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## Analytic Tendency As a Factor in the Performance of Women on the Iowa Pursuitmeter

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# Analytic Tendency As a Factor in the Performance of Women on the Iowa Pursuitmeter<sup>1</sup>

By DAVID A. HILLS

*Abstract.* Women subjects were dichotomized into analyzers and non-analyzers on the basis of their verbal statements regarding their approach in solving Kohs-type block design problems. Groups of analyzers and non-analyzers then learned to perform the standard task on the Iowa Pursuitmeter, and were found to differ only slightly in the amount of skill acquired over 24 trials. These results are in contrast to those of Miles for male analyzers who were found to perform at significantly higher levels of proficiency than non-analyzers. A sex difference apparently attributable to the extreme difficulty of the task for women is discussed.

The performance of subjects on complex perceptual-motor tasks such as those afforded by the Iowa Pursuitmeter is characterized by large individual differences. Miles (1957, 1958) identified a variable—tendency to analyze—which appears to be a primary factor in the learning of these difficult tasks by undergraduate men. He dichotomized male subjects into *analyzers* and *non-analyzers* on the basis of their verbal statements regarding their approach in solving the Kohs-type block design problems constituting the *Test of Tendency to Analyze*. Those subjects who indicated that they tended to break down the designs into component parts before moving the blocks were called analyzers and were shown by Miles to be markedly superior to non-analyzers in performing the Iowa Pursuitmeter tasks. Behrens and Miles (1957) demonstrated that independent observers can do the dichotomizing with a high degree of dependability. Miles and Lewis have examined some of the relationships of the analytic tendency to measures of intelligence (1958). Descriptions of the Pursuitmeter and Pursuitmeter tasks appear in previous studies (Lewis, *et al.*, 1953; Miles and Lewis, 1956).

In experimentation with the analytic variable thus far men have been used as subjects. Although there is nothing in the description of tendency to analyze to suggest that a sex difference should be found, it was important to determine whether or not the analytic variable is useful in the prediction of performance of women on complex perceptual-motor tasks. Therefore, the purposes of this study were to determine whether or not women may be dichotomized as analyzers and non-analyzers, to compare women with men in terms of the speed with which the block design problems are solved, and

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to investigate the performance of undergraduate women, chosen as analyzers and non-analyzers, on Pursuitmeter tasks.

Eighty undergraduate women were administered the *Test of Tendency to Analyze*. Following the completion of the six designs, each subject was asked what method, if any, she used in attempting to reproduce the designs. If the subject reported that she had visualized the designs as being divisible into nine component blocks, she was categorized as an analyzer. If she reported trial and error or some other similar procedure, she was assigned to the non-analyzer group.

The time in seconds required to complete each of the six designs was recorded for the 80 subjects. The time measures for each design were separately normalized and converted into single digit standard scores having a range from zero to nine. Standard scores, assigned on the basis of time in seconds required to complete each design, are shown in Table 1. The sum of the six standard scores for each subject represents her speed of completion of the designs. The distributions of these speed measures for analyzers and non-analyzers are shown in Figure 1. The distribution of measures for 29 analyzers is represented by the solid bars and for the 51 non-analyzers by the open bars.

