

Raven's advanced progressive matrices and increases in intelligence

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Summary—Recently, Flynn 1987, *Psychological Bulletin*, 101, 171–191; 1989, *Psychological Test Bulletin*, 2, 58–61 has reported that scores from some IQ tests have increased significantly over the last few decades and has attributed these gains in IQ to problems in the test measurement of intelligence. This study investigated whether large IQ increases are also to be observed in Raven's Advanced Progressive Matrices (APM) scores in large Australian University samples over the last 30 years. Results indicated that the APM is internally consistent and stable over time.

The Advanced Progressive Matrices (APM) test was first published in Australia in 1947 and later revised in 1962, following the development of the Standard Progressive Matrices (SPM) by Penrose and Raven (1936) which had been developed to measure the "positive manifold" of cognitive abilities first described by Spearman (1927) in his theory of general intelligence. The popularity of the matrices tests is primarily due to two assumptions; that the tests may be culturally reduced and that they are one of the best measures of *g* available (Jensen, 1980). The APM has traditionally been used as an instrument to measure intelligence in high ability groups, frequently for research purposes (at universities and other tertiary institutions) and usually in studies correlating other measures of ability with a supposedly "culturally reduced" measure of intelligence.

Recently, Flynn (1987) has provided some evidence that SPM scores have risen significantly over the last few generations. According to Flynn (1989), the large IQ increases (up to 24 IQ points in the SPM) exceed the gains observed on other less "culturally reduced" intelligence tests [e.g. Wechsler and Binet tests (15 points)] or on purely verbal tests (11 points). Discounting other possibilities (Lynn, 1987), Flynn argues that these large IQ increases reflect problems in the test measurement of the intelligence construct. Moreover, the fact that there does not appear to be a significantly greater level of intelligence in the community suggests that intelligence has not actually increased in the population but only test scores. This incongruence between intelligence and the test measurement of it reflects the fact that IQ tests "... cannot save themselves" (Flynn, 1989, p. 58). Given that the APM has been used extensively as an intelligence test for research purposes (usually within university settings), a large increase in APM scores across generations may suggest that the APM does not measure intelligence but rather, as Flynn suggests, a weak correlate of intelligence. If this is the case then the results and conclusions from this body of research may be invalid. This present study examines whether APM scores have risen significantly over the last 25 to 30 years in large Australian University samples. Yates and Forbes (1967) have published data on APM scores from students at the University of Western Australia in 1965 but since then, no cross sectional data have been reported from an Australian tertiary institution. Very limited data are available for APM scores from the general community, although this is primarily due to the fact that the SPM is nearly always used in the community and at schools (together with the Coloured Progressive Matrices) with the APM being primarily used in high ability groups. Large increases (i.e. those observed with the SPM) would suggest that the APM (as Flynn suggests) may be an invalid test of intelligence or alternatively reflect a change in the mean intelligence of university students over the last 25 to 30 years. More university places have become available in Australia over the last 10 years due to greatly increased demand. If there has been any change in the mean APM scores of student populations at Australian universities over the last 25 years then this may reflect either greater levels of intelligence in the student population (perhaps reflecting increased competition for university places) or the problems associated with the SPM test as described by Flynn. If, however, no large gains in APM scores are found across the two groups then this would suggest that the APM may be a longitudinally stable measure of intelligence within the university sample (at least in terms of Flynn's objections). It is unlikely, that given the greatly increased demand and the fact that higher education has become more accessible to lower socio-economic groups through the abolition of full fees in the early 1970s, that there has been a decrease in mean intelligence within Australian universities over the last 25 years.

METHODOLOGY

The timed version of the group form of the APM was administered to 447 psychology I students at the University of Adelaide (311 female; 136 male) over the period 1984 to 1990. The sample is a combination of students from the Faculties of Arts and Science. The item analysis and Cronbach's reliability measure were calculated based on a smaller sample size of 275 (unfortunately individual item results were not available for the entire sample).

RESULTS AND DISCUSSION

The mean APM scores for the present sample is 24.4 (SD = 4.6; *n* = 447). Yates and Forbes (1967) report a mean APM score of 23.17 (SD = 4.6; *n* = 465) from students in the Faculties of Science and Arts at the University of Western Australia in their 1965 standardization study. The mean APM score from this study equates to a mean IQ of approx. 127. The mean Arts–Science Faculty scores from the 1965 study equates to an IQ of approx. 125. These results would therefore tend to indicate that, at least in university samples, the mean IQ measured by

the APM has not increased greatly over the last 25 years. The stability of APM scores across the two samples may reflect that the APM is not prone to the same large increases reported by Flynn for the SPM test. The modest improvement in IQ scores may reflect the influence of a number of factors known to improve IQ (e.g. assortative mating, adaptation, improvements in nutrition, schooling and childhood experience etc.) or as previously described, the fact that mean intelligence may have increased within Australian university populations because of the greater competition for entry.

In addition to addressing the question raised by Flynn for the APM, these results are an important supplement to the only standardization study of APM scores at Australian universities (Forbes & Yates, 1967). An item analysis suggested that although some of the items need to be re-ordered, generally the items increased progressively in difficulty. The order of questions from most easy to most difficult was; Q6, Q1, Q11, Q2, Q9, Q3, Q4, Q7, Q10, Q5, Q8, Q14, Q15, Q12, Q16, Q21, Q19, Q17, Q13, Q18, Q20, Q23, Q22, Q24, Q25, Q27, Q26, Q30, Q31, Q28, Q29, Q32, Q34, Q33, Q35, Q36. Cronbach's reliability statistic was calculated in order to test the reliability of the APM. An alpha equal to 0.81 was computed, which falls into the acceptable range for reliability purposes.

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