Gifted with dynamic intelligence test measures and normal with static intelligence test measures: what does it means?

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ABSTRACT
In the first part of this chapter, differences and similarities between static and dynamic measures of intelligence are presented and analysed. Static measures of intelligence are generally obtained by testing either a ratio of mental age to chronological age or a score of deviation from age norm. Dynamic measures of intelligence are generally obtained by administrating novel problem solving tasks to the subjects, supplying them with gradual and balanced assistance that progressively disclose the solution of the problem, and determining the amount of aid the learner needs to be able to solve the problem. The amount of aid is inversely proportional to the modifiability index. The modifiability index is the general propensity to change, and can better measure intelligence. In the second part of this chapter it is hypothesized that some subjects can obtain a normal score with static test measures and a giftedness score with dynamic test measures. Two experiments were conducted to examine the relationship between dynamic measures and static measures of intelligence in low socio-economic background subjects and in ADHD subjects. In the first experiment 24 subjects with either high (12) or low (12) level of socio-economic background were trained to master problem solving tests with dynamic and static measures of intelligence. In the second experiment 57 subjects, 10 with ADHD-IA, 10 with ADHD-HI, 10 with ADHD-C and 27 controls were trained to master problem solving tests with dynamic and static measures of intelligence. The results showed that subjects with ADHD-C and Controls scored similarly on dynamic and static measure, but subjects with ADHD-HI and subjects with a low level of socio-economic background had lower scores with static test measures and higher scores with dynamic test measures. Results are discussed in terms of their implications for intelligence tests.

Key words: dynamic measures, intelligence, potential, gifted, adhd
INTRODUCTION
Although definitions of human intelligence vary, the views of most theorists cluster around a few common perspectives. The most common is to think of intelligence as being the ability to successfully operate in an uncertain environment through learning and adapting based on experience (Legg & Hunter, 2006); another definition refers to intelligence as the ability to effectively adapt to the environment, either by changing oneself, changing the environment, or finding a new environment. In any case, intelligence is based upon cognitive processes, including perception, memory, reasoning, and problem-solving. Intelligence is not a single cognitive or mental process, but instead the combination of these processes that we use to adapt to our environment. Since it is related to the individual’s learning ability, the change processes, and the modifiability or plasticity of cognitive processes, it is based on a dynamic and not a static concept. In the first part of this chapter, static and dynamic measure of intelligence will be considered.

Static vs dynamic measures of intelligence
Static measures of intelligence are generally obtained by testing either a ratio of mental age to chronological age or a score of deviation from age norm. Dynamic measures of intelligence are generally obtained by administrating novel problem solving tasks to the subjects, supplying them with gradual and balanced assistance that progressively disclose the solution of the problem, and determining the amount of aid the learner needs to be able to solve the problem. The amount of aid is inversely proportional to the modifiability index. The modifiability index is the general propensity to change, and can better measure intelligence.

Static measure of intelligence
Intelligence tests come in many forms, and some tests use a single type of item or question. Most tests of this type yield both an overall score and individual subtest scores. Regardless of design, all IQ tests attempt to measure the same general intelligence. Their components tests are generally designed and selected because they are found to be predictive of later intellectual development, such as educational achievement. IQ also correlates with job performance, socioeconomic advancement, and social pathologies. Among intelligence tests, one test currently dominates the field: the Wechsler Intelligence Scale for Children Revised (WISC-R; Wechsler, 1974) and the Wechsler Adult Intelligence Scale (WAIS; Wechsler, 1974).

In recent years, new static measures of intelligence have been proposed. As Benson (2006) stated, since the 1970s intelligence researchers have been trying to preserve the usefulness of intelligence tests. They have done so in a number of ways, including updating the Wechsler Intelligence Scale for Children (WISC) and the Stanford-Binet Intelligence Scale so they better reflect the abilities of test-takers from diverse cultural and linguistic backgrounds. They have developed new, more sophisticated ways of creating, administering and interpreting those tests, and they have produced new theories and tests that broaden the concept of intelligence beyond its traditional boundaries. As a result, many of those biases identified by critics of intelligence testing have been reduced, and new tests are available that, unlike traditional intelligence tests are based on modern theories of brain function.

Examples of this new generation of static IQ tests are the K-ABC (Kaufman Assessment Battery for Children) and the KAIT (Kaufman Adolescent and Adult Intelligence Test) of Kaufman & Kaufman (1983; 1993). The Kaufman Assessment Battery for Children (K-ABC; Kaufman & Kaufman, 1983) measures the intelligence of 2½- to 12½-year-olds via the sequential-simultaneous processing model associated with the Luria-Das model (Das, Kirby, & Jar man, 1979; Luria, 1973) and cerebral specialization theory (Sperry, 1968). The KAIT (Kaufman Adolescent and Adult
Intelligence Test; Kaufman & Kaufman, 1993) assesses intelligence of individuals with ages ranging from 11 years to more than 85 years old and is based on the Cattell-Horn theory of fluid and crystallized intelligence (Horn & Cattell, 1966; 1967; Horn, 1985, 1989). Crystallized intelligence (Gc) corresponds to the type of problem solving that depends on schooling and is influenced by one's formal education and training, by reading books, magazines, and newspapers, and by watching television, and generally by participating fully in one's environment. Fluid intelligence (Gf) reflects the ability to solve new problems with adaptability and flexibility; the emphasis is on reasoning ability rather than visuospatial ability, and this type of intelligence can be tested both auditory and visually as well as verbally and nonverbally.