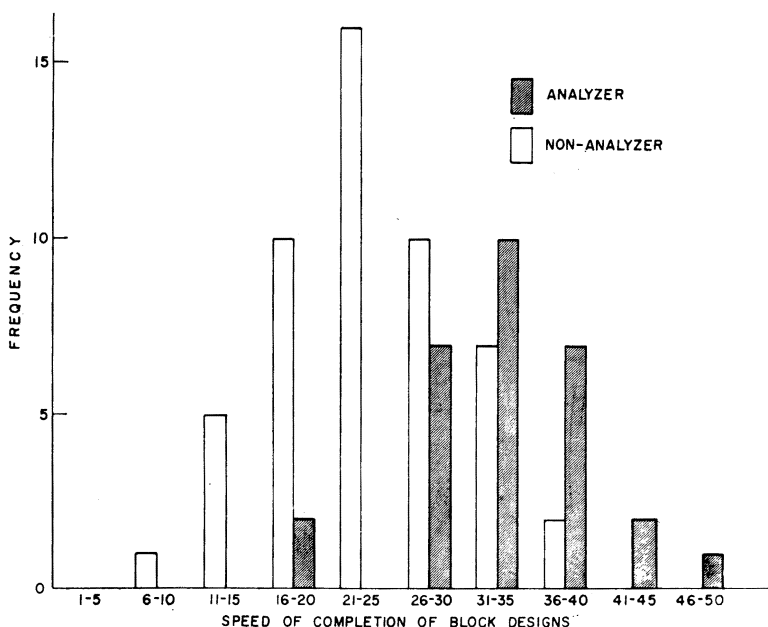


Figure 1. Histograms showing distributions of speeds of completion of block design problems for 29 women undergraduates classified as analyzers and 51 classified as non-analyzers.

**Table 1**  
Table of Standard Scores Assigned on the Basis of Time in Seconds Taken to Complete Each Design

Design	Score									
	9	8	7	6	5	4	3	2	1	0
I	0-18	19-25	26	27-34	35-57	58-95	96-163	164-367	368-599	600
II	0-24	25-26	27-36	37-46	47-64	65-117	118-164	165-295	296-401	402
III	0-21	22-24	25-29	30-44	45-54	55-84	85-142	143-208	209-300	301
IV	0-28	29-30	31-36	37-51	52-76	77-111	112-159	160-217	218-294	295
V	0-24	25-27	28-34	35-43	44-70	71-98	99-160	161-217	218-495	496
VI	0-36	37-38	39-46	47-58	59-71	72-124	125-218	219-339	340-558	559

The speed measures ranged from 10 to 46 with a median score of 27. Although the frequency distributions of time required to complete the designs differed somewhat for each of the designs from the distributions obtained in the Behrens and Miles study with men, the women appear to have responded similarly to men when the composite speed of completion measures is used as the comparative criterion. To check this, each subject's speed of completion was obtained by assigning standard scores on the basis of the table of standard score assignment derived from the performance of men by Behrens and Miles. The speed measures thus re-scored ranged from 10 to 50 with a median of 27. The re-scoring led to negligible changes in the relative rank ordering of any individual subject's speed of completion. A product moment correlation coefficient of .98 was obtained by correlating the two sets of speed measures of the women subjects. It seems justifiable to conclude that women's performance did not differ markedly from men's in terms of speed of completion of the block designs.

In the present study approximately 36 percent of the women were identified as analyzers and the remaining 64 percent as non-analyzers. In contrast, 45 percent of the men were classified as analyzers and 55 percent as non-analyzers, in the Behrens and Miles sample. These two sets of proportions were compared by means of a four-fold contingency table. A chi-square test was applied. The hypothesis of no difference in the relative proportion of men and women analyzers could be retained. However, a pilot study involving women also resulted in a smaller proportion of analyzers than reported for men, which suggests that a real difference may exist.

As is apparent in Figure 1, the analyzers tended to complete the designs faster than the non-analyzers. To determine to what extent the speed of completion was related to the analyzer-non-analyzer dichotomy, a biserial correlation was computed, and a coefficient of .740 was found. Biserial correlation coefficients of .767 and .837 were reported by Behrens and Miles for two different samples of men.

In order to investigate the performance of women analyzers and non-analyzers on a complex perceptual-motor task, volunteers from the initial sample were given practice on the standard Pursuitmeter task. Originally, the plan had been to replicate Miles' work by utilizing the same experimental design he had used which called for 12 trials of practice on the *standard* task, 12 trials on the more difficult *reversed* task, and two trials of relearning on the standard task. However, in preliminary efforts to impose this sequence of tasks, women subjects attained only a low level of proficiency on the standard task and showed almost no mastery of the reversed task. Consequently, the design was changed. Twenty analyzers and

20 non-analyzers from the original sample of women were given 24 trials on the easier standard task under the assumption that all subjects would display some learning of the task, and a comparison between the analyzer and non-analyzer groups would be possible.

