Table 1. Studies of planning in individuals with autism spectrum disorder (ASD) in comparison with well-matched control groups. All studies found significant differences between the performance of ASD and comparison groups.

Task	Study	Control group(s)	Refs
Tower of Hanoi	Ozonoff *et al.* (1991)	Mixed clinical without autism	[1]
	Ozonoff & McEvoy (1994)	Mixed clinical without autism	[2]
	Bennetto *et al.* (1996)	Mixed clinical without autism	[3]
	Ozonoff & Jensen (1999)	ADHD, Tourette syndrome, normal	[4]
Stockings of Cambridge	Hughes *et al.* (1994)	Normal, moderate learning difficulty	[5]
Luria's bar task[a]	Hughes (1996)	Normal, moderate learning difficulty	[6]
Milner mazes[b]	Prior & Hoffmann (1990)	Normal (age-match; mental-age match)	[7,8]
Trail-making	Rumsey & Hamburger (1998)	Normal	[9]
Drawing task[c]	Booth *et al.* (2003)	ADHD, normal	[10]

[a]*Luria's bar task*: a test of motor planning. Participants must lift a bar from its horizontal support and place a specified end of the bar onto a target placed on the table top. In half of reaches an overhand grip is most comfortable for the participant when the bar is held in its end-state (with one end of the bar on its target) and in the other half an underhand grasp on the bar results in the greatest end-state comfort.

[b]*Milner mazes*: a test of planning. Participants must, by trial and error, learn a path between boltheads (an 'incorrect' move between boltheads is indicated by a click). The path is learnt over successive trials and must be memorised.

[c]*Booth et al.'s drawing task*: a test of planning. Participants were shown a picture of a snowman, a house, a boat and a clock. They were asked to draw the same picture, with a missing part included (teeth missing from snowman, windows missing from house, people missing from portholes of boat, numbers missing from clock). The original picture is left in the child's view throughout the test.

Table 2. Studies of flexibility in individuals with autism spectrum disorder (ASD) in comparison with well-matched control groups. Studies that found no differences between the performance of ASD and comparison groups are indictated with an asterisk (*).

Task	Study	Control group(s)	Refs
WCST	Rumsey (1985)	Normal	[11]
	Rumsey & Hamburger (1988)	Normal	[9]
	Rumsey & Hamburger (1990)	Normal, dyslexic	[12]
	Prior & Hoffmann (1990)	Normal (age-match; mental-age match)	[8]
	Szatmari *et al.* (1990)	Outpatient psychiatric (includes ADHD)	[13]
	Ozonoff *et al.* (1991)	Mixed clinical without autism	[1]
	Minshew *et al.* (1992)*	Normal	[14]
	Ozonoff & McEvoy (1994)	Mixed clinical without autism	[2]
	Ozonoff (1995)	Mixed clinical without autism	[15]
	Bennetto *et al.* (1996)	Mixed clinical without autism	[3]
	Nyden *et al.* (1999)*	Normal, ADHD, reading disorder, writing disorder	[16]
	Ozonoff & Jensen (1999)	ADHD, Tourette syndrome, normal	[4]
	Liss *et al.* (2001)	Developmental language disorder	[17]
	Shu *et al.* (2001)	Normal	[18]
Computerised WCST	Ozonoff (1995)	Normal	[15]
ID/ED shift	Hughes *et al.* (1994)	Normal, moderate learning disability	[5]

Table 3. Studies of inhibition in individuals with autism spectrum disorder (ASD) in comparison with well-matched control groups. Studies that found no differences between the performance of ASD and comparison groups are indicated with an asterisk (*).

Task	Study	Control group(s)	Refs
Stroop (colour)	Eskes *et al.* (1990)*	Normal	[19]
	Ozonoff & Jensen (1999)*	ADHD, Tourette syndrome, normal	[4]
Stroop (day-night)	Russell *et al.* (1999)*	Normal, moderate learning disability	[20]
Windows task	Russell *et al.* (1991)	Normal, moderate learning disability	[21]
	Hughes & Russell (1993)	Moderate learning disability	[22]
Automated windows task	Russell *et al.* (2003)	Normal, moderate learning disability	[23]
Detour-reaching task	Hughes & Russell (1993)	Normal, moderate learning disability	[22]
	Bíro & Russell (2001)	Normal, moderate learning disability	[24]
Stop-signal task	Ozonoff & Strayer (1997)*	Normal	[25]
Go/No-Go task	Ozonoff *et al.* (1994)	Normal, Tourette syndrome	[26]
Negative priming task	Ozonoff & Strayer (1997)*	Normal	[25]
Tubes task	Russell *et al.* (1999)*	Normal, moderate learning disability	[20]

Table 4. Measures of executive function, control groups and age of participants included in studies of preschool-aged children with autism. Studies that found no differences between the performance of ASD and comparison groups are indicated with an asterisk (*).

