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An Empirically-Based Proposal for Screening in the Early Identification of Intellectually Gifted Students

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ABSTRACT

The lack of instruments to identify intellectually gifted children at an early age may be a contributing factor towards the limited availability of research studies on these children within the field of developmental psychology. The goal of this research, therefore, was to create a simple, reliable, and inexpensive screening method for identifying gifted children from 4 to 6 years of age. A sample of 138 children from ages 6 to 8 were presented for assessment at the Huerta del Rey Center in Valladolid, Spain. Parents were asked to complete a questionnaire documenting the age at which their child acquired specific developmental and learning skills/ behaviors. Concurrently, these children were tested by professionals on the Stanford-Binet Intelligence Test (Terman-Merrill, L-M Form). Using logistical regression techniques, the study identified which behaviors predicted giftedness as judged by an IQ of 130 or above. This screening method is now in the validation phase and is being applied in 12 countries. It has been translated from Spanish into the Portuguese, Romanian, Serbian, Russian, and English languages. The results from this project were published by the Spanish Ministry of Education, and it was developed and coordinated under the aegis of the General Sub-director of Special Education. The recent results obtained in Spain seem to verify the reliability of this screening method.

Introduction

For over a decade, clinicians at the Huerta Del Rey Center have been collecting diagnostic and assessment data on gifted and nongifted children. As a result of examining this database, a set of behavioral markers was created to assist in the identification of gifted children at early ages in their development. These markers were then used to predict giftedness as defined by an IQ score of 130 or above on an individualized intelligence test. This study resulted in the identification of six behavioral markers that proved to be statistically significant for use in screening gifted children. This article describes the theoretical basis for the research, the research methods and procedures, and the findings from the study. The authors then suggest conclusions that can be drawn from the study and recommend further replication of their work.

Defining Intellectual Giftedness

According to Gagné (1995), the term *gifted* indicates the possession of a high degree of natural ability that develops "through maturational processes, as well as through daily use and/or informal practice" (p. 106). A person who is *talented* within a given domain, on the other hand, exhibits a high level of skill that has been systematically developed, over a period of time, through learning, training, and practice (Gagné, 1995). Gagné maintained that a student who achieves academic success, for instance, is *talented* in a given discipline, and that this talent may be attributed to sustained learning and practice, as well as to a high level of intellectual ability. In contrast, a student who underachieves and whose IQ score exceeds 130 may be evaluated as gifted but not as academically talented.

The authors subscribe to a definition of intellectual giftedness comprising three elements:

1. Intellectual giftedness implies a level of intellectual ability that is significantly higher than the average.
2. General intellectual capacity is defined by IQ, or an equivalent to IQ, obtained by the administration of one or more standardized tests of intelligence. Intellectual giftedness is bound to precocity, which is a high level of maturity for the processing of information, and to a high motivation for learning, creativity, and talent development.
3. Intellectual giftedness is demonstrated during the child's development from conception to 18 years.

Wright (1998, as cited in Plomin & DeFries 1998) argued that most psychologists agree with a global conception of intelligence. Such general cognitive competence is referred to as *g*. The most recent

Benito, Y., & Moro, J. (1999). An empirically-based proposal for screening for early identification of intellectually gifted students. *Gifted and Talented International, 14,* 80-91.

data on genetics and cognition also firmly support the thesis that intelligence is a diffuse or global quality of the mind. Such observations not only underscore the importance of cognitive capacities in real life, but they also suggested that the genes related to an individual's cognitive capacities are those that are linked to school achievement and vice versa (Plomin & DeFries, 1998). Perleth, Sierwall, and Heller (1993) have argued that intellectual giftedness is bound to those skills which are found in the child and which are important for his or her academic learning.

