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Chapter 10

Influences of the past on choices of the future

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A ubiquitous characteristic of decision making is its future orientation: choices are made of courses of action with consequences in the future. This future orientation may explain the relative neglect in previous research of influences of the past.

There are several types of influences of the past (Elster and Loewenstein, 1992). One is learning from the past. For instance, decision strategies are learnt, and so, to varying degrees, are the basic information-processing skills entailed by decision strategies (Payne *et al.*, 1993). It may be true that the quality of decisions is not always improved by learning (Camerer and Johnson, 1991). Nevertheless, there is little reason to question its important role.

Learning is, however, not the focus of this chapter. Its concern is both more general and more specific. We ask what the influences of the memory of outcomes of past decisions are on decisions made in the present. If such memories are mentally related to the conditions under which the decisions were made (e.g., the use of decision strategy), then they constitute a potential source of learning (Hogarth, 1981). However, for experienced decision makers there may be no or little transfer to subsequent decision making. Yet, as we shall see, they are influenced by the outcomes of past decisions.

We consider memory of prior outcomes to be a prerequisite for the kind of influences of the past which we will discuss in the following. As illustrated in Figure 10.1, if an outcome (O_1) of a prior decision (D_1) is remembered, it may change the evaluation of the set of outcomes ($\{O_2\}$) of a decision (D_2) to be made at the present time (t_p). Somewhat loosely, we call such a change *integration*. More specific definitions will be given below.

Although we primarily confine ourselves to integration across time, the concept of integration applies more generally (Thaler, 1980, 1985; Thaler and Johnson, 1990). For instance, in the Jacket and Calculator problem (Ranyard and Abdel-Nabi, 1993; Tversky and Kahneman, 1981), where subjects choose between buying a jacket and a calculator in a nearby store

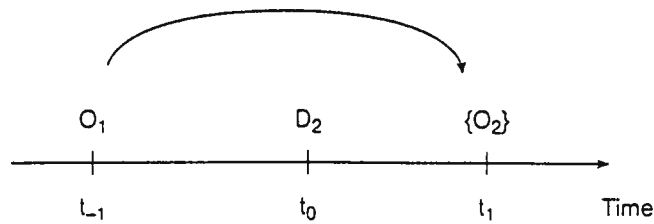


Figure 10.1 Possible influences of prior on current decision

or at a discount rate in a more distant store. the issue is whether the outcomes of two simultaneous choices (of buying the jacket and the calculator) are integrated or segregated.

According to our analysis, remembering prior outcomes is a necessary but not sufficient condition for integration. A primary aim of this chapter is therefore to delimit what we believe are sufficient conditions. In the next section we review several known phenomena in which influences of the past seem to play an important role. We label them phenomena of integration of outcomes across time. Then, in the following section, we examine the explanations which have been offered for the different integration phenomena. In a concluding part we attempt to integrate the different explanations in a process model.

PHENOMENA OF INTEGRATION OF OUTCOMES ACROSS TIME

There are several phenomena with different names which seem to have in common that integration of outcomes takes place across time. The aim of this section is briefly to review these phenomena which include multistage betting, impacts of prior outcomes, sunk cost effects, and escalation.

Review of previous research

Multistage betting

Everyday examples of multistage betting include playing a game of poker, betting at the race track, or managing a stock portfolio. A new bet is usually made after outcomes of previous bets are known. Research examples include performance in the multistage betting game where subjects choose the amount to stake in a series of bets (Funk *et al.*, 1979; Huber, 1990, 1994). The outcome of each trial is added to or deducted from the subjects' capital. The unit of analysis is the betting strategy rather than

single bets. An optimal strategy is to invest a constant proportion of the current capital (Rapoport and Jones, 1970). However, betting is affected empirically by previous wins and losses, by the size of the capital, and by the probability of winning (Huber, 1990). Perceived control is still another factor which Huber *et al.* (1990) demonstrated to be of importance.

Effects of prior outcomes

Although interesting results have emerged from studies of multistage betting (see also Brehmer (1992), for a review of the related research on dynamic decision making), it has proved difficult to investigate integration of outcomes across time. We therefore turn to studies in which subjects have encountered (or, rather, have been asked to imagine that they have encountered) only a single prior outcome when they are facing a new choice. In such a paradigm there needs to be little concern that subjects do not remember the prior outcome. Cognitive limitations may still play a role since integration also requires transformations of the information. An illustration is provided by the following empirical examples from Kahneman and Tversky (1979: 273):

(Example 1) In addition to whatever you own, you have been given 1,000. You are now asked to choose between (A) a 50 per cent chance of winning 1,000 or nothing, and (B) winning 500 for sure:

(Example 2) In addition to whatever you own, you have been given 2,000. You are now asked to choose between (A) a 50 per cent chance of losing 1,000 or nothing, and (B) losing 500 for sure.

A majority of subjects made different choices (B and A, respectively), despite the fact that the options in both cases are a 50 per cent chance of winning 2,000 or 1,000 versus winning 1,500 for sure when the amounts which were given in advance (the prior outcomes) are added to the outcomes of the current choice. It is unlikely, then, that subjects added the prior outcomes to the current outcomes. This form of integration of the prior outcomes was thus not demonstrated.

