year and birth order as clinical confounding factors, the 204 children was matched to controls on the three factors mentioned above. The controls were normally developing children from kindergartens aged from 3–6 years in Taicang District, Suzhou. For data quality control, 5% of the questionnaires were randomly selected and were rechecked, and on average, these showed 97% (73/75) consistency with previously answers.

2.2 Measures

2.2.1 Autistic traits

Autistic traits were measured with the Clancy Autism Behavior Scale (CABS)[21]. It is a validated tool for assessing the risk of autistic traits in screening toddlers aged between 2 to 6 years which widely used in mainland China.[24, 25] It contains 14 items with each item rating three frequency levels, including “Never” (score of 0) “Occasionally” (score of 1) and “Often” (score of 2). Scores on the CABS are usually divided into three groups according to cut-off points of 14 and 21. For the reason that the scale is consisted of 14 kinds of typical autistic behaviors, using this scale to identify autistic traits is reasonable. If a child scores equal to or higher than 14, the child is considered as a case with autistic traits. One previous study reported a sensitivity of 88% and specificity of 82% about the performance of CABS.[26]

2.2.2 Home Nurture Environment

The 3 ~ 6 Years Child Home Nurture Environment Scale[22] is designed based on Chinese culture background, which consist of 53 items in order to measure diverse variables associated with parenting behaviors and living environment. Each item is divided by 5 frequency rates (hardly ever, seldom, occasionally, frequently and normally) to 5 points (1, 2, 3, 4 and 5). The total rewards will be calculated by these points and will rank to 3 levels (good, average and unsatisfactory). The good level is higher than 85%, the average level is defined by 15%-85% and the percentage below 15 is unsatisfactory. The scale included six factors: language/cognition stimulation, parental warmth, social adaptation/self care, variety of actives and games, neglect/intervention/punishment and physical living environment. It should be completed by caregivers. The reliability coefficients of the scale indicated by split-half correlation (0.871) and Cronbach alpha (0.930) are satisfactorily high.

2.3 Statistical analysis

Initial unadjusted analyses were performed for all demographic and nurture environmental variables to identify those significantly associated with autistic traits. Categorical variables were presented as frequencies and percentages and conducted by chi-square test. Continuous variables were analyzed by independent t-test and presented as mean and standard deviation. Variables that were clinically relevant or that showed a univariate relationship with outcome were entered into multivariate logistic regression model. Multivariate logistic regression model with adjusted odds ratio was performed to predict nurture environmental factors associated with autistic traits. P-values were calculated to three decimal places and $P < 0.05$ was the criterion for significance. All analysis was performed using SPSS, Version22. (SPSS Inc, Chicago, USA)

3. Results

All of children were 3–6 years old and of Han ethnicity. Among the 204 cases and 204 controls, there were 140 male and 64 female children for a sex ratio of 2.02:1, reflecting the male preponderance for the autistic trait. The mean age of autistic children was 4.65 ± 1.111 years, and mean age of normal children was 4.75 ± 1.109 years. ($t = 0.981$, $P = 0.327$) Table 1 displays the mean scores of home nurture environment scale for each level. Based on the result, there was no unsatisfactory level among six levels.

Table 1
Scores of Home Nurture Environment Scale for each level

home nurture environmental factors	screening positive group (mean ± SD)	control group (mean ± SD)
language/cognition stimulation		
average level	43.39 ± 5.29	43.66 ± 5.065
good level	52.82 ± 1.701	53.94 ± 2.351
parental warmth		
average level	30.03 ± 3.174	30.19 ± 3.532
good level	36.33 ± 1.772	37.04 ± 2.004
social adaptation/self care		
average level	39.24 ± 2.375	40.61 ± 4.005
good level	46.69 ± 2.302	49.24 ± 2.375
neglect/intervention/punishment		
average level	26.09 ± 6.906	28.30 ± 5.69
good level	47.50 ± 0.707	47.50 ± 0.707
variety of actives and games		
average level	19.66 ± 1.919	19.89 ± 2.019
good level	24.97 ± 1.82	25.35 ± 2.122
physical living environment		
average level	17.17 ± 2.61	18.04 ± 3.039
good level	19.32 ± 2.550	20.81 ± 2.675

Table 2 presents crude odds ratios from univariate analyses. Father completed primary school or below was associated with increased risk for autistic traits. Decreased risks of autistic traits were found in parents as primary caregiver, high level of language/ cognition stimulation, parental warmth and physical living environment and general quality of home nurture environment ($P < 0.05$). However, maternal educational level, separation period longer than 6 months, frequent neglect/intervention/punishment and insufficient opportunities of social adaptation/self care and variety of actives and games were not significantly different between case and control groups.