Measuring Intelligence

Despite the fact that most recent conceptions of giftedness or intelligence frequently use multidimensional models, the tests generally used for identifying gifted children are those which measure children's general intelligence. Children who are intellectually gifted usually achieve outstanding scores on intelligence tests and show a high capacity for learning (Campione, Brown, & Ferrara, 1982; Gardner, 1983; Tannenbaum, 1983). Plomin and DeFries (1998) have suggested that people who are not able to reach a high score on tests of a given cognitive ability also score low on tests which evaluate other cognitive capacities.

While the use of intelligence tests for identifying children with intellectual giftedness has been criticized (Snyderman & Rothman, 1988), such tests remain the most useful measures available (Borland, 1989). They provide the best measure of intellectual ability (Gallagher, 1975; Snyderman & Rothman, 1988) and the most accurate method for identifying gifted children (Sattler, 1982). Tests of individual intelligence are also very useful for identifying children who underachieve (Davis & Rimm, 1985; Whitmore, 1981), gifted children who are of an early school age (Robinson & Chamrad, 1986), and gifted children with other exceptionalities (Kauffman & Harrison, 1988). They also provide useful information when making decisions about early admission and acceleration (Feldhusen & Baska, 1989).

When they have been well-designed and are administered by qualified psychologists under appropriate conditions, IQ tests generally present acceptable rates of reliability and validity (Wilson & Grylls, 1992). A proper diagnosis implies the establishment of an accurate measure of an individual's intellectual status. Reliable tests should provide information about a child's cognitive capacity and must, therefore, provide measures of fluid and crystallized intelligence and of verbal, numerical, and spatial skills (Benito, 1990).

Verdugo (1994) argued, with respect to the field of mental deficiency, that measurement of intelligence is required for the purpose of identification, but that it is not the appropriate measure for determining programs or educational services for individuals diagnosed as mentally deficient. This principle also applies in the case of the child who is intellectually gifted.

In Spain, there are no established rules for the selection of instruments, tests, or evaluation techniques for use in the identification of gifted children; however, the use of multiple procedures is recommended. The results of intelligence tests are an important part of the evaluation process, but these data should be complemented with information from other sources. When multiple techniques are used to evaluate the same variable, it is important that they are, as far as possible, different in nature (Fernández-Ballesteros, 1980).

When evaluating the capacity of an intellectually gifted child, the recommended psychometric instrument is the Stanford-Binet (Terman & Merrill, 1975; L-M Form) intelligence test (Benito, 1992; Silverman & Kearney, 1989). The ceiling effect on this test is the lowest of similar tests, so it offers more precision than other modern tests in measuring both extremes of the normal curve.

Some educators believe that there is little difference between children who score at IQ 160 and those who score at IQ 180. However, we have found that there are important differences between children who achieve such scores, and that these differences lie in their understandings and perceptions of the world and in their distinct emotional, cognitive, and educational needs. Intellectually gifted children are as different from one another as they are from children who do not score in the gifted range. Gifted children as a group are heterogeneous, and an IQ score of approximately 130 to more than 200 is the suggested range for identifying intellectual giftedness (Benito, 1994). After these children are identified, however, additional attention must be focused on meeting their individual needs for appropriate educational interventions (Benito, 1992).

A review of the literature (Benito, 1997; Feldhusen & Jarwan, 1993; Verdugo, 1994) suggests the following guidelines for conducting diagnostic evaluations:

1. The evaluation must only be made if sufficient reasons exist to do so. Identification and evaluation of gifted children should be based on the best concepts and current theories regarding skills, talents, and human abilities.
2. Parents or tutors should give their permission to carry out the identification process. They also have the right to take part in the process and to appeal any decision adopted.
3. Evaluations must only be managed by a fully qualified professional.
4. Even if multiple tests are used, one should not conclude that the evaluation identifies the gifted child in a final and unequivocal way. Identification should be conceived as a continuous process. Giftedness is a set of emerging capacities, and repeated evaluation is required throughout the child's developmental years.
5. The instruments, tests, and rating scales used in the identification process should be selected on the basis of their proven reliability and validity.
6. Identification must be diagnostic in nature, and take into account the individual's values, skills, and talents, as well as his or her problems, weaknesses, and needs.

