

# Autism and parents' education

## New data from the developing world

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### ABSTRACT

**الأهداف:** فحص العلاقة بين اضطراب التوحد و مهنة الوالدين مثل الهندسة والرياضيات .

**الطريقة:** تضمنت عينة الدراسة كل الأطفال الذين تم تشخيصهم بالتوحد اضطرابات النمو الشاملة (PDD) حسب معايير كتاب تشخيص وإحصاءات الاضطرابات النفسية (DSM-IV)، عبر فترة محددة من الزمن من مارس 2006 إلى يونيو 2007. بعدها أخذنا كل الأطفال بدون اضطرابات النمو non-PDD غير اضطرابات التوحد واضطرابات النمو الشاملة والذين كانوا يراجعون في نفس الفترة التي كان يراجع بها أطفال مجموعة التوحد وهذه المجموعة تشمل اضطرابات تأخر الكلام، الإعاقات الذهنية و متلازمة داون. اشتملت الدراسة المعلومات الديموغرافية الأساسية، ثم أضيف إليها تعليم، وتدريب ومهنة الوالدين و الأجداد. لقد صنفت مهنة وتعليم الوالدين إلى 2 مجموعة فقط، المجموعة الأولى شملت الهندسة والرياضيات، أما المجموعة الثانية تشمل الآداب والإنسانيات مما ليس له علاقة بالهندسة أو الرياضيات. تم تقسيم عينة الدراسة إلى 2 مجموعة، مجموعة التوحد (57 حالة)، و مجموعة اضطرابات النمو (40 حالة).

**النتائج:** فيما يخص السؤال الرئيسي لهذه الدراسة ألا وهو العلاقة المفترضة بين التوحد ومهنة الوالدين، فإن النتائج تظهر فرقا إحصائيا دالا صغيرا بين مجموعتين ( $x^2=2.503$ , [df]=1;  $p=0.093$ )، لم يكن هناك فرقا إحصائيا دالا ( $x^2=0.370$ , df=2;  $p=0.831$ ) بين المجموعتين في موضوع قرابة الوالدين. تظهر دراستنا أن الغالبية من الوالدين ليست بينهم قرابة في كلتا مجموعتين.

**خاتمة:** لقد وجدت هذه الدراسة على عينه سعودية نسبياً صغيره تشابه مع عينات في كلاً من بريطانيا UK والولايات المتحدة USA. هناك علاقة ممكنة بين ظهور أعراض التوحد عند الأطفال وتعليم ومهنة الأب في الهندسة والرياضيات. نوقشت الجوانب النظرية باختصار.

**Objectives:** To investigate the link between autism disorders and engineering training of parents.

**Methods:** All Autistic-Pervasive Developmental Disorders (PDD) children that were diagnosed on the bases of the Diagnostic and Statistical Manual for Mental Disorders (DSM-IV), and met the required criteria for autism, over a defined period (March 2006 to June 2007) were included. We then took all non-PDD developmental disorders cases seen during the same time frame as the autistic children as a control; these included speech delay, mental retardation, and Down's syndrome. Our data covered demographic data, parents and grandparents' education, and profession. Parents' education/professions were classified into 2 groups only, 1-engineering or mathematician; and 2-humanities, neither engineering nor math. The children were divided into 2 groups, autism (57 cases), and developmental disorders (40 cases).

**Results:** Regarding the main question of this study (hypothesized engineering link), the data showed some differences between the 2 groups ( $x^2=2.503$ , degrees of freedom [df]=1;  $p=0.093$ ), but not of major significance. There was no significant difference ( $x^2=0.370$ ; df=2;  $p=0.831$ ) between the 2 groups on the variable of consanguinity.

**Conclusion:** We have found that the Saudi Arabian sample, though relatively small, has considerable similarities with both the UK and USA data. There is a possibility of an association between autism and the engineering/math training of fathers. The implication is briefly discussed.

