Strengths and weaknesses in executive functioning in children with intellectual disability

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Abstract

Children with intellectual disability (ID) were given a comprehensive range of executive functioning measures which systematically varied in terms of verbal and non-verbal demands. Their performance was compared to the performance of groups matched on mental age (MA) and chronological age (CA), respectively. 22 children were included in each group. Children with ID performed on par with the MA group on switching, verbal executive-loaded working memory and most fluency tasks, but below the MA group on inhibition, planning, and non-verbal executive-loaded working memory. Children with ID performed below CA comparisons on all the executive tasks. We suggest that children with ID have a specific profile of executive functioning, with MA appropriate abilities to generate new exemplars (fluency) and to switch attention between tasks, but difficulties with respect to inhibiting pre-potent responses, planning, and non-verbal executive-loaded working memory The development of different types of executive functioning skills may, to different degrees, be related to mental age and experience.

Keywords: executive functioning, intellectual disability, inhibition, executive-loaded working memory, switching, fluency, planning

Executive Functioning in Children with Intellectual Disability

1. Introduction

The aim of the present study was to investigate a comprehensive range of executive functioning measures, systematically varied in terms of verbal and non-verbal demands, in children with intellectual disability, and to compare their performance to groups matched on mental age and chronological age, respectively. Executive functioning (EF) refers to processes that control and regulate thought and action. There is increasing evidence that EF can be divided, or "fractionated", into different subcomponents. Miyake et al. (2000) used factor analysis of several tasks assessing three proposed EF subcomponents: updating/working memory, inhibition, and switching. They found that these subcomponents were separable but still partially correlated constructs. Other examples of EF tasks are problem solving, fluency, planning, decision-making and working memory-related dual tasks (e.g. Pennington & Ozonoff, 1996).

Several investigators have reported that EF is related to intelligence tasks (e.g. Carpenter, Just, & Shell, 1990; Miyake, Friedman, Rettinger, Shah, & Hegarty, 2001; Salthouse, Fristoe, McGuthry, & Hambrick, 1998), which makes the investigation of EF in individuals with intelligence levels outside the typical range an important issue. However, this picture has become more nuanced with the division of EF into subcomponents. Friedman et al. (2006) found that fluid intelligence was highly correlated with updating, but not switching and inhibition. Furthermore, Arffa (2007) found correlations between full scale IQ and EF measures of planning, fluency and inhibition, but not trail-making (often described as assessing switching).

Mähler et al. (2009) investigated the distinction between *learning* and *intelligence* by including two groups with learning difficulties in their study, one with typical IQ scores (together with a specific learning difficulty), and one with generally low IQ scores. No differences were found between the two groups on EF measures, but both groups performed more poorly than a comparison group with typical IQ and no learning problems. This was interpreted as evidence that EF is related to learning *ability* instead of being related to intelligence.

The few studies of EF in individuals with intellectual disability (ID) present an inconsistent picture. Some investigations of young adults with ID have reported performance levels *below* mental age (MA), for example on the problem solving task Tower of Hanoi (e.g. Borys, Spitz & Dorans, 1982; Byrnes & Spitz, 1977; Spitz, Webster & Borys, 1982; Vakil, Shelef-Reshef & Levi-Shiff, 1997). Other studies have reported mental age appropriate performance on Tower tasks (Numminen, Lehto, Ruoppila, 2001). By contrast, in a recent study, no differences were found on the Tower of Hanoi or on dual tasks with retrieval demands between adults with ID and a group matched for chronological age (CA), sex, years of education and type of education (Danielsson, Henry, Rönnberg & Nilsson, 2010). Regarding executive-loaded working memory (ELWM) tasks, MA appropriate performance has been reported (Numminen et al., 2002), but see Carretti, Belacchi and Cornoldi, (2010) for an argument that difficulties in this area might be more apparent for ‘high demand’ ELWM tasks. In relation to fluency tasks and dual tasks, Danielsson et al. (2010) reported lower performance for adults with ID compared to adults matched for CA and other attributes (see earlier).

