Risk-Taking Performance of Military Personnel: Sex Differences and Practice Effects

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An initial search of literature dealing with sex differences and performance variables led to several conclusions about past research in the area: 1) a large number of studies have been reported (Hudgens & Fatkin, 1980, cited about 1500 references); 2) most of those studies were conducted by researchers whose primary interest was the performance variable rather than the sex variable which appeared most often to be included only incidentally; and 3) most of the studies represented one-time efforts both in that repeated measures were not obtained within the investigations and in that the investigations were not followed up to determine the reliability of, generality of or factors responsible for the sex differences observed. The present program was established to perform more intensive investigations of sex differences on performance variables of potential importance to military applications.

The literature search also led to the identification of "risk-taking" behavior as one performance variable which could likely yield sex differences of potential importance within military contexts. Our interest in this area was sparked mainly by reports on driving behavior which have consistently demonstrated a more conservative attitude toward risk taking in women drivers (e.g., Ebbesen & Haney, 1973). Our initial efforts have involved attempts to test for sex differences in simplified computer simulations of military-related test situations requiring a degree of risk taking. The hypothesis tested was that women would be more conservative than men in performance involving risk.

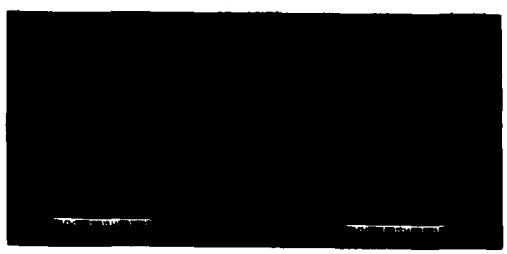
Methods

In the task shown in Figure 1, the subjects faced a screen displaying a simulated mine field with varying numbers and patterns of artillery-launched mines represented by dots in the field. The subjects were to decide whether or not to send a tank across the field based on their judgments of the chances of the tanks getting across successfully. Since the tank was not visible to the subjects prior to their decision, and since it could start from any point along the bottom line and proceed in a straight line through the field, the subjects had only the number of mines and their patterns as bases for a decision. They could decide "go" or "no-go" and were given points or lost points based on the outcomes of their decisions. The decisions made, the scores obtained and the times-to-decision were recorded automatically for each trial.

Figure 1

Examples of two of the patterns used are shown in Figure 2. The pattern on the left is one with a .90 probability of successful crossing. The pattern on the right has a probability of .30 for successful crossing. Twenty such randomly generated patterns were displayed for each probability level used.

Figure 2



The designs for the experiments are shown in Table 1. The subject groups were males and females. Subjects were tested only once in Experiment I, but over 4 test sessions in Experiment II. In Experiment I, the subjects were given extensive practice estimating the actual probability levels for successful crossing of the mine field prior to starting the decision-making phase described above. No such practice was given in Experiment II. In Experiment II, the easiest 20 trials, those with a probability of .90 for success, were eliminated to make the task shorter but more difficult.

Table 1

RISK-TAKING EXPERIMENTS

Experiment	Subject Groups	Test Sessions	Probabilities of Success	Trials
I	1. Males (N=18) 2. Females (N=18)	1. Probability Estimating 2. Decision Making (1 & 2 Same Day)	.90 .70 .50 .30 .10	20/Level of Probability
II	1. Males (N=4) 2. Females (N=4)	1. Decision Making 2. Decision Making 3. Decision Making 4. Decision Making (2/Day, Weeks 1 & 2)	.70 .50 .30 .10	20/Level of Probability

Results

The men and women did not differ significantly in their abilities to estimate probabilities of success in Phase I of Experiment I, or on their total scores for decision-making in either Experiments I or II.

In Experiment I, however, an analysis of the subjects' tendencies to choose the more conservative "no-go" response revealed that, for each set of 20 presentations of each field density, the males selected "no-go" a mean of 8.07 times to the females' mean of 7.03 times ($p<.05$). This difference held only for the more difficult middle range of densities (.70-.30) and not at the easier extreme densities (.90, .10). This finding appears to be contrary to the hypothesis that women would perform more conservatively than men.

