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What are Extraordinary Gifted Children Like (Equal to or Above 189 IQ)? A Study of 10 Cases

Yolanda Benito Mate

Abstract

After a short introduction about previous studies on extraordinarily gifted children with an IQ of over 170, this article refers to the descriptive characteristics of ten children with IQ of over 189. After this, the developmental and learning characteristics of these children are described and finally empirical research about aspects that describe the personal, social and scholar adaptation of these highly gifted children is discussed.

Keywords: Extraordinary gifted children (IQ of over 189), development, learning, adaptation, empirical researches.

Introduction

The focus of this article is highly gifted children with an extraordinarily high IQ level. It is reminiscent of Terman's study carried out in California in 1921 with a sample of 1500 intellectually gifted children. Although clearly Terman's sample had undergone a prior selection, 23.13% of this group had an average IQ slightly above 177. The IQs of 47 boys were between 170 and 194, and three hundred girls had IQs between 170 and 200. It is well to consider that approximately 85% of intellectually gifted children have an IQ of between 130 and 144.

The article is based on the study of gifted children - specifically those with an IQ of over 189, and the family characteristics of such extraordinary individuals. As a starting reference point, the most recent data published will be considered regarding extraordinarily intelligent children. In 1989 Linda Kreger Silverman and Kathi Kearney researched 23 children from Colorado and 15 from Maine. Altogether there were 17 girls and 21 boys whose ages ranged between 3 and 13 years. Their IQs ranged between 170 and 194. According to the authors, given normal distribution the incidence of children with an IQ over 170 is approximately 1 in 290.000 (Dunlap, 1967). This suggests no more than 2 or 3 such children would likely be found in the entire state of Colorado. However, in the last 9 years, 4%, i.e., 80 children living in Colorado and attending the Centre for the Development of Gifted Children had an IQ level of 170 or more.

In similar vein, in the state of Maine, where there is the likelihood of one child with this level of IQ at most, 15 were identified. These data coincide with those of earlier researchers who observed an unexpectedly high frequency at the upper end of the IQ distribution curve (Dunlap, 1967; Gallagher and Moss, 1963; Jensen, 1980; McGuffog, Feiring and Lewis, 1987; Robinson, 1981; Stott and Ball, 1965; Terman, 1925).

The group of 38 children selected by Silverman and Kearney (1989) was the largest number of children studied with an IQ of 170+. Compare, for example, Hollingworth (1942) who detailed her study based on 12 children in her book "Children above 180 IQ"; or the more recent study carried out by McGuffog in 1987. She described 10 children with an IQ of over 164 (in Silverman and Kearney, 1989). Coriat makes reference to the two cases he observed in his (1990) book "Gifted Children".

There are differences between this current study and the Silverman & Kearney study of 1989. Certainly more exceptionally gifted students with an IQ of 170 and above attended the centre in Colorado over a 9 year period than attended the centre in Valladolid, Spain. In fact, the 1989 study involved a total of 2000 children. A total of 650 gifted children from all over Spain in were observed the "Huerta del Rey" Centre over a period of 11 years. Of these,

42 or almost 7% of the sample observed, had an IQ of above 170. Of this group, 20 had IQs from 170 - 179, 13 from 180 - 189 and 9 from 190 - 211.

This means that the proportion of cases per population differs somewhat. The percentage of exceptionally gifted children encountered at the Huerta Del Rey is almost (Based on 42/650 = .0646 cf. 38/2000 = .019; i.e., 6.5% - 2%) larger than the Colorado study. The reason for such differences may be due to different treatment or attention given to gifted children in the two countries. For example, despite there perhaps being striking cases of such children in Spain, it is possible that lack of knowledge and inadequate information during the earlier years meant fewer were noticed in comparison to Colorado.

It is also very curious and, perhaps worrying, how there is a difference in the ratio of boys to girls encountered according to sex, between the Huerta Del Rey study, Terman's observations, and those of Silverman and Kearney. In our sample, the number of girls identified as well as the percentage with high scores is significantly lower. In fact, in the Colorado group, the three highest scores of over 190 were obtained by girls. In the Maine group, one boy obtained the highest score of 194, followed by three girls with an IQ of 190. These data are similar to those obtained by Terman who found the three highest scores of over 190 were obtained by women (Terman, 1925; Hollingworth, 1926). In our sample, of the 20 children with an IQ of between 170 and 179, 4 are girls and 16 are boys. In the group between 180 and 189, 6 are girls and 7 are boys and in the last IQ group of over 190, there are only boys. It is necessary and advisable to remember at this point that none of the children who we observed with an IQ of over 170, had associated disorders.

The current study focused on 10 children with IQs of between 189 and 211. As far as is known, no other studies have been conducted specifically on children in this far upper range of intelligence. It is hoped is that this research may initiate a series of studies which may be of benefit as we seek to understand this subject further. Above all the hope is that the impact of such studies may be positive and be reflected in the impact various personal, academic and social facets of these children and their families as well as the professionals immersed in the fascinating task with respect to their development and education.

According to Silverman and Kearney, the majority of their sample was evaluated by tests which only provide cognitive ability levels, WISC-R, WPPSI, Kaufman ABC, the McCarthy Scales of Children's Abilities and the IV revision of the Stanford-Binet test. Because of upper test limits or test ceilings none of these measures are known for their accuracy in terms of extraordinarily intellectually gifted children. This raises a serious issue which must be taken into account when estimating the cognitive ability of extremely highly gifted children. There can be a difference of as much as 50 IQ points between tests such as the MSCA, K-ABC, WISC-R, WPPSI and the older version of the Stanford-Binet- the Stanford -Binet (LM). An example of this is provided by Silverman and Kearney (1989), in which seven children from Maine and six from Colorado were administered the Stanford-Binet. One child obtained an IQ of 143 on the K-ABC and 194 on the Stanford. Only one child from the 170+ IQ group obtained a score of over 150 in the WISC-R, while another of the children only obtained a score of 135 in the WISC-R.

This phenomenon is observed *only* at the highest end of the psychometric distribution of intelligence. If this occurred at all the levels, the tests would be valueless. For example, imagine if a child obtains an IQ of 100 in one test and 50 in another. One of them would indicate the child has a normal ability for academic learning and the other would indicate the child is severely challenged intellectually.

Silverman and Kearney (1989) calculated the IQ conventionally, i.e., dividing the mental age of the child by the chronological age and multiplying by 100 (Silverman and Kearney, 1989). In the current study, the IQ was calculated using the method recommended in the technical manual of the Stanford-Binet Form L-M. using the conversion tables to transform the conventional IQ values as obtained in revised IQs.

Since the publication of the Stanford-Binet IV (S-B IV) in 1986, many psychologists have abandoned the "old" Stanford-Binet Form L-M, even though some experts in the field, e.g., Davis and Rimm (1994), do not recommend the S-B IV for use with highly gifted individuals. They said: "One problem is that the upper limit of the fourth edition is lower (around 164 IQ) than in the previous edition so that an extraordinarily gifted person would not be identified" (Tourón; Peralta and Repáraz, 1998, p.85).

When used with gifted individuals, the S-B IV typically generates lower scores. The discrepancy between the new and old test score averages 13.5 points at the low end of the gifted spectrum. Children achieving an IQ score of 135 in the L-M version scored an IQ of 121 in the S-B IV version (Thorndike, Hagen and Sattler, 1986). Some additional comparisons follow below (See: Table 1) with regard to the difference in measurement between three of the major instruments used in the current study to estimate cognitive ability. The scores offered have been obtained using the WISC-R, the Stanford-Binet (Form L-M) and the McCarthy Scales of Children's Abilities (MCAS).

