Complex decision-making: initial results of an empirical study

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ABSTRACT

A brief survey of key literature on emotions and decision-making introduces an empirical study of a group of university students exploring the effects of decision-making complexity on error risk. The results clearly show that decision-making under stress in the experimental group produces significantly more errors than in the stress-free control group.

SINTESI

Dopo l'esame di alcuni lavori scientifici su emozioni e processi decisionali, vengono esposti i primi dati di una ricerca sperimentale, condotta su un gruppo di studenti universitari, avente per oggetto gli effetti della densità decisionale sul rischio d'errore. I risultati mettono chiaramente in luce che le condizioni di carico decisionale, a cui è stato sottoposto il gruppo sperimentale, ne hanno determinato un numero di errori significativamente più elevato rispetto al gruppo di controllo.

Introduction

The incompleteness of exclusively rational explanations of various kinds of decision-making, and the need for an approach that takes account of emotion, have been evident in many psychological studies since Zajonc's early findings were published in the late 1960s[1].
A survey of the literature raises interesting issues. According to Bower & Cohen[2], emotions work as an attention filter: how stimuli are interpreted depends on the decision-maker's mood at the time. Thus, an angry person might make radical, even destructive choices, while an anxious person would tend to avoid choosing altogether, or at any rate, choose what seems likely to be the least risky option. More recently, however, Bensi & Giusberti[3] have speculated that anxiety gives rise to the diametrical opposite of this: anxious people will make a hurried decision – any decision – rather than endure their state of insecurity any longer. This is in line with what Garety, Hemsley and Wessely[4] call the *jumping to conclusions* decision-making style, where decisions receive little or no considered thought. However, Bower & Cohen and Bensi & Giusberti's conclusions need not be seen as mutually exclusive; they simply describe *possible* responses which vary according to the personalities of subjects and the situations they find themselves in.
As regards the influence of positive moods on decision-making, Isen[5] notes that they promote flexible, productive thinking, and therefore appropriate, creative decision-making.
So Rumiati & Bonini[6] seem fully justified in saying that "the belief that rational decision-making requires the elimination of emotional influence is an unwarranted limitation."
Neuroscientists have also stressed the importance of emotion in decision-making. One need only cite Antonio Damasio, among the most authoritative of neuroscientists concerned with decision-making, who proposes[7] that somatic markers – automatic emotional associations responsible for identifying how acceptable decision choices are – play a fundamental role in decision-making. Adopting what seems to be a counter-intuitive approach, Damasio maintains that somatic markers precede rational thought, meaning that emotion, not reason, lies at the heart of decision-making.
The implications of all this on activities that involve complex decision-making – those that take place in hospital emergency rooms being a prime example – will be evident.
Rastelli, Cavazza & Cervellin[8] speak of the "huge numbers of patients and massive, unmanageable overcrowding" in hospital emergency rooms that have long been a focus of study in the UK and USA. In recent decades, say the authors, the health services in the main European countries have gradually reduced not only the number of hospital beds per 1000 inhabitants but also the number of hospitals, despite a gradual increase in demand for emergency treatment caused to a significant degree by increases in the numbers of immigrants and elderly people. All this, they say, is having a negative impact on emergency services as well as individual health workers[8]. Waiting times for treatment are getting longer and the system itself is increasingly unable to cope, while health workers often feel threatened by verbal and/or physical violence on the part of patients and their minders. In such circumstances, the greater likelihood of burn-out in health workers cannot be ignored.
The negative emotional impact of burn-out and feeling physically threatened, and therefore the increased likelihood of error in a profession prone decision-making stress (i.e., never-ending, obligatory, unavoidably hasty decision-making where pressure of time may be an appreciable stress factor, at least in subjective terms) will immediately be apparent.
What is certain, however, is that in order to make well-founded observations about this state of affairs, we need solid research data able to predict the likelihod or otherwise of error when making decisions in clearly defined stress conditions.