Also Das (2002; Das, Naglieri & Kirby, 1994) have developed the planning, attention, simultaneous, and successive (PASS) theory as an alternative to the conceptualization of intelligence as a general mental ability. Specifically the PASS theory refers to intelligence as composed of multiple interdependent cognitive processes. From this perspective follows the Das-Naglieri Cognitive Assessment System (CAS; Naglieri & Das, 1997) that measures the PASS processes. This test that can help educators to design interventions that will actually improve children's learning; that can distinguish between children with different conditions, such as a learning disability or attention deficit disorder; and that will accurately measure the abilities of children from different linguistic and cultural backgrounds.

So far, only single or dual factor tests have been considered. However, other theories oppose traditional methods that view intelligence as unitary, and perceive intelligence as multifaceted. For example Gardner's Multiple Intelligence Theory describes IQ as containing seven distinct domains. These domains include and can be defined as follows: Linguistic Intelligence is the ability to use language to excite, please, convince, stimulate or convey information; Logical-mathematical Intelligence is the ability to explore patterns, categories, and relationships by manipulating objects or symbols, and to experiment in a controlled orderly way; Spatial Intelligence is the ability to perceive and mentally manipulate a form or object, and to perceive and create tension, balance, and composition in a visual or spatial display; Musical Intelligence is the ability to enjoy, perform, or compose a musical piece; Bodily-kinaesthetic intelligence is the ability to use fine and gross motor skills in sports, the performing arts, or arts and craft production; Intrapersonal Intelligence is the ability to gain access to and understand one's inner feelings, dreams, and ideas; and Interpersonal Intelligence is the ability to get along and understand others. (Hatch & Gardner, 1988, cited in Viale 1999). This formulation has had little impact on testing, in part because the lack of quantitative factor-analytic studies that might validate the theory.

Also Sternberg (1995) has taken a more direct approach to changing the practice of testing. His Sternberg Triarchic Abilities Test (STAT) is a battery of multiple-choice questions that tap into the three independent aspects of intelligence —analytical, practical, and creative—each of which is itself divided into verbal, quantitative, and figural sections. The STAT test items differ from conventional test items in their emphasis on ability to learn rather than on what has been learnt. Some items are measured by learning from context. For example, verbal skill is measured by learning from context, not by vocabulary (which represents the product rather than the processes of learning). The STAT also measures skills for coping with novelty, whereby the examinee must imagine a hypothetical state of the world (such as cats being magnetic) and then reason as though this state of the world were true. Finally the STAT also measures practical abilities, such as reasoning about advertisements and political slogans, not just about decontextualized words or geometric forms. These are only a few of the differences that separate this test from its predecessors. However, the STAT is not immune to effects of prior learning, nor is it "culture-free." Sternberg suggests that it is impossible to create a test that is genuinely immune to effects of prior experience or that is culture-free, because intelligence cannot be tested outside the boundaries of a culture. Intelligence is always used in some context, and must be measured in some context. The test, however, seems broader and more comprehensive than other existing tests, and hence allows for more diversity in backgrounds than would be true of typical tests. Other reformers have
expressed more fundamental criticisms of traditional IQ measurement like Goleman (1995) who suggests that emotional intelligence (EQ) is more important than IQ.

According to Thorndike (1997), IQ tests have changed little since their inception. They are psychometrically more sophisticated, and have correlations with information processing theories but continue to include items that involve such activities as naming objects, recreating designs with patterned blocks and remembering numerical sequences (Elliot, 2003). However, researchers have come to recognise the many limitations in IQ measures; their tendency to lack an empirically supported theoretical framework (Flanagan & McGrew, 2000), the limited relationship between scores and instructional practices (Reschly, 1997), their emphasis upon products rather than psychological processes (Sternberg, 1995; Wagner & Sternberg, 1984), their tendency to linguistic and cultural bias (Lopez, 1997) and their inability to guide clinicians in deriving specific interventions for educational difficulties (Fuchs et al., 1987; McGrew, 1994).

Dynamic measures

Since the concept of intelligence is referred to as dynamic cognitive process and since the word “adapting” refers to a dynamic quality, a new perspective on the assessment of intelligence is through dynamic measures. For this reason dynamic measures of intelligence can better address dynamic and adaptive behaviour (Fabio, 2005; Sternberg, 2006).