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Autism is not only widely viewed as a brain disorder; it is also universal in prevalence. International studies have demonstrated that autism is found in all continents.<sup>1</sup> Genetics are widely understood to be a major factor in this disorder. We do not yet know the location or the mode of transmission of the genes,<sup>2</sup> however, there is very clear family evidence to suggest that it does run in certain families.<sup>3,4</sup> Wheelwright and Baron-Cohen<sup>5</sup> found in the British cross-sectional study that the relatives of children with autism are more likely to have math or engineering jobs compared with other children with developmental disorders. In this study, we raised the following question: If autism (as a Pervasive Developmental Disorder [PDD]) disorder is a brain disorder and universal in nature, could this engineering link be found in a non-industrial developing society? If yes, it would further confirm the link, and hence support the theory of systematizing versus empathizing as a universal cognitive phenotype.<sup>5,6</sup> The recent developments in understanding how the child with autism thinks, and how their brain differs from normally developing children, is the concept of the extreme male brain.<sup>6,7</sup> This suggests that the male is prepared to be more systematic in his approach to interacting with nature and the environment, much less for the female. While the female is more able to empathize with others, understanding the feelings of others. Such theory and research if supported further by different evidence, may also provide a rationale for selective population genetic research.<sup>8</sup> Given the fact that autism is more prevalent now with no known etiology, one needs to ask if such data represent industrial societies, and hence there was much emphasis on engineering and industrial systems in Europe for many centuries, which may suggest that environmental factors play a role. Or is it not related to the environment in some cases, but those who have a propensity in dealing systematically with the environment are hardwired and prone to have children with severe degrees of this trend (systematic approach) reflected in the diagnostic features of autism. So the question would be: is it possible that we can replicate USA and UK data in our sample? Is it really that autism is linked to engineering regardless of society progress with technology production? The current study aimed to answer the first question. Saudi Arabia is a very recently developing country where engineering is new to the society. We hoped that by testing this hypothesis on a local population we would shed some light on the nature of the link, in a small report. Most fathers work in the society, and very few mothers do; hence, the data were only related to fathers of patients.

**Methods.** The data collections started from March 2006 to June 2007 at King Faisal Specialist Hospital and Research Center, Jeddah, Kingdom of Saudi Arabia. All

autistic (PDD) children were seen by a western trained consultant Developmental Pediatrician. All children were diagnosed on the bases of DSM-IV (American Psychiatric Association, 1994),<sup>9</sup> meeting the criteria for the specific diagnoses for autism. We then took all non-PDD developmental disorder cases seen in the same time frame as the autistic children as a control; these included speech delay, mental retardation, and Down's syndrome. Again, all these patients met the DSM-IV criteria for their diagnoses. The hospital's Institution Review Board (IRB), of the Research Center within the hospital approved the study for methods and ethical reasons. All participating parents gave their direct verbal consent for inclusion in the study. Data were gathered through personal contact, following extraction of all relevant data from the medical records. We used direct and phone contact of the entire sample. Initially, we located 101 cases that met the criteria, however, one parent declined to participate, and 3 cases were not completed. Therefore, we analyzed 97 patients of both categories, 57 autistic cases, and 40 developmental delay cases. Our data covered basic demographic data, and in addition parents and grandparents education and profession. Parents' education/profession was classified into 2 groups only, 1-engineering or mathematician; and 2-humanities, neither engineering nor math. When a father, for instance, graduated from an engineering school or math school, worked or trained as an engineer/math practitioner (civil, chemical, computer, and so forth) he would be classified under the first category (engineering group), but otherwise professions such as, teacher, administration, driver, farmer, military, and so forth were classified under the second category (non-engineer group). To the best of our abilities, we endeavored to clarify parents' education and profession.

Using the Statistical Package for Social Sciences (SPSS Inc, Chicago, IL, USA), the statistical analysis was carried out using Chi-square test and a  $p$ -value of  $<0.05$  was considered statistically significant.

