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LEARNING POTENTIAL ASSESSMENT AND ADAPTATION TO THE EDUCATIONAL CONTEXT: THE USEFULNESS OF THE ACFS FOR ASSESSING IMMIGRANT PRESCHOOL CHILDREN

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The objective of this study was to test the usefulness of dynamic assessment for determining cognitive abilities such as classification, auditory and visual memory, pattern sequences, perspective taking, verbal planning, learning potential, and metacognition in immigrant preschool children with and without competence in the dominant language (Spanish). One hundred seventy-six preschool-children were distributed in three groups according to the cultural background of their parents (native Spanish/Spanish-speaking immigrants/non-Spanish speaking immigrants). The children were assessed by means of the K-BIT, the Application of Cognitive Functions Scale (ACFS), and metacognition, language competence and academic performance estimates. The results show that although there are initial differences in execution between the two groups (Spanish/immigrants), there are no differences with regard to learning potential. The study also demonstrates the importance of behavioral, attitudinal, and metacognitive variables in children's test execution and academic performance. © 2013 Wiley Periodicals, Inc.

Over the last decade, Spain has become one of the principal destinations of international migration. One indication of this is that in the academic year 2007–2008, students with foreign nationality in general, non-university education represented 9.4% of the total, and 124,211 of these were preschool children (Instituto Nacional de Estadística, 2008).

The integration of the immigrant student in her or his school involves a process of adaptation, which is often problematic (Strohmeier & Spiel, 2003). Differences in academic achievement have often been detected between ethnic minorities and native preschool children, with the natives obtaining better results (Cosden, Zimmer, Reyes & Gutiérrez, 1995; Latuheru & Hessels, 1993; Peña, 2000; Resing, De Jong, Bosma, & Tunteler, 2009; Tzuriel & Kaufman, 1999). In general, ethnic minority children do not perform as well as native children do in tasks involved in classic execution tests and performance assessments (Lauchlan & Elliot, 1997; Resing et al., 2009; Tzuriel, 2000). In consequence, immigrant children are frequently classed with the groups with learning difficulties (Gersten & Woodward, 1994; Jeynes, 2004; Lahaie, 2008; Lalueza, Crespo, Sánchez, Camps & Cazorla, 2005; Peña, Iglesias & Lidz, 2001; Turney & Kao, 2009).

On many occasions, however, this phenomenon has been attributed to the use of standardized assessment techniques, which are discriminatory and insensitive to the differences and needs of students from a different cultural context from that of the tests (Gupta & Coxhead, 1988; Lauchlan & Elliot, 1997; Tzuriel & Kaufman, 1999). Among other causes of this phenomenon are the lack of familiarity of the immigrant student with this type of test, cultural and linguistic differences, differences in parental expectations, and lack of confidence (Ceci & Williams, 1997; Hessels, 2000; Lidz & Macrine, 2001; Resing et al., 2009; Tzuriel, 2000). In Spain, various studies have centered on language competence as the chief drawback, demonstrating that students with an adequate command

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of the language of the host country perform better than do those with language difficulties (Colectivo IOÉ, 2003; Franzé, 2008; Olmos, 2009; Rodríguez, 2008). In addition to the immigrant child's own language competence, the parents' language skills also need to be considered. A number of studies have shown that parents with limited language skills are less involved in their children's progress at school, and this in turn adversely affects the children's performance (Crosnoe, 2007; Lahaie, 2008; Peña, 2000; Turney & Kao, 2009). Some authors maintain that the adaptation of children from immigrant families to the educational context, even when they are born in the host country, depends to a great extent on the education they receive at home in their first years, on the language spoken, and on cultural differences with respect to native children, all of which affect their opportunities for success in the academic environment (Alba, Logan, Lutz & Stults, 2002; Glick & Hohmann-Marriott, 2007). In view of these findings, it is of interest to determine how immigrant parents who are speakers of Spanish as a result of their country of origin affect the academic performance of their children.

In this context, various authors have emphasized the need for an alternative type of assessment that does not focus exclusively on results, but is rather designed to evaluate processes and strategies. Such an alternative would seem to be provided by the assessment technology known as dynamic assessment (DA) or learning potential assessment (Elliot, Grigorenko & Resing, 2010; Haywood & Lidz, 2007; Lidz, 2000; Sternberg & Grigorenko, 2002). This type of assessment is based on the concept of Zone of Proximal Development (Vigotsky, 1978) and includes, as part of the assessment procedure, a phase of structured intervention designed to help the children perceive the nature of the task. Assessors are thus able to observe the processes and cognitive abilities developed and employed by the children, in addition to their capacity to generalize their learning to new tasks and/or skills (Elliot, 2003; Elliot et al., 2010; Guthke, 1993; Resing et al., 2009). The aim of this methodology is thus to assess the learning potential of the child, or, in other words, the extent to which the student improves at a particular task after receiving mediation designed to equip him or her with the basic skills required to enhance performance in the domain concerned. This intervention is provided by the assessor, who guides the child in the resolution of the task (Fernández-Ballesteros & Calero, 2000; Gerber, 2001).

