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## Background

- Autism spectrum disorder (ASD) is defined by **early onset** and **persistent impairments** in social communication and the presence of restricted, repetitive, stereotyped behaviors and interests across multiple situations.
- The prevalence of ASD is estimated at 0.62-0.7%.
- The diagnosis of ASD in adults can only be made clinically and is challenging in many cases due to symptom overlap with many other disorders.
- Clinicians lack good clinical tools for the diagnostic.

## Aim

- To examine diagnostic tools for their clinical value
- To describe what was the best screening tool in our data set

## Method

- For the description of the sample, please see the poster "Differential diagnosis of ASD in adults"
- The results of the ADOS and the overall assessment by the examiner were used as a reference standard to validate the diagnosis of an ASD
- Evaluation of the following diagnostic tools:
  - AQ and EQ questionnaire
  - Read-the-mind-in-the-eyes-test (RME)
  - Prosody-test
  - MBAS
  - ADOS-2, module 4
- Finally, we categorized primary **school report** cards in three categories:
  - category 1 (incompatible with ASD),  
*e.g. He/She has integrated well into the class and has already made many friends.*
  - category 2 (not incompatible with ASD)  
*e.g. He/She seems shy, has some difficulties with the community and has not yet found contact although he/she is integrated.*
  - category 3 (suggestive for ASD)  
*e.g. Although others try very hard to include him/her, they do often not succeed. Others are irritated by his/her behavior.*

## Conclusion

- Self-assessment and psychometric tests have no value in diagnosing ASD in adults.
- Systematic observation of behavior, as in the ADOS, is the gold standard.
- We propose a simple analysis of school report cards as a valuable screening tool. It gives a good introspection into behavior during the first decade and is not influenced by biased memory effects or answers in self-assessment.

## Results

Data on the

- AQ questionnaire** were available from 247 individuals. Fig 1 and 5

*The mean values*

ASDyes: 28.4

ASDno: 33.8,

p-value: 0.008

- EQ questionnaire** were available from 243 individuals. Fig 1 and 5

*The mean values*

ASDyes: 24.6

ASDno: 21.1,

p-value: 0.232

- RME** were available from 225 individuals. The RME has no cut-off, and we used the value of 22/36 for calculation. Fig 2 and 5

*The mean values*

ASDyes: 19.9

ASDno: 21.6,

p-value: 0.263

- Prosody test** were available from 170 individuals. The prosody test has no cut-off, and we used the value of 24/32 for calculation. Fig 5

*The mean values*

ASDyes: 22.2

ASDno: 22.8,

p-value: 0.8

- MBAS** were available from 299 individuals. Fig 5

*The mean values*

ASDyes: 114.7

ASDno: 95.1

p-value: 0.37

- ADOS** were available from 299 individuals. Fig 3 and 5

*The mean values*

ASDyes: 1.0

ASDno: 7.32,

p-value: <0.01

- School reports** were available from 273 individuals. Fig 4 and 5

ASDyes:

category 1 (incompatible): 2/17

category 2 (not incompatible): 2/17

category 3 (suggestive for ASD): 13/17

ASDno:

category 1 (incompatible): 246/256

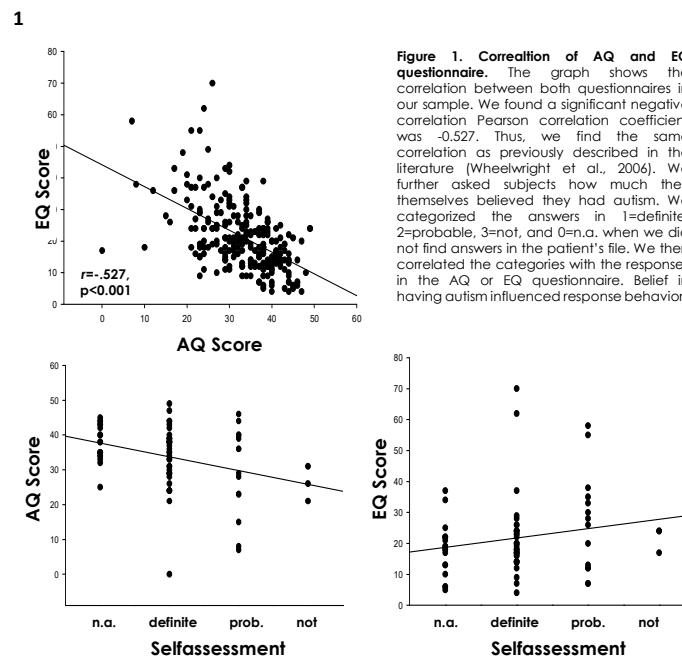
category 2 (not incompatible): 10/256

category 3 (suggestive for ASD): 0/256

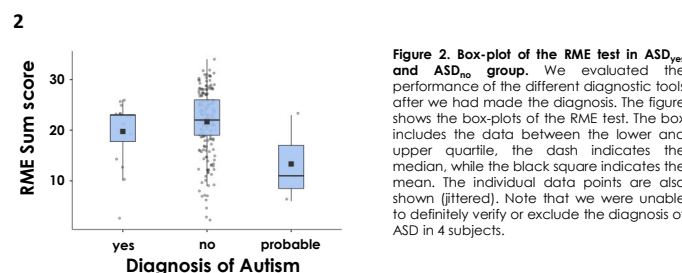
p-value: <0.01

"[...] it became a habit to dilute the original concept of infantile autism by diagnosing it in many disparate conditions which show one or another isolated symptom found as a part feature of the overall syndrome. Almost overnight, the country seemed to be populated by a multitude of autistic children."

