PROGRESSIVE MATRICES AS A SCHOLASTIC
APTITUDE TEST
FOR THAI GRADUATE STUDENTS
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by

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Introduction

This research paper although few in pages, is significant. The Progressive Matrices was first used in selecting students who wanted to enroll at the Bangkok Institute for Child Study during the years 1960-69. The PM test score was not the sole criteria in selection, although a high score on the test was first assumed to indicate a high scholastic aptitude on the part of the students. However, the findings of this research preports raises certain questions as to the validity of the PM as a scholastic aptitude test.

This research bulletin contains both an English version and a Thai version. Main credit is given to its author, Dr. Ravipan Somnapan, who wrote the original report in English, and also to Dr. Preja Dhuunma, who translated the report into Thai. It is hoped that, whether reading in English or Thai, students of this subject will benefit from reading this research paper.

Progressive Matrices as a Scholastic Aptitude Test For Thai Graduate Students

The values of r between PM score and GPA were obtained as a validity measure of the PM test. The 58 subjects used were five groups of graduate students in Psychology at the Bangkok Institute for Child Study from the year 1960 to 1969. The values of r varied markedley from year to year and it’s value is 12 when all the data were used. This study gives some uncertainties to the utility of the PM as a scholastic aptitude test.

The Progressive Matrices (PM) is a "matrix" version of the figure-analogy task, a popular technique to measure the "mental ability." It was invented by L.C. Penrose and J.C. Raven in Great Britain and published as Raven's Progressive Matrices Test (1938). It was designed as a measure of Spearman's g (general ability) factor. The test was regarded by most British psychologists as the best available measure of g (Anastasi, 1968). It is a set of 60 patterns or designs, each of which contains 12 stimuli arranged in r rows and c columns analogous to an r x c rectangular matrix. A small portion, being analogous to a submatrix, on the lower right corner of the rectangular matrix is masked out. The subject's task is to find, among a number of alternatives, the submatrix which is most likely to be in the masked portion of the matrix (see the Figure). The items are grouped into five series, each containing 12 matrices of increasing difficulty but similar in principle. The earlier series require accuracy of discrimination (Anastasi, 1968). Visual discrimination with such long duration of stimulus exposure should, however, play no critical part in the accuracy of responses (Somnapan, 1968). The latter, more difficult series, involve analogy and other logical relation within row i and column j to identify the element (ij). In short, the variables comprising the appearance of each element of the matrix vary along at least two dimensions.

The PM test requires the subject to analyze, extract, and integrate concepts which are familiar to most Europeans. It is less dependent on education than most tests, though scores are low in cultures offering little education. It is customary to use a vocabulary test along with it (Cronbach, 1970), despite the correlations of .4 to .75 between the PM and verbal or performance test (Anastasi, 1968). Several factorial analyses suggest that the PM tests are heavily loaded with a factor common to most intelligence tests, but that the spatial aptitude, inductive reasoning, perceptual accuracy and other group factors also influence performance (Burke, 1958).
The main purpose of the present study is to find the suitability of the PM as a scholastic aptitude test for Thai college students. The test was found not too suitable for the samples of non-European cultures (Burke, 1958), and not related to scholastic achievement of young Thai children (Harinasut, 1958). Nevertheless, there was no study on the exact nature of the selection of candidates into the graduate school to which the Bangkok Institute for Child Study is attached. If some validity was found (between the PM and achievement in the graduate school). PM would be a very useful instrument for the selections.

Method

The PM test used was an adult form of coloured PM published by Raven (1947). Each matrix together with a number of response alternatives were printed on a 35 mm color slide and presented to subjects in groups by a slide projector in a semi-darkened room. The subjects gave the responses on printed answer sheets. The time for a stimulus exposure was 15 seconds, and 5 seconds for a response. The time limits were used despite Anastasi's (1968) contention that the test could be administered with no time limit, since it would have been quite a task if Anastasi was followed verbatim. The time limits were found to be quite sufficient.

Subjects were the Thai students entering the graduate school at the Bangkok Institute for Child Study. They possessed a B.A. in several fields including education and mathematics. The PM test was administered at the beginning of their two year program, leading to an M.Ed. in psychology, starting from 1960 and on every alternate year afterward. The GPA of the subjects' two year performance was collected at the end of the program and used as the criterion for the validity of the PM test.

Results

After ten years of data collections from 58 subjects, the correlation between the PM test scores and GPA's were computed. They varied markedly from year to year, and ranged from -0.16 to .76 with 0.12 being the value for the entire data. The detailed results are presented in the Table. The validity measure is represented by $r$. 