Laughhunn and Payne (1984) note that a decision frequently involves two or more sequential risky choices at different points in time. This applies to decision making in business organisations as well as to personal decision making. At each stage of the decision-making process following the first, the decision maker (DM) may have observed outcomes of prior choices. In an experiment, managers were asked to make fictitious decisions concerning risky investments with very high stakes. There were three different conditions: for identical choice problems subjects were told that they had experienced a gain, a loss, or no prior outcome. In some choice problems the options were to continue or discontinue investments, in

others to decide how to dispose of an asset. Subjects were also presented with similar problems referring to personal financial decisions with lower stakes. Indicating an effect of prior outcome, substantial percentages of choices were changed when subjects were told that they had experienced a prior gain or loss as compared to when there was no prior outcome. This tendency was stronger for personal than for corporate choices. In the latter cases, the tendency was even stronger for prior losses than for prior gains. The impact of prior losses was stronger for continuing/discontinuing than for disposal decisions. With the aim of illuminating how prior outcomes are integrated, whether subjects changed from risk seeking to risk aversion or the reverse was assessed. Unfortunately, in this respect no definite conclusion was reached. Still, in contrast to the results reported in Kahneman and Tversky (1979) (see the examples given above), an impact of a prior outcome was quite lucidly demonstrated. An important reason why different results were observed may be that the choice problems were embedded in real-life scenarios, making the historical contexts salient.

A series of similar experiments was performed more recently by Thaler and Johnson (1990) using as subjects master's degree students in business administration and psychology undergraduate students. The choice problems were very similar in content and structure to those described above, taken from Kahneman and Tversky (1979). As in the Laughhunn and Payne (1984) study, effects of prior outcomes were demonstrated, in this case irrespective of whether subjects gambled for real or hypothetical money. In the scenarios presented to subjects, a prior outcome was described as 'You have just won X' instead of 'In addition to whatever you own, you have been given X' in Kahneman and Tversky (1979). By referring to a betting sequence, the former wording may emphasise that subjects need to keep track of gains and losses. This change may account for the differences in results.

Although none of several possible accounts of how prior outcomes are integrated received ample support, the results obtained by Thaler and Johnson (1990) unequivocally showed that prior gains led to risk seeking whereas prior losses led to risk aversion. The former effect was referred to in gambler jargon as 'playing with the house money'. Thaler and Johnson also observed a 'break-even' effect: if subjects could win an amount which exactly covered a prior loss, they were more likely to gamble than they were otherwise after such a loss or no loss.

Another phenomenon which appears to involve an effect of a prior outcome is the status-quo bias (Samuelson and Zeckhausen, 1988). When the options are to choose or replace a previously chosen option (status quo), subjects tend to choose the status quo. A bias is demonstrated if the chosen option is preferred to another option when it is the status quo but not otherwise.

Whether a previously chosen option being compared to one or several new options is equivalent to a choice between a prior gain and expected future gains or losses was recently investigated by Karlsson *et al.* (1996).¹ Consistent with the status-quo bias, subjects would prefer a prior gain to gambles with the same expected values. However, the results did not show that, not even when several manipulations were undertaken to increase the salience and value of the prior gain. In keeping with the results of Thaler and Johnson (1990) and those of several other experiments (Gärling and Romanus, 1996; Gärling *et al.*, 1994; Romanus *et al.*, 1996a, 1996b), a prior gain instead led to increased risk seeking or likelihood to gamble. In a similar vein, the validity of the status quo bias has more recently been questioned (Ritov and Baron, 1992; Schweitzer, 1994). Although evidence suggests that status quo increases in value (Kahneman *et al.*, 1990), the status-quo bias may reflect a preference for inaction or inertia. The bias may thus be consistent with the impact of a prior outcome when the latter entails a choice to continue or discontinue a course of action.

SUNK COST EFFECTS

Situations exist when a DM chooses between continuing or discontinuing an endeavour in which investments of money, effort, or time (sunk costs) have been made. It is irrational to base a choice on anything else but the consequences of the current choice (Baron, 1994; Daves, 1988). A sunk cost affects all these outcomes in the same way and should therefore be ignored.

Arkes and Blumer (1985) demonstrated sunk cost effects in a series of studies. For instance, in one of several questionnaire experiments subjects imagined that they had purchased two weekend ski trips but were unable to make both. Subjects then chose to cancel the less expensive although they were told that they would like it better. A field experiment was also conducted in which half of the subjects were offered a discount on a subscription to a series of theatre plays whereas the other half paid the full price. Demonstrating external validity of the findings of the questionnaire experiments, those subjects who paid the full price attended more theatre plays than those who received the discount.

Escalation

Escalation refers to a persistent commitment to a failing course of action. Examples include continuing to wait for a bus although walking would be faster, not breaking up a souring romantic relationship or, at an organisational or national level, refusing to discontinue a commitment although finding oneself 'knee-deep in the big muddy', which many international

conflicts or unsuccessful business ventures testify to. Such situations have in common that they entail sunk costs incurred by an originally chosen course of action (Staw and Ross, 1987). Furthermore, distinguishing escalation from sunk cost effects which are one-shot matters, it involves ongoing sequences of choices of persisting or withdrawing. Simple withdrawal is, however, not an obvious solution since it results in losses. Persistence at least holds the promise of an eventual gain. Thus, in escalation situations, losses are suffered in a course of action where the consequences of continuing or discontinuing are uncertain.