Table 1: Psychometric Intelligence Tests.

Child	Age	WISC - R	STANFORD-BINET (Form L-M)	MCAS
A	3 years 6 months		IQ 192, MA 7years 1 month	OIQ +150
B	3 years 9 months	VIQ 144, MIQ 140, TIQ +145	IQ 189, MA 7 years 1 month	OIQ +150
C	4 years 8 months	VIQ 149, MIQ 127, TIQ 144	IQ 208 8 years 2 months	OIQ +150
D	4 years 10 months	VIQ 139, MIQ 144, TIQ +145	IQ 192, MA 9 years 0 months	OIQ +150
E	6 years 5 months	VIQ 149, MIQ 131, TIQ 151	IQ 191, MA 11 years 0 months	OIQ 150
F	7 years 1 month	VIQ 155, MIQ 136, TIQ 150	IQ 199, MA 13 years 9 months	OIQ +150
G	8 years 5 months	VIQ 152, MIQ 142, TIQ 154	IQ 211, MA 17 years 11months	
H	8 years 7 months	VIQ 155, MIQ 124, TIQ 145	IQ 202, MA 17 years 9 months	
I	9 years 3 months	VIQ 152, MIQ 132, TIQ 146	IQ 194, MA 18 years 6 months	
J	10 years 1 month	VIQ +155, MIQ 141, TIQ 153	IQ 194, MA 20 years 6 months	

Such discrepancies caused some difficulties. For example, because professionals tend to trust the lowest scores they assume parents are only trying to boost their own ego by claiming their children have greater abilities.

Given no current instrument adequately evaluates the totality of the abilities of exceptionally gifted children, alternative methods of evaluation must be considered. Almost thirty years ago the National Identification Report (Richert, Alvino and McDonnel, 1982) offered this consensus of opinion:

> "It is recognized that new instruments and identification methods must be developed for gifted students in specific populations, such as for example, ethnic minorities, the disadvantaged, students with a limited ability to speak English, exceptionally gifted students and the handicapped" (pp.77 and 78, emphasis added).

While this recommendation has already being implemented with virtually all the specific groups listed there is one notable by its absence: the exceptionally gifted. As it happens, the old method of identification discussed above is considered more adequate with respect to measuring their ability level than the more recent methods (Silverman and Kearney, 1989). The Stanford-Binet is, after all, one of the tests with the highest ceiling and recognised as the most appropriate by the specialists (MEC, 1991) for measuring high ability. Even so, extreme ability of 180 or over in children over 13 years of age cannot be measured (Benito, 1992). This has caused some to think that cognitive ability in children has gone down over the years. Nothing is further from the truth.

Some individuals will express the opinion that it is irrelevant whether a person has an IQ of 160 or 180 - in the end, they say, it is all the same. Au contraire, it is not the same. This argument underscores the importance of, and the reason for, the present article. There exist very significant differences in the understanding of, and approach to, the world in which these extraordinarily gifted people reside. Their emotional, cognitive and educational needs are very different and, for this reason, appropriate and accurate evaluation is essential (Benito, 1992).

Typically children with IQs of 140 have been termed "Very highly gifted". Yet, the term "Very highly gifted" is best reserved for gifted children with an IQ of over 160. Consider Hollingworth (1926 and 1942), for example, who repeatedly describes the special needs of children with IQs 170 and beyond (Silverman and Kearney, 1989). Similar terminology and the fact that such children do have a socio-emotional development markedly different to intellectually gifted children with lower IQ measures, has been noted in research and doctoral theses (Alonso, 1995; Alonso and Benito, 1996; Benito, 1996).

Method

Sample

In contrast to previous research regarding extraordinarily intelligent children, all the children in the sample were boys.

- Number of children: 10
- IQ range: from 189 to 211
- Age of the children at the time of evaluation: 3 years and 6 months to 10 years and 1 month
- Average age of the group at the time of evaluation: 5 years and 10 months
- Sample taken from 1989 to 1999
- Order of birth:
  - First born: 7
  - Only child: 3
  - Second child: 2
  - Third child: 1
- Number of children per family: from 1 to 3

Of this group, in two of the families other siblings were tested, both of whom were highly gifted. One of them was the elder brother of the 10 years and 1 month old child. He obtained an IQ of 154 on the Stanford-Binet and 141 on the WISC-R. The other child was the second brother of the 6 years and 5 months old child. He obtained an IQ of 147 on the Stanford-Binet, 141 on the WISC-R and an OIQ of 132 on the MSCA.

It should be taken into account that in the case of child I (9 years and 3 months) with an IQ of 194 data provided by the parents with respect to his early development and first learning experiences may not have been entirely accurate since this child was living with his grandparents for the first three years.

Research findings

Family characteristics

This study, as with that of Silverman and Kearney (1989), confirms previous findings, i.e., extraordinarily intelligent children usually come from upper or middle SES level families and have a parent with a high educational level (Hollingworth, 1942; Barbe, 1956; Hitchfield, 1973; Roedell, Jackson and Robinson, 1980; Albert, 1980).

Interestingly, in the sample, there were parents in three families with no university education and of a lower SES:

F's family:

- Father worked as a technical engineer, although without an official title. His studies corresponded to *the first grade of the Baccalaureate* (High School level) and the title obtained was as an administrative worker in marketing and sales. The mother was a housewife and *had studied the Elementary Baccalaureate and the first grade of Vocational Training*. The child was 7 years and I month old with an IQ of 199.

H's family:

- Father had studied the Baccalaureate and the mother had a Middle Grade title. The mother was a housewife and the father was a high executive in banking. The child was 8 years and 7 months old and had an IQ of 202.

I's family:

- Father had studied Vocational Training and the mother the Baccalaureate. The father worked as a draughtsman and the mother was an office worker. The child was 9 years and 3 months old and had an IQ of 194.

Remaining seven families (At least one of the parents had higher levels of education):

- In **A's** family, the father was an electronics expert and the mother had a degree in mathematics. Both parents worked as teachers in Middle School. The boy was 3 years and 6 months old with an IQ of 192.

- In **B's** family, both parents were doctors in Chemistry and worked as researchers in a Scientific Research Centre. The father had studied the piano and the mother played the guitar when she was 3 years old. The child was 3 years and 9 months old with an IQ of 189.
- In **C's** family, the father had studied administration and the mother had studied Teacher Training. The father was a farmer and the mother was a teacher. The child was 4 years and 8 months old with an IQ of 208.
- In **D's** family, the mother had a Law degree and the father an Economics degree. The father worked as an economist and the mother as a University lecturer. The child was 4 years and 10 months old and had an IQ of 192. The father belonged to a very numerous family in which he and other brothers had been considered highly gifted.
- In **E's** family, both parents had studied at university. The father had a degree in Medicine and the mother in Nursing. Both parents worked: the father as a university lecturer in a Teacher Training College and the mother as a nurse. The child was 6 years and 5 months old with an IQ of 191. This was the other family in which another of the children was tested and who was the second of the children less intelligent than the first-born, although also highly gifted.
- In **G's** family, both parents had degrees in Teacher Training and both worked as junior school teachers. The child was 8 years and 5 months old with an IQ of 211.
- In **J's** family, the father was a doctor in Mathematics and the mother had a degree in Medicine. The father worked as a university lecturer and the mother as a doctor. This was one of the families whose children were tested and both were highly gifted. The second of the siblings was more intelligent than the eldest child. The child was 10 years and 1 month old with an IQ of 194.