Norms based on British children and adults are provided. These are similar to those obtained from samples in Argentina by Rimoldi (1948), and are applicable to several European countries. Studies in non-European cultures have raised doubts about the suitability of the test for groups with very dissimilar backgrounds. In such groups the test was found to reflect the amount of education and to be susceptible to practice effect. The test was administered with no time limit, and can be given individually or in groups. Very simple oral instructions were required (Anastasi, 1968).

Retest reliability in groups of older Western children and adults with homogeneous age varies between .7 and .9 (Anastasi, 1968). The validity of the matrix test varies greatly depending on the form of the test and the sample being tested; Barrett's (1956) correlation of .75 with WISC seems to be typical.

In Thailand, Harinasut (1958) using 1358 Thai school children of 7-12 years of age, revealed little or no correlation between the PM test score and scholastic achievement. Unfortunately, neither the value of the correlation nor the joint distribution of test scores and grades for that set of children was reported. One contributing factor to this apparently not very harmonized findings, despite Burke (1958), and Jahoda (1956) remarks on the unsuitability of the matrix test for samples in non-European cultures may, perhaps, be the lack of a common reference. Psychologists in all parts of the world have developed matrix tests of their own (Cronbach, 1970). Harinasut (1958) and the present study employed the original matrices published by Raven (1947) for the lack of pertinent data and the need for a standard reference.
Correlations (r) between PM and GPA

<table>
<thead>
<tr>
<th>Year</th>
<th>r</th>
<th>SEE</th>
<th>Mean PM</th>
<th>SD PM</th>
<th>Mean GPA</th>
<th>SD GPA</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>.43</td>
<td>.120</td>
<td>43.4</td>
<td>6.02</td>
<td>.20</td>
<td>.133</td>
<td>14</td>
</tr>
<tr>
<td>1962</td>
<td>.37</td>
<td>.159</td>
<td>50.8</td>
<td>2.77</td>
<td>.38</td>
<td>.171</td>
<td>16</td>
</tr>
<tr>
<td>1964</td>
<td>-.02</td>
<td>.188</td>
<td>45.1</td>
<td>10.2</td>
<td>.28</td>
<td>.188</td>
<td>15</td>
</tr>
<tr>
<td>1966</td>
<td>.46</td>
<td>.134</td>
<td>34.3</td>
<td>5.02</td>
<td>.34</td>
<td>.151</td>
<td>6</td>
</tr>
<tr>
<td>1969</td>
<td>.76</td>
<td>.103</td>
<td>39.9</td>
<td>6.22</td>
<td>.47</td>
<td>.157</td>
<td>7</td>
</tr>
<tr>
<td>TOTAL</td>
<td>.12</td>
<td>.183</td>
<td>44.5</td>
<td>8.36</td>
<td>.32</td>
<td>.184</td>
<td>58</td>
</tr>
</tbody>
</table>

Regression equation: 

\[(\text{GPA}) = 0.00263 \times \text{PM} + 3.2059\]

The predictive validity measure (r) for the entire sample is .12; this gives the coefficient of alienation close enough to one (.993). The standard error of estimate is almost identical to the standard deviation of the criterion (GPA). Consequently, it can reduce the error of estimate by a discouragingly small proportion of .007. For example, the predicted GPA’s of the individual with the maximum PM (60) and that with zero PM score only differ by 0.1578.

**Conclusion**

The predictive validity of PM as a scholastic aptitude test is discouraging low for most practical purposes. This could be due to few reasons: the test was not designed for this purpose, the educational achievement involves more than ‘g’ factor, the unsuitability of the test for the sample of non-European culture (Burke, 1958), and the independence of PM and scholastic achievement of Thai children (Harinaut, 1958). The values of r between PM and GPA in Table I from sample to sample are very much different (from -.46 to .76). This is one of the reasons why the validity is quite low (.12) when r was computed from the total data. The diversity of r is, however, quite in accord with Barrett’s (1956) findings.

Further investigation to identify the variables influencing the validity of PM test seems to be in order. In this study the validity of .76 was obtained in the year 1969, and -.02 in 1964. There might be some factors besides different set of samples influencing the variation.

With the available evidence, the utility of the PM test as a scholastic aptitude test for graduate school in Thailand is rather doubtful.

**REFERENCES**


Barrett, E. S. The relationship of the Progressive Matrices (1938) and the Columbia Mental Maturity Scale to the WISC, J. consult. Psychol. 1956, 20, 294 - 296.