Empirical research on escalation is reviewed by Brockner (1992). Most of the research uses experimental simulations of actual escalation situations occurring in business organisations. In a typical study (Staw, 1976), students role-played that they were the financial vice-president of a company. Their task was to decide what resources to allocate to continued investments. Prior to making decisions half of the subjects were told that a previous allocation decision had been successful, the other half that it had been unsuccessful. Half of the subjects in each of the groups were furthermore told that they were responsible for the previous decision, the other half that they were not responsible. The group of responsible subjects who were led to believe that the previous decision was unsuccessful allocated more resources to the previous course of action than did the other groups. More recent research includes a study by Davies and Bobko (1986) demonstrating that responsible subjects were more persistent when the outcome of a previous decision was framed as a loss than when it was framed as a gain.

In another review of research findings concerning antecedent factors of escalation or entrapment, Staw and Ross (1987) distinguish project factors (expected benefits and costs) from psychological factors such as responsibility and information feedback, social factors relating to the need for self-justification, and structural factors at an organisational level, exemplified by corporate pride and administrative inertia. A generalisation appears to be that these types of factors come into play sequentially. Project benefits may dominate initially, a desire to recover sunk costs at a later stage when such costs become known, and at still later stages, when failure seems certain, self-justification and responsibility diffusion triggering a host of structural factors.

Summary

A factor distinguishing between the different phenomena is whether one or several choices are made. Another factor is whether or not the DM has incurred losses. In addition to those two factors (see Table 10.1), a third may be what relationship exists between the prior and current choices. However, although some relationship probably must exist for

Table 10.1 Phenomena of integration of outcomes over time

	<i>Single choices</i>	<i>Sequential choices</i>
Prior loss(es)	Sunk cost effects	Escalation
Prior loss(es) or gain(s)	Effects of prior outcome	Multistage betting

integration to occur, it is unclear that the different phenomena differ in this respect.

The impact of a single outcome of a prior choice on a subsequent choice is a limiting case of sequential decision making such as multistage betting. A special case of this limiting case is when the prior outcome is a sunk cost, that is, when the prior outcome is a loss. Escalation constitutes a special case of multistage betting where each preceding outcome is a sunk cost.

The logical relations between the different phenomena do not necessarily imply that identical or similar explanations would apply to all. It may still be argued that a theoretical analysis should focus on the impact of one or several prior outcomes on a single choice. It is a limiting case of sequential decision making (multistage betting, escalation) which is still tractable using single decisions as the unit of analysis. It subsumes a special case such as the sunk cost effect. In the following section different explanations which have been offered are examined with respect to how they explain the impact of a prior outcome on a single choice.

EXPLANATIONS

The editing phase of prospect theory

A complete explanation of integration of outcomes across time must specify when, how and why integration takes place, preferably based on principles embraced by a general theory. Several explanations are discussed by Laughunn and Payne (1984). Since prospect theory (Kahneman and Tversky, 1979; Tversky and Fox, 1995; Tversky and Kahneman, 1991, 1992) figures in several, we begin with explanations related to this major theory of decision making under risk and uncertainty.

Prospect theory is similar to expected utility theory (von Neumann and Morgenstern, 1947; Savage, 1954) in assuming that a DM first assigns a utility or value $v(x)$ to each outcome x , then chooses the option with the highest sum of values across all outcomes. An important difference is, however, the assumption that a DM edits options prior to assigning values to outcomes. Editing operations include framing of outcomes as gains or

losses relative to a reference point. Framing also entails segregating or integrating prior outcomes (Kahneman and Tversky, 1984; Tversky and Kahneman, 1981). A decision frame based on a 'minimal account' implies that outcomes of a particular choice are evaluated independently of prior outcomes (i.e., segregated). Such a decision frame may frequently be employed because it '(i) simplifies evaluations and reduces cognitive strain. (ii) reflects the intuition that consequences should be causally linked to acts, and (iii) matches the properties of hedonic experience which is more sensitive to desirable and undesirable changes than to steady states' (Tversky and Kahneman, 1981: 457).

A comprehensive account is an alternative to a minimal account which encompasses prior outcomes (Ranyard, 1995; Tversky and Kahneman, 1981). Why is such a frame not adopted in the editing process? Of the three reasons noted by Tversky and Kahneman (1981), the last one appears to be the most compelling because it may relate to biological adaptiveness (Barkow *et al.*, 1992). Strong biologically relevant incentives are perhaps therefore needed to force attention to steady states instead of changes. Basically, the ability to remember recent events is a prerequisite for adaptation. At least under some circumstances, biological importance also seems to govern what is remembered (Lachman and Lachman, 1979). Similarly, as a DM judges probabilities on the basis of ease of memory retrieval of past events using the availability heuristic (Tversky and Kahneman, 1973), prior outcomes may be assumed to be integrated if they are easy to retrieve from memory. Thus, factors which improve memory of a prior outcome should enhance its integration with current outcomes. Recency is perhaps the most important single such factor. It should be noted that, despite integration of one or more prior outcomes, a DM still responds to changes from a reference point. Take as an example a sequence of prior outcomes x_1, \dots, x_n which a DM is known to have encountered. Assume that the subset of recent prior outcomes denoted $\{x_i < i + n\}$ retrieved from memory is integrated with the current outcomes. If integration means that the prior outcomes are added, the value of a current outcome y is evaluated as $v(y + \sum x_i)$. In other words, the reference point is neither zero nor the total assets but the sum of the subset of prior outcomes. A special case is that this subset contains only a single prior outcome.