Empirical validation should ensure that the identification-selection system is operating as intended. Are the selected children following the right program? Is the process both effective and efficient to the extent that gifted children are not inadvertently excluded from programs? Are the children who have been selected achieving at advanced levels in the long run?

Efforts must also be made to ensure that all children have the same opportunities to be identified for the programs. Are the needs of the gifted and talented of both sexes, the disabled, and the culturally different being met, as well as those of children who are underachieving? The required instruments and procedures are now available to ensure that all children and adolescents are given the same opportunities to be identified and to be provided with appropriate programs.

The results of an evaluation should be represented by an individualized profile, and the essential educational interventions should be based on this profile. Programs and services should be matched to an individual's special talents, skills, and abilities, as well as to his or her problems and special needs. Our research underscores the importance of the decision-making process for ensuring optimal match.

Our identification procedure is derived from sound theory and has been scientifically validated. By combining theory and research, we have created a tool which facilitates the identification of gifted children at an early age.

Theoretical Framework for Determining Behavioral Indicators of Intellectual Giftedness

Robinson (1993) observed that the literature on early development has primarily focused on central tendencies or on children with developmental problems. Most research studies cited in the *International Handbook of Research and Development of Giftedness and Talent* (Heller, Mönks, & Passow, 1993) come from English-speaking countries or are German research studies published in the English language. There is a dearth of published empirical research about initial indicators of giftedness from other areas of the world.

The Munich-Moscow study on giftedness, undertaken from 1990 to 1993, was the first Russian empirical research addressing different areas of giftedness and high achievement (Averina, Scheblanova, & Perleth, 1991, as cited in Perleth, Sierwall, & Heller, 1993). Empirical data on gifted German children can be found in the longitudinal study in Munich, investigated by Heller (1991); in the study on giftedness of Marburg, conducted by Rost and collaborators (1993); or in the study by Trost (1993). Yet, none of these studies deals with gifted children in the early years of schooling. A Chinese group from the Psychology Institute of Sinica Academy organized some studies on gifted children that included a study of children below the age of compulsory schooling. The publication by this group (Zha, 1990) indicated that gifted children achieve more highly than average children with regard to cognitive variables, yet it did not include statistical results on the validity of the early indicators of giftedness (Perleth et al., 1993).

We believe that gifted children must be identified in their preschool years or in their first year of primary education. Most researchers agree that if gifted children are not identified early, they may not receive appropriate encouragement, nor will they be challenged in an appropriate manner, and, therefore, their gifts will not develop optimally (Karnes & Johnson, 1990). Thus, an identification tool that uses developmental indicators of intellectual giftedness is required.

The decisions taken on the education of gifted children should be based on information and data which have been obtained on each child, including an appropriate diagnosis of his or her personality and a prediction for his or her development (Fatouros, 1986). Many authors agree that the early prediction of the development of a child's intelligence is particularly useful for the children placed at the extremes of the scale from late in their second year. From the age of three, such a prediction is quite reliable (White, 1971). Robinson and Olszewski-Kubilius (1997) found that children in their lactation period who obtained high scores on Bayley's Infant Scales did not demonstrate particular advancement in the long-term. However, in their second or third year, their high scores and their parents' comments were considered to be more effective predictors of precocious development.

Identification of children of high ability should be bound to specific suggestions for creating optimal learning conditions for them. Continuous enrichment, appropriate educational strategies, and encouragement of each child's social relations are integral to talent development (Perleth et al., 1993).

The absence of appropriate grouping and acceleration opportunities may jeopardize talent development. On the other hand, gifted children who are provided with appropriate programs and who are granted educational placement consistent with their accelerated rate of learning tend to achieve more highly than those gifted children who have been simply placed with chronological age peers (Coriat, 1990; Robinson, Roedell, & Jackson, 1979).