In this line of research, authors such as Embretson (1987) and Grigorenko & Sternberg (1998) have questioned the existence of experimental literature supporting the claim of DA to provide a better estimate of ability and to improve mental efficiency compared with static testing procedures and have also challenged the idea that DA enhances performance among students from different backgrounds, in contrast to static tests. Nevertheless, diverse studies have shown that DA is indeed more sensitive than traditional tests for the detection of potential strengths and weaknesses of children from ethnic backgrounds (Hessels & Hamers, 1993; Kaniel, Tzuriel, Feuerstein, Ben-Shachar & Eitan, 1991; Skuy & Shumkler, 1987; Sternberg & Grigorenko, 2002; Tzuriel, 2000). For example, Tzuriel & Kaufman (1999) found that Israeli children initially scored higher than immigrant children of Ethiopian origin did on all tests; however, after the mediation phase, the Ethiopian children improved their execution to a similar or even greater extent than the Israelis. Similar findings were established by Resing et al. (2009), who observed initial differences in the Raven test and a basic sequencing task between 54 ethnic minority children and 54 Dutch children, with the Dutch children presenting better results. However, these differences disappeared when DA techniques were applied; moreover, both groups of children achieved significant improvement after intervention. This study thus indicates that the immigrant children did not have learning difficulties, but rather that they lacked prior training in the assessment task.

Among other advantages of dynamic techniques is the fact that they provide valuable information concerning the cognitive functioning and learning potential of the child while he or she is carrying out a specific task, allowing the assessor to determine which metacognitive strategies the child uses and how he or she learns (Kuhn, 1995; Miller, 2002; Siegler, 2006). DA measures,

therefore, provide more information about thinking processes than static or traditional measures (Lidz, 1991; Lidz & Elliot, 2000). Using this methodology, Resing et al. (2009) analyzed the evolution of the children's use of metacognitive strategies while carrying out a task and found that in the postintervention phase, both the Dutch and the ethnic minority children utilized more advanced metacognitive strategies when resolving problems. Knowledge of how these strategies are used by children is highly relevant because research has increasingly demonstrated the close association between metacognition and academic achievement (Flook et al., 2010), showing that students who achieve better academic results use self-regulation strategies more frequently when learning a new task (García & Pintrich, 1994; Metcalfe, 1998; Versschaffel, 1999; Wang, Haertel & Walberg, 1990; Wong, 1996; Zimmerman, 2000). Indeed, studies such as the survey by Wang et al. (1990) indicate that metacognition is the most powerful predictor of learning.

Bearing in mind that metacognitive skills in preschool children are still in the process of development, it is important to assess the child using procedures that reveal how he or she goes about resolving a task and how he or she takes advantage of the guidance provided (Sternberg & Grigorenko, 2002; Lidz, 2007). Such procedures could assist in determining the needs of immigrant children who obtain deficient results at school and in planning remedial action, providing practical ideas for intervention (Bosma & Resing, 2008; Lidz & Van der Aalsvoort, 2005; Van der Aalsvoort & Lidz, 2007).

A further advantage of DA techniques is that they permit the evaluation of qualitative, nonintellective factors concerning the interaction of the child with both materials and examiner, which may affect execution in IQ tests (Tzuriel & Samuels, 2000). DA attempts to identify and compensate for the effects of these variables, as well as taking them into account when interpreting results. For instance, Cleary (2009) emphasizes the importance of assessment of motivational variables in academic performance, whereas a series of experiments reveals a close association between school achievement and behavioral variables, such as self-regulation, frustration tolerance, motivation, and cognitive flexibility (Diamond, Barnett, Thomas, & Munro, 2007; González-DeHass, Willems, & Doan-Holbein, 2005; Kochanska, Barry, Aksan, & Boldt, 2008; Oudeyer, Kaplan, & Hafner, 2007).

Previous research has established the usefulness of the Application of Cognitive Functions Scale (ACFS), as described in the Materials section, for determining learning potential in diverse populations of preschool children (Lidz & Jepsen, 2000, 2003). This instrument applies a pretest/training/posttest format and assesses not only cognitive abilities related to the educational curriculum but also attitudes toward learning by means of a Behaviour Observation Rating Scale (BORS) applied at the same time as the task. Scores are provided for performance (pretest) and learning potential (gain or transfer scores). The scale has been validated by various studies, in which all the participants who received mediation achieved significant improvement compared with the control group (Lidz, 1992). Examples include a study by Lidz (1996) using a sample of 30 gifted children, studies with normal-development preschool children (Bensoussan, 2002; Lidz, 2000; Malowitsky, 2001), deaf children (Lidz, 2004) and children with developmental problems (Brooks, 1997; Calero, Robles & García, 2010; Levy, 1999; Shurin, 1999). Similarly, various studies have demonstrated the reliability of the scale (Bensoussan, 2002; Brooks, 1997) and its discriminant capacity for groups with learning difficulties (Lidz, 1996). Further studies have confirmed the reliability of the scale of attitudes toward learning (BORS) included in the instrument (Aranov, 1999; Shurin, 1999). Validation studies have also established the effectiveness of the ACFS in different countries and cultures. These include an experiment in Holland with 89 normal-development children (Lidz & Van der Aalsvoort, 2005), an Australian study with 50 preschool children with and without developmental problems (MacDonald, 2006, quoted in Haywood & Lidz, 2007), and a study in Spain featuring preschool children with high and low academic achievement (Calero, Carles, Mata, & Navarro, 2010).

This body of research has established the applicability of the ACFS to several different populations and countries. The present study aimed to evaluate the usefulness of the scale for an immigrant population in the Spanish context, hoping to demonstrate that preschool children of immigrant families, regardless of their competence in the host-country language (Spanish), possess similar learning potential to native children and that consequently, any differences in execution are more closely related to prior experience or differences in attitudinal variables than to cognitive and/or metacognitive factors.

