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Research Memorandum 3

The Relationship Between 1000" Range and Known-Distance Range Rifle Scores

by

Frank J. McGuigan

December 1953

The George Washington University
HUMAN RESOURCES RESEARCH OFFICE
operating under contract with
THE DEPARTMENT OF THE ARMY

THE RELATIONSHIP BETWEEN
1000" RANGE AND KNOWN-DISTANCE RANGE
RIFLE SCORES

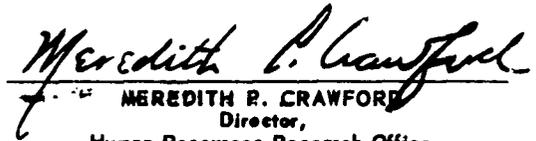
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**THE RELATIONSHIP BETWEEN 1000' RANGE
AND KNOWN-DISTANCE RANGE RIFLE SCORES**

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THE RELATIONSHIP BETWEEN 1000" RANGE AND KNOWN-DISTANCE RANGE RIFLE SCORES

Purpose of the Study

The objective of this study was to determine whether a significant relationship exists between M1 rifle marksmanship scores made by trainees on the 1000" range and their subsequent scores on the known-distance range. The trainee's first experience with live ammunition comes on the 1000" range where he fires at miniature targets. Firing on the known-distance range is a later phase of marksmanship training in which the trainee fires at targets from known distances ranging between 100 and 500 yards.

If a high correlation exists between 1000" and known-distance scores, the 1000" scores might be used for several purposes:

- (1) To predict performance on the known-distance range at an early point in M1 rifle training. It would thus become possible to identify those men who will need supplementary training before they can be expected to achieve a proficiency score which will meet existing Army standards.
- (2) To match groups in training experiments. Such a procedure would serve a valuable research function because it would make possible improved methods for evaluating training variables.
- (3) To substitute for known-distance scores as criteria in training experiments. If 1000" range scores could replace those now used from the known-distance range, numerous administrative problems which arise in the conduct of training experiments could be avoided.

Procedure Used to Measure Marksmanship

At the installation at which data for this study were collected, the slow fire exercises on the 1000" range are fired approximately in the middle of preliminary training, while the sustained fire exercises are fired at the end of that phase and just prior to known-distance firing. In Figure 1, a schematic representation of the M1 rifle course through known-distance firing, the various aspects of rifle training are shown in the sequence in which they are taught.

SCHEMATIC REPRESENTATION OF M1 RIFLE TRAINING USED IN THIS STUDY

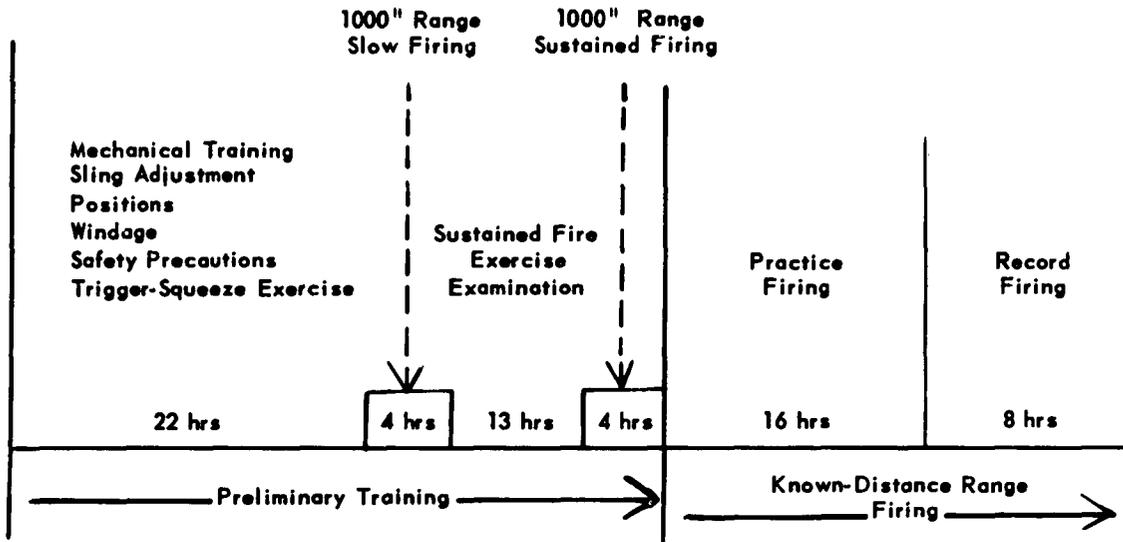


Figure 1

The data upon which this report is based were obtained during work on another study.¹ They represent the performance of approximately 550 men in four basic training companies. Each trainee fired a total of 51 rounds on the 1000" range, and the usual practice and record courses on the known-distance range. Scores were obtained separately for slow and sustained firing on each range. To ensure accurate recording of scores, 1000" range scores were recorded by training committee cadre directly from the targets, and known-distance scores were recorded in the pits by unbiased trainees.

