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## Bilingualism Enriches the Poor: Enhanced Cognitive Control in Low-Income Minority Children

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### Abstract

This study explores whether the cognitive advantage associated with bilingualism in executive functioning extends to young immigrant children challenged by poverty and, if it does, which specific processes are most affected. In the study reported here, 40 Portuguese-Luxembourgish bilingual children from low-income immigrant families in Luxembourg and 40 matched monolingual children from Portugal completed visuospatial tests of working memory, abstract reasoning, selective attention, and interference suppression. Two broad cognitive factors of executive functioning—representation (abstract reasoning and working memory) and control (selective attention and interference suppression)—emerged from principal component analysis. Whereas there were no group differences in representation, the bilinguals performed significantly better than did the monolinguals in control. These results demonstrate, first, that the bilingual advantage is neither confounded with nor limited by socioeconomic and cultural factors and, second, that separable aspects of executive functioning are differentially affected by bilingualism. The bilingual advantage lies in control but not in visuospatial representational processes.

### Keywords

bilingualism; immigration; cognitive processes

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Substantial evidence demonstrates that the regular use of more than one language benefits a variety of executive functions, including switching attention, working memory, metalinguistic awareness, creativity, and problem solving (see Adesope, Lavin, Thompson,

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The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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& Ungerleider, 2010, for a review of research with children and Hilchey & Klein, 2011, for a review of research with adults). One explanation for this bilingual advantage is that the experience of managing several languages on a regular basis trains executive functions that are needed to resolve conflict between competing language systems and improves their functioning across other tasks and domains (Bialystok, Craik, Green, & Gollan, 2009). Support for this view comes from functional MRI studies of bilinguals showing recruitment of the general executive control system for language switching (Luk, Green, Abutalebi, & Grady, 2011).

Bilingual advantages in executive functioning, however, have not been found in all studies (Bajo, Padilla, & Padilla, 2000; Engel de Abreu, 2011), leading to the suggestion that the observed effects might be related to privileged social backgrounds (i.e., high socioeconomic status, SES) rather than bilingualism per se. Differences in SES could bias the results in two ways—namely, as a confound or as a limiting condition. Regarding the first possibility, Morton and Harper (2007) argued that previous studies did not properly match SES across groups, with the consequence that wealthy bilingual children were being compared with monolingual children from less favorable economic conditions. Bialystok (2009) rejected this claim, explaining that, at least in her research, SES was controlled by sampling the bilingual and monolingual children from the same schools in economically homogeneous middle-class neighborhoods (Bialystok, 2010).

Second, it may be that the bilingual advantages reported in executive functioning emerge only for children in higher SES brackets, the population most involved in previous research (Oller & Pearson, 2002). This possibility presents a limiting condition in which the constellation of advantages associated with high SES is necessary for children to fully benefit from the opportunity presented by bilingualism. Thus, bilingualism might produce positive effects for children from advantaged social conditions but produce no effects or even negative effects for children from less-favorable backgrounds.

Although it has been reliably shown that children from lower SES backgrounds manifest poorer performance in executive function tasks than do their wealthier peers (Noble, Norman, & Farah, 2005), few studies have explored the effect of bilingualism in children growing up in poverty. Two previous studies reported some benefit of bilingualism for low-SES Spanish-English bilingual children (Carlson & Meltzoff, 2008; Mezzacappa, 2004), but both studies compared performance with privileged monolingual children from a different ethnic group and used statistical procedures to control for the substantial initial differences between groups. Thus, no studies to date have examined monolingual and bilingual children in comparable low-SES situations from the same cultural group to determine whether the bilingual cognitive advantages previously reported require a specific social context.

In the present study, we examined whether the bilingual advantage in executive functioning that has been observed in studies targeting middle-class, English-speaking bilinguals in North America can be detected in young bilingual children growing up in low-income immigrant families in Luxembourg.

The Grand Duchy of Luxembourg provides a fruitful linguistic and sociodemographic landscape to explore questions related to SES and multilingualism. The country and educational system are trilingual, with Luxembourgish, German, and French being recognized as official languages. Luxembourgish is spoken throughout the country and is the sole language of instruction when children start school at the age of 4 years. At the age of 6 years, children are introduced to their first second language, German, and 1 year later they start to learn their second foreign language, French. The Grand Duchy's stable, prosperous economy depends heavily on foreign workers; the Portuguese community is by far the largest foreign-born population segment, representing 16% of the country's total population (STATEC, 2011). The Portuguese living in Luxembourg mostly emigrated from Northern Portugal and tend to be low or unskilled laborers with little education (Alieva, 2009). Despite government efforts to reduce social inequalities, Portuguese students continue to be vastly overrepresented in lower educational tracks and special education programs (Ministère de l'Éducation nationale et de la Formation professionnelle, 2011).