The first study objective was to analyze preschool children distributed in groups of native Spanish, children with Spanish-speaking immigrant parents, and children with non-Spanish speaking immigrant parents to determine whether differences exist in cognitive abilities and performance as evaluated by means of Kaufman's Brief Intelligence Test (K-BIT), the ACFS scale (pretest), a metacognition questionnaire, a language competence test, and teacher assessment. The second objective was to determine the effectiveness of the ACFS mediation phase in the three groups of preschool children (and to confirm that there were no significant differences between the groups in learning potential, as measured by the ACFS transfer scores (pretest/posttest). The third objective was to show the relation between the variables studied teacher-measured performance in the school context and to determine which variable was the best predictor of academic performance, independently of the children's group affiliation.

Method

Participants

One hundred seventy-six preschool children, aged between 4 and 5 years (48 and 60 months; $M = 5.25$ years, $SD = 3.92$) participated in the experiment. All the children were born in Spain and were speakers of Spanish. The children were enrolled in the second year of public-sector preschools in the south of Spain. None of the participants in the study presented problems of sensory capacity, learning, psychology, or behavior. The sample was divided into three groups according to the cultural background of the parents: (1) the Spanish group (native Spanish) consisted of 85 preschool children, of whom 52 were female and 33 were male, all with Spanish parents (age in months: $M = 55.14$, $SD = 3.76$); (2) the children with Spanish-speaking immigrant parents (S-S immigrant parents group) consisted of 45 children with parents of South American origin whose native language was Spanish (Bolivia, Argentina, and Ecuador; 22 females and 23 males; age in months: $M = 55.98$, $SD = 3.87$); and (3) the children with non-Spanish speaking immigrant parents (N-S-S immigrant parents group) consisted of 46 children with parents from Morocco, Russia, and Romania (24 females and 22 males; age in months: $M = 54.74$, $SD = 4.24$). Researchers ensured there were no significant differences between the groups in terms of age, gender, or preschool affiliation. There were no significant differences between groups in educational levels of parents of children tested, but there were slight differences in the distribution. Thus, in the immigrant group, the educational level was as follows: 23% had an elementary or primary education, 53% had a secondary education, and 24% studied at a university, whereas in the Spanish group, 27% had an elementary or primary education, 39% had a secondary education, and 34% studied at a university. The mean residence time in Spain was 5.33 years ($SD = 1.89$) for the Spanish-speaking immigrant parents and 6.74 ($SD = 3.99$) for the non–Spanish-speaking immigrant parents.

Materials

Given that all the participants were Spanish speakers, Spanish versions of the tasks were used in all the tests.

Kaufman's Brief Intelligence Test. K-BIT (Kaufman & Kaufman, 1994) is a screening test that permits rapid assessment of a child's general IQ by means of two subtests: Vocabulary and Matrices. Vocabulary measures verbal skills related to classroom learning, whereas Matrices measures the child's capacity to resolve problems of reasoning. The test provides a verbal IQ, a non-verbal IQ, and a composite IQ reflecting global test performance. Validity and reliability studies indicate that the test's reliability coefficients vary according to age, but never fall below .76. The K-BIT composite IQ has a correlation of .80 with the Weschler Intelligence Scale for Children-Revised (WISC-R) global IQ. Reliability of the Spanish adaptation of the test used in this study has been rated, for the age range considered, at .88 for the Vocabulary subtest, .74 for the Matrices subtest, and .83 for global IQ. The version has been shown to have high criteria validity compared with different IQ tests for children aged 5 years, including the WISC-R, with correlations of .80 for global IQ, .77 for Vocabulary with respect to Verbal IQ, and .52 for Matrices with respect to Manipulative IQ of WISC-R (Cordero & Calonge, 2000).

Application of Cognitive Functions Scale. ACFS (Lidz & Jepsen, 2000, 2003; this study used the Spanish adaptation by Calero, Robles, Márquez, & De la Osa, 2009) is a DA procedure that measures the application of learning strategies and cognitive processes in typical tasks from the preschool curriculum. Designed for children from 3 to 6 years of age, it is composed of six subtests: *Classification* involves tasks of grouping and alternative thinking, using wooden blocks of different shapes, size and color; *Auditory Memory* tests short-term auditory memory through the narration of a brief story; *Visual Memory* tests immediate recall of images and involves memory strategies; *Pattern Sequences* requires the child to complete sequences of geometric figures; *Perspective Taking* involves putting oneself in the place of another person by asking the child to adopt the role of teacher and explain how to draw a figure; and *Verbal Planning* requires the child to express an action verbally, respecting the different sequences (before and after) of which the action consists.

Application follows the format of pretest/mediation /posttest, thus providing three types of score: pretest (measure of performance), posttest (result after mediation), and transference (the pre–post difference), considered as a measure of learning potential. Mediation consists of a training phase on tasks similar to those of the pretest and posttest, including feedback on performance and instruction to guide the child toward solving the task. In addition, the BORS evaluates seven attitudes of the child regarding his or her learning: Self-Regulation, Persistence, Frustration Tolerance, Flexibility, Motivation, Interactivity, and Responsivity.