A host of other factors are also likely to enhance memory of prior outcomes and thus to increase the likelihood that they are integrated with current outcomes. The magnitude of a prior outcome is one possible such factor. Although negative events are in general processed more comprehensively (Taylor, 1991; Weber, 1994), a positive prior outcome may still be easier to remember than a negative one (Isen, 1987). Any perceptual or cognitive feature making a prior outcome stand out should furthermore enhance its recall. Some of these other factors may override recency.

Sometimes an old prior outcome is therefore integrated with current outcomes whereas a new one is not.

Yet, although memory retrieval is a necessary factor, it cannot be sufficient since, as already mentioned, a prior outcome is sometimes segregated when no memory retrieval is involved (Kahneman and Tversky, 1979). A primary aim of the editing phase proposed in prospect theory is cognitive simplification, thereby alleviating cognitive strain for the DM. In research on both problem solving and decision making, it has been argued that subjects are sometimes unwilling to change the external representation of a problem. In a similar vein, Slovic (1972) proposed a 'concreteness principle' stating that a DM tends to use explicitly available information in its current format. Thus, a DM may frequently not allocate the cognitive resources required either for searching for more information or for changing the format of the information. Gilbert (1991) has more broadly argued that the encoding of information in the given format is pervasive and perhaps unavoidable. According to the concreteness principle, no integration of prior outcomes would be expected unless the format of the decision problem is changed. Empirical evidence in support of this proposition has recently been obtained (Romanus *et al.*, 1996b). Different groups of undergraduates serving as subjects were presented with different descriptions of gambling choices. In one set of descriptions a prior gain or loss was added to the status quo (not gambling), in another set it was added to the potential gain, and in still another set it was added to the possible loss. A finding which will be discussed further below was that ratings of satisfaction with the different outcomes of not gambling, gambling and winning, and gambling and losing, showed that the prior outcomes were integrated with the current loss across all sets of descriptions. However, in support of the concreteness principle, in the remaining cases subjects only integrated the prior outcome when it was explicitly added to the current outcome.

Sometimes less cognitive effort is required to perform a task if its mental representation is changed. Jones and Schkade (1995) actually found that subjects translated a problem from the initial representation in which it was presented to a more familiar or convenient one. A prior outcome retrieved from memory may still be ignored if the DM believes it will have identical effects on all current outcomes. Such cancellation (Kahneman and Tversky, 1979) is a means of transforming a choice problem to render it cognitively simpler. It may account for segregation of prior outcomes.

At a specified point in time, the outcomes of a prior decision are perhaps not yet known. As shown by Tversky and Shafir (1992) and Shafir and Tversky (1992), a prior outcome may then have no impact on a subsequent choice. The conditions appear to be similar to when a prior outcome has no impact because it cannot be retrieved from memory. However,

Tversky and Shafir's finding that subjects segregated an unknown prior outcome was in Gärling and Romanus (1996, Experiment 2) replicated when the probability of a prior gain was stated to be equal to the probability of a prior loss (0.50). A prior gain was also found to be segregated in another condition where it was stated to be 0.75 as well as in a third condition where it was stated to be 0.25. In each case there are still several outcomes. Thus, a reason for the difficulty may be that subjects are unable to think through all of them.

If difficulties in imagining uncertain or risky prior outcomes lead to their being ignored, logically this should extend to the outcomes of a current choice. Since it does not (Gärling and Romanus, 1996), there may be a difference between prior and current outcomes. In the case of a prior outcome, a choice has already been made, whereas current outcomes are directly related to the choice faced by the DM. As a consequence, the editing process may start with the current outcomes, which are those which will be evaluated first. To the extent that prior outcomes are known and easy to retrieve from memory, they will be added to the current outcomes. However, if there are many current outcomes which are risky or uncertain, a preferred cognitive simplification may still be to segregate the prior outcomes.

Whether or not a prior outcome is seen as being connected to the evaluation of current outcomes is a factor promoting integration which needs to be added. In an illustrative empirical study it was found that a majority of subjects chose not to replace a lost theatre ticket although they chose to buy one after having lost an equivalent sum of money (Tversky and Kahneman, 1981). The question is why losing money was not seen as connected to the choice to buy a theatre ticket whereas losing it was. Thaler (1980, 1985) claims that people use mental or psychological accounts to keep track of gains and losses incurred by sequential choices. A negative balance on an account is assumed to have a different effect on a related choice than has a positive balance. However, outcomes one keeps track of in another account have no effect. In the example, although losing a theatre ticket means losing as much money as losing a bill, the latter is registered on a different account.