Task	Study	Control groups and participant age	Matching criteria	Refs
Delayed response	McEvoy *et al.* (1993)*	Autism: 40–80 months	Autism vs. developmental delay: age, nonverbal ability, SES[a]	[27]
		Developmental delay: 30–81 months	Autism vs. normal: verbal mental age, SES	
		Normal: 10–84 months		
Spatial reversal (failures to maintain set)	McEvoy *et al.* (1993)	Autism: 40–80 months	Autism vs. developmental delay: age, nonverbal ability, SES	[27]
	Griffith *et al.* (1999)	Developmental delay: 30–81 months	Autism vs. normal: verbal mental age, SES	[28]
	Dawson *et al.* (2002)*	Normal: 10–84 months	Age, verbal mental age, nonverbal mental age, SES	[29]
		Time 1:	Mental age	
		Autism: 40–61 months		
		Developmental delay: 51 months		
		Time 2:		
		Autism: mean 55 months		
		Developmental delay mean: 58 months		
		Autism: 36–48 months		
		Developmental delay: 36–48 months		
		Normal: 12–48 months		
Alternation task	McEvoy *et al.* (1993)*	Autism: 40–80 months	Autism vs. developmental delay: age, nonverbal ability, SES	[27]
		Developmental delay: 30–81 months	Autism vs. normal: verbal mental age, SES	
		Normal: 10–84 months		
A-not-B task	McEvoy *et al.* (1993)*	Autism: 40–80 months	Autism vs. developmental delay: age, nonverbal ability, SES	[27]
	Dawson *et al.* (2002)*	Developmental delay: 30–81 months	Autism vs. normal: verbal mental age, SES	[29]
		Normal: 10–84 months	Mental age	
		Autism: 36–48 months		
		Developmental delay: 36–48 months		
		Normal: 12–48 months		
A-not-B with invisble displacement	Griffith *et al.* (1999)*	Autism: 40–61 months	Age, verbal mental age, nonverbal mental age, SES	[28]
	Dawson *et al.* (2002)*	Developmental delay: 51 months	Mental age	[29]
		Autism: 36–48 months		
		Developmental delay: 36–48 months		
		Normal: 12–48 months		
3 boxes,	Griffith *et al.* (1999)*	Autism: 40–61 months	Age, verbal mental age, nonverbal mental age, SES	[28]

stationary				
		Developmental delay: 51 months		
6 boxes, stationary	Griffith *et al.* (1999)*	Autism: 40–61 months	Age, verbal mental age, nonverbal mental age, SES	[28]
		Developmental delay: 51 months		
3 boxes, scrambled	Griffith *et al.* (1999)*	Autism: 40–61 months	Age, verbal mental age, nonverbal mental age, SES	[28]
		Developmental delay: 51 months		
6 boxes, scrambled	Griffith *et al.* (1999)*	Autism: 40–61 months	Age, verbal mental age, nonverbal mental age, SES	[28]
		Developmental delay: 51 months		
Object retrieval	Griffith *et al.* (1999)*	Autism: 40–61 months	Age, verbal mental age, nonverbal mental age, SES	[28]
		Developmental delay: 51 months		
Delayed nonmatch to sample	Dawson *et al.* (1998)	Autism: mean 64.6 months	All groups: receptive language mental age, communication subscale of Vineland Adaptive Behavioral Scale	[30]
	Dawson *et al.* (2002)*	Down syndrome: mean 65.3 months		[29]
		Normal: mean 30.9 months		
		Autism: 36–48 months		
		Developmental delay: 36–48 months	Autism vs. Down syndrome: age, verbal IQ	
		Normal: 12–48 months	Mental age	
Delayed response	Dawson *et al.* (1998)	Autism: mean 64.6 months	All groups: receptive language mental age, communication subscale of Vineland Adaptive	[30]
		Down syndrome: mean 65.3 months	Behavioral Scale	
		Normal: mean 30.9 months	Autism vs. Down syndrome: age, verbal IQ	
Object discrimination reversal	Dawson *et al.* (2002)	Autism: 36–48 months	Mental age	[29]
		Developmental delay: 36–48 months		
		Normal: 12–48 months		

[a] SES: socioeconomic status

References

1 Ozonoff, S. *et al.* (1991) Executive function deficits in high-functioning autistic individuals: relationship to theory of mind. *J. Child Psychol. Psychiatry* 32, 1081–1105

2 Ozonoff, S. and McEvoy, R.E. (1994) A longitudinal study of executive function and theory of mind development in autism. *Dev. Psychopathol.* 6, 415–431

