RISK TAKING IN MILITARY AND ECONOMIC DECISION MAKING: AN ANALYSIS VIA AN EXPERIMENTAL SIMULATION

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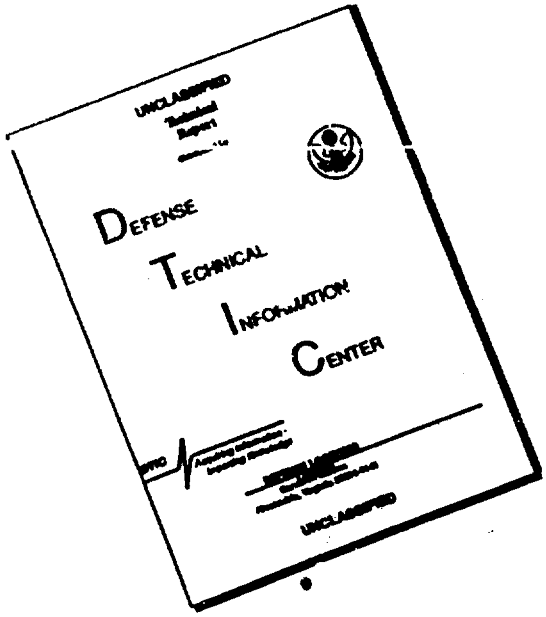

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Abstract

The effect of success, failure, and time spent in decision making on the degree of military and economic risk taking was investigated. A complex experimental simulation technique was employed as the research method to permit comparison of data obtained in the present setting with results reported by investigators using small-scale laboratory techniques. It was found that risk taking increases with the length of time that decision-making groups spend in working on a task. After some time, risky decision making may become concentrated in one decision area at a time, even though risks could be taken in more areas. Comparisons to laboratory results suggest some communalities as well as some differences with regard to risk-taking results.

RISK TAKING IN MILITARY AND ECONOMIC DECISION MAKING: AN ANALYSIS VIA AN EXPERIMENTAL SIMULATION[1]

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There has been considerable speculation among historians, sociologists, and other analysts of past political behavior about the cause of risks which have been taken by military commanders or statesmen. However, risk taking occurred not only in the past; it is just as much a part of the present. Military, economic and other political decision makers take well calculated risks as well as "impulsive" risks every day. Some of these decisions meet with failure, some of them meet with success. Can we anticipate, predict, accelerate, or inhibit their risk taking? One rather simple answer to the problem of producing the ideal risk level is, of course, orders from a higher (and hopefully better informed) source. However, those instructions, when speed of communication is less than ideal, may be cancelled or modified too late to take a change in the environment into account.

Another solution to the dilemma may be given through the anticipation of risky responding by decision makers, whether they are involved in economic or military affairs, and whether their level of responsibility is large or small. Specific positions, under specific environmental conditions, probably have optimal risk levels, which could be specified by experimental analysis or possibly by a consensus of persons with considerable related experience. Assuming this ideal risk level for any particular position is known, one might be able to match that risk level with (a) a person who is likely on the average to engage in that quantity of risk taking, and/or (b) environmental conditions which would serve to promote that risk level while inhibiting any other (higher or lower) risk level.

So far, there is insufficient knowledge about individual differences in risk-taking behavior. Considerably more research has been reported about environmental effects on risk taking, e.g., the work on risky or conservative shift (see below). In this research we are concerned with such environmental effects on risk-taking behavior, utilizing a simulation setting which is more "real" than most settings in which risk taking has been previously studied.

Our concern, from an applied point of view, is with an initial attempt to specify some of the conditions in which military, economic, and other decision makers operate, which serve to increase or decrease risk taking. Before discussing the specific research, we will be concerned with some psychological implications of risk taking.