In drawing parallels between mental accounting and categorisation, Henderson and Peterson (1992) show that principles known to govern categorisation apply to mental-accounting phenomena. In this vein, we identify mental accounting with categorisation of events on some other basis than temporal contiguity. Like temporal integration it serves some biological or psychological purpose. We want in particular to emphasise the role of goals and aspirations in determining the 'mental accounts' a DM uses (Ranyard, 1995). For instance, if a primary goal is to earn a fortune, any monetary loss or gain is likely to be registered and integrated. In contrast, many people prefer to keep track only of large losses, making

sure they avoid misfortune. Also, in many cases monetary outcomes are means rather than goals. As implied by the reasons for their choices stated by subjects presented with the lost theatre ticket scenario (Henderson and Peterson, 1992), unless one really wanted to see the play, paying twice the amount for the ticket did not seem to be a good way of spending money on entertainment since it would reduce other opportunities. However, other bases for categorising events should not be ruled out. Whether or not a prior outcome is compatible (e.g., expressed in the same unit) with the current outcomes is one such basis. The important role of compatibility has been demonstrated in many other circumstances (see Selart, Chapter 4, for a review).

Categorisation is, however, more encompassing than adding values or utilities. It also serves the purpose of identifying and inferring other valuable information. Examples include inferring an expected average outcome (Kahneman and Miller, 1986) or identifying increasing or decreasing trends or recurrent patterns in outcome sequences (Varey and Kahneman, 1992). A temporal and content basis for integrating prior outcomes is frequently available simultaneously. As shown in a recent study by Klaar (1995), the content basis may dominate. However, such a dominance should also be affected by changes in the memory representation of a prior outcome as a function of time.

Thaler and Johnson (1990) asked subjects how much a monetary loss would hurt after they had incurred another loss. As the results showed, the same monetary loss was more unpleasant when it was preceded by either a smaller or larger loss. A small to modest loss thus appears to sensitise, a large loss to numb subjects to subsequent losses. The latter may also be labelled a contrast effect. Independent evidence presented in Thaler and Johnson indicated that the pairs of losses were segregated. In Tversky and Griffin (1991) subjects rated how happy they thought a person would be on a day when he or she experienced a neutral event knowing that a positive or negative, connected or unconnected event had occurred the week before. The impact of the prior event on the ratings was larger when it was unconnected than when it was connected. Inconsistent with Thaler and Johnson (1990), it was concluded that integration does not depend on connectedness but that contrast effects do.

In a recent study² we were interested in whether Tversky and Griffin's (1991) conclusion would generalise to the integration of prior outcomes in risky choices. We chose a fictitious horse-race betting task to study the impact of prior gains and losses. Participants were thirty-two undergraduates who received a modest monetary compensation. The bets were presented in a booklet in which subjects indicated how likely they were to gamble in the current race. Half of the subjects imagined on different trials that in the prior race they had won a specified amount (prior gain), lost a specified amount (prior loss), or withheld from gambling (no prior

outcome). A prior gain was never large enough to cover a possible loss incurred by the current choice to gamble. Likewise, a prior loss was not large enough to jeopardise the potential gain of the current choice. Thus, we attempted to avoid the break-even effect and to reduce the playing-with-the-house-money effect (Thaler and Johnson, 1990). Yet, consistent with what Thaler and Johnson found, subjects rated that they were more likely to gamble when the prior outcome was a gain and less likely when it was a loss (see Table 10.2). The remaining half of the subjects were not told that the prior gain was a win in the preceding race but the same amount of money which they previously had lent to a friend who unexpectedly paid it back. The prior loss was incurred by lending the same amount of money to a friend despite the fact that he or she was very unlikely to repay. If contrast effects depend on connectedness, we expected less integration of the prior outcome. However, as Table 10.2 shows, integration was in fact stronger. This finding is consistent with the notion that money transactions between friends are kept track of in a mental account other than gambling money.

Extending the editing phase of prospect theory

Thaler and Johnson (1990; see also Thaler, 1980, 1985) suggested that prospect theory should incorporate a hedonic editing rule which integrates or segregates prior outcomes. Whereas other editing rules are employed for the sake of cognitive simplification, the goal of such a rule is to maximise value. Thus, the distinction is blurred between an editing phase and an evaluation phase.

No effect of integrating a prior outcome should be expected if options are evaluated according to a linear function mapping an outcome x on value v , that is, if $v(x) = a + bx$. Apparently, in this case the difference in value between $v(x_1)$ corresponding to one option and $v(x_2)$ corresponding to another option is exactly the same as the difference between $v(x_1 + z)$ and $v(x_2 + z)$ where a prior outcome z has been added. However, since the value function proposed in prospect theory is concave for gains and

Table 10.2 Mean ratings of likelihood to gamble (on a scale from -50 to 50) for no prior outcome, a prior loss, or a prior gain which were connected or unconnected to the current outcomes

	<i>Connected</i>		<i>Unconnected</i>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
No prior outcome	7.4	63	3.8	58
Prior loss	-14.4	20	-5.3	38
Prior gain	9.9	67	8.4	59

convex and steeper for losses (Kahneman and Tversky, 1979), the difference in value will be different when the prior outcome is added. It is generally true that either $v(x+z) > v(x) + v(z)$ or the reverse. Integrating rather than segregating a prior outcome will therefore lead to a higher or lower value. If the goal of hedonic editing is to maximise value, editing operations should ensure that the prior outcome is added to (integrated with) some outcomes and not added to (segregated from) other outcomes before being evaluated according to the value function. Value is maximised if a loss is added to a loss but not if a gain is added to a gain. Value is also maximised if a small loss is added to a large gain (a mixed gain). Whether or not value is maximised if a small gain is added to a large loss (a mixed loss) depends on the relative sizes of the gain and the loss.

