

Executive processes in high functioning Autism: Patterns of Performance in a Multiple Case Series.

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Background:

- There is conflicting evidence as to whether executive dysfunction is associated with autism spectrum disorders (ASD) – see Hill (2004).
- This may be due to:
 - The range of tests that are used assess “executive functioning”
 - The age and IQ of the individuals in the ASD group and the comparison control groups
- The present study assessed executive functioning in a large group of high functioning adults with ASD. We also investigated any potential relationships between executive functions and communication deficits often associated with ASD.

Results (Executive Battery)

Impaired (P<0.05)	Unimpaired
Trail Making Test	Modified Card Sorting Test
Part A	Number of categories
Part B	Number of errors
	Number of perseverative errors
Behavioural Assessment of the Dysexecutive Syndrome (BADS)	Behavioural Assessment of the Dysexecutive Syndrome (BADS)
Action Program Test	Rule Shift
Zoo Map Test(Part 1)	Key Search
Zoo Map Test (Profile Score)	Temporal Judgment
Six Element Test (Longest time on a subset)	Stroop Test
Six Element Test (Number of Tasks)	Verbal Fluency (F, A & S)
Six Element Test (Profile Score)	
Hayling Test (All performance measures)	

Summary:

- There was evidence for significant executive dysfunction in a range of cognitive domains.
- Psychomotor speed was impaired (Trail Making Test parts A & B).
- Novel problem solving and planning were both impaired (Action Program and Zoo Map Test).
- Intentionality - the ability to engage and disengage actions in the service of overarching goals – was impaired (Six Element Test).
- Verbal response initiation was impaired (Hayling Test parts 1 & 2).
- Conversely, performance on certain tests of cognitive flexibility and inhibition was normal.

Participants:

- The demographics of the ASD group and their healthy controls are shown below:

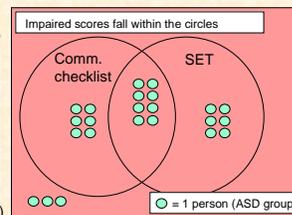
	ASD group	Controls
Number	23	23
Male: Female	17 : 6	15 : 8
Age	31.4 (12.9) 16 - 61	33.6 (14.2) 18 - 64
FSIQ	109.9 (18.1) 80 - 135	107.4 (14.9) 79 - 135

Methods:

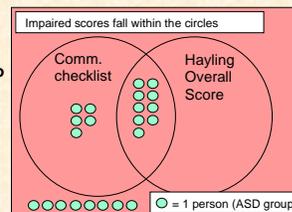
- Executive functions were assessed using a comprehensive battery of neuropsychological tests.
- Group differences were analysed using t-tests or Mann Whitney U tests.

Relationship to Communication Deficits

- Further analyses adopted the procedure used by Ramus et al. (2003) to identify individuals who perform poorly on a particular test. This involved:
 - Identifying any outliers in the control group.
 - Exclude these outliers (≤ 2) and then use the remaining group to define a “normal” range with a 5% cutoff (based on the t-distribution).
 - Any individual (ASD or control) falling outside this cutoff is classified as an outlier on that particular test.
- To investigate whether performance on any cognitive test was related to quality of verbal and non-verbal communication, all participants were rated using an experimental checklist (see Abell et al., 1999). Outliers were identified as above.



The Six Element Test (SET) was the most sensitive to executive deficits in the ASD group. **61%** of the group **performed below the 5th %ile** (Venn Diagram based on the longest time spent on any one task – the only performance measure that was normally distributed). The test was not obviously related to communication impairment.



The Hayling Test was the most sensitive to communication deficits in the ASD group. **64%** of the individuals who were impaired on the communication checklist were impaired on the Hayling Overall score. Furthermore, poorer Hayling Test scores correlated with poorer scores on the Communication Checklist ($R = 0.746$).

NB Data missing for one of the ASD group

Conclusions:

- ASD were associated with deficits in certain executive functions, especially intentionality and verbal response initiation.
- Verbal response initiation appeared to be related to communication deficits.

Further Questions:

- How precisely do these executive deficits impact upon the ability of people with ASD to cope adaptively in the real world?
- Why is one test of verbal production (The Hayling Test) sensitive to deficits in ASD while another (Verbal Fluency) is not?

References:

Hill (2004) Trends Cogn Sci. 8 26-32
Ramus et al., (2003) Brain. 126 841-65
Abell et al., (1999). Neuroreport. 10 1647-51