Scores provided by the ACFS are quantitative and non-normative. Various studies have analyzed ACFS transfer scores and provided data concerning reliability. According to subtests in Shurin (1999), inter-rater reliability for the ACFS ranges from .72 to .83, whereas Levy (1999) shows scores from .70 to .82 for the BORS subscales. Relevant data concerning construct validity and discriminant validity are provided in diverse studies, such as Bensoussan (2002), Brooks (1997), Lidz (1992, 2004), Lidz and Van der Aalsvoort (2005), and Malowitsky (2001). The Spanish adaptation of the instrument (Calero et al., 2009) has been shown to have good reliability, with a Cronbach's alpha of .74; the construct validity has also been demonstrated, with the factorial analysis yielding six independent factors (one corresponding to each measured ability), which together explain 61.12% of the total variance. Likewise, discriminant validity has been confirmed with respect to the differential diagnostic among children with Down syndrome, children with learning difficulties, and healthy children (Calero, Robles et al., 2010) and between children with high and low academic performance. Validity criteria of the different subtests have also been confirmed, with correlations of between .64 and .74 among the ACFS subtests and other tests assessing the skills concerned (Calero, Carles et al., 2010).

Academic Performance Register. To assess the children's academic performance, teachers evaluated the academic performance of each child in six curricular areas: mathematics (knowledge of numbers and simple arithmetic); oral/written expression (pre-reading and writing skills and oral comprehension and expression through simple tasks, such as stories, songs, etc.); personal identity and autonomy (body image and personal adjustment); physical and social medium (knowledge of physical and cultural environment in order to understand the reality); corporal expression; and artistic expression (psychomotor skills and artistic expression). Scores were allocated as follows: (1) low performance, (2) average performance, and (3) high performance, with a total score range from 6 to 18. This register has been shown to have a Cronbach's alpha reliability of .94 for the complete set of items.

Language Competence Register. The teachers, who knew the children from the time of their entry into the educational system the previous year, assessed their global language competence, that is, their degree of skill in both the production and comprehension of oral language in social interaction with them or with other children, using a Likert-type rating scale of 1 to 5 (1 = very low competence, 2 = low, 3 = average, 4 = high, and 5 = very high). Quality requisites for this estimation have not been confirmed.

Metacognition Questionnaire. Metacognition skills were evaluated through analysis of verbal information provided by the children as they carried out the task. In view of the difficulties of using introspection with children of this age (Monereo, 1994), a series of direct questions were compiled to gain insight into the metacognitive skills of the child and his or her understanding of the demands of each task, together with his or her abilities and mode of execution. This format has been frequently used in educational research on reading comprehension tasks and mathematical problem resolution (Desoete, Roeyers, & Buysse, 2001; Manzo, Manzo, & McKenna, 1995; Ward & Traweek, 1993). The questionnaire is composed of 10 questions, which are directed to the child while he or she performs the ACFS Classification task. The instrument is based on behaviors that, according to previous studies, are demonstrative of metacognition at these ages (Annervita & Vauras, 2006; Garrett, Mazzocco, & Baker, 2006; Veenman, Van Hout-Walters & Afflerbach, 2006). These studies have determined the presence of three basic components: evaluation ("Have you managed to do what you wanted?"), self-regulation ("Why are you putting these pieces together? Can you put others together?") and planning ("Tell me what you have to do in this task; what are you going to do first?"). A study of the psychometric requisites has shown high internal consistency (with a Cronbach's alpha of .744) and the existence of three independent factors (planning, assessed by four items, evaluation, and self-regulation, each of which is assessed by three items). Total explained variance among these three factors is 59.83%.

Procedure

In a first step, the Education Delegation of the Autonomous Community of Andalusia, Spain, granted access to 20 schools in the metropolitan area of Granada with the highest concentration of immigrant children. After obtaining permission from the staff at the selected preschools, children were selected from candidates who presented the required personal characteristics (absence of behavioral, learning, or sensory problems), taking into account their family circumstances (whether or not they were immigrants and the native language of the parents). After an initial selection of immigrant children in all the schools that were participating, meetings were held with all the parents to inform them of the objectives of the research and to solicit their consent. When the immigrant sample was established, a similar native group was selected, matching in age, sex, and center, finally obtaining 176 participants for the study. Subsequently, individual assessment of each child was

carried out. Assessment took place in an independent room in two sessions of 30 minutes each. The procedure and order of presentation of the tasks was the same for all the children. In the first session, the K-BIT was undertaken, along with the ACFS Auditory Memory and Pattern Sequences subtests and the corresponding BORS. The second session featured the ACFS Classification, Visual Memory, Verbal Planning, and Perspective Taking subtests, with the corresponding BORS and the metacognition questionnaire. Two to 3 days elapsed between the sessions.

Academic performance scores were obtained through an individualized interview with the teachers, during which the performance register for each child was presented.

Design

A typical three-group quasi-experimental design was employed (native Spanish, children with Spanish-speaking immigrant parents, and children with non–Spanish-speaking immigrant parents). Data were analyzed using version 15.0 of the SPSS Statistics software.

