A study on different forms of intelligence in Indian school-going children

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ABSTRACT

Introduction: Most definitions of intelligence focus on capabilities that are relevant to scholastic performances. However, there are seven forms of intelligences. There is a lack of data on multiple intelligences in Indian children. Hence, this study was conducted to assess different forms of intelligences in students and compared these diverse intelligences with intelligence quotient (IQ) scores. Materials and Methods: In this cross-sectional observational study, we recruited 1065 school children between the age of 12 and 16 years from two government and 13 private schools in five towns, six cities, and two villages across India. All the children were administered multiple intelligences questionnaire by Armstrong, consisting of thirty true/false types of questions to assess the intelligences of a child in seven domains including linguistic skills, logical/mathematical abilities, musical skills, spatial intelligence, bodily-kinesthetic skills, intrapersonal intelligence, and interpersonal intelligence. IQ scores were assessed by Ravens Standard Progressive Matrices. Results: We found that different students possessed different forms of intelligences and most students had more than one forms of intelligence. Of seven forms of intelligence, only three forms of intelligence such as logical/mathematical, musical, and spatial were positively correlated with the IQ score. Conclusions: Even in the children with low IQ, many students had other forms of intelligences. The IQ scores correlated with only logical/mathematical, spatial, and musical intelligence. Hence, tapping the intelligences of students can help enhance their learning process. Our curriculum should have an amalgamation of teaching for all kinds of intelligences for maximum productivity.

Keywords: Children, intelligence, intelligence quotient scores, multiple intelligences

Intelligence involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly, and learn from experience. Rather it reflects a broader and deeper capability for comprehending our surroundings. Most definitions of intelligence focus on the capacities that are important for success in school. While problem-solving is recognized as a crucial component of intelligence, but the ability to fashion a product to write a symphony, execute a painting, stage a play, buildup and manage an organization, and carry out an experiment is not included, presumably because the aforementioned capacities cannot be probed adequately in short-answer tests. These days literature has brought up newer theories on intelligence, which encompass more features than just linguistic or logical-mathematical abilities.

Based on neuropsychological as well as psychometric evidences, Gardner proposed the most acceptable theory of multiple intelligences including the development of cognitive capacities in normal individuals, the breakdown of cognitive capacities under various kinds of organic pathology, the existence of abilities in “special populations” such as prodigies, autistic individuals, savants, and learning-disabled children. While Gardner’s described six types of intelligences, there however are nine known intelligences at present including (i) linguistic, (ii) spatial, (iii) logical, (iv) interpersonal, (v) intrapersonal,
Multiple intelligence theory proposes that each person has capacities in all nine intelligences. Virtually, everyone has the capacity to develop all nine intelligences to a reasonably high level of performance if given the appropriate encouragement, enrichment, and instructions. The different virtues of intelligence usually work together in complex ways and interact with each other. Mere proposal of these theories is not fruitful, but their implementation is crucial for developing human cognitive ability and productivity at their best. Teaching that incorporates the various aspects of intelligence increases academic performance relative to conventional teaching, so it needs to be implemented. Studies done in various parts of the world have proved that using this technique of teaching has resulted in greater success rates. It is of particular importance in those with learning abilities and in gifted individuals.

There is a lack of data on multiple intelligence in Indian children; hence we conducted a study to assess the different forms of intelligences in students and compared these diverse intelligences with the intelligence quotient (IQ) scores to help understand the importance of multiple intelligences in our setup.

**MATERIALS AND METHODS**

The study was approved by the Institutional Review Board.

**Subjects and methods**

**Subjects and recruitment process**

In a cross-sectional observational study, we recruited 1200 school children between the age of 12 and 16 years from two government and 13 private schools in five towns, six cities, and two villages across India. Out of the 1200 students, only 1065 submitted completed forms. Hence, our sample size is 1065. Children <12 years and more than 16 years, children with learning disabilities, children with any mental handicap, and those not willing to participate in the study were excluded from the study.

The schools for inclusion in this study were selected randomly and both government and private schools were selected. Permission from the school authorities was taken for administering the questionnaire of the students, and they were explained in detail the procedure and the implications of the study. The classroom was chosen randomly, and from classes, students were selected according to the inclusion and exclusion criteria mentioned above. Demographic characteristics of each participant such as age and gender were recorded.

**Interviewer**

The data were collected by medical students. They were trained to explain the test, note down the correct duration, and to score the test.

**Multiple intelligences questionnaire**

A questionnaire by Armstrong, consisting of thirty true/false types of questions to assess the intelligences of a child was used in this study [Appendix 1]. This questionnaire is well established and accepted for the assessment of multiple intelligences in accordance with the theory of Multiple Intelligences by Howard Gardner.