**Results.** A total of 97 children (autism group' 57 cases, developmental disorder group 40 cases) who met our inclusion criteria, and diagnosed with autism (autistic-PDD) were included in this study. Table 1 summarizes the demographic details of both groups. Regarding the main question of this study (hypothesized engineering link), the data showed (Table 2) that there is a difference between the 2 groups, but this did not reach major statistical significance ( $\chi^2=2.503$ ,  $df=1$ ;  $p=0.093$ ). Figure 1 demonstrates how our data relates to both UK and USA data. The 3 sets of data are proportional in terms of the percentage of engineering among the autism groups, regardless of the size of each study. Our analysis also shows an interesting result related to consanguinity; most parents are not related in both groups, and there

**Table 1** - Demographic data of both groups.

Variable	Autistics	Controls
Gender, males n (%)	47 (76.3)	27 (23.7)
Age, (mean years)	6.2 years	6.4 years
Age at diagnosis, (mean years)	4.4 years	4.2 years
<b>Consanguinity, n</b>		
First	11	10
Distant	5	3
None	39	27

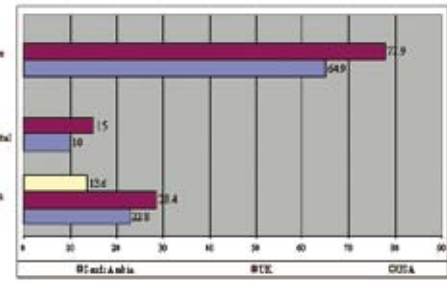
\*2 cases are missing due to incomplete study data

**Table 2** - Education years, speciality, and profession of fathers and grandfathers of autistics (A) and controls (NA).

Groups	Education in years (Mean ± SD)		Education speciality						Profession					
	A	NA	Engineering or Maths		Humanities		Others		Engineering or Maths		Humanities		Others	
			A	NA	A	NA	A	NA	A	NA	A	NA	A	NA
Father	14.6±4.0	13.9±4.4	13	4	44	35	-	1	24	15	31	23	2	1
Grandfather	6.24±6.5	5.32±6.76	1	3	35	22	19	13	-	-	-	-	-	-

was no significant difference ( $\chi^2=0.370$ ;  $df=2$ ;  $p=0.831$ ) between the 2 groups on the variable of consanguinity.

**Discussion.** We have found that the Saudi Arabian sample has similarities to both the UK and USA data. The UK and USA data represent 2 advanced societies in both engineering and industry. However, our data represents a much simpler society where engineering is a new profession. The study (despite its small size) adds more support to the proposed link between autism and engineering (in its widest meaning).<sup>5</sup> The Saudi data are consistent to support the theory that the link is related to 2 types of brain and that cognition is a domain-specific function. Children with autism have shown better skills on selective tasks (block designs) reflecting the systematic brain (extreme male brain hypothesis) just as their fathers in their professions or education. Our data also indicates that there is no connection between consanguinity and the presence of autism. This is new data and we take advantage of the fact that there is significant consanguine marriage in our culture. Our data on a small Saudi sample further adds to the strength of the presented engineering hypothesis. This provides us with a good hint to the cognitive phenotype relevant to autism.<sup>5,6,8</sup> There is good experimental evidence to suggest that that people with autism spectrum show support for the 2 theories: namely systematization versus empathizing, as well as the extreme male theory.<sup>10</sup> This is very helpful in guiding future genetic studies on autism. These are many possibilities that the genetic background plays a major part in the condition, but it is



**Figure 1** - Comparison of data from this study and from the USA<sup>4</sup> and the UK<sup>5,6</sup> on the engineering variable.

also possible that there is an interaction between genetic factors and the environment. Research would further need to explain and elucidate the distinction between them. It may be possible to suggest that certain families may show higher probability of having children with PDD. This is in fact evident in the anecdotal evidence from the high prevalence of PDD (autism) among the people working in the Silicon Valley (computer engineering) in the USA.

Limitations of the study include that this study is only a small retrospective research on a small sample of children from a tertiary hospital. Further community work and more detailed diagnostic criteria using interviews, for instance, would overcome current limitations.

In conclusion, the study found that the Saudi Arabian sample, though relatively small, has considerable similarities with both the UK and USA data. There is a possibility of an association between autism and parents' education (engineering/math training of fathers). The implication is briefly discussed, and we need to expand and replicate this work.

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#### Related topics

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