The performance of the women on the standard Pursuitmeter task revealed only small group differences. Curves for the two groups based on mean time on bullseye in seconds over two trial blocks

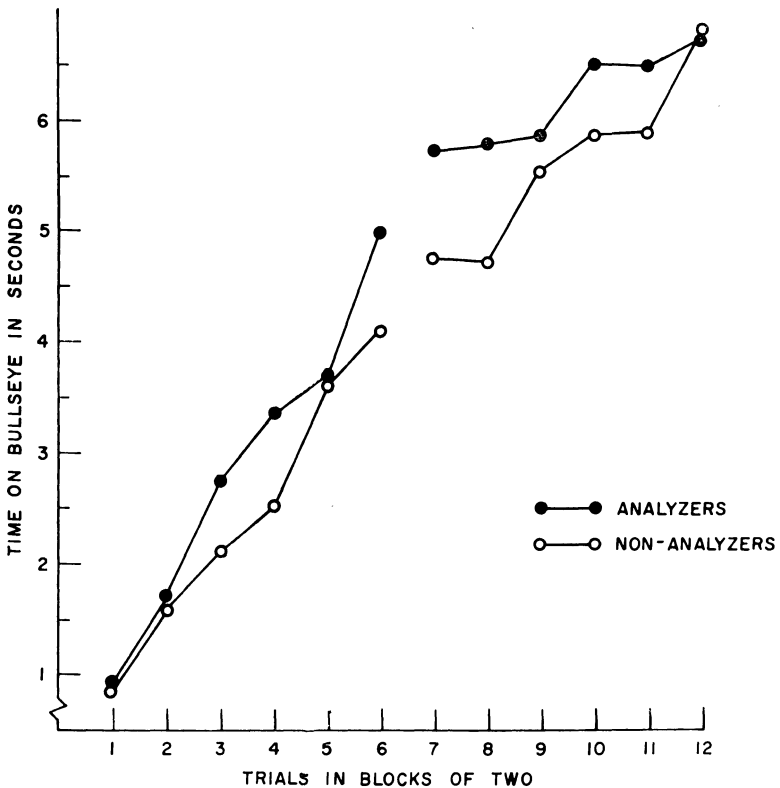


Figure 2. Means of time on bullseye in seconds plotted against trials in blocks of two, on the standard Pursuitmeter task, for analyzer and non-analyzer groups of undergraduate women.

appear in Figure 2. The two groups began performing about equally, at a mean time of less than one second on the bullseye. After block two, the analyzers maintained a slight but consistent superiority over the non-analyzers until final block 12 when the non-analyzers' mean time of 6.81 seconds was slightly higher than that of the analyzers. Both groups improved steadily over the first six blocks of trials, with a less rapid rate of improvement over the last six blocks.

The slight superiority of the analyzer group suggested by the performance curves was not statistically dependable. Comparison

was made of the total time in seconds on bullseye summed across trials. The Mann-Whitney U test was chosen to evaluate the difference in the over-all means of the two groups. The skewed distributions of the measures contraindicated the use of t tests. The probability of a difference of the magnitude obtained occurring by chance was greater than .20.

To determine whether Pursuitmeter performance could be effectively predicted by dichotomizing on the basis of speed of completion of the block designs, subjects were regrouped according to whether their speed of completion measure fell above or below the median speed. Two groups resulted, 20 "fast" subjects and 20 "slow" subjects. The Mann-Whitney U test was used to evaluate the difference in total time on bullseye summed across trials. The difference again was not significant ( $p = .20$ ).