In Spain, the decision of April 29, 1996, on the schooling of students with intellectual giftedness stated that the procedures to be followed for meeting their special educational requirements are dependent upon precise identification and assessment techniques and on the early specification and provision of appropriate educational services. The order of April 24, 1996, carried basic provisions regarding the conditions and procedure for adopting a flexible compulsory education period for students who have special educational requirements as a result of being highly intellectually gifted. This made possible early admission to compulsory schooling.

Coriat (1990) has argued that an early identification has two main goals: a) the placement of gifted children in an appropriate educational environment and b) the provision of suitable guidance and the fostering of understanding of parents and of those who are responsible for their children's education. The contrast between the capacities identified in gifted children and their later development rests on their early environments, family factors, and the educational and professional opportunities afforded them. Support for families and for the teaching team has been found to be the decisive factor in the development of gifted children's talents (Albert, 1980).

The ratio of highly intellectually gifted children in a population differs depending on the socioeconomic group in which the child is found. Apart from the influence of genetic factors, time, energy, opportunities, and expectations of parents either ease or inhibit the development of their children's academic abilities (Lewis & Michalson, 1988; Perleth et al., 1993). A large proportion of those gifted children who are identified come from middle class families, and it is extremely important that children with high capacities who come from families with few resources are also identified and encouraged (Robinson & Olszewski-Kubilius, 1997).

Purpose of the Study

The aim of this research was to develop an instrument that could be used to screen potentially gifted children. The administration of an individualized IQ test is an expensive and time-consuming process, so the goal was to create a screening device that would target the deployment of such a measure. The literature on behavioral indicators of early precocity was considered in developing the screening instrument. Indicators such as the early development of speech, reading, and numerical ability were found. The development of vocabulary has long been related to intelligence (Terman, 1925). Guilford, Scheuerle, and Shonburn (1981) and Lewis and Louis (1991) reported that

precocious speech capacities are often considered to be indicative of giftedness.

Specific reading behaviors may also provide an indicator of giftedness. "Precocious readers" are those children who have advanced substantially in reading comprehension before beginning their first year at school (Jackson, Donaldson, & Cleland, 1988). Mills and Jackson (1990) concluded that individual differences in reading comprehension can be predicted from age five or six through the administration of certain tests, but they have also argued that verbal capacity has been found to be at least as effective a predictor as any other (as cited in Perleth et al., 1993). According to Jackson (1988), precocious attainment of extraordinary reading capacity is an example of gifted achievement.

Healy (1982) pointed out that not all intelligent children read precociously, and that not all precocious readers are especially intelligent. In fact, a condition known as hyperlexia in mentally retarded children, and more usually in autistic individuals, who have learned to decode the written words despite having impaired speech abilities, is characterized by a lack of harmony between intelligence and reading abilities (Robinson, 1993). During the course of this study, the researchers also saw evidence of this phenomenon. A child of 7 years and 6 months who began to recognize letters from the age of 2 years was able to read a book easily at age 4. He also showed outstanding achievement in tests of reading ability, yet was identified as psychotic with a lack of developmental harmony. He presented with serious communication difficulties, was unable to generate spontaneous language at the age of 3 years and 7 months, and was unable to name common objects (such as eraser, pencil, etc.). In spite of his reading skills, he obtained an IQ score of 84, so he was not included in the study being reported.

In general, however, children identified as skilled readers before attending preschool usually show high IQs, with an average score of 130 (Robinson, 1993). Robinson (1993) noted that precocious readers tended to maintain their advantage in reading ability over their classmates, although in a less dramatic fashion, and that they usually showed a high level of achievement at school. Unless these students receive appropriate reading instruction, they can suffer both a period of deceleration in their development and a deep lack of motivation to face the educational system during their early school years when their classmates are being taught to read.

Few researchers have examined very young children's advanced mathematical abilities, despite the fact that extraordinary mathematical abilities are usually considered to be one of the important factors in the checklists of early identification of gifted children (Stapf, 1990). Children in the samples of most studies undertaken have been older than 10 years.