Results

Table 1 shows the results corresponding to the first objective of analyzing differences in execution and performance between the three groups of children. As shown, the analysis of variance reveals significant differences in the K-BIT with regard to total scores, $F(2/174) = 31.12$, $p < .05$, and the Vocabulary, $F(2/174) = 46.21$, $p < .05$, and Matrices subtests, $F(2/174) = 3.90$, $p < .05$. The Bonferroni post-hoc analysis confirmed the significant intergroup differences in the total K-BIT scores in two-by-two comparisons: native Spanish group versus children with S-S immigrant parents group, $F(1/129) = 9.68$, $p < .05$, $\eta 2 = .39$; native Spanish versus children with N-S-S immigrant parents group, $F(1/130) = 16.47$, $p < .05$, $\eta 2 = .56$; and children with S-S immigrant parents group versus children with N-S-S immigrant parents group, $F(1/90) = 6.78$, $p < .05$, $\eta 2 = .27$. The Bonferroni post-hoc analysis also showed differences among the three groups in the Vocabulary subtest: native Spanish group versus children with S-S immigrants parents group, $F(1/129) = 12.12$, $p < .05$, $\eta 2 = .42$; native Spanish versus children N-S-S immigrant parents group, $F(1/130) = 23.12$, $p < .05$, $\eta 2 = .64$; children with S-S immigrant parents group versus children with N-S-S immigrant parents group, $F(1/90) = 11.00$, $p < .05$, $\eta 2 = .40$. By contrast, the Bonferroni post-hoc analysis for the Matrices subtest revealed significant differences only between the group of native Spanish children and the group of children with non–Spanish-speaking immigrant parents, $F(1/130) = 5.71$, $p < .05$, $\eta 2 = .21$.

With regard to the ACFS total pretest score, significant intergroup differences appeared, $F(2/174) = 4.95$, $p < .05$. As shown in Table 1, the native Spanish children obtained the highest execution scores, followed by the children with S-S immigrant parents, with the children with N-S-S immigrant parents achieving the lowest scores. In this case, according to the Bonferroni post-hoc analyses, the differences appeared only between the Spanish group and the children with N-S-S immigrant parents, $F(1/130) = 6.21$, $p < .05$, $\eta 2 = .27$. In relation to the ACFS subtests, significant differences were found only in Verbal Planning, with values of $F(2/174) = 13.16$, $p < .05$. Again, the Bonferroni post-hoc comparisons established that the differences arose between the Spanish group and the two immigrant parent groups: the children with S-S immigrant parents, $F(1/129) = 1.85$, $p < .05$, $\eta 2 = .25$, and the children with N-S-S immigrant parents, $F(1/130) = 2.96$, $p < .05$, $\eta 2 = .44$.

Significant differences also arose in language competence assessed by the Language Competence Register, with values of $F(2/174) = 25.4$, $p < .05$. Again, according to the Bonferroni post-hoc analysis, the significant differences also occurred between the native Spanish group and each of the two immigrant groups: the native Spanish children versus the children with N-S-S immigrant

Table 1
Differences in Execution of and Academic Performance on the Different Tests Among the Three Groups of Children

	Native Spanish (1)		Children of S-S Immigrants Parents (2)		Children of N-S-S Immigrants Parents (3)				
Measure	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*(2/174)	*p*	Eta Squared
K-BIT Total	103.00	11.76	93.31	10.75	86.52	12.67	31.13	.01	(1)–(2) = .39*
									(1)–(3) = .56*
									(2)–(3) = .27*
K-BIT Vocabulary	101.13	14.29	89.00	11.75	78.00	13.07	46.21	.01	(1)–(2) = .42*
									(1)–(3) = .64*
									(2)–(3) = .40*
K-BIT Matrices	108.13	12.39	103.42	11.62	102.41	13.52	3.90	.02	(1)–(2) = .19*
									(1)–(3) = .21*
									(2)–(3) = .04
ACFS Total	39.15	11.01	35.93	11.00	32.93	11.22	4.95	.01	(1)–(2) = .14*
									(1)–(3) = .27*
									(2)–(3) = .13*
ACFS Classification	4.69	2.38	4.31	3.05	4.70	2.69	.35	.70	(1)–(2) = .06
									(1)–(3) = .002
									(2)–(3) = .06
ACFS Auditory Memory	5.09	3.56	4.80	2.54	3.96	3.41	1.80	.17	(1)–(2) = .04
									(1)–(3) = .16*
									(2)–(3) = .13*
ACFS Visual Memory	5.91	1.97	5.89	1.85	5.80	1.92	.04	.96	(1)–(2) = .005
									(1)–(3) = .02
									(2)–(3) = .02
ACFS Pattern Sequences	9.55	4.37	8.49	4.66	8.13	4.86	1.70	.19	(1)–(2) = .11*
									(1)–(3) = .15*
									(2)–(3) = .03
ACFS Perspective Taking	8.99	3.56	9.11	3.17	8.39	3.66	.59	.56	(1)–(2) = .01
									(1)–(3) = .08
									(2)–(3) = .10*
ACFS Verbal Planning	4.92	3.59	3.07	3.59	1.96	2.18	13.16	.01	(1)–(2) = .25*
									(1)–(3) = .44*
									(2)–(3) = .18*
Language Competence	4.44	.76	3.58	1.21	3.22	1.13	25.42	.01	(1)–(2) = .39*
									(1)–(3) = .53*
									(2)–(3) = .15*
Academic Performance	13.47	4.23	12.67	3.85	11.70	2.79	2.80	.06	(1)–(2) = .09
									(1)–(3) = .24*
									(2)–(3) = .14*
Metacognition	4.76	2.43	5.04	2.69	4.28	2.79	1.06	.34	(1)–(2) = .05
									(1)–(3) = .09
									(2)–(3) = .13*

Note. S-S = Spanish speaking; N-S-S = non–Spanish-speaking; K-BIT = Kaufman Brief Intelligence Test (Kaufman & Kaufman, 1994), Spanish version. ACFS = Application of Cognitive Functions Scale (Lidz & Jepsen, 2000, 2003).
*$p < .05$.