As Elliot (2003) and Lidz and Elliott (2000) point out dynamic assessment is an umbrella term used to describe a heterogeneous range of approaches that are linked by a common element, c.f. instruction and feedback, that are built into the testing process and are differentiated on the basis of an individual’s performance. Thus the amount of assistance provided is directly contingent upon the testee’s performance and modifiability. In contrast, static measures require limited instruction, usually involving initial guidance, and contingent feedback from the tester is actively discouraged on the grounds that it will damage test standardisation. Behind this common ground there are some differences between leading proponents about core constructs, purposes, methodologies and implications (Sternberg & Grigorenko, 2002; Elliot, 2003).

In some dynamic testing models, a pretest–intervene–retest procedure is used to measure the breadth of the zone of proximal development. The procedure is based on the assumption that the best way to help a child learn is to explore the teaching strategies to which that child is most responsive (Berk, 2001). The theoretical foundations of dynamic measures are derived from the sociocultural theory of Vygotskij (1978)—in particular, the Zone of Proximal Development (ZPD) concept—and Feurstein’s Mediated Learning Experience (MLE; Feurstein et al., 1979). Vygotskij believed that a great deal of development was mediated by social interaction. The ZPD refers to the distance between the level of performance a child can reach unaided and the level of participation a child can accomplish when guided by someone more knowledgeable in that domain. Therefore, it refers to a range of tasks that the child cannot yet handle alone but can do with the help of more skilled partners (Vygotskij). As Campione, Brown, Ferrara, and Bryant (1984) have pointed out, the breadth of the zone varies across individuals and across domains of learning within an individual. For one child in a particular domain, the zone may be narrow, indicating that the child is not yet ready to master tasks beyond his or her unaided performance. For another child in the same domain or the same child in a different domain, the zone may be broader, suggesting that the child can perform at a higher level than the current performance indicates with the help of a more expert partner. Other researchers have found that the zone tends to be broader or narrower in a great variety of tasks (Fabio, 1999; Fabio, 2001; Fabio & Mancuso, 1995; Vygotskij, 1978).

Another way in which Vygotskij (1978) used the zone of proximal development was to test the child’s readiness, or intellectual maturity, in a specific domain (Brown & Campione, 1984). As such, he was using it as an individual-difference metric. He argued that if we measure the IQ of two children with the same chronological and mental age (8 years), then we cannot make assumptions on the course of their future mental development and school performance. On the contrary, if we consider their IQ measures as starting points and not as definite (static) measurements and we give
them new problems, then they will be able to handle problems above their starting level. If the children solve problems with adult assistance, and one child attains an IQ of a mental age of 9 years and the second child an IQ of a mental age of 12 years, then the difference between 9 and 8 or between 12 and 8 is the zone of proximal development. “It is the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under guidance of persons who know more” (Vygotskij, pp. 85–86). The other theoretical foundation of dynamic measures is the mediated learning experience, which describes a special quality of interaction between a learner and a person, whom we shall call a mediator. The function of a mediator is to observe how the learner approaches problem solving. The problem at hand is a ruse for the mediator to be able to observe the learner’s thinking process (Feuerstein, Rand, Hoffman, & Miller, 1980).

Dynamic tests used in this study

The dynamic tests that have been used in the present study come from balanced and standardized works on subjects of three different age level: 212 kindergarten children (mean age = 5 years 3 months; range 4 years 10 months to 5 years 11 months), 308 primary school children, (mean age = 8 years 2 months, range from 6 to 11 years) and 170 teenager (mean age = 18 years 7 months; range 17 years 10 months to 18 years 11 months) (Fabio & Mancuso, 1995; Fabio, 1999; Fabio, 2001; Fabio, 2003).

The rationale of these studies is that flexible access to information and transfer can be used as an index of plasticity and modifiability. As a consequence indexes of dynamic assessment measure problem solving ability in two phases:
- in the learning phase, when the subject faces new problem solving;
- in the transfer phase, when the subject generalises what he has learnt in the learning phase to new, more complex problem solving.

This type of measure consists of submitting the learners to more difficult problem solving that is more difficult than the level indicated by their basic ability, in supplying them with gradual and balanced assistance, progressively disclosing the solution of the problem submitted and determining the aid level adopted by the learner in solving the problem. The aid level is inversely proportional to the modifiability index.

In the following section some examples of dynamic tests used in the three age levels are presented: kindergarten, primary and secondary dynamic tests.

Kindergarten dynamic test

The test was applied to and standardized with kindergarten children (Fabio & Mancuso, 1995). In its final form consists of 16 items, 8 of which are related to the learning stage and 8 to the transfer stage. The latter contain the same problem solving rules as those in the learning stage plus one new rule that must interact with the other items in order for the child to be able to find the solution.