In recent years, psychologists have been widely concerned with risk taking and the phenomenon of risky shift. Most of the research in that area has employed miniature decision making (e.g., gambling) tasks, where actual pay-offs to subjects were often small or hypothetical. A number of interpretations of the phenomena of risk taking and risky shift have been advanced, and considerable research in support of the various views has been presented (e.g., Bem, Wallach, & Kogan, 1965; Brown, 1965; Edwards, 1953, 1954a, 1954b; Kogan & Wallach, 1964; Lonergan & McClintock, 1961; Pruitt, 1962; Rettig, 1964, 1966; Wallach & Kogan, 1965; Wallach, Kogan, & Bem, 1962, 1965). Although many pertinent experiments with powerful data have been presented, none of the theoretical formulations about risk taking and risky shift (e.g., diffusion of responsibility, censure testing, value, familiarity theories) has been able to gain final pre-eminence.

The availability of data collected in the small group laboratory, as well as relevant theory, suggests that there may be considerable value in extending the research on risk taking to wider settings than those usually employed. Already Kogan and Wallach (1964) have pointed out that the study of risk taking may have much import for questions of human survival -- for instance, for decision making where national and military issues are concerned. Although at present it may be too early to predict situations of such complexity, initial research in that direction could be of value.

It appears certain that conditions producing risky decision making in the "real" world of international conflict differ from the psychological laboratory in at least three ways: (1) potential loss and gain in real world decision making is likely greater, (2) personal involvement of the decision makers is likely greater (e.g., careers or life may depend on success), and (3) the uncertainty of gain or loss in international conflict situations is based on interacting multiple, rather than on single, determinants.

Because of these differences, it may be of value to employ simulation techniques with multiple components in the study of risky decision making. Although it is not possible to introduce loss and gain of real world proportions into simulation research, it has been frequently demonstrated that the participants in simulations experience considerable involvement. Further, the participants are faced with a complex environment in which outcomes are, or appear to be, determined by many interacting factors. Research on risk taking in simulated settings corresponding to international conflict situations may suggest (1) whether previously reported findings in the psychological laboratory hold in more complex environments, and may possibly be of future value in the analysis of "real" international conflicts, and (2) which, if any, theoretical formulations, or groups of risk-taking data, may have meaning beyond a limited laboratory setting.

Previous research using simulation techniques has rarely been specifically concerned with risk taking. One exception is the work of Streufert and Streufert (1968), who employed a simpler form of the present method to measure risk taking as an effect of information load (the quantity of information that decision makers receive per unit time) and of time spent in the simulation. These researchers employed the Tactical Game (Streufert, Clardy, Driver, Karlins, Schroder, & Suedfeld, 1965), a simulation permitting only military decision making. Because of the greater simplicity of that decision-making environment, it may be considered as standing mid-way between the simulation technique of the present experiment and the psychological laboratory experiments usually employed to measure risk taking. Streufert and Streufert (1968) reported that risk taking increased with the time that (four man) groups of subjects spent in decision making and with the optimality of the information available to these groups.

Further, some of the work utilizing the Internation Simulation (INS) technique of Guetzkow (1962) and other related "free" simulations[2] have produced some relevant data. For instance, Driver (1965) has shown that war conditions in the INS result in more aggressive behavior (which may be interpreted as risky). However, the INS research did not specifically attend to risk, nor did the researchers establish environmental conditions which could be held constant over simulation runs to measure the effect of specific (independent) environmental variables on risk-taking behavior. Such an attempt is made in the present research. In this paper we are concerned with risk taking by decision makers who participate in a simulated internation environment, which contains both military and economic components. Risk taking by decision-making groups is measured as a function of the time which groups spent in the simulation and as a function of increasing success or failure experienced by the decision makers.

Method

Subjects

Eighty-eight paid undergraduates at an eastern state university participated as pairs in the simulation. Twenty-two dyad decision-making teams were placed in the success condition, and twenty-two dyads were placed in the failure condition (see below).