Table 2
Repeated Measures Linear Model of Pre–Post Scores for Each ACFS Subtest

ACFS Measures	Group	Pretest		Posttest		Wilks' Lambda	*p*	Eta Square
		M	*SD*	*M*	*SD*			
Classification	Native Spanish	4.69	2.38	7.68	2.50	.407	.001	.59*
	Children of S-S Immigrant Parents	4.31	3.05	7.47	2.45	.404	.001	.59*
	Children of N S-S I parents	4.70	2.69	7.67	2.08	.410	.001	.59*
Auditory emory	Native Spanish	5.09	3.56	8.42	2.79	.410	.001	.59*
	Children of S-S Immigrant Parents	4.80	2.53	7.91	2.91	.444	.001	.55*
	Children of N S-S Immigrant Parents	3.96	3.41	6.85	3.24	.478	.001	.52*
Visual emory	Native Spanish	5.91	1.97	7.36	1.78	.600	.001	.40*
	Children of S-S Immigrant Parents	5.89	1.84	7.44	1.73	.542	.001	.45*
	Children of N S-S Immigrant Parents	5.80	1.91	7.15	1.71	.443	.001	.55*
Pattern Sequences	Native Spanish	9.55	4.37	10.82	3.76	.771	.001	.23*
	Children of S-S Immigrant Parents	8.49	4.65	10.73	4.29	.618	.001	.38*
	Children of N S-S Immigrant Parents.	8.13	4.85	9.50	4.30	.664	.001	.33*
Perspective Taking	Native Spanish	8.99	3.56	10.49	3.25	.642	.001	.35*
	Children of S-S Immigrant Parents	9.11	3.17	11.42	1.81	.560	.001	.44*
	Children of N S-S Immigrant Parents	8.39	3.66	10.17	2.90	.654	.001	.34*
Verbal lanning	Native Spanish	4.92	3.60	6.19	3.50	.698	.001	.30*
	Children of S-S Immigrant Parents	3.07	3.58	4.22	3.53	.629	.001	.37*
	Children of N S-S Immigrant Parents	1.96	2.18	3.50	2.98	.604	.001	.39*
Total	Native Spanish	39.15	11.01	50.99	10.42	.230	.001	.77*
	Children of S-S Immigrant Parents	35.64	11.00	48.96	11.01	.217	.001	.78*
	Children of N S-S Immigrant Parents	32.93	11.22	44.70	10.59	.211	.001	.78*

Note. S-S = Spanish speaking; N-S-S = non–Spanish-speaking; ACFS = Application of Cognitive Functions Scale (Lidz & Jepsen, 2000, 2003; Spanish version, Calero, Robles, Márquez, & De la Osa, 2009).
*$p < .05$.

parents, $F(1/130) = 1.21$; $p < .05$, $\eta 2 = .39$, and the native Spanish children versus the children with S-S immigrant parents, $F(1/129) = 0.85$, $p < .05$, $\eta 2 = .53$.

The second objective of the study was to test the effectiveness of the ACFS mediation phase in the three groups of preschool children. In this respect, the repeated measures general linear model revealed that the mediation was effective in the three groups, with significant differences between the ACFS pretest and posttest scores in all the subtests of the scale and in the total score (see Table 2).

The results also showed that there were no significant differences between the three groups in terms of learning potential in any of the skills measured by the ACFS. This became evident on considering the effect sizes (eta squared) of the pre–post differences obtained by each group for each subscale and for the ACFS total (see Table 2). In other words, the results showed that the three groups achieved similar transfer scores in all the skills after receiving mediation.

Turning to the third objective, which aimed to ascertain the relation between the variables studied and to determine which variable was the best predictor of academic performance independently of group affiliation; results are shown in Table 3. As may be seen, according to the Pearson correlation analysis, all the assessed variables showed a significant and positive correlation with IQ, and all except Frustration Tolerance correlated with academic performance. A significant correlation with performance in the ACFS pretest was also shown by Persistence, Flexibility, Motivation, Interactivity, Responsivity, Metacognition, and Language Competence. However, a correlation with learning

Table 3
Correlations Between Behavioral Variables (BORS) and Language Competence With Academic Performance, ACFS Pre-Total Scores, ACFS Transference-Total Scores, and K-BIT Total

Measures	Academic Performance	ACFS Pre-Total	ACFS Total-Transference	K-BIT Total
Self-Regulation[a]	.18**	.13	.30**	.33**
Persistence[a]	.20**	.16*	.28**	.22**
Frustation Tolerance[a]	.10	.05	.38**	.26**
Flexibility[a]	.52**	.71**	–.02	.39**
Motivation[a]	.25**	.37**	.17*	.22**
Interactivity[a]	.20**	.33**	.07	.22**
Responsivity[a]	.39**	.56**	.21**	.37**
Metacognition	.63**	.59**	–.11	.29**
Language Competence	.43**	.40**	.02	.49**

Note. [a]BORS: Behaviour Observation Rating Scale; ACFS = Application of Cognitive Functions Scale (Lidz & Jepsen, 2000, 2003; Spanish version; Calero, Robles, Márquez & de la Osa, 2009); K-BIT = Kaufman Brief Intelligence Test (Kaufman & Kaufman, 1994), Spanish version.
*$p < .05$; **$p < .01$.

Table 4
Linear Regression Analysis, Dependent Variable: Academic Performance Score

		Beta	R^2	F	p
Model 1	ACFS Total Pretest	.514	.265	62.62	.0001
Model 2	ACFS Total Pretest	.581	.299	36.90	.0001
	Total Transference	.197			

Note. ACFS = Application of Cognitive Functions Scale.

potential was shown only by Self-Regulation, Persistence, Frustration Tolerance, Motivation, and Responsivity.