The items, derived from the piagetian’s theory about the cognitive stage, are the following:
1. conservation of length concept
2. conservation of liquid surface concept
3. simultaneity
4. conservation of substance and weight concept
5. class inclusion
6. transitivity
7. sequentiality
8. bi-univocal (one-to-one) correspondence.

The important focus in this approach to dynamic measures is the standardization of the step-by-step aids supplied to the child for problem solving. There are five identified steps to attain the solution.
of the problem. They range from the most generic attention to the most central one, where the child is taught how to solve the problem:

1. general attention advice: encouraging the child to a higher attention level;
2. selective attention aid: guiding the child’s analytical attention, preventing his making mistakes in task analysis;
3. aid in the presentation of the partial rule: containing a description of some of the rules leading to item solution;
4. aid in the presentation of the global rule: containing all the rules on which the solution of the item is based;
5. execution aid: the mediator teaches the child the strategy needed to attain the solution and helps him to make use of it operatively.

Once the correct solution of the first item was achieved, the same procedure was followed for all the other items: learning items first and then transfer ones. The mediator marked down how many aids had been requested by the child to achieve the correct solution and attributed relevant scores. Scores were established as the inverse of the number of aids required, i.e. when the child solved the task with 1 aid only, he was assigned 5 points; with 2 aids 4 points; with 3 aids 3 points, with 4 aids 2 points and with 5 aids 1 point. Summing up the scores in the learning stage we have the Learning Modifiability Index (LMI), summing up the scores in the transfer stage we have the Transfer Modifiability Index (TMI), the sum of the two indexes gives the General Modifiability Index (GMI: ranging from 16 to 80).

Examples of items are:

Learning item 1 and transfer item 1: conservation of length concept

Concerning the acknowledgement of length as an invariable value. In the test item sheet there are two trees having the same length and coincident ends. The examinee is told that they have the same length. Then another sheet is shown to him where the trees are no longer aligned. In the transfer item the child is shown a third sheet with three non-aligned strokes (length and colour are still the same). Each time the child is required to tell whether the strokes have the same length.

For example, the aid sequence in this transfer item is:

1. Pay attention; look well at the three trees;
2. Observe the length of the three trees;
3. Place the trees as if they were aligned;
4. Place them on the same line, the starting points are different; and they seem to have different length.
5. Examples.

Learning item 2 and transfer item 2: conservation of liquid surface concept

Concerning the acknowledgement of simultaneity of starting and ending of two dynamic processes. In the test item there is a sheet with a tap with three identical water pipes. Under the water pipes there are three different containers. The examinee is told that tap contains some water and that when it is opened water come down in the same quantity in all the three containers. In the test item the examinee is required to tell what of the containers will become full before. In the transfer items the tap has four identical water pipes. Under the water pipes there are three different types of containers. The examinee is required to tell what of the containers will become full before.
Primary School dynamic test

The test was standardized with primary school children (Fabio, 2001) in its final form contains 14 items, 7 items are related to the learning phase, 7 items to the transfer phase. The latter contain the same rules for problem solving as the items related to the learning phase plus a new rule that must interact with the others for the child to be able to find the solution. The items are as follows:

1. completion of a series of letters
2. completion of a series of numbers
3. completion of geometrical figures
4. perceptive difference
5. mental image superimposition
6. chain of words
7. simultaneous coordination of information.

After the first item is presented, the procedure of giving gradual and standardized aids begins. Once the correct solution of the first item had been achieved, the same procedure was followed for all the other items: learning items first and then transfer ones. The mediator marked down how many aids had been requested by the child to achieve the correct solution and attributed relevant scores. As in the kindergarten test, scores were inverted, i.e. when the child solved the task with 1 aid only, he was assigned 5 points; with 2 aids 4 points; with 3 aids 3 points, with 4 aids 2 points and with 5 aids 1 point. Summing up the scores in the learning stage we once more have the learning modifiability index (LMI), summing up the scores in the transfer stage we have the transfer modifiability index (TMI), the sum of the two indexes gives the general modifiability index (GMI: ranging from 14 to 70).

Examples of items are:
Learning item 2 and transfer item 2: completion of a series of numbers
The item is concerned with inductive reasoning in completing a series of numbers. In both stages of the test the child is given a sheet with some numbers: they are in groups of three and are placed one after the other according to a logical criterion. In the learning stage the series of three numbers follow this rule: the first and second figure increase by 1 unit, while the third one decreases by 1 unit. In the transfer stage the rule is: the first figure decreases by 2 units, while the second one increases by 1 and the third one by 2. The child must say in both stages which will be the numbers in the following series of three.

For example, the aid sequence in transfer item 2 was:
1. pay much attention to the relationship between the numbers;
2. the relationship between the numbers refers to the sequence of the series of three numbers;
3. inside each series of three numbers the first figure decreases by 2 units, look at the other two figures;
4. look at the other two figures: the second one increases by 1 unit while the third one increases by 2;
5. example.