The empirical results obtained by Thaler and Johnson (1990) only partially supported the hedonic editing rule. An alternative account labelled the renewable resources model was therefore offered by Linville and Fischer (1991).³ The point of departure is still that a DM maximises value. Since a gain is believed to buffer a loss, outcomes entailing a large gain and a small loss, or the reverse, are integrated. However, awareness of his or her limited but renewable resources to cope with large losses, results in multiple losses being aversive to the DM, who will therefore segregate them. Gain-savouring resources are also perceived to be limited but renewable. Consequently, multiple gains are segregated.

By asking subjects whether they would prefer two events to occur on the same day (integration) or on different days (segregation), Linville and Fisher (1991) obtained empirical support for the predictions from the renewable resources model. The events were either financial (monetary losses or gains), academic (successes or failures in exams), or social (positive or negative encounters with people). Almost identical results were obtained within each domain. Some evidence was also found for integration across domains (e.g., if one event was financial and the other social).

As noted by Larrick (1993), in risky choices a DM is perhaps often more concerned about avoiding negative outcomes than attaining positive ones. Therefore, it may be questioned whether the renewable resources model accurately predicts integration when subjects make risky choices. If the goal is to avoid the negative impact of losses, subjects evaluating risky outcomes presumably attend to and process more thoroughly expected losses (Taylor, 1991; Weber, 1994). If they do, a compatible loss-sensitivity principle of integration may be to add prior outcomes to expected losses rather than to add prior gains to expected losses and prior losses to expected gains (Table 10.3). In contrast, the prior outcomes may be segregated from expected gains. The effect of a prior loss is therefore to increase the dissatisfaction with a possible loss and the effect of a prior gain to decrease it. Direct empirical support for these predictions has been

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obtained in several previous studies (Gärling and Romanus, 1996; Gärling *et al.*, 1994; Romanus *et al.*, 1996a, 1996b). Similar results are presented in Figure 10.2, showing the mean ratings of satisfaction with not gambling, gambling and winning, and gambling and losing, respectively, obtained from one of the groups of participants in our study described above. In accordance with the loss-sensitivity principle, these ratings indicate that only dissatisfaction with the expected loss was affected by the prior outcomes.

Table 10.3 Mean ratings of likelihood to gamble (on a scale from -50 to 50) for no prior outcome, a prior loss, or a prior gain which were connected or unconnected to the current outcomes

	<i>Renewable resources model</i> ¹		<i>Loss-sensitivity principle</i> ²	
	<i>Expected gain</i>	<i>Expected loss</i>	<i>Expected gain</i>	<i>Expected loss</i>
Prior gain	no	yes	no	yes
Prior loss	yes	no	no	yes