The Task

Each pair of subjects was instructed to act as equal-rank commanders with responsibility for military, economic, and intelligence functions of an experimental simulation. The task, a simulated internation decision-making situation, is described in Streufert, Kliger, Castore, and Driver (1967); it has been used in a somewhat simpler form (Streufert, Clardy, Driver, Karlins, Schroder, & Suedfeld, 1965) in considerable previous research (e.g., Stager, 1967; Streufert & Driver, 1965, 1967; Streufert & Schroder, 1965; Streufert, Suedfeld, & Driver, 1965; Streufert, Driver, & Haun, 1967; Suedfeld & Streufert, 1966). Dyad decision-making teams were told that they were playing a tactical and economic game against another team of subjects and that the experimenters would serve as judges (assisted by a computer). Subjects were free to make any kind and number of decisions possible within the constraints of available resources.[3] They were told that the experimenters would determine "wins" and "losses" based on the decisions made by both teams. Such "consequences of decisions made by the subjects" were fed back to the subjects (see below).

In fact, subjects were playing the game against a pre-determined program.[4] All information fed back to the subjects was constant across success or failure (see below) runs, so that all teams in the same condition received the same messages, no matter what their specific decisions had been.

All dyads participated in the game for seven consecutive thirty-minute periods. To avoid an end effect, teams were not told which playing period would be the last. During each period, the teams received seven typed messages, spaced in equal time intervals. The messages contained information about military or economic components of the game. Military and economic messages occurred with equal frequency. The order of messages for each period was randomized. During the first period, one message reported failure (for subjects in the failure condition) or success (for subjects in the success condition). The remaining six messages were neutral in content. During the second period, two messages reported failure or success, and so forth, until in the seventh period all seven messages reported failure or success. The order of failure or success messages vs. neutral messages was randomized.

The teams of subjects made decisions in writing, and included a statement of purposes and rationale for each decision on the decision form.

Data Collection

For the purpose of decision classification, all decisions made by the dyad teams were plotted on a decision sequence graph.[5] Time (condensed for the purpose of the simulation) was plotted horizontally. Types of decisions made by the subjects were listed vertically under representative headings (e.g., military decisions, economic decisions, etc.).[6] In this fashion, each decision made by a dyad team could be represented as a point, placed vertically below the time where it occurred and horizontally beside the type of decision it represented. Based on their categorization in the decision sequence graph, and based on the rationale for each decision prepared by the subjects, all decisions could be separated into risky and non-risky decisions. Decisions were considered risky if they were aggressive rather than defensive in nature and placed troops or equipment into positions where they were in danger of attack or destruction by enemy forces (military risk taking). Further, decisions were considered risky if funds were invested in projects where obtaining the desired effect was uncertain (economic risk taking). Decisions were not considered risky if they were (1) preparatory moves in anticipation of later moves (no matter whether military or economic),

(2) retaliatory moves, e.g., defensive military decisions or economic investments in ventures with the purpose of avoiding enemy control or influence, and (3) withdrawal moves, e.g., decisions withdrawing men or equipment from endangered positions or decisions ending or withholding support of economic projects.[7]

All decisions made by the teams could be classified in this fashion. The number of men ordered by each team during any playing period into positions or engagements considered risky (see above) was used as raw data for the analysis of military risk taking. The quantity of funds investeu in uncertain economic projects was used as raw data for the analysis of economic risk taking.