Learning item 5 and transfer item 5
The item is concerned with the ability to mentally over impose images (Feuerstein, 1979). The child is given two sheets: in the first thee are eight different figures; in the second some of the precedent figures are over imposed to create a complex one. Specifically for learning item three images are over imposed, for transfer item four images are over imposed. The examinee is required to tell which one of the eight figures has to be over imposed both in the learning and in the transfer phase.

Insert here Figures 3, 4
Secondary School Dynamic Test
The test applied and standardized with teenagers (Fabio, 1999) in its final form consists of 12 items, 6 items refer to the learning stage and 6 items refer to the transfer stage. As in the previous tests, the same rules for problem solving in the learning stage apply also to the transfer stage, plus one new rule that must interact with the other items to allow the examinee to achieve the solution. The items are as follows:

1. deductive reasoning, conditional type;
2. deductive reasoning with crypto arithmetic problems;
3. inductive reasoning in completing a series of letters;
4. inductive reasoning in completing a series of numbers;
5. problem solving of a graphic-perceptive mathematic type;
6. problem solving of a graphic-perceptive type on the clock.

After the first item is presented, the procedure of giving gradual and standardized aids begins. Once the correct solution of the first item was achieved, the same procedure was followed for all the other items: learning items first and then transfer ones. The mediator marked down how many aids had been requested by the subject to achieve the correct solution and attributed relevant scores. Scores were established as the inverse of the total number of aids given, i.e. when the child solved the task with 1 aid only, he was assigned 5 points; with 2 aids 4 points; with 3 aids 3 points, with 4 aids 2 points and with 5 aids 1 point. Summing up the scores in the learning stage we have the learning modifiability index (LMI), summing up the scores in the transfer stage we have the transfer modifiability index (TMI), the sum of the two indexes gives the general modifiability index (GMI: ranging from 12 to 60).

Examples of items are:
Learning item 1 and transfer item 1: deductive conditional reasoning
It consists of the following sentence, “If there is the book, then the triangle is there, too,” followed by four questions:
There is the book, what follows?
The book is not there, what follows?
There is the triangle, what follows?
The triangle is not there, what follows?
In this case the possible answers are: 1) It’s there, 2) It’s not there, 3) no conclusion can be made.

The sequence of the five suggestions leading to the solution of the conditional assertion was:

1. Pay much attention to the relation contained in the sentence.
2. The relation only tells you that if the book is there then also the triangle is there. Not the other way round.
3. There might be other objects too, for example, a table or a square and the triangle.
4. It could be that the book is not there and nonetheless the triangle may or may not be there.
5. Since it is implied in the relation that if there is the book then the triangle is there, other objects might also be present and amongst them the triangle. The answers to this problem are: 1) the triangle is there; 2) nothing can be said about the triangle; 3) nothing can be said about the book; 4) the book is not there.

Learning item 5 and transfer item 5: problem solving of a graphic-perceptive mathematic type
The item is concerned with inductive reasoning in completing a graphic-perceptive mathematic type problem. The subject is presented a series of squares that contain some arrows with specific directions. In the test item the examinee is required to tell which (if one) arrow has to be put in the last square. In the transfer item the examinee is required to make the same thing, but he has to reason with a higher number of squares.

Insert here Figures 5, 6
In a recent work Fabio (2005) studied the validity and reliability of dynamic measures related to the tests presented above. The aims that were addressed in that study were: 1. to evaluate whether the modifiability index was specific in the various contexts or whether it could be considered as a general ability to learn and transfer. Because the tests propose several items outlining various types of logical processes, it was important to determine whether there was coherence within the test, that is, whether it was possible to find similar results in the modifiability indexes of the various items; 2. to investigate the validity of dynamic measures in relation to various indexes: the correlations between dynamic testing and some cognitive variables such as the level of selective attention, the global attention level, and overall school performances in language and mathematics; 3. to point out the relationship between dynamic testing and static testing. Three studies investigated the relationship between dynamic measures and the following factors: a) static measures of intelligence (Raven Test, D48) and b) codifying speed, codifying accuracy and school performance. The three studies examined kindergarten children (N=150), primary school children (N=287) and young adult students (N=198) who were trained to master problem solving tests with dynamic measures of intelligence. Static measures of intelligence, codifying speed, codifying accuracy and school performance measures were included in all the studies. Results showed that internal coherence indexes, measured with Cronbach Alpha, were very high. Such data, which have been confirmed in the three age groups, suggest that there is a single latent ability in the performance of the various tasks that can be seen as a general propensity to change. With reference to the correlations between dynamic testing and some cognitive variables such as selective attention level, global attention level (as evaluated by the teacher) and school performances in language and mathematics, the individuals with high modifiability indexes showed higher global attention level (as measure evaluated by the teachers), their codification systems were faster (positive correlation between correct answers in selective attention and index of General Modifiability) and more accurate (negative correlation with omitted answers). These individuals also showed a higher level of school performance. The static indexes of I.Q. were also correlated with the above mentioned cognitive variables, but to a lesser extent, and they were not correlated with the accuracy of codification.

