Early identification of autism by the CHecklist for Autism in Toddlers (CHAT)

Simon Baron-Cohen PhD  Sally Wheelwright MSc  Antony Cox FRCPsych1  Gillian Baird FRCPCH1
Tony Charman PhD2  John Swettenham PhD3  Auriol Drew MA1  Peter Doehring PhD4


The CHecklist for Autism in Toddlers (CHAT) is a screening instrument that identifies children aged 18 months who are at risk for autism. This article explains how the CHAT was developed and how it should be used. First we offer a brief introduction to autism.

WHAT IS AUTISM?

Autism, first described by Kanner in 19431, is one of a family of ‘pervasive developmental disorders2. The most severe of the childhood psychiatric conditions, it is characterized by a triad of impairments—in socialization, communication and flexible behaviour. The exact cause is unclear but family and twin studies suggest a genetic basis3–5; molecular genetic studies are underway6. Altered central nervous system function is evident in several different brain regions including the medial prefrontal cortex7 and the amygdala8–10. Autism occurs in about 1 per 1000 children11.

The general view is that autistic conditions exist in a spectrum, with classic autism at the extreme. In DSM–IV this is referred to as autistic disorder, and in ICD–10 as childhood autism. To qualify for this diagnosis, the difficulties in social interaction, communication, and flexible behaviour must have begun before the age of three years. Atypical autism and ‘pervasive developmental disorder not otherwise specified’ (PDD-NOS) also lie on the autistic spectrum, but children with these conditions do not meet criteria for autism because of late age of onset, atypical symptoms, symptoms which are not very severe, or all of these. Asperger’s syndrome is thought to be another condition on the autistic spectrum: individuals with this syndrome have the social interaction difficulties and restricted patterns of behaviour and interests but their IQ is normal and there is no general delay in language. A final subtype are individuals with ‘high functioning autism’ (HFA), who are diagnosed when all the signs of Asperger’s syndrome are present, together with a history of language delay (defined as not using single words by two years old or phrase speech by three years old).

EARLY DETECTION

Until recently, autism was seldom detected before the age of three years. This is not surprising since it is a relatively uncommon condition and can have subtle manifestations. No specialized screening tool exists and most primary healthcare professionals have little training in the detection of autism in toddlers. However, the earlier a diagnosis can be made, the sooner family stress can be reduced; moreover, intervention can improve outcome12. In addition, early professional recognition of parental concerns may prevent secondary difficulties developing. The challenge is to identify a cost-effective method of detecting the early signs.

Which behaviours might be important?

Parents of children with autism often report that they first suspected that their child was not developing normally around the age of eighteen months13. At this age, certain behaviours are present in the normally developing child that are lacking or limited in older children with autism. Two of these are joint attention14,15 and pretend play11,16.

Joint attention refers to the ability to establish a shared focus of attention with another person via pointing, showing or gaze monitoring (e.g. glancing back and forth between an adult’s face and an object of interest or an event)17. Joint attention allows children to learn through others—both learning what words refer to18,19, and what to pay attention to in the environment (‘social referencing’)20. Joint attention is seen as the earliest expression of the infant’s ‘mind-reading’ capacity, in that the child shows a sensitivity to what another person is interested in or attending to21. Pointing to share interest (or declarative pointing) can be distinguished from a simpler form of pointing (pointing to request, or imperative pointing). This distinction comes from child language research22. It is the declarative form which is of particular importance simply because in this type of pointing mind-reading may be the driving force (‘Look at
Box 3  Risk assignment

- High risk for autism group: Fail A5, A7, BII, BII, BIV
- Medium risk for autism group: Fail A7, BIV (but not in maximum risk group)
- Low risk for autism group: Not in other two risk groups

estimate of the prevalence of autism spectrum conditions in
the general population, 0.34%26, this is still at least ten
times less than the recurrence risk rate among siblings
of children with autism (3%)4. So the likelihood of finding
cases of undiagnosed autism in the sibling group was much
higher than in the control group.