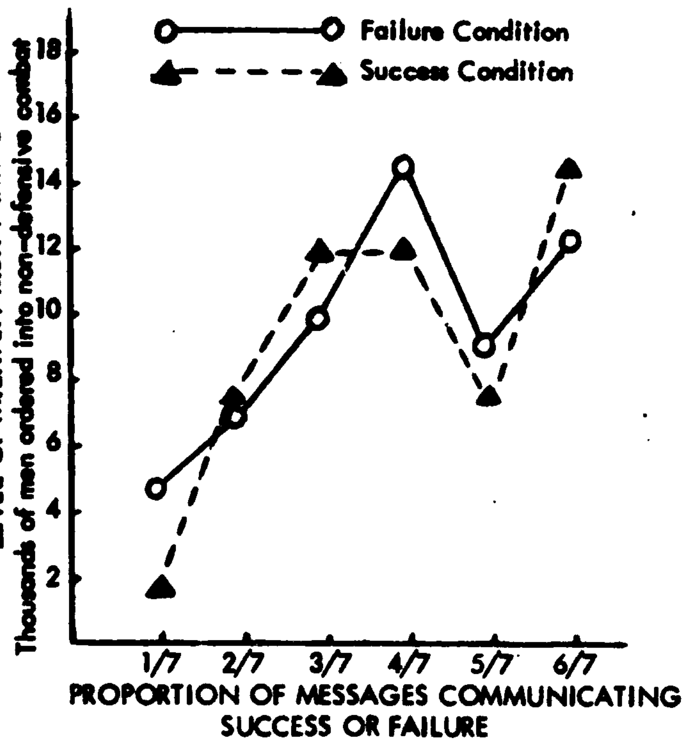
Results

Since the measures of risky military and economic decision making are not comparable, the data were analyzed separately with a two-way mixed design analysis of variance technique. We will be concerned first with military risk taking.

A significant (within) main effect for periods of play (time spent in the simulation) was obtained ($F = 56.64$, $p < .01$). The F ratios for success-failure differences (between) and for the interaction effect (success-failure X periods of play) were not significant. A graphic representation of the results is presented in Figure 1.

Post hoc Newman-Keuls techniques based on the ANOVA error term were employed to test for significance between specific points on the time (periods of play) dimension. For this purpose, data from the failure and success conditions were combined, since no significance for success-failure differences was obtained and since inspection of Figure 1 indicates considerable similarity of the two curves. Differences were found for comparison of military risk taking for periods 1 and 5 vs. periods 3 ($p < .05$), 4 ($p < .01$), and 6 ($p < .01$), as well as for periods 2 and 3 vs. periods 4 and 6 (in all cases $p < .01$).

The results of the ANOVA for risky economic decision making produced a significant F ratio ($F = 7.98$, $p < .01$) for periods of play (time spent in the simulation). Again, differences between success and failure conditions,



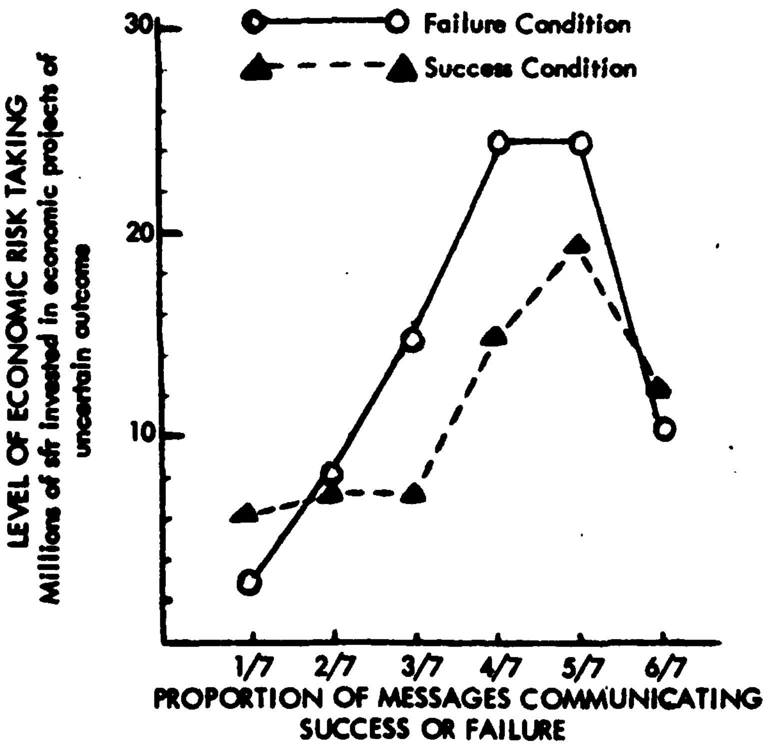
Failure Condition
Success Condition
LEVEL OF MILITARY RISK TAKING
Thousands of men ordered into non-defensive combat
18
16
14
12
10
8
6
4
2
1/7
2/7
3/7
4/7
5/7
6/7
PROPORTION OF MESSAGES COMMUNICATING SUCCESS OR FAILURE

as well as the interaction effect, were not significant. The results are depicted in graphic form in Figure 2. Success and failure conditions were combined for further analysis. Newman-Keuls analysis indicated significance between period 5 and all other periods ($p < .01$) and period 4 compared to period 1 ($p < .05$).

