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Risk-taking [*Abridged*]

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An Experimental Study of Risk-taking

In this paper I shall first present a hypothesis relating risk-taking to the regulation of level of arousal, then describe an experimental study designed to test this hypothesis and, finally, discuss the usefulness of the concept of a risk-taking propensity and the difficulties involved in its measurement.

It is clear from both everyday and clinical observation that people differ widely in their attitude to risk, some being frightened of the slightest exposure while others seem actively to seek out risky situations. Extreme pictures are seen clinically in the cautiousness of some patients with obsessional personalities and the recklessness of certain so-called psychopaths. In addition to these differences in preferred level of risk between subjects there are also variations within individuals at different times depending on the subject's recent experience, mood or the particular situation. A theory of risk-taking thus needs to account for both inter- and intra-individual variations in the tolerance of risk.

Much work now supports the view not only that an optimum level of arousal does exist for each individual at which his performance is most efficient but also that this level is a preferred state. The individual attempts to reach such an optimum level by avoiding excess over- or under-arousal and I would like to suggest that one of the chief ways of doing this is by regulating the amount of risk he exposes himself to. According to this hypothesis a subject who is experiencing levels of arousal above his optimum tends to adopt cautious strategies which will tend to bring his level down while, if he is experiencing low levels, he will tend to accept risks and in this way again bring his level towards the optimum. The hypothesis therefore predicts that the individual will take fewer risks when he is highly aroused than when his level of arousal is low and also that between subjects differences in risk-taking will be related to differences in average level of arousal.

We should therefore expect personality correlates of risk-taking as well as a relationship with clinical states associated with high arousal. The literature on risk-taking (Slovic 1964, Kogan & Wallach 1967) largely deals with experimental studies and has produced no consistent relationships between personality measures and risk-taking. An earlier study of mine (Steiner 1967) showed some promising relationships with several of the scales of the MMPI but these were not confirmed when the study was repeated and the present experiment was designed partly because improvements were made in the experimental measure and partly to assess the validity of the measure by introducing a structured interview in which the subject's everyday responses to risk were examined and his behaviour in the experiment discussed.

Table 1
Means and standard deviation of personality and risk variables

	Obsessional patients		*Surgical patients*		
	Mean	*Standard deviation*	*Mean*	*Standard deviation*	*Significance*●
Age	34·56	10·60	29·22	13·05	n.s.
Intelligence (Mill Hill)	32·23	5·75	28·56	6·02	n.s.
Taylor anxiety scale	26·56	9·49	15·00	7·15	+++
MMPI					
Lie	3·94	2·41	3·39	1·69	n.s.
F	7·50	5·64	4·22	2·58	+
K	14·39	4·82	13·44	3·65	n.s.
Hs	16·83	4·15	13·06	4·65	+
D	31·06	7·87	21·22	5·00	+++
Hy	26·61	4·91	18·78	4·51	+++
Pd	25·50	5·92	18·72	4·31	+++
Mf	32·28	6·63	29·11	7·89	n.s.
Pa	13·33	3·64	7·67	2·45	+++
Ps	36·89	6·28	26·56	4·83	+++
Sc	33·61	12·38	25·67	4·81	+
Ma	15·61	3·73	18·72	4·10	+
Si	38·06	9·96	29·83	10·61	+
Ego strength	37·89	8·46	46·17	5·99	++
R (introversion)	22·05	4·94	17·28	4·92	++
Extroversion	15·44	5·11	22·94	6·70	+++
Caution	−35·58	12·91	18·83	10·48	+++
Risk ratings					
Overall	3·44	1·76	5·89	1·45	+++
Financial	3·50	1·79	5·22	1·99	++
Physical	4·00	2·45	6·33	1·71	++
Social	3·56	1·62	6·33	1·46	+++
Risk threshold	1·30	2·70	1·80	2·30	n.s.

●Significance levels in Tables 1 & 2: + less than 0·05, ++ less than 0·01, +++ less than 0·001, n.s. not significant

Table 2
Correlations between personality scales, risk threshold and overall risk ratings

	All subjects		*Obsessional patients*		*Surgical patients*	
	Overall risk rating	*Risk threshold*	*Overall risk rating*	*Risk threshold*	*Overall risk rating*	*Risk threshold*
Age	−0·38+	−0·14	−0·03	−0·17	−0·61++	−0·08
Intelligence (Mill Hill)	−0·17	−0·13	−0·38	−0·03	−0·37	−0·26
Taylor anxiety scale	−0·57+++	0·14	−0·24	0·25	0·36	0·23
MMPI						
Lie	−0·18	0·08	−0·12	0·07	−0·13	0·15
F	−0·28	−0·16	−0·15	−0·25	0·09	0·15
K	−0·05	0·00	0·08	−0·06	−0·07	0·13
Hs	−0·26	−0·08	0·02	−0·08	−0·04	0·00
D	−0·51++	−0·07	−0·10	0·00	−0·47+	−0·01
Hy	−0·59+++	−0·09	−0·38	−0·06	−0·25	−0·15
Pd	−0·35+	−0·10	−0·17	0·05	0·25	−0·22
Mf	−0·38+	0·35	0·01	0·34	−0·62++	0·46
Pa	−0·47++	−0·13	0·08	−0·23	−0·39	0·20
Ps	−0·68+++	−0·07	−0·42	0·09	−0·49+	0·37
Sc	−0·36+	−0·10	−0·16	−0·15	−0·16	0·18
Ma	0·47++	0·03	−0·05	−0·11	0·76+++	0·10
Si	−0·54++	−0·14	−0·25	0·10	−0·63++	0·31
Ego strength	0·53++	−0·04	0·26	−0·27	0·43	−0·06
R(introversion)	−0·41+	−0·13	0·05	0·03	−0·50+	0·12
Extroversion	0·55++	0·08	0·03	−0·06	0·63++	−0·27
Caution	−0·59+++	0·09	−0·21	0·15	−0·55+	0·25
Risk ratings						
Overall	–	0·12	–	0·17	–	−0·09
Financial	0·87+++	0·18	0·86+++	0·17	0·87+++	0·12
Physical	0·88+++	−0·14	0·86+++	0·16	0·80+++	−0·32
Social	0·89+++	0·11	0·84+++	0·08	0·80+++	0·01