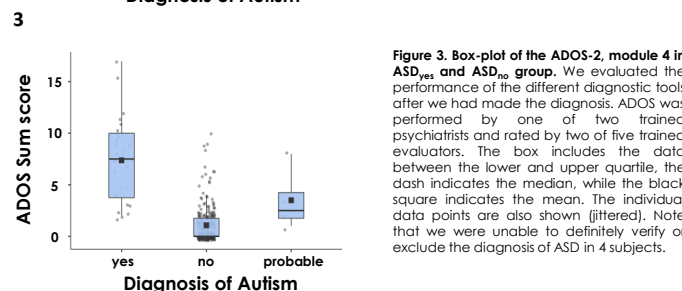
Kanner, 1965, p. 413



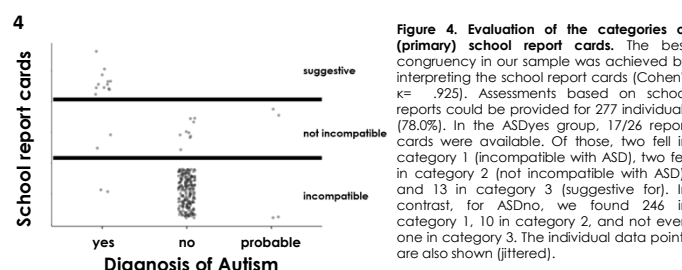
**Figure 1. Correlation of AQ and EQ questionnaire.** The graph shows the correlation between both questionnaires in our sample. We found a significant negative correlation Pearson correlation coefficient was  $-0.527$ . Thus, we find the same correlation as previously described in the literature (Wheelwright et al., 2006). We further asked subjects how much they themselves believed they had autism. We categorized the answers in 1=definite, 2=probable, 3=not, and 0=n.a. when we did not find answers in the patient's file. We then correlated the categories with the responses in the AQ or EQ questionnaire. Belief in having autism influenced response behavior.



**Figure 2. Box-plot of the RME test in ASDyes and ASDno group.** We evaluated the performance of the different diagnostic tools after we had made the diagnosis. The figure shows the box-plots of the RME test. The box includes the data between the lower and upper quartile, the dash indicates the median, while the black square indicates the mean. The individual data points are also shown (jittered). Note that we were unable to definitely verify or exclude the diagnosis of ASD in 4 subjects.



**Figure 3. Box-plot of the ADOS-2, module 4 in ASDyes and ASDno group.** We evaluated the performance of the different diagnostic tools after we had made the diagnosis. ADOS was performed by one of two trained psychiatrists and rated by two of five trained evaluators. The box includes the data between the lower and upper quartile, the dash indicates the median, while the black square indicates the mean. The individual data points are also shown (jittered). Note that we were unable to definitely verify or exclude the diagnosis of ASD in 4 subjects.



**Figure 4. Evaluation of the categories of (primary) school report cards.** The best congruency in our sample was achieved by interpreting the school report cards (Cohen's  $\kappa = .925$ ). Assessments based on school reports could be provided for 277 individuals (78.0%). In the ASDyes group, 17/26 report cards were available. Of those, two fell in category 1 (incompatible with ASD), two fell in category 2 (not incompatible with ASD), and 13 in category 3 (suggestive for). In contrast, for ASDno, we found 246 in category 1, 10 in category 2, and not even one in category 3. The individual data points are also shown (jittered).

Diagnostic tool	$\kappa$	p-value	sensitivity	specificity	PPV	NPV
AQ	-.051	.049	37.5%	37.7%	4.0%	89.7%
EQ	-.002	.873	81.3%	17.2%	6.5%	92.9%
RME	-.012	.728	47.1%	48.6%	7.0%	91.8%
Prosodia	-.014	.678	44.4%	48.4%	4.6%	94.0%
MBAS	-.010	.775	0.0%	99.4%	0.0%	92.4%
ADOS	.625	<.001	56.0%	98.5%	77.8%	96.1%
School Report Cards	.925	<.001	86.7%	100.0%	100.0%	99.2%

**Figure 5. Value of the different diagnostic tools in our sample.** The table summarizes Cohen's kappa  $\kappa$  (<.20 = poor, from .20 = marginal, from .40 = moderate, from .60 = substantial, from .80 = almost perfect), p-value, sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV).