The cognitive style differences in the use of latency and the number of errors as cues for inferring personality characteristics

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Sixty-four reflective and 58 impulsive fifth-graders classified by Matching Familiar Figures Test were presented in a questionnaire four fictitious models, i.e., Reflective (Ref), Fast-Accurate (FA), Impulsive (Imp) and Slow-Inaccurate (SI) in this fixed order, whose performances on the test were described verbally (e.g., "The child took a longer time than usual but made fewer errors.") as well as numerically, and required to give ratings (1-5) on brightness and diligence. The reflective and impulsive children differed significantly in two of the eight ratings; the former rated FA brighter and SI more diligent than the latter. Discriminant function using these two ratings yielded a 68.0% correct prediction of the subjects' cognitive style. Both style groups similarly gave different brightness ratings to FA, Ref, Imp and SI in descending order. The reflectives, however, gave SI a higher diligence rating than Imp, following Ref and FA, while the impulsives gave Imp a higher diligence rating than SI.

Key words: reflection-impulsivity, brightness rating, diligence rating, model's speed-accuracy.

Kagan's Matching Familiar Figures Test (MFFT) can be regarded as a typical speed-accuracy tradeoff task. If subjects repeat visual exploration for accurate matching, they will have to sacrifice speed. If they seek to respond fast, they will tend make many errors. The previous studies have revealed that older children can rather flexibly modify their speed-accuracy orientations depending upon the instructions or feedback given (Barstis & Ford, 1977; Briggs & Weinberg, 1973; Inagaki & Hatano, 1979). Thus the dimension of reflection-impulsivity represents subjects' orientation as to whether to emphasize speed or accuracy in the absence of any specified goal.

What are the primary determinants of their orientation? Kagan and Kogan (1970) claimed that the fear of making an error is an important elicitor of the reflective tendency. However, the previous studies have shown that inter-individual variation in fear of failure measured by the Test Anxiety Scale or similar tests was not predictive of reflection-impulsivity (Messer, 1970; Inagaki & Hatano, 1974). We assume that the fear of failure may influence children's performance on MFFT only when they think the number of errors there is used as a cue for inferring negatively evaluated personality characteristics. Some children with a strong fear of failure want to avoid making many errors on MFFT because they feel that doing so will indicate undesirable personality characteristics, such as low intelligence, while others, just as fearful, do not mind making many errors.
on MFFT because they attribute the errors to less stable factors (e.g., hard luck or inattention) and do not take it as a personal failure.

Likewise, Kagan and Kogan (1970) asserted that the fear of being judged incompetent for responding too slowly makes one take the impulsive orientation. However, long latency or responding slowly does not necessarily mean that the subject is incompetent, and sometimes implies no more than a cautious or diligent personality. Subjects' reactions to their own long latency will depend upon their cognition of the cue values of that dimension of performance.

In short, we assume that subjects take a certain orientation because they believe, somewhat intuitively, that it would be the best tradeoff point for obtaining a favorable personality assessment and/or avoiding an unfavorable one. This implies that reflective and impulsive subjects would tend to differ in their interpretation of making errors and responding slowly in the MFFT situation. The impulsive would be more lenient toward errors but harsher toward responding slowly than the reflectives. In other words, the reflectives would tend to assign a greater cue value to making errors but a smaller one to responding slowly for inferring undesirable personality characteristics.

Therefore, in this study, we investigated possible cognitive style differences in the use of cues of response latency (or speed) and the number of matching errors (or accuracy) for inferring two personality characteristics. The subjects were given, in addition to MFFT, a questionnaire wherein four hypothetical models differing both in latency and in the number of errors were rated in terms of brightness and diligence. These ratings were expected to reflect subjective meanings for children of accuracy and speed in MFFT. We thought this indirect assessment strategy was more revealing than directly asking them to verbally describe the subjective meanings. The personality ratings of the four models were compared within each cognitive style as well as between styles.

Method

We administered MFFT under the standard procedure to 162 fifth-graders of an elementary school in a small city near Tokyo. They showed median mean latency to the first choice response of 7.8 s, and median number of errors of eight. With these two figures, we divided the subjects into four groups, using the conventional double median cut procedure. Twenty-two were classified as fast-accurate, 64 as reflective, 58 as impulsive, and 18 as slow-inaccurate. The correlation between the response latency and the number of errors in this sample was $-0.62$. Excluding the fast-accurate and slow-inaccurate subjects as not being enough in number, 64 reflective (34 boys and 30 girls) and 58 impulsive (26 and 32) subjects were compared in terms of their use of cues of response latency and number of errors for inferring personality characteristics. The reflectives and impulsives were comparable for school grades (5-point) in the four core subjects (language, social studies, arithmetic and science); means of the grade point average were 3.08 (SD of 1.28) and 2.95 (0.84) for the reflectives and impulsives, respectively.