A group of 18 obsessional patients were compared with 18 patients who had recently undergone minor surgery who were matched for age, sex and intelligence and who had no history of psychiatric disorder. Obsessionals were chosen because they are not only highly aroused (Kelly & Walter 1968) but from clinical experience are usually exceedingly cautious. Thus if this was confirmed in the structured interview it would be a good test for the experimental measure.

In the experimental task the subjects were on each trial offered a choice between a gamble and a sure thing. They were given an initial stake of £3 and were allowed to keep any winnings in excess of this. On each trial a card showing the value of the sure thing, which could be a gain or loss, was presented to the subject together with the gamble in the form of a disc divided into black and yellow segments. If the subject decided to risk, the disc was spun and the subject won 10s if the pointer came to rest against the yellow and lost 10s if it came to rest against the black. The proportion of the two colours therefore determined the favourability of the bet and could be easily estimated by the subjects. There were 17 different discs each paired with a different sure thing. Unknown to the subject the next pair offered depended on his choice on the preceding trial. If he chose to gamble, the next bet was made less favourable and paired with a sure thing which was more favourable, while if he chose the sure thing the next bet was more favourable and the sure thing less so. This procedure, which was disguised by the introduction of a random element, ensured that the average payoff did not depend on the strategy chosen, and the subject worked his way up or down the pairs, tending to stabilize at one or other level.

We argued that risky subjects would prefer to spin the disc even at low probabilities of success and even when it was paired with a favourable sure thing, while cautious subjects would be willing to pay considerable sums to avoid taking a risk even though it was relatively favourable. As an index of risk-taking we used the value of the sure thing at which the subject was as likely to risk as not and called it the risk threshold. In addition to this task the subjects did the card form of the MMPI and after the experimental session had their structured interview on the basis of which separate ratings were made of how risky or cautious they were in situations involving physical, financial and social risk.

Results

Table 1 shows that even though the obsessional patients differed from the surgical patients on most of the personality scales there was no difference on their mean risk threshold on the game.

Moreover, Table 2 shows that the correlations between the risk threshold and personality measures did not significantly differ from zero, so that the experimental measure of risk-taking offers no support for the hypothesis linking risk-taking and arousal.

Fortunately we have the interview ratings which tell us something about the validity of the risk-taking measure and also about the subjects' approach to the task. The ratings are seen to discriminate clearly between the two groups (Table 1) and to correlate significantly with several of the personality scales of the MMPI (Table 2). If the ratings alone are considered, therefore, the results support the hypothesis by demonstrating a difference in real life risk-taking between the obsessional and surgical patients and by showing a correlation between risk-taking and abnormal scores on clinical scales of the MMPI. Such a conclusion of course assumes that the ratings were valid indices of risk-taking and an effort to assess the possibility of bias in the ratings was made by scoring the factual information collected in the interview. This factual score correlated highly with the ratings and also with personality measures and it seems unlikely that an important source of bias was present.

The results therefore suggest that the experimental measure was a poor index of risk-taking, at least in the present context, and the interviews with the subjects shed some light on the reasons. The subjects were found to approach the game in very different ways which in some cases invalidated the risk threshold as a measure of risk-taking. One pattern found particularly among the male controls was that subjects tried to behave as rationally as possible and although it made no difference to the average payoff it did appear to be rational to take a risk whenever the chance of winning was greater than 0·5 and to take the sure thing whenever it was less than this. This resulted in a cautious strategy from subjects who were usually quite prepared to take risks and most of them said that they would have played differently in a non-test situation. Another pattern was found particularly among the female obsessional patients who became very anxious and embarrassed about winning money and who said that they would never agree to play such a game in real life. Four subjects actually tried to lose money because of their reluctance to take anything from us and did this by accepting grossly unfavourable bets which resulted in a very risky score. There were in fact 8 subjects who were grossly aberrant in their treatment of the game on the basis of the interview and if these are excluded from the analysis the risk threshold on the game does correlate significantly with several of the personality variables. This exclusion of subjects is of course *post hoc* and is presented here only to illustrate the difficulties encountered in experimental research with human subjects where attitudes and motivations can be so diverse.

Similar difficulties may well be responsible for some of the conflicting results reported in the literature and although improvements in experimental technique are of course possible it may prove more fruitful to develop other methods of assessment. We are now working on a risk questionnaire with which we hope to collect information about the subject's behaviour in real life risky situations and about his attitudes to various types of risk.

Information of this kind could be useful in a variety of theoretical and clinical contexts. Suicide attempts, for example, might well be related to risk-taking propensities and antisocial behaviour of many types involves risk as does alcohol and drug addiction and perhaps most of all gambling. Many diverse factors contribute to these problems but a study of risk-taking may contribute something to their understanding.

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Clinical and Social Aspects of Risk-taking

Since the resolution of uncertainty may produce a catharsis when the outcome becomes known, risk-taking often is pleasurable. This is probably responsible for the fact that gambling, which is a contrived form of risk-taking, has always been popular (Moran 1970*b*). The personality factors underlying this are not fully understood. However, in view of the known association between gambling and superstition, it is interesting that Liverant & Scodel (1960) have shown that in normal subjects there is a correlation between the degree of risk-taking on the one hand and the individual's attitude about the degree of control