Our study focused on first- and second-generation immigrant children of low-income parents born in Portugal but living in Luxembourg who were carefully matched with monolinguals from comparable sociodemographic backgrounds in Northern Portugal—the region from which the families in Luxembourg had emigrated. The matching ensured that there was no confound with SES and ethnicity in the group structure, so performance differences between language groups could be clearly attributed to bilingualism. Additionally, the low-income status of the children provided a means for testing the possibility that high SES was an enabling condition for bilingualism to enhance executive functioning. Finally, in contrast to previous studies that generally employed a single measure or type of task to assess executive functioning (e.g., Bialystok, 2010; Engel de Abreu, 2011; Morton & Harper, 2007), the present study included a range of measures that varied in their underlying processes and surface manifestations; this variation was designed to help identify the specific aspect of executive functioning that is affected by bilingualism.

Bialystok (1991, 2001; Craik & Bialystok, 2006) proposed a theoretical distinction between representation (formerly “analysis”) and control. Representation is the process of encoding and structuring knowledge in a manner that permits retrieval, logical inference, and access to relational information. The functions contributing to control include selectively attending to relevant aspects of a problem, inhibiting misleading information, and switching between competing responses. In studies with adults and older children, bilingual advantages were found for tasks based on control, but no differences were observed for tasks based on representation (for reviews, see Bialystok, 1991, 2001). This distinction was incorporated into the present design to validate the dissociation of representation and control processes in young children, determine the effect of bilingualism on each, and establish the applicability of this model for low-SES children. The hypotheses were that bilingualism selectively affects the ability to resolve conflict, an aspect of cognitive control, and that this difference would emerge in carefully matched children from low-SES backgrounds.

## Method

### Background and participants

Testing was conducted in second-grade classrooms across Northern Portugal and the Grand Duchy of Luxembourg. Portugal and Luxembourg are relatively small countries; both are members of the European Union; and there are no apparent within-country disparities in terms of the quality of public school education. Schools were carefully targeted to be comparable across countries with respect to their number (six schools in each country), class size ( $M = 22$  students per class), and demographic region (mean resident population = 8,892). Although the selected children lived in low-SES families, none of the schools were located in severely disadvantaged neighborhoods, all of the teachers were highly qualified, the curriculum was equivalent across countries (with the exception of foreign language instruction being part of the curriculum in Luxembourg), and none of the schools indicated difficulties with educational resources (additional school and country information is available in Table S1 in the Supplemental Material available online).

In total, 121 children were assessed (67 in Luxembourg and 54 in Portugal); they were matched on gender (50% boys and 50% girls in each group), ethnicity (99% Caucasian, 1% other), chronological age, and the International Socio- Economic Index of occupational status (Ganzeboom, 2010). Exclusion criteria included maternal alcohol or drug use during pregnancy; severe pregnancy or birth complications; history of head injury, epilepsy, or hearing problems; diagnosis of special educational needs; and bilingualism (for the Northern Portugal group only). The final sample consisted of 40 Portuguese children from monolingual homes in Portugal and 40 Portuguese-Luxembourgish bilingual children who lived in Portuguese-speaking homes in Luxembourg.

The first language of all children was Portuguese. In the bilingual group, 25% of the children were first-generation immigrants; they were born in Portugal and immigrated to Luxembourg before the age of 3. The remaining children were second-generation immigrants who were born in Luxembourg to Portugal-born parents. All children were exposed to Portuguese at home and had completed their first 4 years of education in Luxembourgish schools. Parents reported that children used Portuguese and Luxembourgish on a daily basis. The monolingual group had monolingual parents, spoke only Portuguese at home, and attended monolingual schools in Portugal.