In relation to children with ID, Van der Molen et al. (2007) carried out a comprehensive EF assessment. They included measures of letter fluency, category fluency, dual task performance, mazes and random number generation. Children with ID performed at the same level as typically developing MA-matched comparisons on all tasks. This study appears to be the only one on children with ID that has included a broad range of EF measures. Several other studies of children with ID have included measures of ELWM, generally reporting MA appropriate performance for children with ID (e.g. Brown, 1974; Connors et al, 1998; Henry & MacLean, 2002; Henry & Winfield, 2010; Mähler et al., 2009). Yet some inconsistency in the literature is also apparent: a few authors have reported that children with ID perform *more poorly* than MA comparisons (Russell et al., 1996; van der Molen et al., 2009). With respect to verbal fluency, Conners et al. (1998) found no differences in performance between children with ID and MA comparisons on a *letter* fluency task; similarly, Henry (2010) found no group differences using a *category* fluency task. Overall, there is some evidence for MA-appropriate performance on EF tasks in children with ID, yet when we look at performance levels in relation to typically developing comparison groups matched for CA, research findings are consistent: children with ID have lower EF abilities than CA comparisons (e.g. Connors et al, 1998; Levén, Lyxell, Andersson, Danielsson & Rönnberg, 2008).

In sum, research on *adults* with ID presents a mixed picture of EF abilities: some EF areas appear to be well-preserved with performance levels reaching CA levels; but other EF areas involve greater difficulties even though there are inconsistencies in the findings. The more consistent literature on EF in *children* with ID suggests performance in line with MA for generative tasks such as fluency and random number generation, but difficulties with problem-solving and planning tasks. The less consistent ELWM literature suggests MA-appropriate levels of performance.

Because it is rare for a comprehensive range of EF measures to be included in studies of children with ID, there are uncertainties about the EF profile in this group. The Van der Molen et al. (2007) study assessed four different EF tasks, but these were largely in the verbal domain. Therefore, in the present study measures of five different EF sub-domains was investigated to provide a comprehensive assessment of EF skills in children with ID. The areas assessed included ELWM, switching, fluency, planning and inhibition. Because the profile of abilities in children with ID may vary according to verbal and visuo-spatial/non-verbal abilities, EF tasks that assessed both these dimensions were included. This methodological improvement compared to previous studies allowed us to investigate differences between performance on verbal and non-verbal tasks. Some investigators have reported relatively good performance on visuospatial simple working memory tasks such as Corsi span in children with ID, together with relatively weak performance on verbal simple working memory tasks such as word span (e.g. Henry & MacLean, 2002; Henry & Winfield, 2010). Therefore, a secondary aim of the current study was to explore potential differences between verbal and non-verbal EF measures.

Thus, the principal research question concerned whether children with ID perform differently on tests of five EF subcomponents compared to groups matched on mental age and chronological age, respectively.

The use of MA and CA comparison groups also allowed us to address issues related to the developmental model of intellectual disability (Zigler, 1969; Zigler & Balla, 1982). This model states that the cognitive development of ‘cultural-familial’ children with ID (i.e. no organic disorder) proceeds through the same sequence of cognitive stages as in typically developing children. It also states that children with ID have the same cognitive structures as typically developing children. The difference model of intellectual disability (Ellis, 1969; Ellis & Cavalier, 1982; Milgram, 1973) assumes qualitatively and quantitatively different cognitive functioning in children with ID compared to in typically developing children due to key differences in cognitive architecture and cognitive processes (Bennett-Gates & Zigler, 1998).

To test these two models adequately, both MA and CA matched typical comparison groups are required, although the premise for the comparison groups differs between the models (Bennett-Gates & Zigler, 1998). In general, the developmental model predicts a reasonably flat EF profile with significant EF correlations with mental age level for the ID group, although variability in EF performance can be expected. This would mean that the ID children have a similar EF profile to MA comparisons. On the other hand, the difference model predicts difficulties in all or most EF areas for children with ID compared to CA comparisons.

2. Method

2.1 Participants

The study included three groups. The first group consisted of children with ID and the others were comparison groups matched on CA and MA, respectively. Twenty-eight children were recruited from special schools in the Greater London area, UK. Four children were excluded since they performed at floor level on four or more tests. Two children with full scale IQ, as measured by four components (Matrices, Quantitative reasoning, Word definitions and Verbal similarities) of the British Ability Scale II (Elliot, Smith, & McCullough, 1996), higher than 75 were also excluded. Two further individuals had IQ scores between 75 and 70. Therefore, all analyses were carried out with the two children included *and* excluded from the sample, and the same results were obtained. Consequently, these two individuals were retained in the study. In total, 22 children with ID were included in the study. All children in the CA-comparision group and most children in the MA comparison group were recruited through schools close to the special schools to minimize the influence of socio-economic factors. The remaining children were recruited via personal contacts.