The conclusion that the analytic variable was not a useful predictor of the Pursuitmeter performance of women seems justified. However, it is important to note that other variables demonstrated

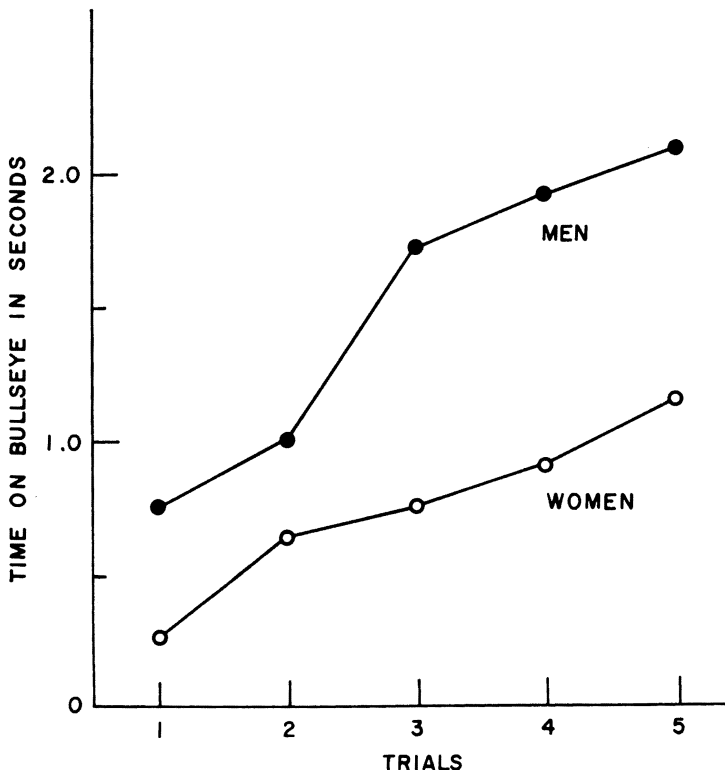


Figure 3. Means of time on bullseye in seconds plotted against five successive trials on the standard Pursuitmeter task, for 30 undergraduate men and 40 undergraduate women.

by Miles to influence performance were not controlled in this study.

Another possible explanation for the slight differences between the women analyzers and non-analyzers in performing on the Pursuitmeter relates to the difficulty of the standard task for women. Increasing the number of trials from 12 to 24 did not result in the women reaching the level of proficiency displayed by the men in Miles' studies. The men attained a higher mean time on bullseye on the standard task after 12 trials than the women in the present study after 24 trials.

Additional evidence of the greater difficulty of the standard task for women is available. In a study by Sheldon (1959) men were given the *Test of Tendency to Analyze* and analyzer and non-analyzer groups were thus obtained. In Figure 3 the performance curve for Sheldon's sample of 30 men is shown along with the curve for the 40 women of this study. Separate curves for analyzers and non-analyzers are not included. The curves are based on the means of time on bullseye over the first five trials. The men began performing at a mean time of 0.5 seconds higher than the women, and the curves diverge as practice continues until the mean difference favoring the men has reached approximately one second.

To evaluate the dependability of the observed sex difference, a Mann-Whitney U test was utilized. The two groups were found to differ significantly ( $p = .005$ ) in total time on bullseye during these five trials on the standard task.

Miles hypothesized that the analytic variable reflects a habitual mode of approaching new tasks. The Iowa Pursuitmeter is described as providing complex perceptual-motor tasks such that analysis by the subject of the underlying task features would result in a higher level of performance. However, in a task so difficult that even the component movements could not be performed quickly and easily, it would be predicted that the analytic variable would not be as highly related to performance as in a task in which the basic movements and appropriate responses were already acquired or easily mastered.

With college men it is assumed that the responses of steering and aiming required by the complex Pursuitmeter tasks are well understood and easily performed. It is conceivable that this assumption is not warranted with women subjects.

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