By culling the literature for behavioral markers, we were able to construct a questionnaire which could be completed by parents or other professionals. Parents can be extremely accurate in their observations of the development of their children's advanced abilities in domains such as speech, reading, and early recognition of numbers (Robinson & Olszewski-Kubilius, 1997). Many researchers have reported that parents who have been instructed in the administration of specific criteria and checklists of behaviors for evaluating their children usually present very young children who are significantly advanced (Benito, 1990; Ari & Rich, as cited in Robinson, 1993).

Responses to the questionnaire were then categorized into an Observational Table of Development and Learning, which identified 32 behaviors and the onset age associated with them. The purpose of this table is to identify behavioral markers for screening potentially gifted children who require educational intervention in order to develop their gifts and talents. As with all screening tests, the approaches selected represent neither a diagnosis nor confirmation of identification, but rather, they are simply tools to be used when selecting individuals for later evaluation through standardized tests. The following statistical study reports on only 10 of the behaviors.

Sample

The present research work began with the observation of the development of gifted and nongifted children during ten years of work in the Huerta del Rey Center. During this time, children from 2 ½ years to 18 years were evaluated and diagnosed. These young people came from state and private schools throughout Spain and from lower-, middle-, and upper-class families. Multiple techniques and instruments were used to evaluate the children: interviews, observations, questionnaires, and some psychometric tests (Benito, 1997).

The sample for this study involved 138 children who were 6, 7, or 8 years of age and identified from 1989 to 1997. Children of this age were selected since it was assumed that precocious behaviors would already be present in them. Also, parents' memories would be more realistic in terms of recalling the age of onset of the behaviors.

Once the data had been collected, it was hypothesized that they provided a set of development and learning indicators that could be used to distinguish the gifted children from nongifted children (Benito, 1997). Such a profile, it was believed, would not differ greatly for children from one country to another, as it would profile children placed at the upper extreme of the normal curve.

A means of empirical verification of this hypothesis was then sought. Children in the sample were categorized as intellectually gifted based on attainment of a score that equaled or exceeded IQ 130 on the Stanford-Binet (Terman-Merrill, L-M Form), considered the most appropriate tool for measurement of higher levels of intelligence (Benito, 1997). In addition, they were expected to be more precocious than other children in terms of social development, mobility, speech, and learning. Children whose intellectual quotient fell below 90 were excluded. This was done in order to concentrate on the distinction between gifted and average ability children.

Method

Parents were given a questionnaire at the beginning of their child's psychological consultation at the Huerta del Rey Center. This allowed determination of the presence of the following behavioral milestones, which were the basis for this study in all 138 of the children.

- Crawling at the age of 6 months,
- Recognition of at least 6 colors by 18 months,
- Conversing by age 2,
- Constructing a 20-piece puzzle at 2 ½ years,
- Recognition of 18 letters of the alphabet at 2 ½ years,
- Ability to count to 10 at 2 ½ years,
- Beginning to read at 3 ½ years,
- Reading ability of 52 words per minute at 4 years,
- Recognition of time system and its management in hours at 5 years, and
- Indicators of leadership ability at 6 years.

There were insufficient data to examine other behavioral markers from the Observational Table. Two trained examiners, prior to seeing the parent questionnaires, separately conducted the evaluation and test correction process. The questionnaire data were later referred to by the child's examiner. Parents, in turn, did not have access to their child's report before completing the questionnaire.

The Statistical Package for the Social Sciences (SPSS) was used to analyze the questionnaire and evaluation data, along with each child's personal data, which included date of birth, sex, and IQ score (Stanford-Binet, Terman-Merrill, L-M Form). A multivariate study consisting of a multiple linear regression was undertaken, with an IQ above 129 as the dependent variable. The aim of the data analysis was to discover those variables that were significant in predicting the child's intelligence quotient. A forward conditional method was used to introduce variables, with a significance level of $p < 0.05$ as the inclusion approach, and as the exclusion approach, a significance level of $p < 0.10$.