Mean participant characteristics are reported in Table 1 (for additional sample information, see Table S2 in the Supplemental Material). SES was assessed using a range of indices: the equivalized disposable household income (Organisation for Economic Co-operation and Development, 2011), household possessions and size, stimulation in the home (based on Caldwell & Bradley, 1984), caregiver education (International Standard Classification of Education mapped onto years of education; United Nations Educational, Scientific and Cultural Organization, 1997), caregiver occupation (International Standard Classification of Occupations; International Labour Organization, 2008), and nutritional status of the child (body mass index for age; World Health Organization, 2009).

Despite International Socio-Economic Index matching, the bilingual group was disadvantaged in terms of parental education, household possessions, and household size. Income information showed that all of the bilingual children came from low-income households of which 18% fell below the poverty line.<sup>1</sup> The poverty index frequencies for the monolingual households were as follows: 72%, low income (of which 22% were below the poverty line); 15%, median income; 12%, wealthy.

## Materials and procedure

With the exception of the Luxembourgish vocabulary measure (bilinguals only), all the tests were administered in Portuguese by native Portuguese speakers. All measures had been translated and back-translated from the English original and used in previous studies with Portuguese-speaking children (Engel, Santos, & Gathercole, 2008). Reliability of instruments was established for the scores produced by the measures in this study. Computerized tasks were administered on Dell Vostro laptops with a 15.4-in. display.

**Language measure**—Children completed the Expressive One-Word Picture Vocabulary Test (Brownell, 2000), in which they name pictures. The bilingual children completed the task in both languages (counterbalanced across the first and last testing sessions) and received a score for each language and a conceptual score indicating the number of unique concepts that could be named. Children who did not know a word in Luxembourgish could use a German or a French word, which then counted toward the total conceptual score. As no norms or item statistics were available, the same predetermined fixed set of items was administered to all children. The maximum score on the test was 51.

**Cognitive measures**—Abstract reasoning was assessed with Raven's Coloured Progressive Matrices (Raven, Court, & Raven, 1986), a nonverbal task in which geometrical figures need to be completed by choosing the missing piece among six alternatives. The maximum score was 36.

Two working memory measures—Odd-One-Out and Dot Matrix—were administered from the European Portuguese version of the computerized Automated Working Memory Assessment (Alloway, 2007). Both measures are span tasks in which the number of items to be remembered increases progressively over successive blocks. The number of correctly recalled trials serves as the dependent variable. The Odd-One-Out is a complex span task in which visuospatial information has to be simultaneously processed and stored. Children are presented with arrays of three boxes with one shape in each. They are asked to identify the shape that does not match the two others (processing) and remember its location in each array (storage). At the end of the trial, children are presented with an array of empty boxes and asked to recall the localization of the odd shape of each array by tapping the empty

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<sup>1</sup>This article employs the Organisation for Economic Co-operation and Development (2011) poverty indicator, which is constructed by comparing a household's equivalent income with a relative poverty line that is set at 50% of the median disposable income prevailing in each country. *Relative poverty* refers to a standard of living or level of income that is high enough to satisfy basic needs but is still significantly lower than that of the majority of the population under consideration. A child was considered poor if the household's equivalent income fell below the poverty line, a child was considered low income if the household income was less than the median of the respective country, and a child was considered wealthy when the household's income was above 50% of the median income of the respective country.

boxes in the right order. The Dot Matrix is a visuospatial simple span task involving storage but no explicit processing demands. A red dot appears in different locations of a  $4 \times 4$  matrix; children are asked to remember the sequence of locations and recall them by tapping the squares of the empty matrix in the right order at the end of each trial.

The Sky Search task from the Test of Everyday Attention for Children (Manly, Robertson, Anderson, & Nimmo-Smith, 1998) was administered as a measure of selective attention. The test consists of an A3 sheet depicting 128 paired spacecrafts of which 20 pairs are identical. Children have to circle the 20 target items as fast as possible without being distracted by the lures. Subsequently, children are given a motor-control version of the task containing only the 20 target items. The Sky Search attention score is calculated adjusted for motor speed.

Interference suppression was assessed with a flanker task, modified from Rueda et al. (2004), which was administered with response buttons on each side of the computer screen. The test consists of displays containing a horizontal row of five equally spaced yellow fish, and children indicate the direction of the central fish by pressing the corresponding left or right response button as quickly as possible. On congruent trials (50% of all trials), the flanking fish are pointing in the same direction as the target, and on incongruent trials (50% of all trials), the distractors point in the opposite direction. Each trial starts with a 1,000-ms fixation cross in the middle of the screen, followed by the fish array for 5,000 ms or until a response is made. Responses are followed by feedback (2,000 ms) and a 400-ms blank interval. Children complete two blocks of 20 trials each in which presentation of congruent and incongruent trials is randomized. Eight practice trials precede the experimental trials: If more than two errors occur on these trials, the instructions and the practice are repeated until the child reaches the criterion level. Reaction times (RTs) and accuracy are recorded. Incorrect responses, RTs below 200 ms, and RTs above three standard deviations of children's individual means were excluded from the analyses (< 3% of trials).