This project was granted ethical approval from the Research Ethics Committee, London South Bank University, and was discussed in detail with appropriate school staff before recruitment. Informed consent for participation was obtained in writing (telephone permission occasionally) from parents/guardians; children/students also gave their written consent and were told they could opt out at any time.

Means and standard deviations for chronological age and mental age for all three groups can be seen in Table 1.

Insert Table 1 about here

A *t*-test showed no differences in mental age between the ID group and the MA comparison group. The CA comparison group had slightly lower chronological age than the ID group (10 months). Since the ID group were compared to the slightly younger CA group, we can be even more confident that findings where the ID group perform worse than the CA group reflect a real area of difficulty.

2.2 Tasks

Verbal and non-verbal tests of all the following EF subcomponents were included: executive-loaded working memory (ELWM), inhibition, planning, switching and fluency. In the selection of tests, standardized, simple measures of the construct in question that had been used for young children before were favored. An overview of all tests can be seen in Table 2.

Insert Table 2 about here

From the Working Memory Test Battery for Children (WMTB-C; Pickering & Gathercole, 2001), the Listening Span test was used to assess verbal ELWM. The instructions were to judge whether sentences were absurd or not and then to remember the last word of each sentence. The number of sentences before recall was increased until the participant responded incorrectly on at least four out of six repetitions on a particular span length. Number of correctly recalled trials was used as a measure of verbal ELWM.

To assess non-verbal ELWM, the odd one out span task was used (Henry, 2001). A set of three pictures in a row was shown and the participant had to judge which of the pictures was different from the other two (‘odd one out’). The task was to recall the positions of the odd ones out in the correct order. The number of rows presented was increased until the participant responded incorrectly on at least two out of three repetitions of a particular span length. Number of totally correct trials was used as a measure of non-verbal ELWM.

The inhibition tasks were from the ‘VIMI’, a test of verbal inhibition and motor inhibition (Henry, Messer & Nash, in press). In the verbal task, the experimenter said one out of two words (e.g. car or doll) and the task was to say the same word as the experimenter. After 20 repetitions, the instructions were changed such that the participant must say the alternative word; when the experimenter says “car”, the participant should reply “doll”, and *vice versa* for 20 repetitions. The motor inhibition task involved the same procedure, but instead of words, a hand shape (e.g. fist vs flat hand) was shown and copied. The numbers of errors in the inhibition phases were used as measures of verbal and non-verbal inhibition, respectively.

The planning, fluency and verbal switching tasks from the Delis-Kaplan test battery (Delis, Kaplan & Kramer, 2001) were also given to the children. The ‘Sorting task’ was used to assess verbal and non-verbal planning and required the generation of different ways to sort different types of picture cards into two discrete categories. The number of correct responses was used as the measure planning - separate scores were available for verbal and non-verbal sorts.

The ‘Design fluency’ task required participants to generate as many different patterns as possible. The child was asked to draw as many different designs as possible in one minute, each in a different box, by connecting dots using four straight lines (with no line drawn in isolation). The total number of different patterns created over for two different sets of dots was used as the design fluency measure.

In the ‘Verbal fluency’ task, the instructions were to generate as many words as possible in one minute. All words should start with a certain letter in the letter fluency task. All words should belong to a certain category in the category fluency task. For both tasks, the measure used was total number of correct responses.

To assess verbal switching, the ‘category fluency switching task’ from the Delis-Kaplan Battery was used. The task required children to generate category exemplars from two different categories alternately - hence requiring shifting between each category. Scores represented the total number of correct answers from both categories in one minute

Finally, the ID/ED task from the CANTAB (Cambridge Cognition, 2006) was used to assess non-verbal switching. The task required the participant to choose one of two figures on a computer screen; each figure contained both relevant and irrelevant features with respect to the choice to be made and the figures became more complex as the task went on (features included shapes, lines and colours). The only guidance as to which features were important for the correct choices came from feedback after each response was given via the touch screen (i.e. whether the choice had been correct or incorrect). Once a participant had made a series of correct choices, the choice ‘criteria’ were altered and the participant was required to use the correct/incorrect feedback to switch strategy with respect to the features used to make his or her choices. Total number of errors made were scored.