Results

There were 104 boys and 34 girls included in the study. Table 1 presents the age and sex distribution of the children who were included in our study. Of the 85 children who were identified as gifted as a result of the intelligence testing, 64 were boys and 21 were girls, with each representing 61% of their respective samples.

Table 1
Child Distribution by Age and Sex (N = 138)

Age	Boys		Girls		Total
	n	%	*n*	%	
6	40	38.46	14	41.18	54
7	30	28.85	12	35.29	42
8	34	32.69	8	23.53	42
Total	104	100	34	100	138

Table 2 presents the distribution of gifted children by age and sex.

Table 2
Gifted Children Distribution by Age and Sex (N = 85)

Age	Gifted Boys		Gifted Girls		Total
	n	%	*n*	%	
6	31	48.44	12	57.14	43
7	13	20.31	4	19.05	17
8	20	31.25	5	23.81	25
Total	64	100	21	100	85

As a result of the logistical regression, only 5 of 10 variables proved to be statistically significant. These variables were as follows:

- Recognition of at least 6 colors by 18 months,
- Constructing a 20-piece puzzle at 2 ½ years,
- Recognition of 18 letters of the alphabet at 2 ½ years,
- Ability to count to 10 at 2 ½ years, and
- Reading ability of 52 words per minute at 4 years.

Table 3 shows the statistical data from the logistical regression of these variables.

Table 3
Study of Logistic Regression According to Forward Method Using IQ Score as Dependent Variable

Variable	B	S.E.	Wald	Sig
Knowing colors - V1	3.3416	1.4021	5.6801	0.0006 *
Reading a book - V2	12.0357	25.5031	0.2227	0.0000 *
Building a puzzle - V3	1.577	0.5545	8.0885	0.0025 *
Knowing the alphabet - V4	1.0414	0.5099	4.171	0.0368 *
Counting to 10 - V5	2.9537	1.3208	5.0011	0.0089 *
Constant	0.8128	0.2958	7.5495	

*$p < .05$
B=Regression Coefficient
SE=Standard Error From Regression Coefficient
Wald=Wald's Statistical Value
Sig=Signification of Log Likelihood

Based on the regression pattern, a child would be considered as potentially gifted if he or she showed some evidence of the following two conditions:

1. The child demonstrates <u>at least one</u> of the following abilities:
   (a) reading a book by 4 years,
   (b) recognition of at least 6 colors at 18 months, or
   (c) constructing a 20-piece puzzle by 2 ½ years.
2. The child also demonstrates <u>both</u> of the following abilities:
   (a) counting to 10 by 2 ½ years, and
   (b) learning at least 18 letters of the alphabet by 2 ½ years.

This screening method reliably identified 83.5% of gifted children (from every 100 children observed, the screen was positive for almost 84). The reliability interval, calculated on 95% confidence intervals, ranged from 75.6% to 91.4%. The capacity to detect nongifted children from among the group of nongifted children was also high at 79.2%. For every 100 nongifted children, the screening process confirmed the existence of a negative result of almost 80. The reliability interval for the level of specification, calculated on 95% confidence intervals, ranged from 68.3% to 90.1%.

The ratio between the real-positive children (gifted children identified as positive by the screening) and the false-positive children (nongifted children identified as positive by the screening), was 1: 6.45. For each child of average ability selected by the screening as gifted (false positive), 6 gifted children were identified (real positive). Furthermore, the level of confirmation of giftedness in the children screened as positive was 11.1% (from every 100 children screened as positive, 11 children turned out to be certainly gifted), corresponding to a 3% proportion of giftedness in the general population. The reliability interval, calculated on 95% rates, ranged from 6.9% to 15.1%.

Discussion

Studies on specific indicators of high capacity are scarce, and the few available studies lack empirical support. The number of gifted children identified in this study (n = 85 children) is significant, since it is very difficult to obtain so large a sample of these children from age 6 to 8 years. The proportion of boys (n = 64) to girls (n = 21) is similar to that found in other studies (García & Benito, 1992). In general, fewer girls are identified and enrolled in gifted programs due to the particular difficulties they face, notably parent and teacher preconceptions, which may lead to lack of motivation or even to discrimination, and which may therefore hinder identification. While the institution responsible for the study is a private center drawing children from predominantly middle-class fami-

lies, the children who were evaluated in this study came from lower middle-class to upper middle-class families from throughout Spain and attended both public and private schools.