As in the study of Silverman and Kearney, the parents responded differently upon knowing the intellectual exceptionality of their children. While some even questioned the validity of the tests, and others rejected it out of hand declaring they "didn't believe in such things", others indicated their interest in how their children achieved such high results by asking, "What are the questions like?" or "What are the problems?" In yet other cases, the parents concentrated more on what to do and how to educate their children knowing that their abilities were so high.

Given the school authorities were rarely aware of the needs and rights of these pupils, the parents had to inform them of the educational options. All parents recognized the difficulties of making the teaching suitable and their responsibilities in this respect. They provided books, information and all types of information that might serve as a guide for the people responsible in the schools. Even so, attempts by parents to collaborate were not always accepted.

In nine of the ten cases, the reason for an initial consultation by the parents was a desire for knowledge about the psychological development of the child. They had noted significant differences in learning, memory, knowledge, reasoning and interests, compared with other children. In one case, the parents had first sought out advice from a teacher and psychologist who was a friend of the family. Overall their opinion was that their children were intelligent.

However, it was hard for them to imagine their children might be highly gifted - much less that they might be extraordinarily gifted. In the case of the youngest child, the parents showed considerable reticence when it came to deciding about testing their child. Another child, the eldest, came coincidently having been brought his elder brother. The child insisted on coming but did not consider himself intelligent.

Development and Learning characteristics

Personal, Academic and Social Adaptation: Development and Learning

Precocity with regard to attention and coordination is evident from the moment of birth in all of the children in the sample:

- *"Supporting himself with his hands, he lifted his head and sat up with his eyes open the very day he was born. This wasn't a one-off thing because from then onwards he repeated it frequently".*

- *"Twenty days after birth he went into hospital (for a urinary infection) and was put in an incubator. We saw him through a glass window and he went mad when they showed him to us through it. He was watching our movements and making guttural sounds to attract our attention".*
- *"When those who were born at the same time still couldn't hold their heads steady, he was going all over the place face down in the chair with his head raised looking at everything. He quickly coordinated his hands so as to handle objects or pass them from one hand to another".*
- *"After about a month ½ he paid attention for twenty minutes to stories which his mother read to him and at 18 months he listened attentively and uninterruptedly to concerts on video for approximately 30 minutes. The road signs and traffic lights fascinated him from 18 months onwards. Numbers and letters have always been a game for him".*
- *"From very young (six months) he was able to learn to clap and move his hands and to distinguish different songs".*
- *"Two hours after birth I picked him up in my arms and he threw a glance at me which left me astonished. I felt an intense emotion; I don't know to explain it: it's beyond words".*
- *"At six months he remained seated, turning over the pages of a book of animals for ages. From very early he listened to stories even though they were very long".*
- *"At a year ½ he began to ask about the letters and numbers and when he learnt them, he continually asked you to write the entire alphabet and the numbers from 1 to100. He was able to remain seated, looking, while he demanded that you wrote the vocabulary or the numbers four times in a row".*

All the children slept fewer hours than those expected for their age. They showed great vitality, agility and manual coordination but not as regards the rest of the body. In fact, only five of the children could walk without support before the age of one. The others did it at about the age of one.

With regard to language development, more than 50 years ago, Leta. Hollingworth pointed out that the subjects she treated with an IQ of over 180 began to speak *in sentences* between the ages of 6 and 19 months, with an average of 14 months; the average child does not begin to join words, not even in pairs, until about 18 months (Gross, 1998, p.5). In the sample one of them uttered his first words at six months and his first sentence at one. At the age of 2 all of them were able to maintain a conversation.

Gross (1998, p.1), in a longitudinal study of Australian children with an IQ of 160 or more, found the average age when highly gifted children expressed their first word was at 8.5 months and many of them began to speak at the age of 4 and 5 months. Such precocity in verbal development and movement among the gifted profoundly affects their early cognitive and socio-emotional development (Gross, 1998, p.6). Their very early verbal fluency makes them able to express their ideas, to look for information by asking and to interact verbally with their parents and other members of the family at an age at which other children are only just beginning to experiment with oral communication.

The development of vocabulary correlates well with intelligence, as Terman (1925) pointed out. Guilford, Scheuerle and Shonburn (1981) as well as Lewis and Louis (1991) reported that linguistic capacities are often considered a sign of giftedness (Benito and Moro, 1997). Both studies examined precocious children. Such children invariably ask about new words and quickly put them to use in a correct context. From approximately 3 years old they develop an interest in the spelling of the words.

Another outstanding characteristic of these children is the continual need of learning. Since they began to speak, they showed a great curiosity for everything around them. They asked about new words and asked exploratory questions: the cause of things, their working, etc. Their questions were complex and already from a young age, they were interested in such metaphysical subjects as the origin of man and the universe. One child …, at 3 years of age, asked how Jesus could exist if he didn't see him. *"Where was he" and "How did he feel him?"* His questions frequently concerned death, truth, the beginning of the universe, the cosmos, etc.:

- *"He asks questions about the meaning of life and justice. He is curious about everything. At 4, he wanted to know what a country or a nation was. At 5, he knew the majority of the capitals of the world, the types of animals there were, etc. In general, everything interests him. If he was riding in a car, he wanted to know the road signs, the types of trees that he saw, the kinds of*

clouds in the sky. Everything was a cause of curiosity and some subjects were sufficient reason for him to go and consult a book and encyclopedias: what are constellations, mythology, minerals, history, etc.".

- *"…from very young his vocabulary has been very rich but, above all, since he began to read (before 4 years old) he has been very concerned about using words correctly and to look for expressions and synonyms in order to express himself very clearly. He always stood out because his way of speaking did not correspond to what a child of his age is supposed to say. For example, a few months ago, aged 6, he began to use phrases he had read in some books and which he liked or which occurred to him because they appeared more exact (according to his own idea of exactitude). One day, in a book shop, he was asked if he had fallen down because he had an injury and he answered: "No. I've bumped into another human being of my own species". He said it entirely naturally but the face of the shop assistant, his comment and others in different circumstances have given rise to the fact that now, at 6 years and 5 months, he speaks differently depending on the place and the people who he meets".*

Other parents comment that:

- *"Before he was 2, he began to distinguish day, night, afternoon and morning. Later, he became interested in the hours, the days of the week, the seasons, the months, the days of every month. At 2 and a half, he even asked whether time ever finishes".*

- *"At 2 years, he could count up to over 100 in Spanish and almost up to 100 in French and Basque. He knew the letters, he could read, write and the hours of the clock. He could identify the majority of the geometrical figures, the road signs, some countries, their location and their flags. He has always shown interest in everything and asked about everything around him: the names of cities, trees, flowers, cars, etc.".*

Other parents also reported how, at 3 years and 6 months, their child asked: *And before I was in Mum's stomach, where was I?"* At the same age, he counted up to 100 in English and German. In Spanish he could say any 5-figure number. He could answer the question: what day does 24th March fall on? And he answered correctly, for example, on Saturday.

He showed great interest in traffic signs, letters, numbers, symbols in general, ways of measuring time, the sun, the moon and the stars. On the piano he was able to reproduce quite complex melodies with a truly surprising capacity for phrasing for his age (3 years and 9 months) having only recently heard them.

He could distinguish the sound of almost all the instruments of an orchestra. He was able to read simple pieces written in the key of G with intonation, although without melody. He was able to play simple pieces on the piano appropriate for children over 7 years old. When he was asked about the name of the three songs he most liked, he answered: The New World Symphony by Dvorak (first movement); Variations on a theme by Haydn (Brahms) and The Sun is Sad which he had learnt at school. When the child was asked about these, he hummed them and his mother wrote the name. He identified them by the author and their order on the record.