Table 2

Distributions, unadjusted OR and 95% CI for demographic and home nurture environmental factors

	Screening positive group	Control group	OR	95%CI	p- value
	n (%)	n (%)			
Paternal education level					
master and above	11(5.4)	6(2.9)	-		
collage	30(14.7)	26(12.7)	1.589	0.516, 4.893	0.42
undergraduate	108(52.9)	86(42.2)	1.46	0.519, 4.107	0.473
middle school or below	55(27)	86(42.2)	2.867	1.002, 8.198	0.049*
maternal education level					
master and above	7(3.4)	7(3.4)	-		
collage	37(18.1)	13(6.4)	0.351	0.103, 1.194	0.094
undergraduate	93(45.6)	94(46.1)	1.011	0.341,2.995	0.985
middle school or below	67(32.8)	90(44.1)	1.343	0.45, 4.013	0.597
separation period					
longer than 6 months	184(90.2)	188(92.2)	-		
less than 6 months	20(9.8)	16(7.8)	0.783	0.393, 1.558	0.486
primary caregiver					
grandparents	63(30.9)	32(15.7)	-		
parents	141(69.1)	172(84.3)	0.416	0.258, 0.673	< 0.001*
language/cognition stimulation					
average level	176(86.3)	154(75.5)	-		
high level	28(13.7)	50(24.5)	0.49	0.294, 0.817	0.006*
parental warmth					
*Significant (P < 0.05)					

	Screening positive group	Control group	OR	95%CI	p-value
	n (%)	n (%)			
average level	120(58.8)	97(47.5)	-		
high level	84(41.2)	107(52.5)	0.635	0.429, 0.939	0.023*
social adaptation/self care					
average level	170(83.3)	155(76)	-		
high level	34(16.7)	49(24)	0.633	0.388, 1.031	0.066
neglect/intervention/punishment					
average level	41(20.1)	28(13.7)	-		
high level	163(79.9)	176(86.3)	0.632	0.374, 1.07	0.088
variety of actives and games					
average level	111(54.4)	101(49.5)	-		
high level	93(45.6)	103(50.5)	0.822	0.557, 1.212	0.322
physical living environment					
average level	176(86.3)	131(67.2)	-		
high level	28(13.7)	67(32.8)	0.325	0.198, 0.533	< 0.001*
*Significant (P < 0.05)					

On multivariate regression analyses (Table 3), adjusting for familial characteristics (birth year, gender, birth order, parental educational level, primary caregiver and separation period) showed frequent language/cognition stimulation (aOR 0.520, 95%CI 0.302–0.896), favorable parental warmth (aOR 0.596, 95%CI 0.392–0.905), pleasant physical living environment (aOR 0.332, 95%CI 0.196–0.561) were associated with decreased odds of autistic traits.

Table 3
Multiple-factor logistic regression analysis of autistic traits

home nurture environmental factors	aOR	95%CI	p-value
language/cognition stimulation (high level vs. average level)	0.52	0.302, 0.896	0.019*
parental warmth (high level vs. average level)	0.596	0.392, 0.905	0.015*
social/adaptation self-care (high level vs. average level)	0.717	0.405, 1.208	0.211
neglect/intervention/punishment (high level vs. average level)	0.635	0.364, 1.106	0.109
variety of actives and games (high level vs. average level)	0.729	0.479, 1.111	0.142
physical living environment (high level vs. average level)	0.332	0.196, 0.954	0.03*
*Significant (P < 0.05)			

Adjusted for: birth year, gender, birth order, parental educational level, primary caregiver and separation period

4. Discussion

We have conducted a rigorous community-based cross-sectional study, frequency-matched on gender, birth year and birth order to investigate the home nurture environmental factors for autistic traits in China. Overall, the results from the study suggested that poor home nurture environment, including insufficient language/cognition stimulation, undesirable parental warmth and poor physical living environment may place preschool children at a great risk for autistic traits. We will discuss each of these findings in turn and address the implications of these findings.