Aim and hypothesis

The research study, still very much of an exploratory nature, attempted to induce in the experimental group a degree of decision-making stress greater than that in the control group using multiple-choice tests based on logical series. Assuming my hypothesis to be correct, the experimental group would have significantly lower scores than the control group.

Method

Participants

Forty university students aged 19-25 years. Table 1 shows the composition of the sample.

Material and procedure

Fifteen multiple-choice alphanumeric logical series. In each series the correct answer was one of the three or four choices (see Table 2).
Group members performed the task individually and remained anonymous at all times. I tried to introduce an element of decision-making stress by asking the participants to do the test as quickly as possible and giving them a new one as soon as they had finished the previous one. Further stress was added for half of the experimental group (totalling 5 males and 5 females) by giving them four choices; the remaining 5 males and 5 females had three choices.

Table 1

Composition of sample (n = 40).

Group	Males		Females		Total
	Choices		Choices		
	Three	Four	Three	Four	
Experimental	5	5	5	5	20
Control	5	5	5	5	20
Total	10	10	10	10	40

Table 2

Example of alphanumeric logical series with three and four choices.

Logical series	Three choices	Four choices
VUZ20 RQS16 NMO12	BAD8 HGI8 GHI8	HGI10 BAD8 GHI8 HGI8

The control group was given the same test without being asked to do it as quickly as possible. Here, too, 5 males and 5 females did the test with four choices, while the other 5 males and 5 females had three choices.

Statistical analysis

Pearson's *r* correlation coefficient (product-moment correlation coefficient) between time taken and number of correct answers was calculated for all the participants.
Student's *t*-test revealed any significant differences between scores and time taken to complete the test, in terms of sex difference, test conditions and number of choices (Tables 3-5).

Results and comment

The *r* correlation coefficient between time taken and number of correct answers was highly significant (n = 40; *r* = .43; p <.01), showing that working in stress-free conditions enhanced performance. The fact that allowing more time to do the test resulted in higher scores is in line with expectations: successful completion of alphanumeric series as challenging as the ones used in this experiment is undoubtedly facilitated by being able to work without strict time limits.
T-test values were also as predicted, with significantly higher scores (p < .001) in the control group, which benefited from working in stress-free conditions. The lack of stress was reflected in the fact that they took significantly longer to do the test than the experimental group. Moreover, the added stress of having four rather than three choices resulted significantly higher scores for tests with only three choices.

Conclusions

In my view, the most important finding of the study is the difficulty of performing under stress: being asked to do the test as quickly as possible, doing the test in the presence of someone probably perceived as a judge of performance, and the impossibility of being able to review all or part of one's work before handing in the test to the examiner, may have jointly created a state of emotional unease. I don't think having been able to briefly review answers before handing in the test would have narrowed the gap between the experimental group and control group scores, given the highly significant differences between them.
The study certainly makes no claim to be a full simulation of the decision-making problems met with in real life, especially in a hospital's emergency ward. However, it does clearly show that induced emotion and decision-making complexity have a far from negligible impact on error risk.

References

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Table 3

Time taken (in seconds) to perform test in stressful and stress-free conditions.

Stressful conditions	m	422,5	t = -4,75***
	s	239,5	
Stress-free conditions	m	701,95	
	s	108,3	
t-test on independent samples (n = 40). ***p < 0,001; g.di l.: 38.			

Table 4

Test score in stressful and stress-free conditions.

Stressful conditions	m	7,3	t = -4,73***
	s	2,49	
Stress-free conditions	m	11,05	
	s	2,5	
t-test on independent samples (n = 40). ***p < 0,001; g.di l.: 38.			

Table 5

Score by number of choices.

Three choices	m	10,45	t = 2,8**
	s	2,87	
Four choices	m	7,9	
	s	2,88	
t-test on independent samples (n = 40). **p < 0,01; g.di l.: 38.			