Elevated Self-Rated Intellectual Ability Among Biological Parents of Autistic Individuals

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Journal of Secondary and Undergraduate Research

Published on October 12th, 2024

We conducted an online survey asking biological parents of autistic individuals to self-assess their intellectual ability by ranking themselves in one of five quintiles: 1st-20th percentile, 21st-40th percentile, 41st-60th percentile, 61st-80th percentile, and 81st-100th percentile. A flyer containing a QR code linked to the questionnaire was distributed to organizations, centers, and clinics supporting autistic individuals and their families. A total of 30 responses were collected, with 3 excluded due to irrelevance (as they described the autistic individuals rather than the biological parents). Of the 27 valid responses, 16 respondents placed themselves in the 81st-100th percentile, 9 in the 61st-80th percentile, 1 in the 41st-60th percentile, and 1 in the 21st-40th percentile. Given an assumed equal distribution across quintiles in the general population (20% each), 59.3% of respondents rated themselves in the highest quintile, and 92.6% rated themselves in the top two quintiles. A chi-square goodness-of-fit test confirmed that the observed distribution deviates significantly from the expected values (χ^2 = 35.78, p = 3.21 × 10^{-7}). Linear regression analysis also demonstrated a statistically significant upward trend across quintiles (R^2 = 0.828; F = 14.46, p = 0.032). We conclude that biological parents of autistic individuals self-report significantly higher intellectual ability than expected in the general population.

1 Introduction

Genetic and twin studies have established a hereditary component in autism, leading some researchers to postulate that the genes associated with autism represent harmful new mutations [6, 4]. This assumption, however, is inconsistent with epidemiological evidence showing that autism is both prevalent and potentially increasing in frequency. Additional empirical and anecdotal findings challenge the idea that autism results from deleterious de novo mutations. There are numerous reports suggesting that the parents of autistic individuals are often intellectually advanced and professionally accomplished. Autistic individuals with exceptional intellectual abilities have also been well-documented, with some achieving notable success [1].

Empirical studies have identified correlations between parental career success, higher paternal IQ, and the likelihood of autism in offspring [2, 5]. Moreover, recent research has discovered that a sub-type of autism is associated with neuron overgrowth and macrocephaly, suggesting that certain genetic factors related to intellectual growth may contribute to autism [3]. These findings support an alternative hypothesis: that the alleles associated with autism may enhance intellectual ability and contribute to the intellectual and professional success of individuals who carry them. As a result, these alleles may be prevalent and even increasing in the population. However, when individuals with these advantageous alleles mate and reproduce, their children may inherit homozygous or novel combinations of these alleles, leading to autism through pleiotropic effects. One possibility is that neural overgrowth or heightened activity, which enhances intellectual ability in the parents, could overwhelm or impair neural pathways for typical social interaction in autistic offspring.

To explore this hypothesis, we designed a questionnaire to test whether the biological parents of autistic children report higher intellectual ability compared to the general population.

2 Methodology

The questionnaire asked respondents to place themselves in one of five quintiles in the population in terms of general intellectual ability.

Quintile 1: 1st-20th percentile
Quintile 2: 21st-40th percentile
Quintile 3: 41st-60th percentile
Quintile 4: 61st-80th percentile
Quintile 5: 81st-100th percentile

The exact question was: "How would you rate your general intelligence compared to the general adult population?" Below the rating box, respondents were asked to provide a brief explanation to support their self-assessment. The instruction read: "If possible, please provide a short explanation to support the rating you selected. You may mention IQ score, standardized test scores, high school and college class performance and GPA, honors received such as cum laude, and subjective experiences. For your reference, the 80th percentile IQ is around 115, and the IQ of an average college graduate is also around 115. The 80th percentile SAT score is 1280 out of 1600." This explanation, though not mandatory, served to validate the ratings and allowed us to eliminate 3 out of the 30 responses that were deemed irrelevant, as they clearly referred to the children rather than the biological parents.

At the beginning of the questionnaire, respondents were asked to provide their real names and email addresses to ensure data integrity. At the end of the questionnaire, respondents were asked to check a consent box allowing their responses to be used in the research. The consent statement read: "I consent to allow the data I inputted above to be analyzed in the autism research project. I understand that my name and email will remain confidential and that no one other than the main researchers will have access to them."

The link to the online questionnaire was emailed to various organizations, centers, and clinics supporting autistic individuals and their parents. A flyer with a QR code linking to the questionnaire was also distributed through social media groups for parents of autistic individuals.

3 Results

The first response was submitted on July 12, 2024, and the last response accepted before data analysis commenced was on October 5, 2024. Of the 27 valid responses, 1 respondent rated themselves in the 21st-40th percentile, 1 in the 41st-60th percentile, 9 in the 61st-80th percentile, and 16 in the 81st-100th percentile. Most of the explanations provided supported the ratings with objective criteria such as IQ scores and standardized test results.