The results regarding the correlation with the various cognitive variables can be seen as the indexes of the external validity of dynamic testing. Through these studies we have come to believe that dynamic indexes, although partially correlated to static ones, are qualitatively superior to the latter since they are capable of measuring a concept that is closer to the definition of intelligence as adaptability or modifiability.

Finally, dynamic testing proved to be only partially correlated with static testing. The correlation coefficients between the scores obtained with static testing (Raven Matrices) and dynamic indexes were \( r(150) = .58, p < .01 \), \( r(287) = .48, p < .01 \) and \( r(190) = .48, p < .01 \), respectively for kindergarten children, primary school children and teenagers. Figures 10, 11, 12 show these correlations in a more analytical way.

For the definition of static testing categories we took into account the subjects who had achieved the worst (13%) and the best (13%) scores, in the Raven Matrices test. Subjects who had the worst scores and were defined as children with “low static measures”, those who achieved standard scores were defined as subjects with “medium static measures” while those with best scores were defined as having “high static measures”. In the same way, to define low and high dynamic indexes we found those who had achieved the worst (13%) and the best (13%) performance in the modifiability indexes. The percentage of individuals in each category is presented in the figures shown below. These results show that subjects with “low static measures” lack high modifiability indexes, while most of the children with “high static measures” show high modifiability indexes and only a small little percentage of them show a low modifiability indexes.

By combining static and dynamic testing the following profiles emerge:
1. individuals with low static indexes and a low or medium modifiability level
2. individuals with medium static indexes and a low, medium or high modifiability level
3. individuals with high static indexes and a medium or high modifiability level. In the present work we are particularly interested in understanding the nature of the subjects that come into the joint classes of lower static measures and higher dynamic measures (see fig. 10, 11, 12).

Rationale of the present study

The enhanced subjects of the figures 10, 11 and 12 with lower static indexes and a higher modifiability level are those who perform poorly when left on their own and often perform substantially better when given appropriate instructional intervention; conceptually it may be that the measurement of the ‘product’ flowing into the static index is likely to include the dynamic type index, i.e. the changing capability of the individual. However these subjects show high latent abilities and expertise that more conventional measures fail to tap. It may be that subjects are underestimated (like the underachievers). This underestimate may come from two lines: from low socio-economic background subjects and from ADHD subjects.

For the first group, the rationale is that dynamic measures can add predictive information because instructed tasks are somewhat beyond the learner's competence, hence, requiring modification of existing knowledge or skills dynamic indexes of intelligence, and so are not related to low sociocultural background.

Low-socioeconomic status children may demonstrate a large difference between actual and potential development (Missiuna & Samuels, 1989). They can perform poorly on static measures but better on dynamic measures. Because cognitive modifiability indexes measure the potential intelligence of the individual, the influence of an individual’s sociocultural background may not be significant at all (Tzuriel & Kaufman, 1999). Also Vialle (1999) notes the under representation of disadvantaged students in educationally gifted programs and suggests the cause of this under representation of disadvantaged students lies in the traditional approach, whereby a narrow set of identification procedures—usually an IQ test—is used to identify gifted students who are then placed in a program that may or may not be specifically designed to meet their intellectual strengths.

For the second group the rationale is that static measures of intelligence, because they reveal the product of learning and not the process, may underestimate gifted ADHD students. Disruptive behaviours of gifted ADHD students can emerge and fail to see indicators of high ability. Some studies (Kalbfleisch, 2000; Kaufmann, Kalbfleisch, & Castellanos, 2000; Moon, 2001; Moon, Zentall, Grskovic, Hall, & Stormant, 2001; Zentall, Moon, Hall, & Grskovic, 2001; Moon, 2002) suggest that identified gifted ADHD children are more impaired than other ADHD children, suggesting the possibility that we are missing gifted children with milder forms of ADHD and that high ability can mask ADHD, and attention deficits and impulsivity tend to depress the test scores as well as the high academic performance that many schools rely on to identify giftedness. Hyperactive is a word often used to describe gifted children as well as children with ADHD. As with attention span, children with ADHD have a high activity level, but this activity level is often found across situations (Barkley, 1997). A large proportion of gifted children are highly active too. As many as one-fourth may require less sleep; however, their activity is generally focused and directed (Clark, 1992; Webb, Meckstroth, & Tolan, 1982), in contrast to the behaviour of children with ADHD. Bright children are referred to psychologists or paediatricians because they exhibited certain behaviours (e.g., restlessness, inattention, impulsivity, high activity level, day-dreaming) commonly associated with a diagnosis of ADHD.