Taking into account the strong correlation between most of the evaluated variables and academic performance, we decided to determine which cognitive-skill-associated variables were the best predictors of academic performance and to compare them with the IQ scores. Accordingly, we performed a step-by-step linear regression analysis, including the ACFS total pretest, total transfer score, and K-BIT total IQ score. As shown in Table 4, results indicated that the variable with most influence in the explanation of academic performance was the ACFS total pretest score (first model), followed (in the second model) by the total transfer score. In both models, the K-BIT total was excluded (beta = .139; $t = 1.870$; $p = .063$).

Discussion

The general objective of this study was to establish the usefulness of DA for determining cognitive abilities (classification, auditory and visual memory, pattern sequences, perspective taking, and verbal planning) and learning potential in preschool children from immigrant families, independently of their parents' competence in the Spanish language.

With regard to the first specific objective (analysis of the differences in performance and cognitive abilities among the three groups of children), the results showed significant differences in a traditional IQ test (K-BIT), with the group of Spanish children obtaining the highest scores, followed by the children with S-S immigrant parents and, in third place, the children with N-S-S

immigrant parents, who presented the lowest scores, most notably in the Verbal subtest but also in the Matrices subtest. This is an interesting result, given that although the instructions for the Matrices subtest are verbal, the task itself is largely non-verbal and would therefore not be expected to show significant differences among the groups. In our view, the differences revealed—including in this subtest—were due to the fact that performance in standard IQ tests has a cultural component over and above their verbal or non-verbal content, so that children belonging to the culture in which the test was designed achieve better results because, among other factors, they are more familiar with the content, materials, and dynamics of the test (Ceci & Williams, 1997; Hessels, 2000; Lidz & Macrine, 2001; Resing et al., 2009; Tzuriel, 2000).

Similarly, significant intergroup differences arose in the total score of the ACFS and in the subtests with a larger verbal component, particularly the pretest phase of Verbal Planning, that is, before mediation. These results corroborate those of Resing et al. (2009), who observed significant initial differences in the Raven test, with ethnic minority children obtaining lower scores than Dutch children. Similarly, in a basic mathematical sequencing task, the immigrant children showed fewer metacognitive strategies and required more help than the native children. The differences found in our study in static performance measures (K-BIT and ACFS pretest) between children of different cultural groups concur with other studies and support the opinions of various authors with regard to the discrimination inherent in standard assessment techniques and their lack of sensitivity toward the differences and needs of students whose background is different from the cultural orientation of the test (Ceci & Williams, 1997; Gupta & Coxhead, 1988; Hessels, 2000; Lauchlan & Elliot, 1997; Lidz & Macrine, 2001; Tzuriel, 2000; Tzuriel & Kaufman, 1999). Thus, even in the case of children who were born in Spain and with parents from Spanish-speaking countries, our results show that these children do not possess the same competence in verbal skills as the native Spanish children, although there was no difference in education levels of the parents among groups. This is undoubtedly an interesting finding requiring further investigation.

Our second objective was to measure the effectiveness of the ACFS mediation in the three groups. The results show that the mediation phase applied to each subtest was effective and produced significant improvements in the performance of all participants, whether native or immigrant, independently of their language competence. In other words, in accordance with previous studies (Calero, Carles et al., 2010; Levy, 1999; Lidz, 1992, 2004; Lidz & Van der Aalsvoort, 2005; Malowitsky, 2001), and contrary to the limitations perceived by Embretson (1987) and Grigorenko & Sternberg (1998), the preschool children, independently of their parents' country of origin, showed a similar learning potential for the various tasks involved in the educational curriculum. All the children improved significantly, and there was even a tendency on the part of the children from immigrant families to achieve higher gain scores than the native Spanish children. Accordingly, we consider that the differences among children of diverse cultural backgrounds in the execution of tasks similar to those in the educational curriculum (ACFS) and in classic assessment tests (K-BIT) are not related to the children's learning potential.

Our third objective was to demonstrate the relation between the diverse variables studied and the performance of the children in both the test situation and the school context. In this regard, the results confirmed the significant and positive relation between the behavioral variables as assessed by the BORS and the children's execution in the test situation (K-BIT and ACFS pretest) and at school, as well as their learning potential. Specifically, Persistence, Flexibility, Motivation, Interactivity, and Responsivity obtained the highest correlation with all the variables assessed. However, in the execution tasks, other variables, such as Motivation, Metacognition, and Language Competence also showed significant correlations. These results confirm the importance that numerous researchers attribute to attitudinal and behavioral variables in academic performance (Diamond et al., 2007; Kochanska et al., 2008; Oudeyer et al., 2007) and are consistent with previous

studies that demonstrate, for example, how Persistence and Motivation discriminate significantly between groups with and without learning problems (Calero, Robles et al., 2010), and/or between groups with high and low academic performance (Calero, Carles et al., 2010). The results also support other studies that stress the importance of metacognition and language competence in students' performance, variables that do not seem to have significant weight where learning potential is concerned.

