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Abstract

Eight choice scenarios were used to test Linville and Fischer's (1991) Renewable Resources Model, which predicts that people will prefer to separate multiple gains over time and also to separate multiple losses over time, the latter prediction being contrary to Kahneman and Tversky's (1979) Prospect Theory. The Renewable Resources Model was tested under conditions that, theoretically, should enhance the dual separation outcomes. However, in seven of the eight choice scenarios, complete reversals of these outcomes were observed. That is, the participants in the experiments preferred to combine multiple gains and to combine multiple losses. Explanations of these unexpected results were sought in differences in rating procedures and task presentation between the original study and the present study. The conclusion is that the Renewable Resources Model is not robust.

Keywords

multiple, gains, losses, resources, test, model, renewable

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A TEST OF THE RENEWABLE RESOURCES MODEL OF MULTIPLE GAINS AND MULTIPLE LOSSES

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ABSTRACT -

Eight choice scenarios were used to test Linville and Fischer's (1991) Renewable Resources Model, which predicts that people will prefer to separate multiple gains over time and also to separate multiple losses over time, the latter prediction being contrary to Kahneman and Tversky's (1979) Prospect Theory. The Renewable Resources Model was tested under conditions that, theoretically, should enhance the dual separation outcomes. However, in seven of the eight choice scenarios, complete reversals of these outcomes were observed B that is, the participants in the experiments preferred to combine multiple gains and to combine multiple losses. Explanations of these unexpected results were sought in differences

in rating procedures and task presentation between the original study and the present study. The conclusion is that the Renewable Resources Model is not robust.

INTRODUCTION

Whereas some of the important events in people's lives happen by chance, in many other cases people have some degree of control over the occurrence and timing of these events. For example, people can choose to pay bills all at once at the end of the month or separately when they arrive; similarly, when planning a trip overseas they can choose to have immunizations for various diseases all at once or to spread them over several visits to their physician. For positive events, too, there is often a degree of time-related control. For example, people can take their retirement payout as a lump sum or spread it over monthly amounts (this is also an option offered by many government lotteries); and they may choose to take one long vacation or several short ones.

Kahneman and Tversky's (1979) Prospect Theory (PT) predicts that, because of diminishing marginal returns to beneficial outcomes, people will prefer to separate multiple gains so as to experience a greater subjective total utility than would be achieved by considering the gains together; and, because of diminishing marginal returns to costly or harmful outcomes, they will prefer to combine these so as to experience less subjective negative utility than would be incurred by considering them separately. These two predictions were also made by Thaler (1985) as the main two of his "Hedonic Editing Principles (HEP)."

Initial tests of PT/HEP were supportive. However, participants in these tests were presented with choices between combined or separated events occurring on the same day (for example, winning \$50 in one lottery and \$25 in another on the same day, *or* \$75 in one lottery). When the tests were extended by introducing a time dimension (Thaler and Johnson 1990), such that the events could occur combined on the same day or separated by two weeks, the loss prediction of PT/HEP failed to hold. When given a choice of a combined simultaneous loss and time-separated losses of equal magnitude, people preferred to separate the losses. We note that separation of events in the real world is more likely to happen by people choosing to space them over time and thus time is a critical consideration in multiple gain or loss scenarios. Thaler and Johnson (1990) therefore proposed, to account for temporal separation of events, the "Quasi-Hedonic Editing Principles (QHEP)," which predict preference for separation of gains (as does PT and HEP) and *also* separation of losses.

It is important to note that, in the above experiments, the choices were all monetary. This raises the question as to whether people would still prefer to combine or separate as predicted by the theory when the choices are on non-monetary dimensions, such as multiple health or social outcomes.

Independently of Thaler and Johnson's (1990) QHEP, Linville and Fischer (1991) proposed a time-related "Renewable Resources Model (RRM)." Whereas the QHEP focuses on utility, the RRM introduces a cost factor, namely, people's cognitive, emotional and physical resources. They propose that the preference for separation not only of gains but also of losses is due to people's limited "gain-savoring" and "loss-buffering" resources, respectively, and that, once these resources are consumed, they are renewed over time. That is, while QHEP and RRM make the same predictions, RRM is based on a more definite causal rationale.

Linville and Fischer (1991) examined gains and losses across three domains (academic, financial and social) in terms of large gains/losses, small gains/losses, and mixed gains and losses. We are interested in the main phenomena of multiple gains and multiple losses, not mixed gains and losses, thus only the relevant portion of Linville and Fischer's study will be discussed here.

Participants in Linville and Fischer's study were given pairs of outcomes (e.g., in the large gains condition, "You receive an excellent grade, better than you expected, on an exam that counts 40% towards your grade in an important course in your major" and "You receive an excellent grade, better than you expected, on a paper that counts 40% towards your grade in another important course in your major") and asked to state whether they would prefer to have both events occur on the same day or on different days. It is important to note, and this will be considered at length in the discussion of our results, that Linville and Fischer had their participants pre-rate the individual events for desirability before they undertook the choice phase.

