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impulsivity, reflectivity, and high IQ

Abstract
The Matching Familiar Figures (MFF) test, a measure of the reflection-impulsivity construct, was used to determine whether 52 high IQ students (mean age 16, mean PM IQ 120) could be described as slow and accurate or fast and accurate. No significant differences in mean IQ were found among fast accurates, slow accurates (reflectives), fast inaccurates (impulsives), and slow inaccurates The reflectivity-distinction may not be useful for high IQ individuals. It may be better to learn to discriminate what speeds is appropriate while giving priority to accuracy.

The respective roles of speed and accuracy in intellectual performance were ostensibly decided decades ago, but perhaps prematurely. There is a speed-accuracy trade-off (see Furneaux, 1960; Heim, 1970, Pachella, 1974) in timed intelligence tests. Individuals operate at below maximum accuracy in a speeded or timed test yet those same individuals may have a perfect score in an untimed test (Pew, 1969). Speed and accuracy have also become linked with two rather value-laden constructs, reflection and impulsivity, which refer to speed of judgment in problems of response uncertainty (Kagan, Moss & Siegel, 1963). A dual index with median splits on speed and accuracy was created to differentiate individuals into four categories as determined by the Matching Familiar Figures test (MFF): Reflectives (slow accurates), slow inaccurates, impulsives (fast inaccurates), and fast accurates (Kagan, Pearson & Welch, 1966).

While most researchers agree that the student who combines speed and accuracy will do best (Kagan & Kogan, 1970; Kagan et al., 1966; Salkind & Wright, 1976; Zelnicker & Wendell, 1976), apparently endorsing the superiority of the fast-accurate group, most of the research has actually compared reflectives and impulsives. An unresolved issue is which processing strategy or which group (reflectives, impulsives, fast accurates and slow inaccurates) is most representative of high ability? In particular, is a slow and accurate (reflective) response more associated with high ability than a fast and accurate one? Since the issue of impulsively-reflectivity continues to appear even in the most recent texts on giftedness (e.g., Davis & Rimm, 1985, who raise it in relation to creativity), it seemed important to examine the relevance of the reflectivity-impulsivity concept to another common index of giftedness, the IQ. This is the present goal.

Kagan and others have studied correlations between reflection and impulsivity on various measures of intellectual reasoning and educational achievement rather than attempting to relate the style directly to subscores or patterns of scores on intelligence tests. A summary of studies that attempted to correlate performance on the MFF to measured intelligence is found in Messer (1976).

There are many contradictions in the reflection-impulsivity literature. Some researchers have suggested that response time in problems containing response uncertainty, such as the MFF, is relatively uncorrelated with traditional IQ scores (Kagan, 1965, 1966; Lewis, Rausch, Goldberg & Dodd, 1968), however, the accuracy issue is unresolved and few studies report data concerning intelligence test results for all four MFF groups. Research has shown that there were no significant differences in IQ scores between fast accurates and reflectives, but that reflectives scored higher than impulsives (Eska & Black, 1971; Frierson, 1975). Conceptual impulsivity was negatively related to educational achievement (Messer, 1970). Overall, the groups are presumed to differ among each other.

Firm conclusions regarding reflection-impulsivity and intelligence have been difficult to attain considering that different measures of intelligence as well as different formats have been used across studies (Messer, 1970). In addition, the oldest subjects cited in the reflection-impulsivity data were only 10 years old, and this may be too young to fully examine some of these relations.

Method

Fifty-two grade-ten subjects in two English classes participated in the study, 18 girls and 34 boys (mean age 16-1; range 14-8 to 18-9). The students were from middle-income families in a suburb of Montreal. The mean IQ of this sample measured by the Primary Mental Abilities Test (PMA) was 120.3 (s.d. = 15.1).

The PMA was selected because it has a high ceiling and contains potentially useful subscales. Group testing for the PMA occurred on three consecutive days during students' regular English classes. Individual testing on the MFF required an individual testing session for each subject. There were no missing data. Subjects were informed about the nature of the study after completing the test battery.