Discussion

Although modifications of risk-taking behavior in the direction of more risky decision making was found for all groups, no matter whether exposed to increasing success or failure conditions, there were considerable differences between groups in the degree to which they were <u>generally</u> risky or conservative. Some groups engaged in economic and/or military risk levels that were ten times or more the size of risk levels employed by other groups. The resulting high variance between groups for military as well as economic risk taking in the success and failure conditions contributed to the absence of a main effect (or an interaction effect) for success-failure differences. This high variance is indicative of differences between groups in both the <u>number</u> of risky decisions made, as well as the <u>size</u> of each particular risk (the number of troops or funds invested per decision). Apparently risk-taking differences between groups of decision makers are considerably greater in the simulation (and possibly in the "real world" which it attempts to represent) than they are in the psychological laboratory. Laboratory studies tend to report generally similar "preferred" risk levels (e.g., in gambling behavior).

Another interesting result is the similar effect of success and failure treatments on risk taking (as visible in Figures 1 and 2). Two different conclusions can be drawn from this finding: (1) the effects of success and of failure on risky decision making are highly similar, or (2) the effect observed in this research is a function of the time that groups of subjects spent as participants in the simulation. This latter conclusion would suggest that the success or failure content of information which the decision-making groups received had no effect on risk levels. We will explore the two possibilities in sequence.


Failure Condition
Success Condition
LEVEL OF ECONOMIC RISK TAKING
Millions of sfr invested in economic projects of uncertain outcome
30
20
10
1/7
2/7
3/7
4/7
5/7
6/7
PROPORTION OF MESSAGES COMMUNICATING
SUCCESS OR FAILURE

The first conclusion would be in agreement with propositions of complexity theory. As proposed by Driver and Streufert (1965, 1966), Schroder, Driver, and Streufert (1967), and Streufert and Driver (1967), this theory suggests that information load, success, and failure should have similar stressing effects on decision makers, producing similar structural (but not content) determined behavior. If risk levels are determined in part by levels of stress (cf., Driver, 1965), then the present results are explained. In earlier research Streufert and Streufert (1968) demonstrated some effect of stressing information load levels on risk taking. However, some doubts remain. Whether risky decision making can be ascribed to "structural" information processing by decision-making groups rather than to content effects (cf., Schroder et al., 1967) remains in question. In addition, previous work by Streufert and Streufert (1967) has indicated that some of the propositions of complexity theory with regard to success-failure similarities may not hold. Finally, the above cited experiment of Streufert and Streufert (1968) has demonstrated a considerable effect of the time which decision makers spend in the simulation, in addition to the stress effect of load on risky decision making. It was found that progressing time spent in decision making results in increasing risk taking. This effect is sufficiently similar to the results obtained in the present experiment to make the less parsimonious explanation via complexity theory unnecessary. We will, therefore, view the results as due to the time which decision-making groups spent in the simulation.

Although the results of this experiment showed some similarity to those of Streufert and Streufert (1968), several important differences between experimental conditions and results are of interest. The environment utilized in the present simulation was more complex than that used in the previous experiment. Risk taking was here possible in two decision areas, rather than in only one. The results obtained in the two studies showed only initial similarity. Both military and economic risk taking increased during the first four periods (two hours actual time spent in decision-making activity) of this simulation. Such a general increase was also reported by Streufert and Streufert (1968). However, differences between these results and those of the present experiment become rather evident beyond this point in the time sequence. Military risk taking dropped off sharply during the fifth period of play but recovered for the sixth period. Economic risk taking was maintained (or slightly increased) from the fourth to the fifth period but dropped off sharply for the sixth period. A view of the raw data revealed that these mean results were a reflection of an even more pronounced shift in risky decision making: groups dropped one area of risky decision making (usually military) nearly entirely during the fifth period, while maintaining or increasing risky decision making in the other area. When this appeared to produce insufficient change in their environment[8], they dropped risky decision making in the area in which they had just been heavily engaged and tried the other area.