These characteristics reflect those observed in some important historic figures. Take for example, Francis Galton. Here is an example from a letter written a little before his fifth birthday:

"My dearest Adela, I am four years old and I can read any book in English. I can say all the nouns, adjectives and active verbs in Latin as well as reciting 50 lines of Latin poetry. I can add any quantity and multiply by 2, 3, 4, 5, 6, 7, 8, 9, 10, and 11. I can also say the monetary table, I read a little French and I know times" (Colom, 1995, p.51).

The vocabulary level attained by the children in some of the tests was as follows:

Table 2: Equivalent ages in vocabulary tests.

Child	Age	WECHSLER SCALE (VOCABULARY)	STANFORD-BINET (Form L-M) (VOCABULARY)	TVTP (PEABODY)
A	3 years 6 months, IQ 192		10 years	8 years 10 months
B	3 years 9 months, IQ 189	6 years	6 years	5 years 0 months
C	4 years 8 months, IQ 208	+6 years 6 months	8 years	7 years 1 month
D	4 years 10 months, IQ 192	+6 years 6 months	8 years	8 years 0 months
E	6 years 5 months, IQ 191	14 years 6 months	12 years	9 years 8 months
F	7 years 1 month, IQ 199	15 years 2 months	12 years	9 years 3 months
G	8 years 5 months, IQ 211	+16 years 10 months	Upper Adults II	
H	8 years 7 months, IQ 202	16 years 10 months	Medium Adults	16 years 2 months
I	9 years 3 months, IQ 194	+16 years 10 months	Upper Adults I	19 years 2 months
J	10 years 1 month, IQ 194	16 years 10 months	Upper Adults II	15 years 2 months

Regarding the subject of reading, precocious readers have been defined as those children who have made substantial progress in reading comprehension before starting the first year at school (Jackson, Donaldson and Cleland, 1988). Mills and Jackson (1990) suggested that individual differences in reading comprehension can be predicted from the tests carried out 5 or 6 years previously. They also point out that verbal ability turns out to be an equally good predictor (e.g., Perleth, 1993). According to Jackson (1988), the ability to read at such a precocious age demonstrates the potential for highly gifted performance.

In this context, Robinson (1993) points out that the children she studied were competent readers before starting infants' school and typically possessed a high IQ, which tended towards an average of 130. She also found precocious readers tended to maintain an advantage over their peers with regard to their skills in reading - although less dramatically - and generally they perform well at school. She maintained that if these pupils were not adequately taught to read very early on and when their companions are beginning to read, not only a brake on the growth of their abilities could occur, but also a profound discouragement with regard to the educational system could develop.

The precocious learning of reading in these precocious children is not caused by the insistence of the parents. Not all gifted children who are ready to read actually read. Many parents resist responding to questions and an interest in reading of their children, after advice from teachers who argue that this could be harmful in their academic learning in subsequent years.

Gifted children who read early learn to read incidentally and unguided and it is curiosity which leads them to learn. Of the 10 cases in the sample, one began to recognize letters at 1 year, 2 months, another at 1 year, 8 months and six started to recognize letters at the age of 2. In another case, the data is not available and in the two remaining, one began to recognize letters at 3 years and 6 months and the other at 4.

They learn to read functionally, gathering knowledge of certain logotypes and anagrams. They ply continuous questions, e.g., *"What does it say here?"* Typically they do not ask about single letters rather whole words (although curiously one child learned by asking about the letters and not the words):

> *"At 3 years and 10 months he learnt to read by himself by asking what each capital letter was. Before reading, he used to spell everything he saw written. Nobody taught him to write, he did it very badly but he liked to do it. From 3 years of age his favorite toys have been books, paper and pencils".*

In Terman's (1925) sample, precocity was very significantly evident concerning learning to read: 42% of the very gifted (IQ over 170) learned to read before 5 years old, compared to 18.4% of the total for the group studied (gifted and highly gifted over 170). From the statistical point of view this difference is very significant.

In the girls, the percentage is of 25% compared to 18% of the total of the group studied (all very gifted). The proportion of individuals reading before the age of 4 is two ½ times more among the very gifted (IQ of 170 or more) than the group of gifted in general.

In research aimed at identifying the most useful variables regarding early and reliable screening of gifted pupils, reading a book easily at the age of 4 was the variable with the highest level of significance. This variable can be seen in 100% of the cases of gifted children in the study.

Another important variable observed is the existence of a qualitative difference among children with an IQ of 130 and children with an IQ of more than 145. The significant difference between them was found to be the learning of the alphabet at 2 ½ years old in children whose IQ is over 145 (Benito and Moro, 1997, p.24).

In the sample, four of the children started reading at approximately 2 ½, another at 3 years 10 months, another three began at 4 and the remainder at 5 years old. All of them, with the exception of the eldest child in the sample, showed an intense interest in reading and a high reading speed. In fact, the two children who read latest, began to read very quickly shortly after:

- *"At about 5 years and 6 months, in class they took him to the library so that he was occupied while the other classmates learnt to read".*
- *"He learnt to read in one week in second grade of preschool. At 6 years old, on school days, he would read a short story before breakfast".*
- *"He liked the books from the collection "Steam Boat". He even read while he watched TV".*

The only child in the group who showed no intense interest in reading was aged 10 years and I month. Even so, he was a very quick reader: *"At 7 he read more than 100 words per minute".*

The most precocious child learned to read at 2 years and 3 months. At the age of 2 years and 10 months, he could read 52 words per minute. He could write some words dictated to him, mainly in capital letters and in the reading comprehension test for level 1 of primary school he obtained a score of 8 on a scale of 1 to 10. He learned to read by asking what was written on the notices in the street.

In spite of the fact that extraordinary mathematical skills are often considered as very important factors in the early identification of intellectually gifted children (Stapf, 1990, p.300), there has been very little research regarding the extraordinary mathematical abilities of the youngest children. The majority of the studies have been carried out with pupils over 10 years old. (Perleth, Lehwald and Browder, 1993).

Marjoran and Nelson (1985) reported some indicators for the early identification of children with a talent for mathematics, such as a preference for logical elements of connection in its language, the interest in and dedication to geometrical drawings or systems of order and the great satisfaction obtained from puzzles and building toys. However, no empirical evidence exists to support the said indicators (Perleth, Lehwald and Browder, 1993).

In some of these cases, even in babies, parents observed a tendency to structure the environment. In their games, for example, they might form series and order things logically, placing their toys in rows, circles, according to size and shape:

> *"Since he began to move his arms, he placed everything in rows (his dummy, rubber doll, etc.). As he got older, all his games were based on putting all his toys in a row and ordering them by types".*

The interest in jigsaws has been very significant. Of the ten children studied, five worked with 20 pieces at 2 years old and four at 3 years. Only one showed no special fondness for them. - he preferred word grids. Some of the accounts from parents whose children had learned to do 20-piece jigsaws at 2 years old include:

- *"He showed greater interest in numbers. As for jigsaws, he did them quickly and once he understood how to do them, he moved on to another one. He never did one twice".*
- *"The toys which he played with were always jigsaws. He had other toys: cars, dolls, building toys, etc, but he hardly played with them, only if we insisted".*
- *"He did them face down, covering the picture".*
- *"He liked jigsaws about Spain and that's how his interest began in geography: the nations, continents and the globe of the earth. At the age of 3 he did them with 50 or 60 pieces".*

All ten children showed a very deep level of aptitude for mathematics. Most were exceptional and one had a prodigious aptitude: i.e. he equaled the performance of an adult in mathematical reasoning before he was 10 years old.

