

Cognitive Chronometry (out?) in the Cold

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White, Taylor and McCormick (1983) argued as follows: Research in cognitive psychology has established speed of information processing as a useful measure of cognitive performance ("Chronometric analysis"). Variation in some parameter of a cognitive task affords two "higher-order" measures: overall speed of information processing and the extent of change in processing speed as a function of the change in task parameters. For instance, when reaction time is a linear function of some variable, these higher-order measures would correspond to the intercept and slope of the function. Classic examples are the chronometric analysis of performance on memory scanning and mental-rotation tasks. The main point of the paper by White et al. was that when performance of individuals in two samples is to be compared with regard to the effects of some situational variable, differences in overall processing speed may be confounded with differences in the characteristics of the samples (e.g., psychiatric versus normal patients; Korsakoff syndrome versus alcoholic patients, retarded versus normal children), whereas rate of change in performance may be sensitive to the effects of the situational variables. It might be added that a usual way of coping with the comparative problem is to "match" pairs of individuals from two samples. In view of the difficulty of knowing whether subjects have been "matched" on the appropriate variables and the inapplicability of repeated-measures analyses to data from studies involving the "matching" of subjects, the strategy proposed by White et al. might be a useful alternative to "matching".

The argument advanced by White et al. (1983) relies on the demonstration of interpretable interactions. The point of whether an interaction is interpretable is an important one and has been discussed lucidly by Loftus (1978). If the response measure was transformed in some way (e.g., log transformation of reaction times, d' transformation of recognition frequencies, or arcsin transformation of proportion correct) and the data indicated an interaction between two variables, the interaction would be uninterpretable if a new transformation made the interaction disappear. The interaction described by White et al. (1983, Figure 3) was of the interpretable

variety. Nevertheless the general argument advanced by White et al. depends on the nature of the interaction between task parameters and situational variables. And in the absence of knowing what the interaction might look like, it becomes necessary to engage in parametric manipulation to find out.

White et al. (1983) illustrated their argument by comparing times to complete a "mental paper folding" task performed by police recruits and Scott Base personnel. Their evidence for a decrement in rate of information processing under Antarctic conditions has been questioned by Barabasz, Gregson and Mullin (1984). The procedural details described by White et al. were correct. For the comparison between the performance of the police recruits and personnel tested at Scott Base after wintering-over (White et al., 1983, Figure 3), variances contributing to main effects and the interaction were homogeneous. In any study, the possibility that variances contributing to an interaction may not be homogeneous (in which case the interaction is evaluated with reduced degrees of freedom) means that the interaction may be unreliable, particularly if it is relatively weak. If this is the case, the best course of action is to replicate the experiment and to explore further the conditions favouring the occurrence of rate-of-processing changes.

In the instance of cognitive performance under Antarctic conditions, the illustrative data described by White et al. need to be replicated in more extensive studies, not because of the criticisms raised by Barabasz et al., but because of the relative absence of studies of performance under Antarctic conditions that use sensitive measures of cognitive capabilities. The earlier research by Gregson and Barabasz (cited in Barabasz et al., 1984) was invited by A.J.W. Taylor in order to extend the wider study of performance under Antarctic conditions and its bearing on selection issues (Taylor, in press) to cognitive and perceptual processes. In view of the inconclusiveness of the earlier results, the possibility suggested by the data reported by White et al. (1983) that Antarctic conditions may have detrimental effects on cognitive performance merits further investigation.

References

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