Additionally, the women in this experiment tended to take longer than the men to make their decisions, particularly for the more difficult densities. This difference was significant for those fields with mine densities allowing for a .30 probability of successful crossing (decision time: male $\bar{X}$ = 2.56 sec, female $\bar{X}$ = 3.76 sec; $p<.025$).

When the experiment was partially replicated and extended to four sessions in Experiment II, the findings and interpretations became more complex.

Analysis of the subjects' tendencies to choose the "no-go" response again indicated that the males had a slightly (non-significantly) greater tendency than the females to choose the more conservative "no-go" response during the initial session (male $\bar{X}$ = 8.89; female $\bar{X}$ = 8.61). This pattern reversed for sessions 2-4; but, the sex X sessions interaction was not significant ($p<.25$). This reversal was great enough for the more dense fields, however, to result in a significant overall sex X field-density interaction ($p<.01$) as shown in Table 2. The prominent tendency for the women to choose the more conservative "no-go" response for the denser, more difficult fields supports the hypothesis that women would act more conservatively in situations involving risk.

Table 2

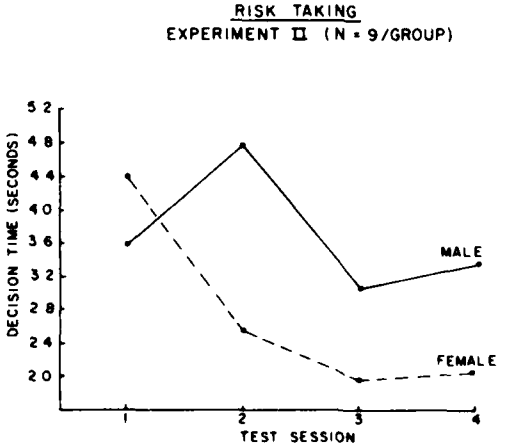
Risk Taking Experiment II

Mean Number "No-Go" Decisions (Out of 20)

GROUP	PROBABILITY OF SUCCESS .70	.50	.30	.10
Male (N=9)	1.31	4.42	13.14	18.47
Female (N=9)	0.72	5.36	16.17	19.64

Similarly complex patterns of results occurred for the decision-making latency measure in Experiment II. Figure 3 shows that, for the .30 probability density fields, a significant interaction occurred over test days. As in Experiment I, the women took longer than men to make their decisions on the first day of testing. However, on days 2-4 of testing, the women took significantly less time to make their decisions. The women appeared to have reduced their response time, while the men did not, over the 4 test days. Although this interaction between sex and days was significant only for fields with .30 probability densities, similar patterns occurred for the other probability densities as well in Experiment II.

Figure 3



Summary and Conclusions

1. While women were slightly less conservative in their performance on the initial session for the task described, they displayed a significantly greater tendency toward more conservative performance during the subsequent sessions. This predominantly conservative behavior for women in a risk-taking situation is consistent with the literature on decision making in risky driving situations where women drivers have been found to behave more conservatively than men drivers. Taken together, these results suggest that women may, in general, behave more conservatively than men in risk-taking situations.

2. The women took longer than men to make their decisions, particularly for the more difficult situations, during the initial session. However, this behavior pattern reversed for sessions 2-4 as had the tendency toward conservatism. This suggests that the more conservative response, once established, may involve less mental processing time.

3. The findings suggest that this type of computer simulation provides a reasonably valid and reliable means for studying risk-taking behavior in men and women.

4. These data clearly illustrate that one should be very cautious in drawing conclusions regarding male/female performance differences based solely on initial test trials. A very small amount of experience or training can have a dramatic effect on the relative performance of the groups. The value of obtaining repeated measures in sex-differences research is made quite apparent, as well.

References

Ebbesen, E. G., & Haney, M. Flirting with death: Variables affecting risk taking at intersections. Journal of Applied Social Psychology, 1973, 3, 303-324.

Hudgens, G. A., & Fatkin, L. T. Human performance: Psychological and physiological sex differences (A selected bibliography). Aberdeen Proving Ground, MD: US Army Human Engineering Laboratory, February 1980.