2.3 Procedure

Children with ID were tested at their school in sessions of their normal lessons (often 40 minutes). Most children completed the tests in 3-4 sessions and the tests were administered in the same order for most children. Differences in procedures were due to adaptions to individual needs and school circumstances. The children in the CA group were also assessed in school using the same procedure. In the MA group, most children were tested in schools, but some were tested in their homes. The session lengths and number of sessions were adapted to the childrens needs and school schedules.

2.4 Design

The results were analyzed using one-way ANOVAs, with group as the between subjects variable (ID, MA, CA) followed by the Tukey-Kramer post hoc test to explore relevant group differences (ID vs MA and ID vs CA). Each of the different EF measures was used as dependent variable.

3. Results

The α-level was set to .05 for all analyses. Means and standard deviations for all 11 EF tests for each of the three groups are shown in Table 3.

Insert Table 3 about here

All measures were checked for skewness and kurtosis. Verbal inhibition, non-verbal inhibition and non-verbal switching had z-values higher than 2 and were therefore log transformed. The transformed values had acceptable skewness and kurtosis and were used instead of the original values in subsequent analyses.

The ANOVAs conducted on each of the EF variables all produced significant effects of group, all *F*s > 5.9 and all *p*s < .01. Results from the post hoc tests are given in Table 4.

Insert Table 4 about here

The post hoc comparisons showed that the children with ID performed below CA comparisons on all tests. There were no significant differences between children with ID and MA comparisons on verbal ELWM, verbal and non-verbal switching and all fluency measures except letter fluency. However, the children with ID had significantly lower performance than MA comparisons on non-verbal ELWM, verbal and non-verbal inhibition, verbal and non-verbal planning, and letter fluency. The only difference between verbal and non-verbal EF measures was for ELWM where non-verbal difficulties were more apparent for children with ID.

To investigate to what extent mental age was related to EF, correlations between mental age and the EF measures were calculated, see Table 5.

Insert Table 5 about here

ELWM was related to mental age for all three groups, however, relationships between mental age and the other executive variables were inconsistent across the groups. EF measures were more consistently related to mental age in the ID group than in either of the typical comparison groups.

4. Discussion

This study assessed executive functioning in children with ID using a more comprehensive test battery of verbal and non-verbal EF tasks than had been used in previous studies. Children with ID experienced EF difficulties in relation to CA comparisons on all the EF tests administered. This supported the difference model of intellectual disability because in every case, children with ID obtained scores significantly below chronological age level. However, their performance in relation to MA comparisons was more nuanced: there were MA-relative difficulties in non-verbal ELWM, verbal and non-verbal inhibition and verbal and non-verbal planning. Conversely, children with ID showed no significant difficulties in relation to mental age comparisons with verbal and non-verbal switching, most fluency measures and verbal ELWM. The results therefore failed to provide unequivocal support for the developmental model prediction that ID performance would be no different from MA comparisons. This is discussed in more detail below.

Little evidence supported differentially affected verbal and non-verbal abilities in fluency, inhibition, switching and planning in children with ID. For fluency (discussed later), and ELWM, there were differences between verbal and non-verbal performance. There were MA-relative difficulties on the non-verbal ELWM measure but not on the verbal ELWM measure. The literature is mixed with respect to previous findings on ELWM, as evidence has been found for the performance of children with ID being on a par with MA (Bayliss et al., 2005; Conners et al., 1998; Henry & MacLean, 2002; Henry & Winfield, 2010), and also below MA level (Russell et al., 1996; van der Molen et al., 2009) for a range of verbal and non-verbal WM tasks. The correlation coefficients between mental age and verbal ELWM were of the same magnitude for all groups. This suggests that the development of verbal ELWM follows a similar, mental age dependent, path in all groups instead of being qualitatively different in the ID group. However, the correlation pattern was somewhat different for non-verbal ELWM, where the CA group had a slightly higher correlation than the other groups. The development of non-verbal ELWM is may be weakly related to mental age and more dependent on other factors in developmentally younger individuals.