First study

As expressed above children who perform similarly on static pretests sometimes respond quite differently to instruction (e.g., Brown & Barclay, 1976; Brown, Campione, & Barclay, 1979; Vygotsky, 1978), suggesting that dynamic measures can provide information over and above that
available from static tests. May be that dynamic measures more consistently tap fluid abilities, whereas many static tests tend to tap primarily crystallized ability (Lohman, 1993).

Hypotheses

The prediction is that children with low socioeconomic status perform worse in static intelligence measures than children with high socioeconomic status, but they perform equally well on dynamic measures of intelligence with respect to children with high socioeconomic status.

Method
Participants
24 subjects with either high (12) or low (12) level of socio-economic background. The descriptive characteristics of the sample are provided in Table I. Socioeconomic status was assessed using the Duncan Socioeconomic Index (SEI; Duncan 1961; Stevens & Cho, 1985; Lynch & Kaplan, 2000). The ethnic composition of the overall sample was 100% White. The participants in this study were selected from a database containing 210 children attending public primary schools in a district in Lombardy (Italy). All girls and boys were eligible for inclusion in this study, no child had a history of brain damage, epilepsy, psychosis or anxiety disorder.

Procedure
Participants were assessed during school lessons. Static I.Q. was assessed using the WISC-R for each subject, in a silent classroom. The dynamic test applied and standardized with primary school children (Fabio, 2001) was also administered. Description of the procedure was as described above. Parents completed consent forms prior to participation in the study.

Results
The aim of the study was to identify the influence of the ‘socio-cultural background’ variable on dynamic testing. Table 2 show means, standard deviations and statistical significance related to each scale and subscales of static and dynamic measures.

The results showed that subjects with a low level of socio-economic background had lower scores with static test measures than subjects with high socio-economic background. Considering dynamic test measures, subjects with a low level of socio-economic background had the same scores of subjects with high socio-economic background. The socio-cultural background was not significant with respect to dynamic measures, but it was significant in relation to static ones. This is in agreement with the results of previous studies on dynamic indexes and once again stresses the fact that dynamic indexes measure something different about the culture of an individual, they measure his propensity to change (Tzuriel, 1997; Tzuriel & Kaufman, 1999).

Second study
As described in the rationale of the two studies, the second one was related to one particular category of subjects that may be underestimated in cognitive functioning: ADHD. The Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV; APA, 1994) defines ADHD based on elevations of two separate but correlated symptom dimensions, those of inattention (IA) and hyperactivity/impulsivity (H/I). Children meet criteria for the disorder by having six or more symptoms of either IA or of H/I, or both. Hence, DSM-IV describes three diagnostic subtypes of
ADHD based on differential elevations of symptoms on these two dimensions. The first is Predominantly Inattentive subtype (ADHD-IA), in which children have six or more symptoms of IA but fewer than six symptoms of H/I, the second is Predominantly Hyperactive/Impulsive subtype (ADHD-HI), in which children have six or more symptoms of H/I but fewer than six symptoms of IA, and the third is Combined subtype (ADHD-C), in which children show elevations of six or more symptoms on both dimensions. Sets of symptoms are diagnosed with ADHD, combined type (ADHD-C). The combined type group is the most common, occurring in 61% of identified cases compared to 30% for the inattentive type and 9% for the hyperactive impulsive type. It is possible that the dimensions of IA and H/I are each associated with unique neuropsychological impairments. For instance, as Barkley (1997) proposes and some previous studies support, the dimension of H/I may be associated with deficits in behavioral inhibition. In contrast, some studies suggest that the dimension of IA may be associated with general deficits in processing speed and vigilance. Characteristics of ADHD that are similar (or overlap) with giftedness are as follows:

Behaviors Associated with ADHD (Barkley, 1997)

1. Poorly sustained attention in almost all situations
2. Diminished persistence on tasks not having immediate consequences
3. Impulsivity, poor delay of gratification
4. Impaired adherence to commands to regulate or inhibit behavior in social contexts
5. More active, restless than normal children
6. Difficulty adhering to rules and regulations

Behaviors Associated with Giftedness (Webb, 1993)

1. Poor attention, boredom, daydreaming in specific situations
2. Low tolerance for persistence on tasks that seem irrelevant
3. Judgment lags behind development of intellect
4. Intensity may lead to power struggles with authorities
5. High activity level; may need less sleep
6. Questions rules, customs and traditions

Particular characteristics of ADHD-HI, such as boredom, high activity level, low lack of attention are mainly associated with gifted children.

Hypotheses

The prediction is that children with ADHD-C can show similar results on static and dynamic measures of intelligence, ADHD-HI will have similar results on static measure but may exhibit giftedness results dynamic measures of intelligence.