Table 3: Equivalent ages in calculus and numerical reasoning.

Child	AGE	WECHSLER SCALE Arithmetic	STANFORD-BINET (Form L-M) Numerical Reasoning	MSCA Calculus
A	3 years 6 months IQ 192		6 years	7 years 6 months
B	3 years 9 months IQ 189	+6 years 6 months	6 years	7 years approximately
C	4 years 8 months IQ 208	+6 years 6 months	+6 years	8 years approximately
D	4 years 10 months IQ 192	+6 years 6 months	9 years	+8 years 6 months
E	6 years 5 months IQ 191	8 years 10 months	9 years	+8 years 6 months
F	7 years 1 month IQ 199	+16 years 10 months	Upper Adults I	+8 years 6 months
G	8 years 5 months IQ 211	+16 years 10 months	Upper Adults III	
H	8 years 7 months IQ 202	16 years 10 months	Medium Adults	
I	9 years 3 months IQ 194	16 years 10 months	Upper Adults I	
J	10 years 1 month IQ 194	+16 years 10 months	Upper Adults III	

In four children, an extraordinary capacity for mathematics could be observed: **A** (3 years and 6 months), **D** (4 years and 10 months), **F** (7 years and 1 month) and **G** (8 years and 5 months). In the latter case, he had a prodigious ability:

> *"At 13 or 14 months, he loved to arrange geometrical shapes. At 14 months he could make a perfect pyramid. At 18 months, he wanted a book with numbers and he asked about the numbers of all the houses. At 2 years old, he had mastered all the numbers. At 3, he mastered quantities of millions. Before he was 4, he could count backwards from one thousand and at the same age he was able to resolve problems in his head with 2 or more operations. At 5, he knew the surface area and population of many Spanish provinces. He learnt the multiplication tables with a calculator at 5. By himself, he started to understand how the tables worked. At 8 and a half, the age at which he attended the Centre, he could resolve problems from 8th grade of secondary school and very quickly".*

When he was tested the examiners were surprised by the way he looked at them and his numerical capacity. It was amazing how he resolved the problems - performing the Calculus Test of the TEA-3 without using paper to do the operations and doing everything mentally. He was in the 99th percentile on the scale corresponding to the pre-university school course. But what really was surprising was how he solved the reasoning problem pertaining to the Upper Adult Level III of the Stanford Test:

> *"In my garden there was a plant which was 8 centimeters high. At the end of one year I measured it and it was 12 centimeters high, at 2 years it reached 18 centimeters and at the end of the third year it was 27 centimeters. What height do you think it would reach at the end of the fourth year?".*

After 7 seconds he gave the correct answer. When asked how he had done it, he answered that it was easy once he realized the difference between each of the numbers was 1.5:

8 x 1.5 = 12
12 x 1.5 = 18
18 x 1.5 = 27
27 x 1.5 = 40'5

At the time he was beginning third grade and in class just beginning to learn how to divide. As indicated on previous occasions, typically intellectually gifted children from the age of 6 show meta-cognitive abilities in the resolution of mathematical problems (Benito, 1992). However, extraordinarily gifted children even as young as 4 years and 10 months demonstrate the emergence of this skill. For example, when **D** was asked, *"If you buy a ball that costs 20 Euros and you pay with 100 how much have you left?"* He answered *"80*!". Before setting the stop watch, the child had already given the right answer, although in this case it did not appear to be due to an automatic

thought. He knew on some occasions, at least, what reasoning he had followed to resolve the problem.

In the quantitative concepts component of the Cognitive Aptitudes Test, he did not count the points one by one, but rather at a glance. He rapidly added up and took away numbers with more than 3 figures in his head and not with the use of paper. When asked how he did it, he responded: *"I think about them, one plus one, and I add them up but without paper. For example: 4 plus 6 equals 10"*.

The youngest of the children had a way of thinking about problem solving that is usual in some gifted children up to 5 years old, i.e. automatically and without any apparent thought. After reading the problem, they give the correct answer. When they are very young, if they start counting on their fingers they would make a mistake. For example, when asked how many cubes are on the table at a glance they would say 11. On the other hand, if asked to count the cubes one by one, they would often commit a mistake. The youngest of 3 years took only 2 seconds to respond to a problem such as the following: "*If you have 9 Euros and you lose 2, how many have you left?".*

Another child, **H** (8 years and 7 months), although greatly interested in mathematics had a real passion for chemistry:

- *"At about 6 years old, he learnt at midnight, with his brother, and in a little over an hour, something as arid as the Valence chemistry tables because he wanted to learn how to formulate".*
- *"At the same age, one of the things which most amazed me about my son, and which actually frightened me, was the speed and ease with which le learnt the basic rules of formulation. Between approximately an hour and a quarter and an hour ½ he was formulating acids, taught by his brother".*

The general idea that creativity and intelligence are distinct abilities is founded on the basis of the differential correlations obtained between the two abilities at different levels of general intelligence. Creativity can correlate with *"g",* but at the highest levels of general intelligence, the correlation is lower. The ultimate reason is that, even when a high level of general intelligence is a necessary condition for high creativity, the first does not guarantee the second. Many intelligent individuals lack truly creative capacities (Buss and Poley, 1986, p.58).

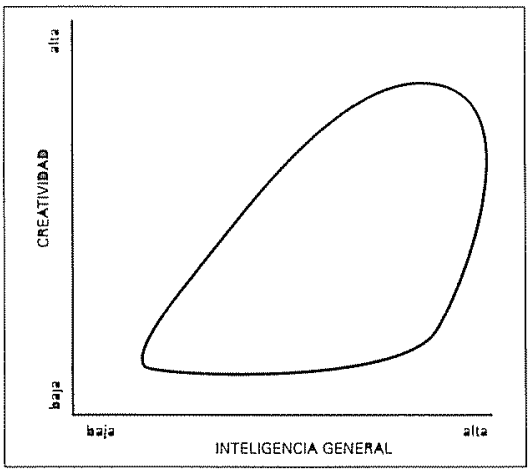


Figure 1: Intelligence and Creativity.

Currently, it is widely accepted that at least a normal intelligence is necessary to be creative. According to Erika Landau, there is no significant creativity without a high IQ of about 120 (Benito, 1992). Terman (1925) observed how the intellectually gifted presented other exceptional features such as creativity and talent. It may also be noted that Garcia Yagüe and others (1986, p.114) considered the separation made between intellectual gifts, creativity and special talents to be

unjustifiable. In fact, it seems probable that, when we manage, in the future, to identify which genes are associated with a certain cognitive capacity, they will be the same ones that condition other cognitive abilities (Plomin and DeFries, 1998, p.20).

The 10 children in the current study group showed great creativity which was clearly shown in their different fields of interest and their aptitudes. For example:

- In the case of **A** (3 years 6 months): *"Starting from all his knowledge and the few films he had seen, he spent all the day imagining what a galactic warrior was whose laser had to destroy the mother ship AZ1350, because the space condenser and thousands of similar adventures. At other times he would be an archaeologist who was searching for the mummy of…etc.".*
- **B** (3 years and 9 months): *"He had no imaginary friends but he himself adopted different personalities: some days he got up as Tarzan, others his grandmother, others the letter /R/, etc. He invented names for the dolls and even everyday objects. He took on different personalities and often changed the identity of the objects and people around him".*
- **H** (8 years and 7 months): *"He liked to make comic stories by drawing them and to invent real things: for example, at 6 years and 5 months, one day with a remote control car, a rope, a knife, some books which held down the remote control and some other things, he arranged everything in such a way that, when a certain place was pressed, it was like a trap and the car crashed into you (it didn't always work because the knife was a little blunt and it didn't always cut the rope".*
- **F** (7 years and 1 month): *"He liked to invent stories very much. In his drawings he tried to reflect the real situation of the personages: the hair blown by the wind, candles behind windows, sweat on the face of people working, etc.".*
- **G** (8 years and 5 months): *"He dreamt of building his own house and car, etc. He knew the majority of the makes of car on the market, as well as their technical features and price. He was interested in knowing the prices of flats and houses, designing his own house and the layout, furnishing it, drawing up the plans, etc.".*

All intellectually gifted children are, in general, creative in their early years. As previously indicated, there is no real creativity without a high IQ of at least 120: below this level, the correlation decreases. But on what does it depend the fact that in their adolescence, maturity and professional life they become highly creative people? An answer to this question will be provided in the following section.