## Results

Descriptive statistics for all measures are reported in Table 2. Within-subjects comparisons showed that the bilinguals named significantly more words in Portuguese than in Luxembourgish,  $t(39) = 5.76, p < .01, d = 1.14$ . Monolingual children performed significantly better than did the bilinguals on the Portuguese single vocabulary measure ( $p < .01$ ) and on conceptual vocabulary ( $p < .01$ ). Groups did not differ significantly on abstract reasoning (Raven's) or on the working memory measures (Odd-One-Out and Dot Matrix;  $ps > .15$ ). Accuracy on the flanker task was at ceiling for both groups in both conditions (mean percentage correct = 97.72,  $SD = 4.48$ ). RTs were significantly lower for the congruent than the incongruent trials,  $t(79) = 5.35, p < .01, d = 0.37$ , and bilinguals were significantly faster than monolinguals in both trial conditions, incongruent trials:  $t(78) = -3.39, p < .01, d = 0.76$ ; congruent trials:  $t(78) = -3.13, p < .01, d = 0.69$ . RTs were strongly related across trial conditions ( $r = .87$ ); only RTs for incongruent trials were therefore included in the subsequent principal component analysis. Groups did not differ significantly on the Sky Search motor-control task ( $p > .05$ ), but bilinguals were significantly faster than

monolinguals in the Sky Search attention score (controlled for motor speed),  $t(78) = -2.97$ ,  $p < .01$ ,  $d = 0.67$ .

Raven's, Odd-One-Out, Dot Matrix, and Sky Search attention scores and the RTs for incongruent flanker trials were submitted to a principal component analysis with varimax rotation of the factor structure. Two factors with eigenvalues above 1.00 emerged (accounting for 35% and 25% of the variance), indicating that the measures capture distinct aspects of executive functioning. Factor loadings on the rotated matrix are represented in Table 3. The factor structure was very clear: Abstract reasoning and the working memory measures loaded on Factor 1 (factor loadings between .66 and .77), and the selective-attention and interference-suppression tasks loaded on Factor 2 (factor loadings of .83 and .85). Factor 1 is interpreted as "representation" because the working memory measures and the Raven's scores rely on visuospatial encoding and analytical processes without a misleading context. Factor 2 is labeled "control" because Sky Search and flanker tasks both involve conflicting information that requires selective attention and inhibition to be resolved successfully. Using computed factor scores as the dependent variable, between-groups comparisons showed that the bilinguals outperformed the monolinguals on the control factor—bilinguals:  $M = -0.41$ ,  $SD = 0.69$ ; monolinguals:  $M = 0.41$ ,  $SD = 1.10$ ;  $t(78) = -3.98$ ,  $p < .01$ ,  $d = 0.89$ —but that groups performed equivalently on the representation factor—bilinguals:  $M = -0.14$ ,  $SD = 1.03$ ; monolinguals:  $M = 0.14$ ,  $SD = 0.96$ ;  $t(78) = -1.29$ ,  $p = .20$ ,  $d = 0.29$ .

## Discussion

There were three major findings of this study. First, the principal component analysis revealed two clear factors that were described as representation (abstract reasoning and working memory) and control (selective attention and interference suppression). This result validates the dissociation account of executive functions (Bialystok, 1991, 2001; Craik & Bialystok, 2006) and extends it to young children from a low-SES background.

Second, bilingualism positively affected only one of these processes—namely, control—with no group difference in representation (cf. Bialystok, 1991, 2001). Thus, bilingualism does not simply lead to a domain-general increase in cognitive ability that could reflect other environmental factors associated with bilingualism, such as SES, but instead selectively influences the ability to deal with conflict. Our findings shed light on inconsistencies in previous research by demonstrating the importance of considering the specific cognitive demands of executive function tasks. The higher the control demand of the task, the more likely it is that a bilingual effect will emerge.