There are not many screening methods that can be applied to children younger than 6 years, and the very few available do not have a solid empirical base. Studies on the identification of gifted children by teachers suggest a very low reliability with that approach (Pegnato & Birch, 1959). Postlethwaite, Deans, & Denton (1995) cited a sensibility index of 45% and a specification level of 73%. In part, this may be attributed to a lack of teacher training in this area (Fatouros, 1986) and/or to a general resistance amongst teachers to the identification of gifted children (Rost, 1993).

Postlethwaite et al. (1995) found that if group tests of intelligence and academic achievement were used jointly, the sensibility level reached 97%, concluding that this joint use was the most appropriate way to identify such children. Nevertheless, this method does not apply to the identification of children at an early age. Neither self-nomination nor peer nomination approaches have proven successful in identifying gifted children in the primary school (Gagné, 1989).

Parent identification of their children as gifted appears to be more reliable than teachers' recognition of student giftedness. According to Jacobs (1936), parents' comments are more reliable than those of teachers as guides in the selection of gifted children because young children's cognitive and social abilities are largely hidden from those outside the family. In 70% of cases, parents have been found to identify their child's advanced abilities accurately. Jacobs (1936) argued that parents are more qualified to identify precocious children in kindergarten and primary school than teachers are, and that the widespread belief that parents tend to overestimate their children's abilities is not verified by research. On the contrary, parents are usually more reserved than teachers in their estimation of their children's abilities. More recent research indicates similiar findings (Louis & Lewis, 1992; Robinson, 1993). Our study findings also suggested that parents were able to correctly recall the onset of behaviors that led to an accurate diagnosis.

The most highly significant variable in our study is the ability to read a book easily by age 4, to the extent that 100% of the sample who demonstrated this capacity (n = 31) were gifted, although 64% of the gifted children (n = 55) did not do so. This reading capacity had not previously been confirmed as an indicator of giftedness by means of empirical evidence (Perleth et al., 1993). Terman (1925) found that one of the few variables on which the exceptionally gifted children in his study (the group above IQ 170) differed from the moderately and highly gifted was the very early onset of reading, while Hollingworth (1926) also noted that the early development of reading was one of the variables which most clearly differentiated gifted children from children of average ability (as cited in Gross, 1998).

Another significant variable in our study is that of learning the alphabet at an early age. This variable seemed to mark the difference between the children showing an IQ score of 130 and those who scored above IQ 145. According to Gross (1998), the reason that the advanced reading abilities of many gifted children do not develop may be that, despite the fact that these children show an overwhelming desire to learn to read, many parents do not encourage this behavior, since they have been told by friends or pre-school teachers that they should not assist the development of their child's reading ability in any way. It is important that we recognize that children who demonstrate early speech, mobility, and reading are unlikely to have been pushed by their parents; it is much more likely that they are exhibiting the natural precocity which is associated with intellectual giftedness (Gross, 1998).

Marjoran and Nelson (1985) outlined some early indicators of potential talent in mathematics, such as a preference for logical elements of connection in the use of language, an interest and devotion to geometric drawings and organizational systems, as well as the great satisfaction experienced when playing puzzles and construction games. Nevertheless, no empirical evidence exists to support the validity of these indicators (Perleth et al., 1993). Puzzle building, however, has proven to be a significant variable in our research.

The variables regarding children's speech did not prove to be significant, particularly given the data recorded in parent reports. This result is in harmony with Browder's (1994) findings. The parents involved in Browder's study did not report important differences in children's language devel-

opment, regardless of whether their child scored above the average level of intelligence (C1 > 125) or below the average (C1 < 95) (as cited in Perleth et al., 1993).

