

Developing TONI (Test of Nonverbal Intelligence) 4 norms for a Sri Lankan population

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Abstract.

Defining and measuring human intelligence has been a topic of much scientific contention over the years (Sternberg, 1985). In order to measure it, g factor constructs such as problem solving, logical and critical reasoning are used, and differential psychology has settled on IQ (Intelligent Quotient) tests as the best means of testing intelligence but for the purposes of testing intelligence in different cultural settings, nonverbal tests are most effective (McGrew, et al., 1997; Richardson, 2002).

Research on IQ levels in Sri Lanka is sparse and current tests involve using existing norms that are not representative of a population such as Sri Lanka due to in built cultural, environmental and socioeconomic factors ((Vyshedskiy et al., 2017). This study sets out to devise norms for a nonverbal test for a Sri Lankan population and enable the use of an IQ test which can render accurate test scores for a Sri Lankan population which is a huge void in Sri Lanka currently. The TONI 4 (Test of Nonverbal Intelligence) was selected for its high level of standardized psychometric properties and is specifically designed to reduce cultural bias but while the test itself is very useful for different cultures, the current US norms were devised on a representative sample of US population demographics and may not be representative of a Sri Lankan population (Brown et al., 2010).

Keywords: IQ Test, Norm development, Intelligence, Culturally relevant tests

Objective:

While the broad objective of this study is to develop norms for the Test of Nonverbal Intelligence – 4th Edition (TONI 4) for a Sri Lankan population, the specific norms include the investigation of IQ and correlates to academic performance as well as exploration of IQ with regards to sex, medium of instruction, type of school and handedness. It also involved the prediction and validation of the new norms as well as the reliability of the test using test retest and item consistency.

Methodology:

The study was conducted on 3 phases, first to identify if there are differences in the means between the US and Sri Lankan populations and if so to devise an appropriate method of predicting the norms for all age categories of the test. This phase was conducted in the Kandy educational zone in 4 grades which captured 8 age groups out of the 21 age groups of the TONI test.

The 2nd phase would validate the reliability of the test through test retest and internal consistency of items through Cronbach's alpha on a sample of 40 adults and in the 3rd phase it would test if these predicted norms are the same as the actual scores derived from a second sample in Kegalle which would include the testing of 6 age groups as well as the assessment of correlations of IQ to academic performance. Both samples would also be explored for variation of IQ by other factors such as sex, medium of instruction, type of school and handedness.

Results:

A total sample of 2357 school children were assessed for this study, 1744 in Kandy and 613 in Kegalle. In Phase 1, a mean difference was indicated where the reported mean for the US was 100, whereas the Sri Lankan mean that emerged from this study is 95, so the study proceeded to the next phase which was to develop norms for a Sri Lankan population (Brown et al., 2010).

In Phase 2, the test retest analysis found that IQ scores of both the test and the retest were statistically significantly and positively correlated. Internal consistency of the tool was assessed by the Cronbach's alpha and the Cronbach's alpha was 0.97 and removing any of the items would not increase the Cronbach's alpha value further. Phase 3 showed that age category and sex were statistically significantly associated with IQ score and were fitted in to a multivariate linear regression model to predict IQ score of other age groups - this was able to accurately predict IQ norms for the other age groups. The math and language test scores were evaluated with the spearman correlation coefficient which confirmed that the two IQ score was statistically significantly positively correlated.

Overall there was no difference that was observed by sex in the IQ score but when divided by age, the P value indicates that there is a statistically significant difference in IQ by sex at 10 years and below where females are higher while males indicated as being higher in the above 10 group. There were no significant differences indicated between the mediums of instruction out of the two languages that were tested – Sinhalese and Tamil as children who studied in both

languages had similar IQ scores. The difference in IQ score between the 4 types of schools which were 1 AB, 1C, 2 and 3 showed a marginal difference but there were no statistically significant differences and there were also no significant differences in IQ score by handedness preference. These results were congruent for both samples that were tested and confirm current study data too.

Conclusions:

It can be concluded that the present study investigated the relevance of US norms on a Sri Lankan population and based on the mean difference proceeded to identify a formula which was able to correctly predict new norms which were validated with the actual scores of a second sample.

Therefore, results of this study conclusively show that new norms for a Sri Lankan population are required and were accurately developed. The test is also reliable and valid, which was ascertained by two tests of reliability and can be used as an effective measurement tool. The further exploration of variation in IQ by other factors found confirmation of existing evidence that there are no differences in IQ score by sex, medium of instruction, type of school, handedness and that it had a positive correlation to academic performance.

With these new norms the Test of Nonverbal Intelligence 4th Edition can now be used in a Sri Lankan context for assessment in hospitals and judiciary contexts as well as for clinical purposes in further research.

References:

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