Third, and most important, the bilingual advantage in control was found in children growing up in economically disadvantaged families. This bilingual advantage was robust, with a large effect size. Because of the detailed matching of children across the monolingual and bilingual groups, these results rule out claims that the bilingual benefits previously reported can be explained by economic or cultural differences (Morton & Harper, 2007; Oh & Lewis, 2008). Instead, the data are consistent with the position that the constant use of executive control to resolve language conflict strengthens these processes and makes bilinguals more

proficient than monolinguals in executive function tasks involving directing attention, focusing on relevant aspects of a problem, and filtering misleading information (Bialystok, 1991, 2001).

It is firmly established that early adverse childhood experience can have detrimental effects on children's cognitive development (Noble et al., 2005). Young children growing up in underprivileged conditions are likely to experience environments that impede or even harm healthy brain development (e.g., unresponsive caregiving, stress exposure, economic hardship). In the present study, low-income bilingual children outperformed monolinguals in executive control, despite the presence of environmental conditions that would usually be associated with equivalent or even lower performance. The ability of the brain to sustain normal or improved functioning in the face of significant adverse conditions has been referred to as *cognitive reserve* (Stern, 2003). Lifelong bilingualism has been found to contribute to cognitive reserve in the elderly by attenuating the negative effects associated with dementia (Craik, Bialystok, & Freedman, 2010). The present study suggests that bilingualism might also provide protection against the adverse cognitive effects that are associated with poverty. From this perspective, regular use of more than one language is a mentally stimulating activity that provides the opportunity to strengthen executive control mechanisms that build a defense to counteract the negative impact of poverty on cognition.

One remarkable feature of our results was that cognitive benefits were detected despite the strikingly low vocabulary scores of the bilingual children. Cognitive advantages are thus possible even with a seemingly low degree of proficiency in both languages. These results clearly show that in spite of facing many linguistic challenges, bilingual immigrant children present important strengths in nonlinguistic cognitive domains that promote academic achievement (Blair & Razza, 2007; Engel de Abreu, Gathercole, & Martin, 2011; St Clair-Thompson & Gathercole, 2006).

There are a variety of intervention programs designed to improve children's executive control capacities, ranging from martial arts to computerized training programs (see Diamond & Lee, 2011, for a review). Unfortunately, the majority of these approaches are expensive, so instead of reducing social inequalities, they may exacerbate them. Curriculum-based approaches that are accessible to all children might be more appropriate for children from economically disadvantaged backgrounds. Our findings indicate that intervention programs based on foreign-language learning are a fruitful avenue for further exploration. Teaching a foreign language does not involve costly equipment, it has the obvious benefit of widening children's linguistic and cultural horizons, and it fosters the healthy development of executive control. Recent research has shown that studying a second language in an immersion school program leads to similar benefits found for bilingual children but in a somewhat reduced form (Bialystok, Peets, & Moreno, 2012; Hermanto, Moreno, & Bialystok, 2012). Participating in foreign-language programs might thus be a promising tool for reducing the achievement gap between more- and less-advantaged children by contributing to the construction of a sound cognitive foundation that might help children to reach their full potential and improve their educational opportunities.



## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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**Table 1**

## Mean Characteristics of the Two Groups in the Study

Characteristic	Bilinguals ( <i>n</i> = 40)	Monolinguals ( <i>n</i> = 40)	<i>t</i> (78)	Cohen's <i>d</i>
Age	99 months (3.3)	98 months (3.8)	1.25	0.28
Schooling	54.9 months (4.6)	54.6 months (8.4)	0.20	0.04
Number of students per class	22.1 (9.8)	22.4 (2.0)	-0.19	0.04
Resident population	9,741 (8,540)	8,043 (15,461)	0.61	0.14
International Socio-Economic Index	35.3 (6.2)	35.7 (8.7)	-0.24	0.05
BMI for age	0.72 (1.1)	0.81 (1.0)	-0.46	0.09
Home stimulation	.71 (.15)	.70 (.16)	0.23	0.06
Caregiver education	9.2 years (3.1)	10.8 years (3.4)	-2.17*	0.49*
Household possessions	.53 (.15)	.64 (.14)	-3.60*	0.76*
Household size	4.4 (0.90)	3.8 (0.89)	3.00*	0.67*
Annual household income	\$23,882 (\$7,850) <sup>a</sup>	\$11,095 (\$6,076) <sup>b</sup>	—	—