Questionnaire

One month after the administration of MFFT, a questionnaire was given in which the procedure of MFFT was described concisely. That is, there were one target drawing and six alternative drawings of which all resembled the target, but only one was identical to the target, and the task was to find the identical drawing as fast as possible and without making errors. The subjects were also told that among fifth-graders in general the mean latency of 8.9 s to
the first choice and total number of errors over 12 items of eight were usual. Then, four hypothetical models were presented. The children were asked to assume that all models were fifth-graders of the same sex as themselves. The first model, which was in fact a reflective model (Ref), had mean latency of 13.7 s and total number of errors of three. This performance was rephrased as “taking longer than usual, but making fewer errors than usual.” The subjects were required to think of what kind of child he/she would be and to give ratings in terms of a 5-point scale on two personality dimensions, i.e., bright vs. dull and diligent vs. non-diligent. The higher the score, the brighter or more diligent was the rating. Then, similarly, we presented the remaining models: second (FA) with mean latency of 4.2 and total number of errors of three, third (Imp) with mean latency of 4.2 and 13 errors and finally fourth (SI) with 13.7 s mean latency and 13 errors. In all cases the subjects were advised as to whether the latency was longer or shorter than usual, and whether there were more or fewer errors than usual, but the labels like “fast” or “accurate” were not given. In the last section of the questionnaire, the subjects were asked how they themselves had performed on the test (MFFT) a month before in terms of 5-point scales. Verbal

Findings

First, we examined whether the reflectives and impulsives would give different personality ratings to the fictitious models. See Table 1. Two ratings differed significantly. On the brightness rating for the FA model, the reflective children had a higher rating than the impulsives, \( t(120)=2.16, p<.05 \), and on the diligence dimension for the SI model, reflective children rated higher than their impulsive counterparts, \( t(120)=2.06, p<.05 \).

We tried to construct a discriminant function by the direct solution, using the two ratings mentioned above. The resultant function was significant by the test of Wilks’ lambda, \( \chi^2(2)=8.20, p<.05 \).
and produced a fairly well-matched group assignment for the subjects. This is shown in Table 2. Considering that the number of cases belonging to each group was almost identical, the percentage of correspondence of 68.0 suggests that an attempt in this direction is at least promising in the effort to identify some of the psychodynamic factors underlying cognitive style performance.

Secondly, we examined difference in ratings within each cognitive style group. In addition to one-way ANOVAs with model's cognitive style (FA, Ref, Imp, SI) as a within-subject factor, we made the following two comparisons by the usual F-test (instead of the Scheffe procedure), since it had been expected that models' accuracy and/or speed would contribute to possible rating difference among the four models (see Winer, 1971): accurate (FA and Ref) versus inaccurate (Imp and SI), and quick (FA and Imp) versus slow (Ref and SI).

On the brightness dimension, both cognitive style groups gave markedly different ratings to the models, with ratings from the highest to the lowest, FA, Ref, Imp, and SI. See Table 1. These patterns were so similar that we combined both groups for ANOVAs. The effect of model's cognitive style was highly significant, $F(3, 360)=295.7$, $p<.01$. The difference between the two accurate models and the two inaccurate models was significant, $F(1, 360)=697.1$, $p<.01$; the difference between the two quick models and the two slow models was also significant, $F(1, 360)=177.4$, $p<.01$. On the diligence dimension, among the reflective children, the four models, which were ranked Ref, FA, SI and Imp from the highest to the lowest, differed significantly, $F(3, 189)=41.1$, $p<.01$; the accurate models had a significantly higher rating than the inaccurate models, $F(1, 189)=116.5$, $p<.01$; the quick models had a marginally insignificantly lower rating than the slow models, $F(1, 189)=3.73$, .05 $<p<.10$. Among the impulsive children, the four models were ranked FA, Ref, Imp and SI. They were also significantly different, $F(1, 171)=49.4$, $p<.01$; the accurate models had a significantly higher rating than the inaccurate models, $F(1, 171)=147.2$, $p<.01$; the quick models did not differ from the slow models.