On the inhibition tasks, children with ID performed more poorly than the MA comparison group. The correlation patterns between mental age and inhibition for the CA and MA groups were relatively similar to each other (low or moderate positive relationships), yet different from the ID group pattern (moderate negative relationships), which implies that the ID group may have been treating the task in a qualitatively different manner than the other groups. Maybe the ID group recruited other cognitive skills linked to mental age, such as working memory (e.g. keeping the rules of the task constantly updated), to a larger extent than the typical groups, possibly to compensate for inhibitory difficulties. Alternatively, children with ID might have slower overall speeds of information processing (Anderson, 2001), which place larger constraints on some types of executive tasks than others. Perhaps performance on the inhibition tasks used here was related to processing speed for children with ID, or required some minimal processing speed threshold for successful performance that many children with ID did not reach.

Children with ID also performed more poorly than the MA comparison group on the planning tasks. This implies that organizing material according to self-generated criteria was challenging for children with ID. The correlation between planning and mental age was moderate/strong for the ID group, a bit weaker for the MA group and even weaker for the CA group. This suggests that planning is dependent on mental age up to a certain point and after that other factors determine performance. An interesting issue is whether the type of planning task employed here could be facilitated by inner speech, such that younger children with higher MAs who are in a transition period towards using inner speech produce better performance on planning tasks; whereas in older children who are all using inner speech, there is no longer a significant association between CA/MA and planning. It could also reflect the recruitment of other cognitive skills, as was suggested for inhibition, or gained experience due to similarities with school tasks.

For switching, fewer difficulties were found for children with ID. Children with ID obtained significantly lower scores than CA comparisons, but reached the same level of performance as MA comparisons on both the verbal and non-verbal tasks. Therefore, although switching difficulties may be characteristic of at least some groups of children with developmental disorders (e.g. autism spectrum disorders, Geurts, Verte, Oosterlaan, Roeyers & Sergeant, 2004), this was not the case for children with ID. Maybe children with ID are forced to switch a lot due to their lower working memory capacity. This increased switching experience may improve switching abilities compared to other EF tasks.

The inclusion of three fluency tasks enabled conclusions to be drawn using triangulation from a range of related measures. Children with ID performed more poorly than CA comparisons on all fluency tasks, but they only showed MA-relative difficulties on letter fluency. This suggests that children with ID do not necessarily have problems with fluency per se (category and design fluency) in relation to MA, but, rather, have problems with accessing lexical items based on a rule that requires knowledge of spelling and sound patterns in words. This finding is surprising in some respects as the ID children, compared to the younger MA comparisons, would be expected to have had longer exposure to the phonological structures of speech and possibly longer exposure to literacy activities that involve identification of letters and phonemes. The finding suggests greater problems with phonological processes for children with ID than might be expected from their mental age profile. The findings, therefore, imply that children with ID have no particular difficulties on measures of fluency that do not require other relevant skills in relation to their mental age level.

5. Conclusions

In the present study, children with ID obtained significantly lower scores than CA comparisons on a comprehensive range of EF tasks. They also obtained lower scores than MA comparisons on *some* EF measures: these included inhibition; planning; and non-verbal ELWM. The findings in relation to EF were broadly consistent regardless of whether EF skills were assessed using verbal or non-verbal tasks, with the exception of ELWM. Here, MA-relative difficulties were found only for the non-verbal task. The remaining results suggested greater problems with selective aspects of EF for children with ID than would be expected by their mental age, particularly in relation to the inhibition of salient but incorrect responses and in categorizing materials according to self-generated organizing principles. However, children with ID have MA-appropriate skills in relation to generating exemplars according to a rule and switching between tasks. We suggest that the results on some of the EF tasks could be influenced by lower working memory capacity in children with ID.

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Table 1

Means and standard deviations on chronological age and mental age (in months), number of children and percent females for the intellectual disability group (ID), the comparison group matched on chronological age (CA), and the comparison group matched on mental age (MA).

Test	ID		CA		MA	
	M	*SD*	*M*	*SD*	*M*	*SD*
N	22		22		22	
Chronological age	158	14	148	12	88	9
Mental age	89	19	177	20	96	11
Percent females	45		45		32	

Table 2

Overview of tests included, which EF subcomponent they measure and if they are verbal or non-verbal. ELWM stands for executive loaded working memory.