Note: Standard deviations are given in parentheses. The highest level of education of either caregiver was used to determine caregiver education and occupation. Body mass index (BMI; given as *z* scores) was established following guidelines of the World Health Organization (2008) with calibrated Plenna MEA 07400 scales (Plebal Plenna Balanças Comércio, São Paulo, Brazil), Seca 214 stadiometers (Seca GmbH & Co, Hamburg, Germany), and World Health Organization (2009) Anthroplus software. Home stimulation and household possessions are given in proportions; caregivers were asked a series of questions with rating-scale format, and responses were totaled and divided by the highest possible score. Annual household income represents the annual median equivalized disposable household income in U.S. dollars (Organisation for Economic Co-operation and Development, 2011). Data were obtained from caregivers and teachers using the Luxembourg Language and Background Questionnaire–Portuguese Version, the Luxembourg Teacher Questionnaire–Luxembourgish Version, and the Luxembourg Teacher Questionnaire–Portuguese Version, all of which were designed for this study.

<sup>a</sup> \$23,882 corresponds to 30% below the median annual household income in Luxembourg.

<sup>b</sup> \$11,095 corresponds to 15% below the median annual household income in Portugal.

\*  $p < .05$ .

Table 2

## Descriptive Statistics for Task Measures by Language Group

Measure	Bilinguals ( <i>n</i> = 40)		Monolinguals ( <i>n</i> = 40)		<i>t</i> (78)	Cohen's <i>d</i>
	<i>M</i>	Cronbach's $\alpha$	<i>M</i>	Cronbach's $\alpha$		
Language						
EOWPVT Portuguese	23.7 (5.9)	.84	36.0 (3.9)	.72	-11.01*	2.46*
EOWPVT Luxembourgish	17.2 (5.3)	.83	—	—	—	—
Conceptual vocabulary	27.3 (4.3)	.83	36.0 (3.9)	.72	-9.32*	2.08*
Cognitive abilities						
Raven's accuracy	26.1 (3.6)	.86	26.4 (4.0)	.92	-0.36	0.08
Odd-One-Out accuracy	15.4 (4.1)	.91	15.7 (3.9)	.91	-0.31	0.07
Dot Matrix accuracy	19.1 (4.3)	.93	20.3 (3.7)	.85	-1.30	0.30
Sky Search: motor control (s)	28.9 (8.9)	—	32.3 (8.2)	—	-1.77	0.40
Sky Search: attention (s)	5.0 (1.5)	—	6.2 (1.9)	—	-2.97*	0.67*
Flanker congruent reaction time (ms)	734 (122)	.82	838 (174)	.89	-3.13*	0.69*
Flanker incongruent reaction time (ms)	776 (140)	.84	940 (270)	.89	-3.39*	0.76*
Flanker congruent accuracy	19.7 (0.80)	—	19.6 (0.83)	—	0.89	0.03
Flanker incongruent accuracy	19.4 (0.87)	—	19.4 (1.1)	—	0.00	0.01

Note: Standard deviations are given in parentheses. Language was measured using the Expressive One-Word Picture Vocabulary Test (EOWPVT; Brownell, 2000). Cognitive abilities were measured using Raven's Coloured Progressive Matrices (Raven, Court, & Raven, 1986), the Odd-One-Out and Dot Matrix tasks of the Automated Working Memory Assessment (Alloway, 2007), the Sky Search task from the Test of Everyday Attention for Children (Manly, Robertson, Anderson, & Nimmo-Smith, 1998), and a flanker task modified from Rueda et al. (2004).

\*  $p < .05$ .

**Table 3**

## Factor Loadings From Principal Component Analysis

Measure	Factor 1	Factor 2
Raven's Coloured Progressive Matrices	<b>.71</b>	.01
Odd-One-Out	<b>.66</b>	-.14
Dot Matrix	<b>.77</b>	-.06
Sky Search	-.09	<b>.83</b>
Flanker	-.06	<b>.85</b>

Note: Factor loadings above .65 are marked in boldface. Measures used consisted of Raven's Coloured Progressive Matrices (Raven, Court, & Raven, 1986), the Odd-One-Out and Dot Matrix tasks of the Automated Working Memory Assessment (Alloway, 2007), the Sky Search task from the Test of Everyday Attention for Children (Manly, Robertson, Anderson, & Nimmo-Smith, 1998), and a flanker task modified from Rueda et al. (2004).