Self-ratings of mean latency and total number of errors on MFFT, i.e., ratings of their own performance, showed an interesting pattern: reflective children rated their number of errors as being fewer than the middle point of three (2.56 with 1.19 as SD), whereas impulsive children rated it as more than the middle point (3.24 with 0.96). This difference in subjective number of errors between the two groups was highly significant; $t(120)=3.41$, $p<.01$. This may imply that the reflectives had tried harder to reduce the number of errors. Both reflective and impulsive children, however, answered that their latency was close to the middle point (3.06 with 0.99 as SD for reflectives and 3.40 with 0.70 for impulsives). In other words, those two groups of children, objectively markedly different in terms of the mean latency, did not accurately recognize their relative performance to that of the other children.

Discussions

The between-cognitive style comparison revealed that our original predictions, i.e., the reflectives would be more favorable toward the models with long latency and less favorable toward the models committing many errors than the impulsive, were too simplistic. There was no significant difference in ratings for Ref or Imp. However, the reflective children gave significantly higher brightness ratings to the FA model and diligence ratings to the SI model than their impulsive counterparts. The latter difference can easily be interpreted, assuming that reflective children, but not impulsive ones, tend to
use long latency as a cue for inferring diligence. But what produced the former finding? Here it should be noted that the reflective children answered correctly that they had had fewer errors than the average. This was in contrast to responses by the 22 fast-accurate children excluded from the above data analysis. Though they by definition had had fewer errors, they did not believe that their number of errors was smaller than the average; the mean self-rating was 3.09 with $SD$ of 0.81. This was probably because the reflective children deliberately tried very hard to reduce the number of errors. This conscious effort induced the reflective children to exceed the impulsive in rating the hypothetical FA model, who performed the difficult task of reducing errors in a very short time, as brighter.

The within-cognitive style comparison clearly showed that a smaller number of errors on MFFT was used as a cue for inferring desirable personality characteristics by both reflective and impulsive children. The time taken being equal, models with fewer errors than with more errors were rated brighter and more diligent. The impulsive children tended to use the cue of a shorter time also for inferring desirable characteristics: the number of errors being equal, quick models were rated consistently more favorably than slow ones. However, the reflective children used that cue differently in terms of diligence: taking one's time in making a response, even if failing to reduce the number of errors, was favored in the diligence rating. The shorter latency was favored only in terms of the brightness rating. This difference in the use of long latency as a cue for inferring personality characteristics seemed to be related to their own performance on MFFT. For impulsive children, putting in time without being able to reduce errors effectively is not rewarding. Thus it is reasonable for them to respond as quickly as possible unless they consider that spending further time is very likely to lead to fewer errors. However, it is also quite rational for reflective children to spend time before responding if for this they expect to receive a higher diligence rating even when they fail to minimize errors enough to compensate for the long latency.

We would like to emphasize that, though the subjective meanings of long latency as a cue for inferring personality characteristics, embodied in the ratings of hypothetical models, were significant predictors, the predictions based on these subjective meanings were very far from perfect. First, we think that the speed-accuracy tradeoff by subjects on MFFT is determined not only by the cue values of long latency as inferring stable personality characteristics but also for inferring such psychodynamic factors specific to the situation as effort, cooperativeness, and conformance. In other words, the long latency may be attributed to these unstable factors rather than stable ones like dullness and diligence. Therefore, adding rating scales for these unstable factors should increase the predictability. Secondly, in addition to the difference in cognition of cue values, there may be difference in their evaluation. Reflective children may put more emphasis on some and less on other personality and psychodynamic characteristics than impulsive children. For example, it is likely that reflective children want themselves to be perceived as effortful in the situation because they emphasize the intrinsic value of effort and/or think it instrumental for avoiding severe punishment in case of failure. Weiner and Kukla (1970) have suggested that when poor performance is attributed to lack of effort, a student expects more severe punishment and/or think it instrumental for avoiding severe punishment in case of failure. Weiner and Kukla (1970) have suggested that when poor performance is attributed to lack of effort, a student expects more severe punishment and/or think it instrumental for avoiding severe punishment in case of failure.
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(Hatano, 1974; Salkind, Kojima, & Zelniker, 1978). This cultural difference may be explained in terms of perceived meanings of the number of errors and the long latency and significance attributed to them. For example, Japanese children become reflective earlier than American children because the Japanese take spending a long time as a sign of effort and stress effort and conformance to the demands of one's elders.

References


(Received April 12, 1982; accepted Sept. 13, 1982)