In addition, our results have practical importance in that they indicate which non-intellective aspects should be analyzed and treated in preschool children from cultural groups different from the host country, so that they may adjust successfully to the school and achieve satisfactory academic performance. Such intervention may also serve to prevent future behavioral problems that, according to earlier studies, are associated with low levels of these non-intellective variables (Diamond et al., 2007; González-DeHass et al., 2005; Kochanska et al., 2008). Variables such as Motivation, Self-Regulation, Frustration Tolerance, and/or Cognitive Flexibility are all closely related to styles of parental socialization applied in the cultural context of the country of origin (Ho, Bluestein & Jenkins, 2008). In recent years, such factors have come to be recognized as strongly associated with deficient academic performance related to problems of behavior and adaptation (Cleary, 2009; Diamond et al., 2007; Gonzalez-DeHass et al., 2005; Kochanska et al., 2008; Oudeyer et al., 2007).

Given that there were no differences in either education levels or time of residence in Spain (in the case of immigrant families) among the parents of the three groups of children assessed and that the major difference appeared in the competence of Spanish, we can say that the language competence of the children—and above all, of the parents—was significantly related to academic performance, which may be one of the reasons children from immigrant families tend to obtain poorer scores in academic performance and classic assessment tests (Colectivo IOÉ, 2003; Franzé, 2008; Olmos, 2009; Rodríguez, 2008; Taylor & Whittaker, 2003). This concurs with previous studies showing that the language abilities of the parents are related to the children's academic results (Crosnoe, 2007; Peña, 2000; Turney & Kao, 2009). Nevertheless, low language competence is not related to learning potential because all the children assessed, regardless of their cultural background and level of language competence, presented a similar capacity for learning.

With regard to metacognition, as expected, this factor was shown to relate positively to academic performance and test execution. Many previous studies likewise indicated the close association between metacognition and academic performance, metacognition and language skills in young children, and metacognition and the execution of assessment tasks (García & Pintrich, 1994; Metcalfe, 1998; Resing et al., 2009; Ugartetxea, 2001; Versschaffel, 1999; Wang et al., 1990; Wong, 1996; Zimmerman, 2000). These results also indicate the need for early intervention aimed at fomenting language skills in immigrant children.

A final objective of this study was to ascertain which cognitive-ability-associated variables are the best predictors of academic performance. Results show that the ACFS pretest score is the variable with the most weight in this respect, presenting a higher predictive value than the traditional K-BIT, followed in importance by the ACFS transfer score. In addition to confirming the predictive value of the scale, this finding casts doubt on the appropriateness of using the K-BIT IQ task to predict the academic performance of children from ethnic minorities, as demonstrated in earlier studies (Glaser, 1981; Resing et al., 2009).

In summary, these results show that preschool children from ethnic minority families present lower performance scores in the initial phase of DA, as also occurs with classic IQ tests, particularly if their parents' country of origin has a different language from the host country. In this respect, language competence, in spite of the simple method of estimation, seems to be an important factor that interferes with the initial performance of immigrant children. However, in DA, the brief training on the tasks involved exerts positive effects on the performance of all the groups. As has been

shown in previous studies (e.g., the meta-analysis by Swanson & Lussier, 2001), and contrary to the criticisms by Embretson (1987) and Grigorenko & Sternberg (1998), these improvements result from the training and are independent of the children's previous level of ability. It becomes apparent that there are no significant differences in learning potential, regardless of the group affiliation of the children, who all succeed in resolving a greater number of problems than in the initial phase. Bearing in mind that after the brief ACFS mediation phase, the children are capable of applying what they have learned to new situations (transference). These results allow us to predict that with appropriate training, children of immigrant origin may acquire the necessary academic skills to enable them to perform successfully at school—a highly relevant conclusion to take into account when introducing educational measures.

At the same time, our results underline the importance that behavioral variables and metacognitive processes acquire in academic performance at such early stages of development. This aspect should also be taken into account when assessing academic performance and planning educational action to prevent subsequent failure at school.

In the educational process for immigrant children, the preschool stage is especially important because during this critical period, the groundwork is laid for primary education, and measures can be taken to prevent the appearance of future problems that the child may have in adjusting the educational system (Keller & Otto, 2009). In fact, efforts to improve academic performance during the preschool period have long-term effects that help to reduce school dropout rates (Alexander, Entwisle & Kabbani, 2001). It is therefore particularly important to use efficient methods for the detection of weak points during this early phase in the child's education.

In this regard, our study demonstrates the effectiveness of the ACFS in various ways: the technique makes it possible to identify weak points in the immigrant child's learning (Grigorenko & Sternberg, 1998; Lidz, 1991; Lidz & Elliot, 2000); it provides important information about the child's cognitive functioning, learning potential, and various attitudinal and behavioral variables while he or she is carrying out the tasks (Kuhn, 1995; Miller, 2002; Siegler, 2006); and finally, it provides indications for educational intervention that is appropriate to the needs and level of help required by each child (Lidz, 2000; Resing et al., 2009). In this way, the results obtained in DA may be used to design specific curricular objectives, thus permitting a closer relation between assessment and teaching (Bosma & Resing, 2008; Lidz, 2000).

Finally, with regard to the possible limitations of the study, we should mention the size and origin of the sample of children with immigrant parents. In this respect, the study featured two groups of children with Spanish-speaking and non–Spanish-speaking immigrant parents. As a result, the study grouped together children originating from different countries whose common factor was the presence or not of Spanish as the mother tongue. This fact and the subjective measurement used for language competence may mean that certain variables were not adequately controlled in our study. For this reason, it would be appropriate to replicate the study with a larger sample of children who could be grouped according to the country of origin of their parents. It might also be interesting to replicate the study at other stages of the school career to determine the extent to which results are related to the children's ages and number of years spent at school.

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