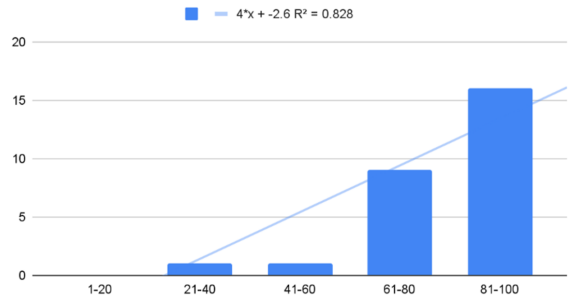

Figure 1: Histogram of 27 responses from biological parents of autistic children who filled out the questionnaire.

4 Analysis

In the general population, each quintile represents 20% of individuals, reflecting the expected distribution if there were no association between intellectual ability and the likelihood of having autistic children. This would mean that individuals from all intellectual ability levels would have autistic children at equal rates. However, if a positive association exists between intellectual ability and the likelihood of having autistic children, we would expect biological parents of autistic children to rate themselves higher in intellectual ability compared to the general population.

First, we calculated the percentage of respondents in each quintile, as well as the combined percentage in the top two quintiles:

1st–20th percentile: 0%
21st–40th percentile: 3.7%
41st–60th percentile: 3.7%
61st–80th percentile: 33.3%
81st–100th percentile: 59.3%
61st–100th percentile (combined): 92.6%

Next, we performed a chi-square goodness-of-fit test to assess whether the observed distribution significantly deviates from the expected equal distribution across quintiles in the general population. The hypotheses were set as follows:

Null hypothesis (H_0): The data fit the expected distribution, indicating no association between intellectual ability and the likelihood of having autistic children.

Alternative hypothesis (H_1): The data do not fit the expected distribution, suggesting an association between intellectual ability and the likelihood of having autistic children.

Given that there are five groups and an expected equal distribution, the expected frequency for each group is the total number of respondents divided by five:

$$Freq_{expected} = \frac{0+1+1+9+16}{5} = 5.4 \quad (1)$$

The chi-square statistic is calculated using the formula:

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i} \quad (2)$$

Where O_i is the observed frequency in group i, and E_i is the expected frequency.

The degrees of freedom (df) for this test are calculated as:

$$\text{df} = \text{Number of groups} - 1 = 4 \quad (3)$$

The chi-square statistic is approximately 35.78, and the p-value is approximately 3.21×10^{-7}.

Since the p-value is far smaller than the conventional significance level of 0.05, we reject the null hypothesis. This suggests that the observed distribution significantly differs from the expected equal distribution across quintiles.

Finally, we conducted a linear regression to examine if there was a statistically significant upward trend across the quintiles. A small p-value (typically < 0.05) for the slope in the regression model would suggest a significant progression from lower to higher quintile groups. The results from the linear regression were as follows:

R^2: 0.828; F-statistic: 14.46; p-value: 0.032

These results indicate that the overall regression model is statistically significant at the 5% level, demonstrating a clear upward progression across the quintile groups.

5 Discussion

Out of 27 respondents, 16 (59.3%) rated themselves in the top quintile, while 25 (92.6%) rated themselves in the top two quintiles. These values are significantly higher than the expected percentages in the general population (59.3% vs. 20% for the top quintile and 92.6% vs. 40% for the top two quintiles).

The chi-square goodness-of-fit test ($\chi^2 = 35.78$, $p = 3.21 \times 10^{-7}$) supports the rejection of the null hypothesis, suggesting that the distribution of self-rated intellectual ability among biological parents of autistic children deviates significantly from the expected equal distribution. This indicates a statistically significant association between having autistic children and higher self-rated intellectual ability in their biological parents.

Additionally, the linear regression results ($R^2 = 0.828$, F-statistic = 14.46, p-value = 0.032) reveal a clear upward trend across the quintiles, with an increasing number of parents rating themselves in higher quintiles of intellectual ability. This further supports the finding that biological parents of autistic children are more likely to perceive themselves as having higher intellectual ability compared to the general population.

6 Conclusion

The prevalence and increasing rate of autism have been a mystery for researchers for decades. After a genetic component was demonstrated, researchers began searching for de novo deleterious mutations as a possible cause of autism. However, new harmful mutations should not be common, nor should they be spreading rapidly. The widespread occurrence and rising prevalence of autism suggest the involvement of advantageous alleles that provide greater fitness to those who carry them. These alleles' pleiotropic effects of autism, which is often a devastating condition that is apparently harmful, have likely concealed the beneficial properties of the alleles responsible for causing autism for a long time.

We propose that autism is caused by alleles that enhance intellectual abilities in biological parents. Through assortative mating, these parents may produce offspring with homozygous or novel combinations of alleles that predispose them to autism. Our research supports this hypothesis. According to our findings, biological parents of autistic individuals appear to have significantly higher intellectual abilities compared to the general population.

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