The toddlers in both groups were assessed with the
CHAT. None of the children in group A failed all five key
items whilst 4 of the children in group B failed all five key
items. A year later, when the children were thirty months
old, a follow-up was arranged. None of the children in
group A had autism. The 4 children in group B who had
failed the five key items were all diagnosed as having autism.
This strongly confirmed the prediction that absence of joint
attention and pretend play at eighteen months of age is a
marker that a child is highly likely to receive a diagnosis of
autism.

Population screening study

After the preliminary success of the CHAT in detecting
children at risk for autism in the sibling group, a more
stringent test of the CHAT was set up in a population
screening study27. 16 235 children aged eighteen months
were screened with the CHAT from April 1992 to April
1993 by health visitors or GPs and parents. These were all
children born in the South Thames Region of the UK. 38
children matched the high risk for autism profile and 369
the medium risk profile, with the remainder at low risk by
the criteria in Box 3. One month later, all 38 of the high
risk for autism group were re-screened by a psychologist in
our research team, and 12 continued to meet this profile.
Limited resources meant that only about half of the medium
risk group could be re-screened: 22 met the criteria on the
second CHAT, 2 of whom did not continue to participate in
the project. 16 children were selected at random from the
low risk group to receive a second CHAT and continued to
match this profile. Thus 12 children in the high risk for
autism group, 20 children in the medium risk for autism
and 16 children in the low risk for autism group were
assessed clinically at twenty months and forty-two months.
The diagnoses made at twenty months were provisional
since this is earlier than the age at which children have
usually been seen for diagnostic assessment and there is
little evidence about the accuracy and stability of childhood
autism and PDD diagnoses made in infancy. Substantive
diagnoses were made at the forty-two month clinical
assessment. We were able to diagnose children with
childhood autism reasonably accurately at twenty months of
age, in that most were thought to have either autism or
PDD at that time.

By forty-two months, 10 of the 12 children in the high
risk for autism group had received a diagnosis on the autistic
spectrum. The eleventh child was clinically normal and the
twelfth child had language delay. In the medium risk for
autism group, half the children were diagnosed with autism
spectrum conditions (childhood autism, Asperger’s syndrome,
or PDD), 2 received no diagnosis and the rest had language
or learning difficulties. In the low risk for autism group, although
1 child was diagnosed with language delay, the other 15 were
normal. Figure 1 summarises how the diagnoses in each group
changed between twenty and forty-two months. Full details
of diagnostic methods can be found elsewhere28.

KEY ISSUES IN ANY SCREENING PROGRAMME

To be appropriate for screening, a condition should meet
the following criteria29: (1) It should be serious; (2) treatment
given early (before symptoms are fully
developed) should be more beneficial in terms of reducing
morbidity or mortality than treatment given later; and
(3) the prevalence of the condition should be high among
the population screened. Autism meets all three of these
criteria. In addition a screening test should ideally be
inexpensive, easy to administer, and cause negligible
discomfort. The CHAT meets these too.

<table>
<thead>
<tr>
<th>18 months</th>
<th>20 months</th>
<th>42 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>High risk for autism group</td>
<td>9 CA</td>
<td>9 CA</td>
</tr>
<tr>
<td>Medium risk for autism group</td>
<td>1 PDD</td>
<td>8 CA</td>
</tr>
<tr>
<td>Low risk for autism group</td>
<td>15 N</td>
<td>15 N</td>
</tr>
</tbody>
</table>

Figure 1  Summary of changing diagnosis. CA=Childhood autism; DD/LD=developmental delay/learning difficulties; Lang=language disorder; N=normal; PDD=pervasive developmental disorder

523
Acknowledgments  We are grateful to the Medical Research Council for support through project grants to SBC, AC and GB. Carol Brayne gave us valuable feedback.

REFERENCES

1 Kanner L. Autistic disturbance of affective contact. Nerv Child 1943;2:217–50
6 Bailey A, Bolton P, Rutter M. A full genome screen for autism with evidence for linkage to a region on chromosome 7q. Hum Molec Genet 1998;7:571–8
20 Feinman S. Social referencing in infancy. Merrill-Palmer Q 1982;28: 445–70