Sources: 1 Linville and Fisher, 1991
2 Gärling and Romanus, 1996

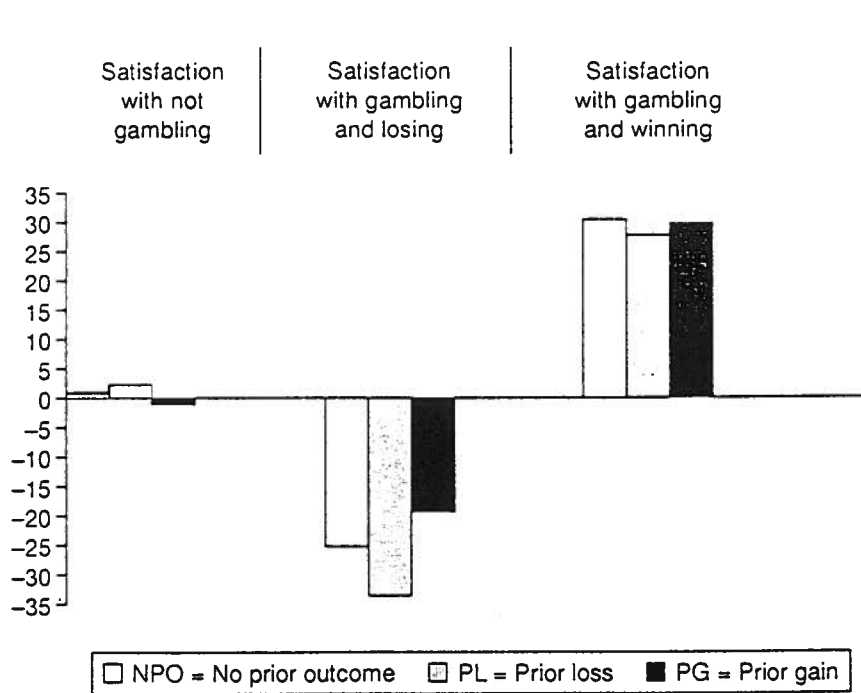


Figure 10.2 Mean ratings of satisfaction in gambling outcomes

Explanations unrelated to prospect theory

Explanations based on prospect theory rely on mechanisms of information processing leading to various forms of biases. Although Whyte (1986) has suggested that such mechanisms may also account for escalation (see Schaubroeck and Davies, 1994, for empirical support), an alternative explanation in terms of self-justification or desire to appear rational was originally proposed by Rubín and Brockner (1975) and Staw (1976). Brockner (1992) concludes that this explanation is supported by many empirical studies of escalation in which the need for self-justification has been manipulated. Yet Brockner admits that it is unlikely that self-justification is a sufficient explanation of escalation. Is self-justification a viable general explanation of effects of prior outcomes? The need for self-justification appears to be confined to situations where losses are due to prior decisions for which one is responsible. However, if presenting oneself as being consistent is another important ingredient of the need for self-justification, it may perhaps be evoked as an explanation in the somewhat broader class of situations where a DM has a choice of continuing or discontinuing a course of action after having faced a prior outcome. In addition to being confined to a limited number of situations, the concept of self-justification does not seem to offer more than an alternative description of the observed phenomenon.

In a similar vein, Arkes and Blumer (1985) suggested that sunk cost effects in many cases reflect a DM's wish to avoid appearing wasteful. However, despite being consistent with some of the reported data, neither does this explanation seem to be a candidate for a more general account of effects of prior outcomes. It may also be noted that Garland and Newport (1991) argued, on the basis of experimental evidence, that sunk cost effects primarily reflect biased information processing.

It is conceivable that a prior outcome alters a DM's mood state. If so, the prior outcome may have an influence on the process of making a current choice although there is no integration of the prior outcome with the expected outcomes (but note that Romanus *et al.* (1996a), found that a positive mood may increase integration). A distinction is frequently made between an enduring temperament to react emotionally in certain ways, transitory moods or affect, and emotional reactions to situational factors (Russell and Snodgrass, 1987). A prior outcome may trigger an emotional reaction resulting in a transitory mood, perhaps more easily in people who are disposed to react in a certain way or already are in a certain mood.

A positive mood has been found to lead to optimism in judging probabilities (Isen and Geva, 1987; Johnson and Tversky, 1983). Presumably because subjects do not want to jeopardise their positive mood, the dissatisfaction with an expected loss has also been shown to increase (Arkes

et al., 1988). In Isen and Geva (1987), the net effect was increased risk aversion. Arkes *et al.* (1988) and Isen and Patrick (1983) found that positive affect increased risk aversion when subjects were offered an insurance policy in which the loss was salient. However, increased risk seeking was observed when subjects in a positive mood were offered lottery tickets for which the loss was less salient. Presumably, in this case risk seeking was caused by optimism.

If subjects react to a prior gain with positive affect, a reduced likelihood to gamble should be expected, consistent with the results obtained by, for instance, Isen and Geva (1987). The reverse was, however, observed in experiments conducted by Gärling and Romanus (1996), Gärling *et al.* (1994), and Romanus *et al.* (1996a, 1996b). On the other hand, Laughunn and Payne (1984) concluded that their results concerning risk taking were consistent with a mood effect. In none of the cited studies did subjects experience real prior outcomes. It is therefore doubtful that mood was induced. A more plausible possibility is that a prior gain (or loss) did not alter mood but nevertheless induced optimism (or pessimism). Consistent with this interpretation, optimism and pessimism have been shown to change the decision weights a DM assigns to risky or uncertain outcomes (Hogarth and Einhorn, 1990).

Some of the explanations of effects of prior outcomes based on prospect theory which were examined in the previous subsection (hedonic editing, the renewable resources model, and the loss-sensitivity principle) make allowance for the effects of different motives on information processing. In contrast, the explanations examined in this subsection do not go far in specifying the consequences of differences in motives for how information is processed. A potential contribution is instead to suggest motives (self-justification or desire to appear rational, maintaining a positive mood) which should be added to maximising value or avoiding negative outcomes.

An Integration of explanations

A summary of the different explanations is given in Table 10.4. In this table only explanations which seem to have some generality are included. Some refer to cognitive limitations on why integration does not occur. Failure to retrieve a prior outcome, a description of the decision problem which does not include the prior outcome, cancellation, and uncertainty about the prior outcome all belong to this category. Connectedness, hedonic editing, the renewable resources model, the loss-sensitivity principle, and mood are explanations which focus on motivational or affective reasons why integration of a prior outcome sometimes occurs and sometimes does not occur. Optimism is categorised as a cognitive explanation because it may reflect a cognitive bias (Gilovich *et al.*, 1985). However, it

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Table 10.4 Summary of major explanations of integration of prior outcomes in risky choices.