Results

There were neither significant sex differences on the

criterion (PMA) test nor between the two grade 10 classes on the overall score. Significant differences between the two grade 10 classes were found on three subtests of the PMA. Class A scored significantly higher than class B on Word fluency (t (50) = 2.92, $p <$ .005), Verbal Meaning (t (50) = 3.03 $p <$ .004) and Reasoning (t (50) = 2.68, $p <$ .01). These class differences were not explored further since they were not crucial to the results of the study.

The four MFF groups were determined by using Kagan, Pearson & Welch's (1966) method of median splits. This technique tends to place more individuals in the two extreme categories, reflectives (n = 21) impulsives (n = 20), leaving fewer subjects in the fast accurate (n = 5) and slow inaccurate (n = 4) categories. The methodology of median splits is also questionable because one sample's reflectives may be another sample's impulsives. However, at present there does not seem to be another way to determine these four groups while still maintaining congruity with the past research on this cognitive style. Larger sample sizes will help but the extreme group differentiation will still occur.

Did speed-by-accuracy groups classified by the MFF score significantly differently from each other on the PMA? Table 1 indicates that reflectives (slow accurates) scored highest on all the intelligence measures except Word Fluency on which the fast accurates scored highest, and slow inaccurates scored the lowest except on verbal meaning and reasoning. All observed differences, however, were small, and none was statistically significant (at the .01 level).

In order to test the significance of the observed differences between speed and accuracy levels as defined by the MFF, a separate 2(speed)-by-2(accuracy) multivariate analysis of variance was performed for the intelligence measures. Univariate analysis of variance were conducted to find whether the four MFF groups differed in performance on the total PMA raw score. Subjects were classified fast or slow on the MFF did not significantly differ from each other (F (1,48) = 0.4364, $p >$ .01). Second, subjects classified as accurate or inaccurate did not significantly differ from each other (F (1,48) = 0.7832, $p >$ .01). Third, an interaction of speed and accuracy which classified the subjects into the four MFF groups also did not significantly differentiate student performance (F (1,48) = 2.4009, $p >$ .01).

A multivariate analysis of variance was conducted to test the possibility that four groups performed differently on the PMA subtests. The multivariate F test for the main effect of speed indicated that subjects who were fast or slow on the MFF did not differ significantly on the subtests of the PMA raw score (F (5,44) = 1.1795, $p >$ .01). The same result was obtained for accuracy (F = 1.3355, $p >$ .01) and for the speed-by-accuracy interaction (F (5,44) = 1.5279, $p >$ .01).

Discussion

Fast accurates, impulsives, reflectives and slow inaccurates differed but not significantly from each other in performance on the PMA. No significant differences were found between fast accurates and reflectives on mean IQ. Similar results have been reported by others (Christos, 1973; Eska & Black, 1971; Frierson, 1975; Johnson, 1969).

This study supports Johnson's (1969) research which found no significant difference in IQ between reflectives and impulsives, but contradicts other research which found differences (Eska & Black, 1971; Frierson, 1975). The reflection-impulsivity literature has implied that reflectives are more efficient than impulsives in certain areas of problem solving and educational achievement (Cathcart & Liedkte, 1969; Kagan, 1965, 1966; Kagan et al., 1966; Messer, 1970). The present research suggests that high-ability impulsives are just as efficient as reflectives in performance on the PMA and its subtests. It lends support to Zelniker and Wendell's (1976) claim that fast-global processors are just as efficient as slow-analytic processors, depending on the nature of the task. Impulsives and slow inaccurates on the MFF were just as successful as reflectives and fast accurates on the PMA (see Table 1). This lack of significance in the differences observed may be due to attentuation resulting from the limited range of higher IQs in the sample, but this in itself is of interest to advocates of differential education for the more able. Perhaps the reflectivity-impulsivity distinction is not useful for a high IQ sample. Generalizations regarding fast accurates, reflectives, impulsives and slow inaccurates are furthermore difficult to make since the classification of these subjects is sample-based.