**Translation of the questionnaire**

The questionnaire was made in English and translated into Hindi without any loss of meaning of the questionnaire during translation. The participants were administered the questionnaire as per the choice of the participants.

**Assessment of intelligence quotient**

For the assessment of IQ scores, Raven’s Standard Progressive Matrices were used. It is a multiple-choice type of a questionnaire consisting of sixty questions. There is no language barrier in this test as it uses just figures. Hence, no translation was required.

**Administration of the questionnaire**

The eligible participants were made up to fill up the multiple intelligences questionnaire first. Thereafter, they were asked to solve the Ravens test and the time in which they completed that test was also noted.

**Calculation of different forms of intelligence**

Each true response was awarded 1 point and false response was awarded 0 point. A score of 4 points in questions pertaining to linguistic, logical/mathematical, musical, spatial, or bodily-kinesthetic intelligences indicated a strong ability in that category, whereas a score of 1 or more in intrapersonal or interpersonal categories indicated abilities in these as well. A person may have multiple types of intelligences.

**Calculation of the intelligence quotient**

An approximate IQ score was calculated using the score on the Ravens test. IQ scores were divided into three groups: below normal IQ (0–79), normal IQ (80–119), and high IQ (above 120).

**Statistical analysis**

The data were analyzed using IBM SPSS package for Microsoft Windows Version 22.0 (Armonk, NY:IBM
We calculated the percentage of students in each IQ group and percentage of students having different forms of intelligence. Qualitative data were analyzed using Chi-square test. \( P < 0.05 \) was considered statistically significant.

### RESULTS

**Demographic details of students**
The age group of the students was between 12 and 16 years. The mean age of the 1065 students was 14.1 ± 1.3 standard deviation years and 596 (56.1%) were males. No significant gender difference was noted in any of the intelligence domains.

**Distribution of linguistic intelligence in children with low, normal, and high intelligence quotient**
Of 1065 students, 584 (54.8%) students had a linguistic form of intelligence. Interestingly, 238 students with low IQ possessed a linguistic form of intelligence. There was no difference in the presence of linguistic form of intelligence in children having either low, normal, or high IQ \((P = 0.059)\) [Table 1].

**Logical/mathematical intelligence in children with low, normal, and high intelligence quotient**
Of 1065 students, approximately half of the students (508, 52.3%) possessed logical/mathematical form of ability. Furthermore, a higher number of children with high IQ were logically/mathematically more intelligent than those with low IQ (58.3% vs. 32.4%; \( P = 0.001 \)). There was a very strong association between IQ and logical/mathematical intelligence [Table 1].

**Musical intelligence in children with low, normal, and high intelligence quotient**
Of 1065 students, 615 (57.7%) students had a musical form of intelligence. A higher number of children with high IQ group had a musical form of intelligence compared to those with low IQ (69.3% vs. 44.5%; \( P = 0.001 \)) [Table 1].

**Spatial intelligence in children with low, normal, and high intelligence quotient**
Only 375 (35.2%) students had spatial intelligence. A significantly higher number of children with high IQ had spatial intelligence, in comparison to that with low IQ (123 [75.5%] vs. 100 [42%]; \( P = 0.002 \)). This observation signifies an association between level of IQ and the spatial domain of intelligence [Table 1].

**Bodily/kinesthetic intelligence children with low, normal, and high intelligence quotient**
Of 1065 students, only 394 (37%) students had bodily-kinesthetic intelligence. There was no significant difference in the bodily-kinesthetic intelligence among children having either low IQ or high IQ (30.7% vs. 42.4%; \( P = 0.053 \)) [Table 1].

**Intrapersonal intelligence in different children with low, normal, and high intelligence quotient**
Majority (961, 90.2%) of children had intrapersonal intelligence, and there was no significant difference in the intrapersonal intelligence between children with low IQ and high IQ \((P = 0.261)\) [Table 1].

**Distribution of interpersonal intelligence in different intelligence quotient groups**
More than 95% children (96.2%) possessed interpersonal intelligence, and interpersonal intelligence was present almost equally in children with low, normal, or high IQ \((P = 0.611)\) [Table 1].

### DISCUSSION

In this study involving 1065 students, we found that an individual person can possess various forms of intelligence, and IQ measures just one part of it. Only some forms of intelligence are correlated with IQ scores while some are not at all related to it. Out of these nine forms of intelligence, only two are positively correlated to IQ score because IQ tests measure only logical/mathematical part and spatial part of our intelligence.

Studies have shown that IQ also has an association with music. Children who undergo musical training have better verbal memory, second language pronunciation accuracy, reading ability, and executive functions.\[^{15}\] Some IQ tests also measure linguistic part of intelligence. However, no IQ test can objectively measure all different aspects of intelligence and thus IQ tests are not a very effective method for assessment of overall intelligence.