EF subcomponent	Test	Verbal/Non-verbal
ELWM	WMTB-C Listening Recall	Verbal
	Odd-one-out Task	Non-verbal
Inhibition	Verbal inhibition task doll/car	Verbal
	Motor inhibition task fist/finger	Non-verbal
Planning	Delis-Kaplan Sorting test	verbal + non-verbal
Switching	Delis-Kaplan Category fluency switching	Verbal
	CANTAB ID/ED	Non-verbal
Fluency	Delis-Kaplan letter fluency	Verbal
	Delis-Kaplan category fluency	Verbal
	Delis-Kaplan Design fluency	Non-verbal

Table 3

Means and standard deviations for all 11 EF tests for each of the three groups: Intellectual disability, Mental age comparisons and Chronological age comparisons. ELWM stands for executive loaded working memory.

Test	ID		MA		CA	
	M	*SD*	*M*	*SD*	*M*	*SD*
ELWM verbal	7.47	4.0	9.45	2.9	17.1	4.0
ELWM non-verbal	4.95	1.9	7.18	1.9	12.0	2.8
Inhibition verbal	17.7	22.6	7.0	4.8	4.45	3.7
Inhibition non-verbal	37.3	26.7	17.6	4.7	14.05	6.7
Planning verbal	0.95	0.83	2.1	1.1	3.05	1.0
Planning non-verbal	1.75	1.8	3.32	1.9	7.14	0.94
Switching verbal	7.15	2.87	8.05	1.86	13.5	2.9
Switching non-verbal	38.0	16.2	34.3	8.2	21.6	12.6
Letter fluency (verbal)	13.6	8.6	24.45	5.1	42.9	10.3
Category fluency (verbal)	24.1	9.4	26.7	4.6	41.4	6.8
Design fluency (non-verbal)	8.55	5.57	9.82	3.26	20.7	5.2

Table 4

Results for Tukey-Kramer post hoc test on all EF subcomponents. Comparisons between Chronological age comparisons and Intellectual disability group are presented in the second column and comparisons between Mental age comparisons and Intellectual disability group are presented in the third column. ELWM stands for executive loaded working memory.

EF subcomponent	CA vs. ID	MA vs. ID
ELWM verbal	$Q(3, 62) = 12.0$, $p < .001$	$Q(3, 62) = 2.47$, *ns*
ELWM non-verbal	$Q(3, 63) = 14.3$, $p < .001$	$Q(3, 63) = 4.53$, $p < .01$
Inhibition verbal	$Q(3, 61) = 4.67$, $p < .01$	$Q(3, 61) = 3.78$, $p<.05$
Inhibition non-verbal	$Q(3, 62) = 6.81$, $p < .001$	$Q(3, 62) = 5.76$, $p < .001$
Planning verbal	$Q(3, 63) = 9.54$, $p < .001$	$Q(3, 63) = 5.19$, $p < .01$
Planning non-verbal	$Q(3, 63) = 15.4$, $p < .001$	$Q(3, 63) = 4.47$, $p < .01$
Switching verbal	$Q(3, 63) = 11.1$, $p < .001$	$Q(3, 63) = 1.58$, *ns*
Switching non-verbal	$Q(3, 65) = 6.06$, $p < .001$	$Q(3, 64) = 1.37$, *ns*
Letter fluency (verbal)	$Q(3, 64) = 10.3$, $p < .001$	$Q(3, 64) = 6.11$, $p < .001$
Category fluency (verbal)	$Q(3, 64) = 11.2$, $p < .001$	$Q(3, 64) = 1.67$, *ns*
Design fluency (non-verbal)	$Q(3, 65) = 11.9$, $p < .001$	$Q(3, 65) = 1.25$, *ns*

Note: p-values higher than .05 are written out as numbers, other p-values are marked as < .05, < .01 and < .001 respectively.

Table 5.

Correlations between mental age and the EF subcomponents for the three groups: Intellectual disability, Mental age comparisons and Chronological age comparisons.

	Groups		
EF	ID	MA	CA
ELWM verbal	.72*	.57*	.46*
ELWM non-verbal	.32	.40	.56*
Inhibition verbal	-.61*	-.09	.43*
Inhibition non-verbal	-.52*	-.04	-.06
Planning verbal	.58*	.29	.23
Planning non-verbal	.60*	.37	-.14
Switching verbal	.56*	.14	.59*
Switching non-verbal	-.18	.24	-.27
Letter fluency (verbal)	.14	.27	.42
Category fluency (verbal)	.28	.22	.49*
Design fluency (non-verbal)	.66*	.26	.48*