Personal, academic and social adaptation

Contrary to what might be supposed, the personal, academic, social and family adaptation within the current sample was good, with the exception of the two youngest children. They had difficulties adapting which could be observed both in the school environment as well as in their relations with their class mates. Completely inappropriate teaching methods were evident at that age. However, they were too young to (articulate their problems?), work out a solution to their problems and receive understanding.

For example, **A's** parents said while their son was valued: "*The big problem of the child of 3 years and 6 months was to adapt to the school because outside of it he related with anybody who understood him and dedicated time to his games and his books, but in the classroom, when he had of necessity to relate with those of his own age who didn't have the same level of language, concerns or emotional development, he was a loner and got bored painting all day and playing "stupid games" as he said. He didn't feel at ease, he didn't like fighting with the other children for balls and he didn't participate in any activity in which the winner was the strongest. The mental maturity of the child led him to accept with resignation that he had to be in class in the morning and he even claimed that "it was his work, I do it the same as you, why don't they pay me for it?". The worst of all was that he didn't have friends although he wanted to mix with the others. In class he didn't participate because as the children didn't sit still and that annoyed him, he preferred not to speak at all so as "not to add to the racket and understand even less. The teacher gives the class only to me because the others don't pay attention. But I already know all the things she says". The tendency of the children to laugh when they heard him say "strange things" had given him a certain complex of "they're laughing at*

me". He was happy to find out that it was possible to change to another class of older children where he could learn "interesting things" as he said (Benito, 1996).

When very young it would better to bring these children together as a homogeneous group at specific times in order for them to share with the rest of their highly able companions other educational activities, e.g., physical education and art., while other less able classmates are learning to read and learn other basic skills. This would help not only their cognitive development but also fundamentally their social and emotional development.

The rest of the children in the current study group showed good school and social adaptation. They maintained adequate relationships both with their classmates as well as with other children of different ages. Their psychological balance was good and they were distinguished by their notable maturity, energy, desire to shine, self-confidence, sense of responsibility and sociability. They had a natural influence on their school mates and five of the ten were very clearly leaders.

For example, **J's** mother (10 years and 1 month) described her son in the following way:

> *"My child has successfully cultivated friendships. He is well accepted and very rarely argues with his friends. He has no problems in dealing with people. He's very determined. When he wants to talk to somebody (authorities, sports person, etc.) he finds them and talks to them without being shy. He's independent and at times stubborn. He doesn't lie and prefers to be reprimanded".*

F (7 years and 1 month) was chosen in pre-school to direct the other children in the end of term show and to recite a poem with another child. He was then 4 years and 5 months old. At football he was always captain and frequently proposed games to his friends.

In Alonso and Benito's research it was observed that children aged between 6 and 10 are the most stable, mature and extroverted. It was noted that the higher the IQ level, the higher are the levels of academic and social adaptation, as can be seen in the following figures (Alonso and Benito, 1996, pp.109-115; Benito, 1996, pp.176-181):

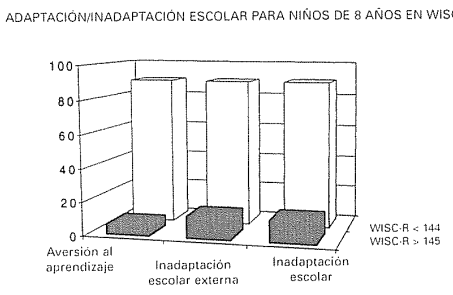


Gráfico 4. *Adaptación escolar para niños de 8 años en WISC-R*

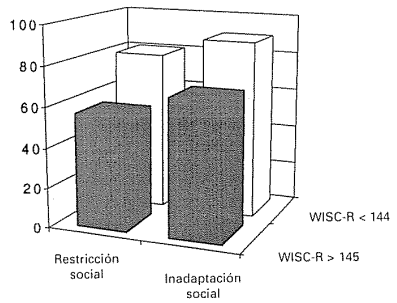
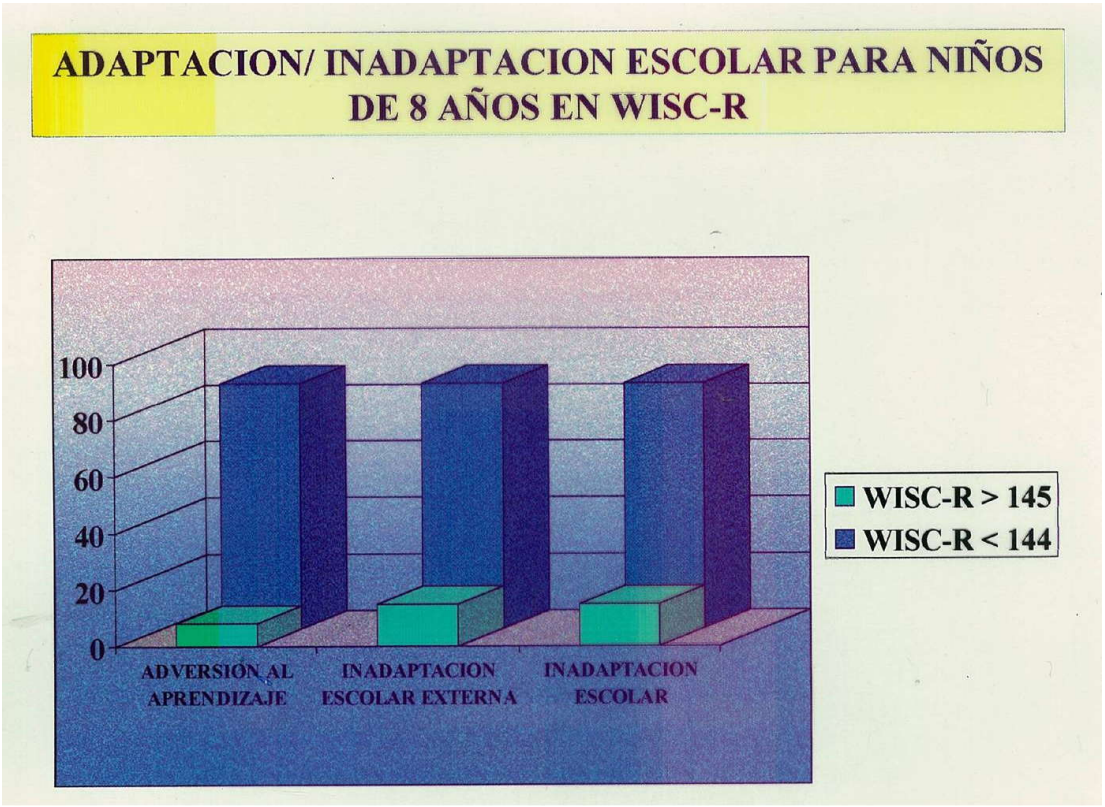


Gráfico 5. *Inadaptación social para niños de 8 años en WISC-R*

Figure 2: Levels of academic adaptation for 8 years old children on WISC-R.