<i>Type</i>	<i>Specific effect</i>	<i>Non-specific effect</i>
Cognitive	Concreteness (Slovic, 1972) Cancellation (Kahneman and Tversky, 1979) Uncertainty (Tversky and Shafir, 1992) Availability (Tversky and Kahneman, 1973)	Optimism (Hogarth and Einhorn, 1990)
Motivational	Connectedness (Thaler, 1980, 1985; Tversky and Kahneman, 1981) Hedonic editing (Thaler & Johnson, 1990) Renewable resources model (Linville & Fischer, 1991) Loss-sensitivity principle (Gärling & Romanus, 1996)	Mood (Isen, 1987)

also qualifies as a motivational explanation if optimism is induced by a positive mood (Isen and Geva, 1987).

Some of the explanations make the assumption that there are specific effects of a prior outcome on assessments of likelihoods, decision weights, or values. In effect the DM chooses among different sets of options than he or she would do otherwise. Non-specific effects imply that the prior outcome changes the DM's state which in turn affects his or her processing of the current options. Anything other than a prior outcome will have the same effect. Again, the optimism explanation is difficult to classify. Its effect is specific if a prior outcome leads to optimism which changes the subjective probabilities or decision weights assigned to outcomes. However, it may be more appropriate to classify the effect as non-specific if it is assumed that optimism induced in some other way has the same effect. As an example, consider the possibility that a lucky outcome in one domain (winning a game of poker at a friend's house) generalises to another (taking risks when driving home). It may be noted that if motivational explanations presuppose specific effects (hedonic editing, the renewable resources model, and the loss-sensitivity principle), they make the assumption that cognitive limitations can to some extent be overcome by increased effort. No such assumption is entailed by motivational explanations (mood) presupposing non-specific effects.

The proposed explanations appear to be complementary rather than conflicting. An exception is hedonic editing and the renewable resources model, which attempt to explain the same observations in different ways.

According to the loss-sensitivity principle, a DM attempts to avoid negative outcomes rather than to maximise value as the hedonic editing rule and the renewable resources model presuppose. Thus, the loss-sensitivity principle is complementary since a DM may sometimes maximise value and sometimes attempt to avoid negative outcomes. Highlighting the complementary nature of the explanations, Figure 10.3 outlines a process model. Goals and aspirations constitute one factor which determines how options are evaluated, including whether or not current options should be edited so that prior outcomes are integrated with the expected outcomes of those options. Of course, the prior outcomes must be retrieved from memory. Memory retrieval of prior outcomes may also directly influence editing of the options. Likewise, editing may be directly influenced by how the choice problem is described. Mood and optimism may both be affected by prior outcomes and influence evaluations of the options.

CONCLUDING REMARKS

The review of previous research in this chapter shows that the past in the form of outcomes of prior decisions influences choices. Such influences have been labelled effects of or integration of prior outcomes (Thaler and Johnson, 1990), sunk cost effects (Arkes and Blumer, 1985; Laughhunn and Payne, 1984), multistage betting (Funk *et al.*, 1979), and escalation (Brockner, 1992). As noted, these phenomena are closely related. Yet they may have different explanations.

In the review it was possible to identify ten general explanations which have been or may be proposed concerning the integration of prior outcomes in risky choices. These explanations encompass both specific cognitive limitations and motivational or affective factors with specific as well as non-specific effects. It is suggested that most of them are complementary, and that it is possible to integrate them in a process model.

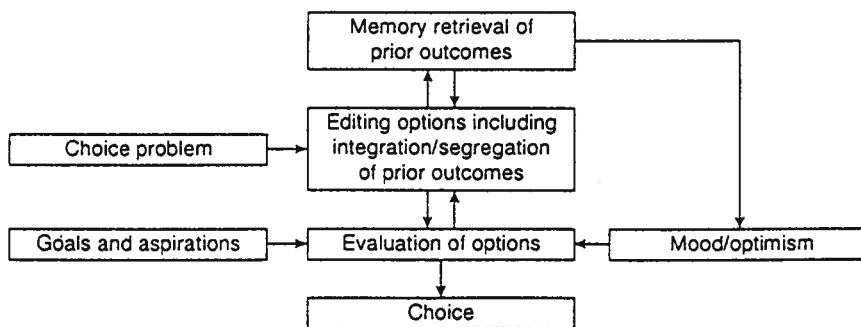


Figure 10.3 Process model encompassing compatible explanations

Although our previous research (Gärling and Romanus, 1996) has shown that the loss-sensitivity principle is a viable motivational explanation based on the assumption that a DM attempts to avoid negative outcomes rather than to maximise value, the present review suggests that a thorough understanding of effects of prior outcomes on risky choices requires a broader approach. It is hoped that valuable directions for such an approach are suggested by the diverse sets of possible explanatory factors.

NOTES

- 1 Although perhaps not natural, it is not logically excluded that status quo constitutes a loss which is compared to other losses, some of which are as bad or less bad.
- 2 This study has not been reported elsewhere. For further details, see Gärling and Romanus (1996) who used an almost identical procedure.
- 3 Thaler and Johnson (1990) also proposed a quasi-hedonic editing rule which accounted for their empirical findings. However, this rule will not be discussed since it does not seem to have the same solid theoretical rationale and makes the same predictions as the renewable resources model.

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