The relationship between 1000" and known-distance range scores was evaluated by analyzing the following sets of scores:²

- (1) 1000" slow fire and KD record slow fire
- (2) 1000" slow fire and KD practice plus record slow fire
- (3) 1000" sustained fire and KD record sustained fire
- (4) 1000" sustained fire and KD practice plus record sustained fire
- (5) 1000" total score and KD record total score
- (6) 1000" total score and KD practice plus record total score

¹Denenberg, V. H. and McGuigan, F. J., "Evaluation of a Special Live-Firing Trigger-Squeeze Exercise." Final report is in preparation. Information Report as rendered to Office, Chief of Army Field Forces, available at Human Research Unit No. 1, OCAFF, at Fort Knox, Kentucky.

²The evaluation was made by a product-moment correlational analysis.

Statement of Results

The relation between 1000" slow fire and known-distance slow fire scores is reported in Table 1.³ Table 2 presents similar correlations for sustained fire, while Table 3 shows the correlations between total 1000" scores and the total of the practice plus record scores on the known-distance range. Each table also presents the weighted average of these correlations. Complete scores were not available for all companies; for this reason some correlations had to be omitted from the tables.

All correlations reported in Tables 1, 2, and 3 are significantly⁴ greater than zero, i.e., they indicate a degree of relationship larger than that which might reasonably have arisen through chance.

Table 1

CORRELATIONS BETWEEN 1000" SLOW FIRE SCORES AND KNOWN-DISTANCE SLOW FIRE SCORES^a

| Company | 1000" Slow Fire and KD Record Slow Fire | | 1000" Slow Fire and KD Practice Plus Record Slow Fire | |
|------------------|--|-------------|---|-------------|
| | No. | Correlation | No. | Correlation |
| 1 | 113 | .24 | (b) | (b) |
| 2 | 142 | .29 | 140 | .46 |
| 4 | 174 | .42 | 166 | .36 |
| Total | 429 | | 306 | |
| Weighted average | | .33 | | .40 |

^aAll correlations are significant at the $p = .01$ level.

^bComplete scores not available.

³Correlation values are expressed in a range from zero, indicating no relationship, to ± 1.00 , indicating perfect relationship.

⁴The level of statistical significance is expressed in terms of the probability that a given relationship would occur by chance; thus, a significance level of $p = .01$ indicates a probability of one in 100 that the value in question would occur by chance.

Table 2

**CORRELATIONS BETWEEN 1000" SUSTAINED FIRE SCORES
AND KNOWN-DISTANCE SUSTAINED FIRE SCORES^a**

| Company | 1000" Sustained Fire and KD Record Sustained Fire | | 1000" Sustained Fire and KD Practice Plus Record Sustained Fire | |
|------------------|--|------------------|---|-------------|
| | No. | Correlation | No. | Correlation |
| 2 | 106 | .23 ^b | 79 | .32 |
| 3 | 168 | .43 | 168 | .54 |
| 4 | 133 | .39 | 124 | .40 |
| Total | 407 | | 371 | |
| Weighted average | | .36 | | .45 |

^aCorrelations significant at $p = .01$ level except as noted.

^bSignificant at the $p = .05$ level.

Table 3

**CORRELATIONS BETWEEN 1000" TOTAL SCORES
AND KNOWN-DISTANCE TOTAL SCORES^a**

| Company | 1000" Total Score and KD Record Total Score | | 1000" Total Score and KD Practice Plus Record Total Score | |
|------------------|--|-------------|---|-------------|
| | No. | Correlation | No. | Correlation |
| 2 | 129 | .50 | 128 | .67 |
| 4 | 126 | .54 | 118 | .51 |
| Total | 255 | | 246 | |
| Weighted average | | .52 | | .59 |

^aAll correlations are significant at the $p = .01$ level.

Interpretation of Results

Since the obtained correlations are all significantly greater than zero, it can be concluded that there is a positive relationship between 1000" and known-distance range scores. This relationship is not high enough, however, to permit accurate prediction of individual known-distance performance, or to justify substitution of the 1000" range for the known-distance range as a measure of the degree of skill the trainee has attained. However, the correlations are sufficiently high to warrant using 1000" range scores as criteria for matching groups in experiments on training methods.

Note should be made of the fact that the 1000" scores upon which these correlations are based were obtained either midway through, or at the completion of, preliminary rifle instruction. Scores obtained at an earlier level of training on the 1000" range (as might be the case if the scores were to be used in setting up matched groups in a training experiment) would probably show a lower relationship to known-distance range performance.

Conclusions

- (1) Scores on the 1000" and the known-distance ranges correlate significantly for slow fire, sustained fire, and total scores.
- (2) On the basis of 1000" range scores, known-distance performance can be predicted significantly better than by chance. However, the correlation is not high enough to permit accurate prediction on an individual basis.
- (3) Scores on the 1000" range appear to be satisfactory criteria for use in matching trainees in experiments on training methods.
- (4) Substitution of the 1000" range for the known-distance range as a measure of proficiency is not feasible.