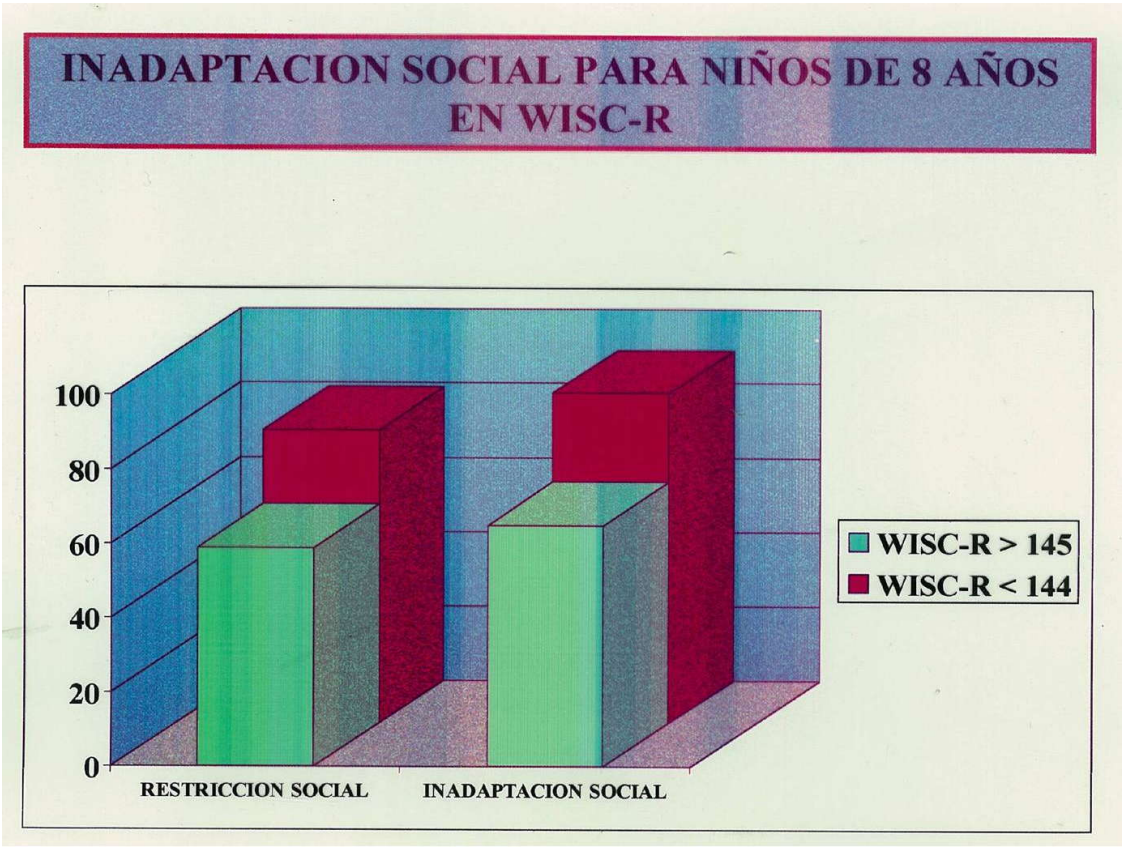


Figure 3: .Levels of social adaptation for 8 years old children on WISC-R.

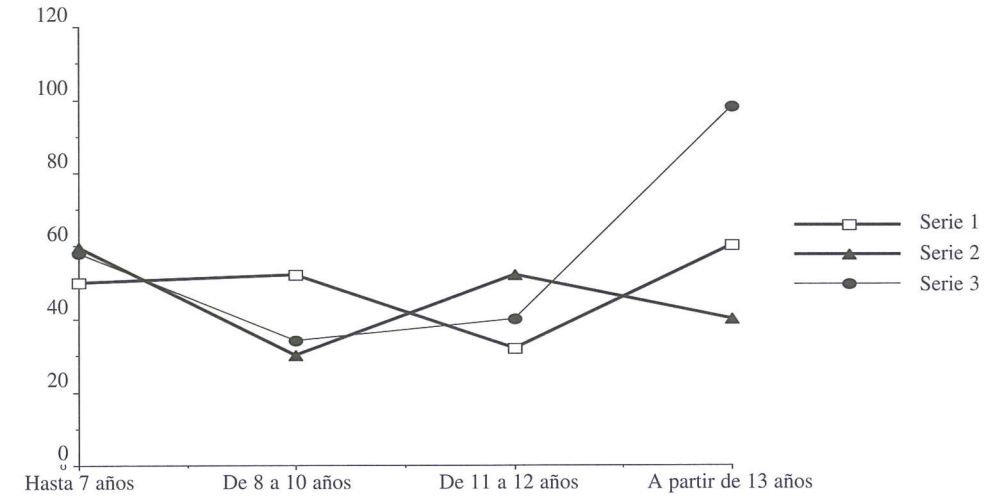


Figure 4: .Males' mean QI according age and giftedness level.

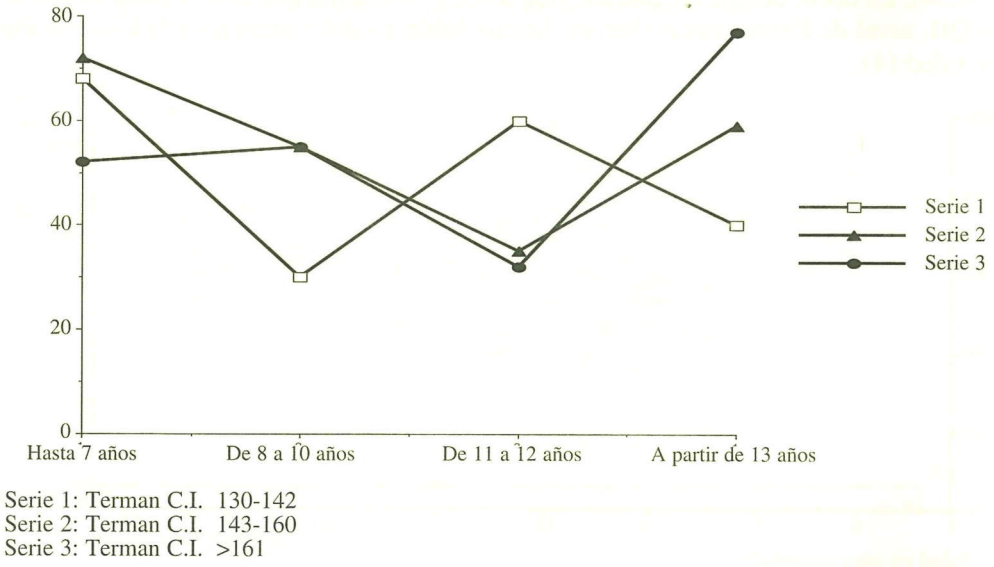


Figure 5: .Males' mean QII according age and giftedness level.

In this context, the Alonso and Benito's studies conducted, differ with each other. This is a consequence of the continuous confusion between the terms "highly gifted", "medium gifted" and "exceptionally gifted" and the different ages compared in the studies. (Alonso and Benito, 1996, pp.109-115; Benito, 1996, pp.176-181).