One might assume that this restriction of risk to one area of emphasis during the (later) fifth and sixth periods could be an effect of cumulative stress experienced over time in simulation participation. Some support for this assumption can be found in the work of Driver (1965); in his INS subjects' stress (there defined as war in the simulation) resulted in decrease of perceptual dimensionality from two or three to one dimension. The characteristic of the remaining dimension (alliance) in Driver's research was a necessary effect of his experimental characteristics. The characteristic of the remaining dimension which our present subjects employed during any particular period, whether military or economic, was probably determined by their cultural background. One may consider it encouraging that American college students usually engage in greater economic risks before engaging in greater military risks. Let us note again, however, that this pattern reverses, at least for some of the participants in this research.

We have above questioned the comparability of laboratory and simulation research. How do the findings in the present experiment compare to psychological laboratory research? Most research employing decision-making groups has resulted in risky shift (rather than no shift, or in conservative shift). If we conceive of the simulation as an environment where subjects move from being individuals, or a social aggregate, to being a close "group" of decision makers, then increased risk taking should be expected, no matter whether one bases one's prediction on diffusion of responsibility (Kogan & Wallach, 1965) or on value theory (Brown, 1965). Research which considers the time that decision makers spent in a group, and its effect on risk taking, is comparatively rare. One interesting exception is the work of Davis, Hoppe, and Hornseth (1968). Employing a gambling task, these researchers found that risk taking (when loss is threatening) increased over blocks of trials. They obtained this result for both individuals and groups. Their data, gathered in a very simple environment, are strikingly similar (including the general levelling off of risky decision making in later blocks of trials) to the results obtained in the present experimental simulation.

A number of tentative conclusions may be drawn from the results reported in this paper. The similarity between results obtained in laboratory settings, in a simple simulation, and in the present more complex simulation suggests that the risk-taking data obtained in previous research may have more than limited application. However, more research is needed to clarify the determinants of between group variability in risk taking when complex tasks are used. We may also conclude that risk taking increases over time which groups spend in a decision-making situation. Finally, we may suggest that risky decision making, after some time has passed, may begin to be concentrated on one decision area and that this decision area may not be stable over time.

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Footnotes

[1] Research support from the Office of Naval Research, Group Psychology Branch, is gratefully acknowledged.

[2] The method employed in this research is an "experimental simulation." While in the "free simulation," subjects begin with a predetermined set of conditions and rules but are free to modify their environment as they go along; the experimental simulation permits predetermination (without the participants' knowledge) of environmental characteristics throughout the simulation, as well as predetermined outcomes for all decisions made by the participants (see the Method section of this paper).

[3] Subjects were given fixed quantities of men, equipment, and funds. They were told that nothing lost could be replaced. Any unwarranted investment of men, equipment, or funds without certainty of maintaining or enhancing their quantity could therefore be construed as risk taking.

[4] For descriptions and manuals of the game (TNG), see Streufert, Clardy, Driver, Karlins, Schroder, and Suedfeld, 1965; Streufert, Kliger, Castore, and Driver, 1967; and Streufert, Castore, and Kliger, 1967.

[5] For detailed descriptions of decision sequence graphs beyond the scope of the present paper, see Schroder, Driver, and Streufert (1967) and Streufert, Clardy, Driver, Karlins, Schroder, and Suedfeld (1965).

[6] For instance, military decisions included such decision types as "air attack," "reconnaissance," "troop movement," etc. Economic decisions included decision types such as "agricultural mechanization," "construction of steel mills," "food assistance programs," etc.

[7] The present definition of risk and non-risk is for operational purposes only and may not be universally applicable. Research on degrees of risk taking with relevance to specific decision types and with relevance to environmental variables appears necessary.

[8] For groups in the failure condition, failure continues to increase, while for groups in the success condition, not all actions result in immediate success. (Note: only seven success messages per period are possible.)

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13. ABSTRACT

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14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Risk taking						
Decision making						
success						
failure						
military decision making						
economic decision making						
simulation						
conflict						
time spent in decision making						
complexity theory						