Table 1

Cell Means and Standard Deviations of Raw Scores on the PMA and Subtests

		Group			
		Fast Accurates	Impulsives	Reflectives	Slow Inaccurates
n =	6	20	22	4	
PMA Total	(mean)	114.33	118.40	126.05	101.25
	(s.d.)	25.84	29.36	20.03	38.19
Word Fluency	(mean)	44.83	38.15	37.55	35.75
	(s.d.)	8.30	10.45	9.67	7.04
Verbal Meaning	(mean)	16.33	20.20	20.45	18.50
	(s.d.)	5.85	8.73	5.69	12.61
Number Facility	(mean)	18.00	17.85	19.95	17.00
	(s.d.)	5.40	5.42	4.56	8.08
Reasoning	(mean)	39.83	39.85	42.68	41.25
	(s.d.)	5.91	8.20	7.82	7.50
Spatial Relations	(mean)	40.17	40.50	72.95	24.50
	(s.d.)	15.25	12.71	10.33	12.69
PMA IQ Total	(mean)	117.67	119.75	123.55	109.75
	(s.d.)	14.21	16.88	12.04	21.98

Some people perform well in speeded tasks, some not. Speed is an advantage on some tasks, a disadvantage on others. It may be more appropriate to teach able children to discriminate that there are tasks where being quick is an advantage and others where slowness is an advantage, meanwhile giving priority to accuracy.

References

Cathcart, W. G., & Liedtke, W. (1969). Reflectiveness/impulsiveness and mathematics achievement. *The Arithmetic Teacher*, **16**, 565-567.

Christos, C. (1973). Conceptual tempo and its relationship to academic aptitude and school achievement. *Dissertation Abstracts International*, **33**, 1861A.

Davis, G. A., & Rimm, S. B. (1985). *Education of the gifted and talented.* Englewood Cliffs, NJ: Prentice-Hall.

Eska, B., & Black, K. N. (1971). Conceptual tempo in young grade-school children. *Child Development*, **42**, 505-516.

Frierson, H. T. (1975). Differences associated with conceptual tempo on academic achievement, IQ, and internal-external control measures. *Dissertation Abstracts International*, **36**, 1861A.

Furneaux, W. D. (1960). Intellectual abilities and problem solving behavior. In H. Eysenck (Ed.), *Handbook of abnormal psychology.* London: Pitman.

Heim, A. (1970). *Intelligence and personality.* Harmondsworth, UK: Pelican.

Johnson, B. L. (1969). Conceptual tempo and the achievement of elementary school boys. *Dissertation Abstracts International*, **30**, 37897A-37898A.

Kagan, J. (1965). Reflection-impulsivity and reading ability in primary grade children. *Child Development*, **36**, 609-628.

Kagan, J., & Kogan, N. (1970). Individual variation in cognitive processes. In P. H. Mussen (Ed.), *Carmichael's manual of child psychology* (3rd ed.), Vol. 1, New York: Wiley.

Kagan, J., Moss, H. A., & Siegal I. E. (1963). Psychological significance of style of conceptualization. In J. C. Wright & J. Kagan (Eds.), Basic cognitive processes in children. *Monographs of the Society of Research in Child Development*, **28**, Whole No. 2.

Kagan, J., Pearson, L., & Welch, L. (1966). Conceptual impulsive and inductive reasoning. *Child Development*, **37**, 537-594.

Lewis, M., Rausch, M., Goldberg, S., & Dodd, C. (1968). Error, response time and IQ: sex differences in cognitive style of preschool children. *Perceptual and Motor Skills*, **26**, 563-568.

Messer, S. B. (1970). The effect of anxiety over intellectual performance on reflection and impulsivity in children. *Child Development*, **41**, 723-735.

Messer, S. B. (1976). Reflection-impulsivity: a review. *Psychological Bulletin,* **83,** 1026-1052.

Pachella, R. G. (1974). The interpretation of reaction time in information processing research. In B. H. Kantowitz (Ed.), *Human information processing.* Hillsdale, NJ: Erlbaum.

Pew, R. W. (1969). The speed-accuracy operating characteristic. (Attention and Performance.) *Acta Psychologica*, **30**, 16-26.

Salkind, N. J., & Wright, J. C. (1976). *Impulsivity and efficiency: A revised model and a new perspective.* Paper presented at the Southeastern Conference on Human Development, Nashville, TN.

Zelniker, T., & Wendell, J. (1976). Reflective and impulsive children: Strategies of information processing underlying differences in problem solving. *Monographs of the Society for Research in Child Development*, **41**, Whole No. 5.

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