According to Terman (1925), the difficulties of social adaptation or merely social relations, for the most part, appear to manifest themselves in "ten-year-olds" in the exceptionally gifted 10 year old children. Terman said children whose IQ is extraordinarily high present a particularly serious problem. If their IQ is 180, their intellectual level at the age of 6 is 80% greater and corresponds to 11 years. When 10 or 11 years old, their intellectual level is close to that of a student finishing university studies. To compound the problem, their *physical development* may be no more than 11% greater and their *social development* no greater than 20-30%. The inevitable result of this

asynchrony is that the child must face and overcome very difficult problems in terms of social adaptation.

With this in mind, how is it possible for such a child to become a socially "normal" adult. The exceptionally gifted cannot expect the children of their equal mental age to accept them, since, although they know their games or pastimes, their physical aspect is too immature for them to find a natural place in the physically older group.

In adolescence, the whole internal situation becomes more complex when the biological impact of sexuality rears its head. Ajuriaguerra (1980, p.838) wrote:

> "Suddenly, all the internal forces which until then had been sublimated in "genius" resuscitate a new life in the struggle between the relations of objects and the narcissistic position of the "genius" and it is from this moment onwards when the decisive battle commences".

According to Hollingworth, their difficulties reflect the fact that "they do not resign themselves to accept silliness and madness". In consequence, the sensation of isolation which they experience may provoke a growing anguish in the face of social relations which must necessarily be established.

In contrast, children with an IQ of between 130 and 145 integrate much better into the social milieu at this age since starting at approximately 10 years of age their level of emotional stability and extroversion increases, although at the cost of a lower academic performance in the majority of instances (Benito, 1996).

It is obviously very difficult for all gifted pupils to successfully resolve the conflict between high performance and affiliation (the need to make friends) while establishing a correct balance between the two. Satisfaction comes with a resolution of this dilemma. Those able to reach a resolution are the autonomous adolescent students described by Betts and Niehart (1988). They are conscious of the resistance to high performance by their peers, but they do not allow this situation to deter the realization of their potential. They also establish circles of friends and usually get actively involved in school activities.

Students who achieve this balance in general show high self-esteem, confidence and satisfaction both within their group of companions as well as in their academic achievements.

Those who manage to resolve the conflict between high performance and affiliation are sure of their abilities and feel comfortable with their friends. They are very focused on their objectives and have their sights set on the future. The majority of the students who resolve this specific conflict are well balanced in their lives. At the same time as they stand out academically, they are usually involved in academic and social activities. The majority of the students have groups of friends from different circles (Clasen and Clasen, 1995, p.71).

J., a tenth grade student, is a good example:

> *"I had an average of 3.8 points and I was always among the first in the class and I was very popular with my schoolmates. I was the President of the Students´ Association and I was keen on the music band and the chorus. Through an organization of school services I used to visit an old peoples´ home once a week. I also gave my schoolmates private classes. I realized at once that my friends were negative about academic excellence, but I felt I could handle it. You need to have goals. I know what I want, and one of them is to go to university so I won't let other people stop me. But at the same time you have to be a mate. If I dedicate time to my friends and classmates in activities and social groups, they'll get to know me and see that I'm not a victim or strange. But if they don't like me…well, somebody will, I suppose".*

When considering children with the highest levels of intelligence it is the characteristics of temperament, motivation, socio-cultural circumstances and educational possibilities that best determine who manages to reach the top and who does not. The intellectually giftedness not necessary drives to the outcome, nor the outcome drives to the personality development.

Conclusion

Cox, in Colom (1995, p. 51) calculated IQs for some of the most important historical figures, were not extremely high: 200 IQ (Galton), 185 IQ (Goethe, Leibniz), 150 IQ (Mozart), 135 IQ (Newton) and 130 IQ (Kant, Napoleon, Darwin).

Interest in the personality of prominent persons, as well as the relationship between emotional stability and eminence, is not something new!

It is difficult to draw a line between normal and abnormal behavior. The context and the aim act as subjective registers throughout the continuum of acts and thoughts. An overall formulation of the relationship between eminence and emotional instability must include the degree and great variety of types of behavior which are features of exceptional human working. Stable and unstable individuals can be found in the categories of the eminent. It is probable that the key factor, from an evolutionary perspective, is the nature and emotional climate of the childhood home of the eminent person. (Yewchuk, 1995, p.53).

Mental illness does not imply a fixed state. Rothenberg (1990, p.160) points out that "no mental illness, not even the most serious, produces a uniform impact on all the aspects of human working or on all the segments of the life of a person…" The productive genius does not arise as a result of mental disorder, but rather in spite of it. Nevertheless, creative writers and poets can incorporate the experience of psychotic episodes into the content of their stories.

Simonton (1984) proposed the fascinating hypothesis that pathological behavior, rather than being a cause, could really be a consequence of achieving eminence, given that many eminent creators meet fierce opposition to their ideas on behalf of those who defend the status quo. He quotes Ignar Semmelweis as an example, who died in a mental institution after a nervous breakdown produced by the opposition to his argument that doctors should wash their hands before attending a birth in order to reduce the death rates caused by puerperal fever. The tension of being in disagreement with your own colleagues and social conventions can lead to psychiatric disorders (Yewchuk, 1995, p.54).

According to Simonton, the incidence of psychiatric disorders among eminent people is no greater than that present in the general public. The frequency of psychological pathology among the eminent population is 10%, approximately the same which appears among the general population. (Yewchuk, 1995, p.54).

The studies carried out up to the present on creative writers (Barron, 1992), architects (Dudek and Hall, 1992; MacKinnon, 1983), scientists (Eiduson, 1983; Roe 1983; Zuckerman, 1992) and mathematicians (Helson, 1983) offer a series of results which follow the psychological profile of eminence described by Cox**.** Although there are some differences between the different disciplines studied, taken together they show the professionals to be respected, independent, self-sufficient, open to experience, skeptical, socially distant and competitive (Yewchuk, 1995, p.53).

Eminent individuals normally begin their productive careers early. The majority produce their first professional work at about 20 years of age, although this varies, depending on the field. People of great eminence normally have very productive careers over a long period of time. Freud produced 330 publications in more than 45 years and Einstein 248 in over 53 years (Albert, 1992). Only individuals with a stable personality, a strong passion for a specific field, as well as an intense motivation to triumph possess the necessary persistence to achieve excellence at this level (Yewchuk, 1995, p.53).

The original objective of Terman consisted in describing both the social characteristics as well as the physical characteristics of a group of intellectually talented children. They were identified at a relatively early age and Terman demonstrated to his own satisfaction that the intellectually gifted youngsters were happier and healthier than children in general. Furthermore, they achieved high academic performances, they were frequently fast-tracked by the educational system and it seems they responded positively to this. Their professional success was

considerable as regards the professional level achieved and the monetary rewards.

From the point of view of Terman, the study supported his posture that intellectual ability evaluated by tests had a predictive value for academic and professional achievement. Although he was a fervent supporter of the metric IQ test for predicting achievement, he also demonstrated the importance of the variables of personality and motivation, both for achieving success as well as happiness (Hastorf, 1997).

Nevertheless, although they were very successful in their careers, none of the subjects identified by Terman achieved the degree of eminence of "genius". Following Albert, the appearance of an eminent person does not depend only on the level of intelligence: a series of specific circumstances must be present at the socio-cultural, intellectual and creative level as well as certain motivational, temperamental and specific personality characteristics - factors which, in their interaction, are very difficult to control (Albert, 1975).

It would be interesting to develop an all-embracing model which could explain why some people led creative lives and others, with a similar creative potential, did not. This model would be a considerable breakthrough, and not only theoretically desirable, but also relevant for using in the education of gifted and talented people, from a human perspective (Benito, 1992; Heller, 1995).

All things considered, the final objective is none other than to discover the special needs of the school children within the framework of diversity.

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