We found that frequent language/cognition stimulation, which means the quality of verbal and cognitive information a caregiver provides to a child was significantly associated with autistic traits. In other words, children with higher levels of autistic traits reported by caregivers had more difficulty on language interaction. The variability in child language in the early years is well-established.[27] Positive characteristics such as high maternal vocabulary level[27] and high socio-economic status[28] have advantageous impact on children's language and cognitive development. One previous research also demonstrated that poorer child language development predicted more autistic traits.[29] It is hypothesized that the identified association between autistic traits and language and cognitive stimulation may be explained by two key pathways. Firstly, there is a relationship between early language and later autistic traits, which is comparatively to the interaction with caregivers.[30] Therefore, caregivers did not give children enough response and less opportunities on verbal and cognitive information, children with autistic traits themselves has deficiency on capability for self-explanation and communication, and as a result, the symptom would also be more obvious. Alternatively, it has been reported that the shared genetic influences of children and caregivers may be responsible for the overlap

in linkage signals reported in molecular genetic studies of language skills and autistic traits.[31, 32] Caregivers themselves had defect on communication skills, and therefore decrease the stimulation of language at home environment. Although this finding need to be replicated before any firm conclusions can be mad, it raises the possibility that early interventions in terms of language and cognitive skills by caregivers may reduce the occurrence of autistic traits.

Previous research has demonstrated parental warmth an indicator of parents' love and acceptance of the child[33] which was associated with children's better mental health and psychological adjustment, as well as lower levels of child behavior problems.[34] Studies examining warm affect, positive cooperation and communication showed negative associations with conduct problems and high levels of emotional symptoms.[35, 36] In our study, we found parental warmth a protective factor for autistic traits. Generally speaking, if a child did not experience consistent warmth from a parent, his own positive emotional responsiveness to the parent might decrease. Likewise, if a parent found that their attempts at warmth were not reciprocated, the frequency of their displays of warmth would also decrease over time.[35] Preschool children with high levels of autistic trait were preceded by early manifested ASD-like problems in infancy and toddlerhood.[37] Thus, favorable parental warmth and considerate care in early childhood are needed in an attempt to diminish further derailment of the child's behavior and development, and to prevent the autistic traits or related externalizing problems. However, it is yet to be established whether interventions targeting particular aspects of parental warmth or other parenting behaviors can be effective in driving more change in children with high levels autistic traits or if such interventions can directly reduce autistic traits, which are both questions we hope to examine in future studies.

The home physical environment not only affects individual child well-being, but also is an important pathway through which socio-economic inequalities create child health and developmental disparities. Unstable home physical environment has negative effects on children's health and development.[38] One possible reason proposed for the negative effects of poor physical environments on child behavior problem is through increased exposure to stress.[39, 40] Biological changes are likely to occur if the body is exposed to chronic stress (repeated stress response over time), resulting in dysfunction of the neuroendocrine and immune systems. These systems might be particularly sensitive during the formative years of childhood.[41] Dysfunction of children's neuroendocrine, in turn, is associated with cognitive[42] and socio-emotional [38]outcomes. Children with autistic traits have lower neuropsychological performance [43] and impairment in social function.[11, 44] And as a result, terrible home physical environment may make their symptoms more apparent.

All of these findings should be interpreted in the context of several study limitations. First, there are clear limitations with using a tool of this type to measure home nurture environment. It relies on the observation and perceptions of parents, who may not be entirely objective. Second, because we did not assess other emotional or behavioral problems, we could not rule out the possibilities that other comorbid conditions may have contributed to the significant associations between autistic trait and home nurture environment reported in this study. In addition, the study was limited to only six schools in one city, with obvious issues of representativeness for the wider population.

5. Conclusions

In conclusion, findings revealed that high levels of autistic traits were related to poor home nurture environment. Furthermore, frequent language and cognition stimulation, favorable parental warmth and pleasant home physical environment were the protective factors for autistic traits. Taken together, the current study extends the previous research on potential influences in terms of parenting which is relevant to autistic traits, and highlights the importance of home nurture environment. Meanwhile, it would indicate that public health programs should also focus on guidance of parents for developing more adequate parenting skills and favorable home nurture environment.

Declarations

Ethics approval and consent to participate

The study adhered to the Declaration of Helsinki and ethics approval was obtained from the Institutional Review Board of Soochow University. The participants gave informed consent prior to entry into the study first and then fulfilled the questionnaires.

Consent for publication

Not applicable.

Availability of data and materials

All data generated or analyzed during this study are included in this published article.

Competing interests:

We declare that we have no financial and personal relationships with other people or organizations that can inappropriately influence our work, there is no professional or other personal interest of any nature or kind in any product, service and/or company that could be construed as influencing the position presented in, or the review of.

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CW

Bartlett

JF

Flax

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Bassett

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F

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LME

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Muetzel

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2019

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