Method

Participants

The descriptive characteristics of the sample are provided in Table 3. All the subjects of the groups did not differ in socioeconomic status or ethnicity; the ethnic composition of the overall sample was 100% White. The participants in this study were selected from a database containing 1020 children attending public primary schools in a district in Lombardy (Italy). All 1020 9- and 10- year girls and boys were eligible for inclusion in this study, no child had a history of brain damage, epilepsy, psychosis or anxiety disorder.
The final sample included 57 children, 10 with ADHD-IA (3 female, 7 males), 10 with ADHD-HI (1 female, 9 males), 10 with ADHD-C (1 female, 9 males), and 27 controls children (8 female, 19 males).

Children belonging to these groups were tested for ADHD using an Italian version of parents’ interview, the Deficit Attention Parent Scale (SDAG) and an Italian version of teachers interview, the Deficit Attention Teacher Scale (SDAI), of Marzocchi and Cornoldi (2000), following DSM-IV (APA, 1994) criteria. The Deficit Attention Teacher Scale (SDAI) is composed of 18 items, corresponding to the symptom domain of ADHD, as described in the DSM-IV (APA, 1994). The items provide an ADD index: nine of them overlap with the hyperactivity index (even items) and nine overlap with distractibility or attention problems (odd items). Inclusion in the clinical group was based also on clinical assessment by a specialized psychologist. Children with symptoms of ADHD were included in the ADHD group, whilst children with symptoms of Conduct Disorder (CD) or ADHD with Oppositional Deviant Disorder (ODD) were excluded to maintain a more homogeneous subject population. In order to confirm this diagnosis, the Italian version of Disruptive Behaviour Disorder Rating Scale (SCOD) of Marzocchi, Oosterlaan, De Meo, Di Pietro, Pezzica, Cavolina, Sergeant & Zuddas (2001), was completed by parents and teachers. On the bases of the number of symptoms recorded in the SCOD - the psychologist used the six symptoms criterion to decide whether the child had a disorder which was pervasive (both at school and at home) and chronic (over 6 months period disorder). Children were categorized as ADHD-HI if they had six or more symptoms of H/I but fewer than six symptoms of IA; as ADHD-C if they showed elevations of six or more symptoms on both dimensions IA and H/I; and as ADHD-IA if they showed elevations of six or more symptoms of IA and fewer than six symptoms of H/I. The groups were matched for gender and for age. Control children were recruited from the same school of the two clinical groups. Demographic and clinical characteristics of ADHD and control children are summarized in Table 3.

----------------------------------------------Insert here table 3--------------------------------------------

**Procedure**

Participants were assessed during school lessons. Parents completed consent forms prior to participation in the study. The IQ measure was administered by WISC-R for each subject, in a silent classroom. The dynamic test applied and standardized with primary school children (Fabio, 2001) was also administered. Description of the procedure for presentation of the dynamic test can be found above.

**Data Analyses**

One way ANOVA with “subjects” (ADHD-IA, ADHD-HI, ADHD-C and Controls) as independent variable. The dependent variables were the measures derived from static and dynamic general scale and subscales. Post hoc t-test were used to make paired comparisons of the groups.

**Results**

Table 4 show means, standard deviations and statistical significance related to each scale and subscale of static and dynamic measures.

----------------------------------------------Insert here table 4--------------------------------------------

The results showed that subjects with ADHD had lower scores (subtype IA and C) with static test measures than controls. Considering dynamic test measures, subjects with ADHD had the same scores as controls subjects. In the case of ADHD-HI subjects scored better than controls. With reference to static measure they present just one S.D.’s over the medium(100 ± 15), but with
reference to dynamic measures they present two S.D.’s over the medium (48.4 ± 9.3), showing giftness.
Although this is beyond the aim of this study, it is interesting to note that static results of ADHD-IA were the worse. The reason may be that subjects with ADHD-IA had very high level of comorbidity with learning disabilities and this can result in low static measures. In any case, dynamic measure of these subjects become normal.

CONCLUSION
Dynamic testing reduces the possibility that a child who can profit from instruction mediation is denied opportunities to learn because of a poor score on a static assessment. On the other hand, children who perform similarly on static pretests sometimes respond quite differently to instruction (e.g., Brown & Barclay, 1976; Brown, Campione, & Barclay, 1979; Vygotsky, 1978), suggesting that dynamic measures can provide information over and above that available from static tests. Perhaps dynamic measures add predictive information because instructed tasks are somewhat beyond the learner's competence and, hence, require modification of existing knowledge or skills. The present results are emphasizing two important issues: the first one is that they don’t discriminate against minorities and individuals whose backgrounds are not middle and upper-middle class; the second one is that dynamic measures are able to underline subjects with latent giftness like the subjects that lie in the overlapping area between ADHD-HI and giftness. Returning to the title of this work “Gifted with dynamic intelligence test measures and normal with static intelligence test measures: what does it mean?”, the reply may be that the meaning lies in the possibility that dynamic assessment better measure intelligence.

REFERENCES