Conclusions

The positive predictive value and effectiveness of this screening method can be considered to be relatively sound, given the results of this study. The simplicity, clarity, objectivity, and economy of the variables on the observational table enhance the feasibility of this screening method. The observational instrument may be completed by parents and requires only minutes to be evaluated. Furthermore, the effectiveness of the screening processes can be substantially improved by planning appropriate training for all those involved in the selection process. The threshold for selection could be adjusted further based on evidence supplied from other sources.

In addition to these predictions, preliminary data from the application of the screening process to a population of 738 children throughout Spain are confirmatory. Sixty-three of these children (8.5%) have been identified as intellectually gifted. Subsequent diagnostic evaluation has confirmed the existence of intellectual giftedness in 16 of the 63 selected children, in accordance with the criterion level IQ of above 129.

This observational table may also be administered as a survey in schools or by professional educators and in primary health centers by pediatricians who have strategic posts from which to administer such tables or from which to verify a child's development and learning. This would provide individuals who are in close contact with the children during their early years at school, and hence who were likely to be more accurate in their judgements, with a means of identifying the existence of intellectual giftedness. In this way, evaluation of children who evidenced signs of giftedness could be proposed to confirm the diagnosis.

Implications of the Study

The fourth disposition of Recommendation 1248 of the Parliamentary Assembly of the Council of Europe (1994) on the education of gifted children declares the importance of recognizing children's special needs at the earliest possible time and of providing special educational provisions for gifted children from preschool onwards. To assist with this goal, the researchers have proposed that the variables identified through this study be verified in replication studies in order to construct a profile that will assist in the identification and understanding of intellectually gifted students' development. The proposed variables have been presented in the form of a questionnaire to parents and have been used to make the observational instrument which is being used to screen children in the populations under study. It has been translated from Spanish into Portuguese, Romanian, Serbian, Russian, and the English language in order to aid in such replication efforts.

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Appendix 1
Possible Variables to be Observed

1. Variables concerning mobility development
- Crawling by 6 months
- Walking alone by 9 months
- Cutting out with scissors by 2 years and 5 months
- Riding a bicycle and practicing skating and skipping from 4 years
- Writing in capital letters from the age of 3 years and 5 months

2. Variables concerning speech development
- Saying first word at the age of 6 months
- Saying first sentence by 12 months
- Conversing by 24 months
- Managing an advanced vocabulary by 24 months
- Being interested in new words which are unknown at the age of 3 years
- Knowing and managing terms of relationship (brother, uncle, aunt, grandfather, etc.) from 2 years and 5 months

3. Variables concerning cognitive development
- Drawing the human figure (head, trunk, and 4 extremities) by 2 years and 5 months
- Counting to 10 by 2 ½ years
- Constructing a 20-piece puzzle by 2 ½ years
- Reading figures of five or more digits by 5 years
- Identifying time (hours, halves, and quarters in the analogue system) at the age of 5 years
- Being very interested in the surrounding world, asking about the origin of things, as well as in learning "everything" from 2 years and 5 months
- Learning to recognize at least 6 colors by 18 months
- Learning the alphabet (upper case letters) by 2 ½ years
- Beginning to read by 3 years of age
- Reading a book easily by 4 years of age
- Knowing the full name of all his or her classmates during the first quarter of the academic year
- Memorizing tales, songs, and sentences from 2 ½ years
- Being interested in the orthography of words at 4 years
- Copying a rhombus from 4 years
- Watching video movies from 2 ½ years

4. Variables concerning self-help
- Learning to [get] clean and tidy from 1 ½ years (day and night sphincter control)
- Choosing own clothes at 3 years
- Getting dressed and removing clothing at 4 years

5. Variables concerning socialization
- Exhibiting leadership (the others follow them in their games and they are invited to at least 75% of the birthdays of their class mates) at 6 years
- Making contact with older people and preferring to play with older children at 4 years
- Having problems with making contacts with age peers at 4 years