In our study, we observed that almost half of children possessed linguistic skills. They had an ability and interest in writing projects such as poems, stories, books, or...
letters. Children with linguistic skills are good at oral communication, memorization, and description. They analyze and organize information in written form. Teaching these students by tapping this intelligence can make their productivity better.

Over 50% of the students in this study had logical/mathematical form of intelligence. For these students, organization, problem-solving and logical reasoning, mathematical operations, and science experiments can be used to improve their learning.

Furthermore, more than 50% of the students had musical abilities. For teaching them, rhymes and melodies can be incorporated into the curriculum. About 35% of the students had spatial intelligence. Using three-dimensional models, crafts, paintings, etc., can help them learn better.

Bodily-kinesthetic intelligence was present in almost 40% of the students. Students with bodily-kinesthetic intelligence have an ability to move the whole body for physical activities such as balancing, coordination, and sports. They can also use their bodies in expressive, rhythmical, and imitative ways. They can also use their hands with dexterity for finer works. Hence, adding activities such as drama and dance in their curriculum can help them learn better.

Over 90% of the students had intrapersonal form of intelligence. They were aware of their own ideas, abilities; and personal decision-making skills. They can regulate their feelings, moods, and emotional responses. Hence, using introspection as a method in teaching can be used for people having intrapersonal form of intelligence.

More than 95% of the students had interpersonal form of intelligence. They are sensitive to other people’s moods, feelings, and point of view and get along with others. They also take a leadership role. Brainstorming ideas and discussing that day’s topic collaboratively are a way to tap their intelligence.

Hence, to educate students, all these different forms of intelligence should be kept in mind and should be used to provide students with a wholesome education. Every student should be allowed to nurture to his full potential through her/his own unique way of learning. The curriculum should include all these forms of teaching to cater to the needs of each and everyone.[19,20] Many studies have shown these methods to be more effective than traditional teaching, especially in those with leaning abilities and in gifted individuals.[17-22]

While the present study is the first study to assess multiple intelligences in Indian school-going children, there, however, are certain limitations of the study also. The questionnaire used in this study measured the intelligences in a subjective manner. The different intelligences would be more suitable if applied to preschool and early school children when they are still developing their learning styles. The IQ test that we used was a figure analogy test that basically tested only logical/mathematical and spatial components of intelligence, not linguistic like some other tests.

CONCLUSIONS

The present study including 1065 students showed that different students possessed different forms of intelligences. Most students had more than one forms of intelligence. The IQ scores correlated with only logical/mathematical, spatial, and musical intelligence. However, even in the low IQ group, many students had other forms of intelligences. Hence, tapping the intelligences of students can help enhance their learning process. Our curriculum should have an amalgamation of teaching for all kinds of intelligences for maximum productivity.

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Conflicts of interest
There are no conflicts of interest.

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Appendix 1
Multiple intelligence questionnaire

Name: ________________________ Age: _____ Sex: M/F Class__________

Instructions
1. Read each statement
2. If it expresses some characteristic of yours and sounds true for the most part, write “T.” If it doesn’t, mark an “F”
3. If the statement is sometimes true, sometimes false, leave it blank

1. I’d rather draw a map than give someone verbal directions
2. I can play (or used to play) a musical instrument
3. I can associate music with my moods
4. I can add or multiply in my head
5. I like to work with calculators and computers
6. I pick up new dance steps fast
7. It’s easy for me to say what I think in an argument or debate
8. I enjoy a good lecture, speech, or sermon
9. I always know North from South no matter where I am
10. Life seems empty without music
11. I always understand the directions that come with new gadgets or appliances
12. I like to work puzzles and play games
13. Learning to ride a bike (or skates) was easy
14. I am irritated when I hear an argument or statement that sounds illogical
15. My sense of balance and coordination is good
16. I often see patterns and relationships between numbers faster and easier than others
17. I enjoy building models (or sculpting)
18. I'm good at finding the fine points of word meanings
19. I can look at an object one way and see it sideways or backward just as easily
20. I often connect a piece of music with some event in my life
21. I like to work with numbers and figures
22. Just looking at shapes of buildings and structures is pleasurable to me
23. I like to hum, whistle, and sing in the shower or when I’m alone
24. I'm good at athletics
25. I’d like to study the structure and logic of languages
26. I’m usually aware of the expression on my face
27. I’m sensitive to the expressions on other people’s faces
28. I stay “in touch” with my moods. I have no trouble identifying them
29. I am sensitive to the moods of others
30. I have a good sense of what others think of me.

(not to be filled by the student)

1. Place a check mark by each item you marked as “true.” Add your totals. A total of four in any of the categories A through E indicates strong ability
2. In categories F and G, a score of one or more means you have abilities as well.