3 Bennetto, L. *et al.* (1996) Intact and impaired memory functions in autism. *Child Dev.* 67, 1816–1835

4 Ozonoff, S. and Jensen, J. (1999) Brief report: specific executive function profiles in three neurodevelopmental disorders. *J. Autism Dev. Disord.* 29, 171–177

5 Hughes, C. *et al.* (1994) Evidence for executive dysfunction in autism. *Neuropsychologia* 32, 477–492

6 Hughes, C. (1996) Brief report: planning problems in autism at the level of motor control. *J. Autism Dev. Disord.* 26, 99–107

7 Milner, B. (1965) Visually-guided maze learning in man: effects of bilateral hippocampal, bilateral frontal, and unilateral cerebral lesions. *Neuropsychologia* 3, 317–338

8 Prior, M.R. and Hoffmann, W. (1990) Brief report: neuropsychological testing of autistic children through an exploration with frontal lobe tests. *J. Autism Dev. Disord.* 20, 581–590

9 Rumsey, J.M. and Hamburger, S.D. (1988) Neuropsychological findings in high-functioning men with infantile autism. *J. Autism Dev. Disord.* 20, 155–168

10 Booth, R. *et al.* (2003) Disentangling weak coherence and executive dysfunction: planning drawing in autism and attention-deficit/hyperactivity disorder. *Philos. Trans. R. Soc. Lond. B Biol. Sci.* 358, 387–392

11 Rumsey, J.M. (1985) Conceptual problem-solving in highly verbal, nonretarded autistic men. *J. Autism Dev. Disord.* 15, 23–36

12 Rumsey, J.M. and Hamburger, S.D. (1990) Neuropsychological divergence of high-level autism and severe dyslexia. *J. Autism Dev. Disord.* 20, 155–168

13 Szatmari, P. *et al.* (1990) Asperger syndrome and autism: neurocognitive aspects. *J. Am. Acad. Child Adolesc. Psychiatry* 29, 130–136

14 Minshew, N.J. *et al.* (1992) Neuropsychological functioning in nonmentally retarded autistic individuals. *J. Clin. Exp. Neuropsychol.* 14, 749–761

15 Ozonoff, S. (1995) Reliability and validity of the Wisconsin card sorting test in studies of autism. *Neuropsychology* 9, 491–500

16 Nyden, A. *et al.* (1999) Executive/attention deficits in boys with Asperger syndrome, attention disorder and reading/writing disorder. *Autism* 3, 213–228

17 Liss, M. *et al.* (2001) Predictors and correlates of adaptive functioning in children with developmental disorders. *J. Autism Dev. Disord.* 31, 219–230

18 Shu, B-C. *et al.* (2001) Executive function deficits in non-retarded autistic children. *Autism* 5, 165–174

19 Eskes, G.A. *et al.* (1990) Comprehension of concrete and abstract words in autistic children. *J. Autism Dev. Disord.* 20, 61–73

20 Russell, J. *et al.* (1999) Two intact executive capacities in children with autism: implications for the core executive dysfunctions in the disorder. *J. Autism Dev. Disord.* 29, 103–112

21 Russell, J. *et al.* (1991) The 'Windows task' as a measure of strategic deception in preschoolers and autistic subjects. *Br. J. Dev. Psychol.* 9, 101–119

22 Hughes, C. and Russell, J. (1993) Autistic children's difficulty with mental disengagement from an object: its implications for theories of autism. *Dev. Psychol.* 29, 498–510

23 Russell, J. *et al.* (2003) Mechanising an executive task: the performance of preschool children, children with autism and with moderate learning difficulties in the automated Windows Task. *Cogn. Dev.* 18, 111–137

24 Bíro, S. and Russell, J. (2001) The execution of arbitrary procedures by children with autism. *Dev. Psychopathol.* 13, 97–110

25 Ozonoff, S. and Strayer, D.L. (1997) Inhibitory function in nonretarded children with autism. *J. Autism Dev. Disord.* 27, 59–77
26 Ozonoff, S. *et al.* (1994) Executive function abilities in autism and Tourette syndrome: an information-processing approach. *J. Child Psychol. Psychiatry* 35, 1015–1032
27 McEvoy, R.E. *et al.* (1993) Executive function and social communication deficits in young autistic children. *J. Child Psychol. Psychiatry* 34, 563–578
28 Griffith, E.M. *et al.* (1999) Executive functions in young children with autism. *Child Dev.* 70, 817–832
29 Dawson, G. *et al.* (2002) Neurocognitive function and joint attention ability in young children with autism spectrum disorder versus developmental delay. *Child Dev.* 73, 345–358
30 Dawson, G. *et al.* (1998) Neuropsychological correlates of early symptoms of autism. *Child Dev.* 69, 1276–1285