Linville and Fischer found a strong preference for separating large gains (78% of participants chose this option) and a non-significant preference (52%) for separating small gains. Further, they found a strong preference for separating large losses (72%) and a weaker but significant preference (56%) for separating small losses. The findings were robust across the choice tasks in academic, social and financial domains.

Thus, the findings of their study evidenced strong support for the predictions of the RRM (and QHEP), for both losses and gains, as long as these are of reasonably substantial magnitude. Explanations sought from participants by Linville and Fischer following task completion suggested, in accordance with RRM theory, that resource renewal and depletion over time was the most prevalent cause of preferences.

Despite the apparent support for RRM, we believe that Linville and Fischer's results may have been induced by the specific procedure and method of task presentation that they employed. We designed the present study to examine these concerns.

TABLE 1

THE CHOICE SCENARIOS

THE PRESENT STUDY

The present study's methodology differed from Linville and Fischer's in four main aspects:

1. We increased the number of events in each choice scenario. Linville and Fischer presented participants with pairs of events. We used three events. If the separation of losses is due to the need to "recover" from each before incurring the next, and the separation of gains is due to the desire to "savor" each, then the tendency to separate should be higher when the number of events is increased.
2. We did not have participants pre-rate the individual events for desirability. This prior task might, in our view, encourage cognitive separation of the events.

3. Whereas Linville and Fischer presented participants with all possible choice pairs B that is, each participant made 38 decisions about different combinations of the same 24 events B we used only eight events and each participant made only four decisions.

4. We increased the domain specificity of events. Linville and Fischer presented participants with pairs of events that were similar, but not identical. For example, in their "small financial losses" condition, the events were "You lose a paperback novel that you just bought for \$5" and "You lose a \$5 bill." Kahneman and Tversky (1984) have demonstrated B in relation to financial events B that people will be more inclined to combine events where the events are coded by the individual as part of the same "mental account" (e.g., "regular bills"); and more likely to separate when the outcomes are coded to separate accounts (e.g., "regular bills" and "unforeseen medical expenses"). Conversely, the concept of "renewable resources" would imply that the more related the groups of events, the more likely it is that people will separate them; that is, the more they will deplete B and thus require the recovery of B the same resource(s). Therefore, if Linville and Fischer's respondents coded the events into separate mental accounts this would provide a rival explanation for separation that does not depend on renewable resources.

To test the Renewable Resource Model's predictions, in the present study, the events used within each scenario were identical (e.g., three x \$10 library fines, three x distinction-graded assignments). If the RRM is correct, this should favor separation. We note that "mental accounting" suggests that the more related the groups of events, the more likely that people will combine them; this would favor combination of events in the case of both positive and negative events.

TABLE 2

PERCENTAGE OF PARTICIPANTS CHOOSING THE SEPARATION OPTION

METHODOLOGY

The present study was designed to replicate the main sections of Linville and Fischer's study (with modifications as discussed) and to examine the applicability of the Renewable Resources Model to decisions in four domains:

- Academic
- Financial
- Social
- Physical

Linville and Fischer used "large" and "small" events, and obtained clear support for RRM only with the large events. We therefore chose "medium" value events, because we wanted events that were of sufficient magnitude to require resources, but not so large as to virtually guarantee separation. For example, in the social domain, Linville and Fischer used "You share a pizza with some good friends" (small) and "The friends that you would most like to

live with want you to join them in a suite next year" (large); we used "You have done something which will make three of your close friends very happy" (medium).

The eight conditions (four domains, positive and negative) and the verbatim tasks are shown in Table 1.

It is important to note that our events were chosen to minimize any financial cost or physical effort differentials between the combined and separate events. That is, the library fines were described as payable in class, thus eliminating the possibility of choices being influenced by the additional physical effort which would have been required for separate payment of fines. Similarly, the dental scenario referred to visiting the *campus* dentist, rather than the respondent's regular dentist (who may have been located some distance away).

Hypotheses

Given that we removed three task factors (see points 2, 3 and 4 above) that appear likely to favor preference for separation of events, our main hypothesis is that we would not replicate Linville and Fischer's findings of separation preference for gains and separation preference for losses. Thus, compared with Linville and Fischer's results:

H1: Participants will show a lesser preference for the separation of gains.

H2: Participants will show a lesser preference for the separation of losses.

H3: H1 and H2 will hold for all four domains of choices (academic, social, financial, and physical).

Participants

Participants were 175 2nd, 3rd, and 4th year students in the Department of Human Movement and Exercise Science at a large Australian public university. The participants' ages ranged from 18 to 53 (mean age 22.4); 57% were female; and 84% were born in Australia. Scenarios were randomly allocated to participants such that each received one scenario in each domain and, in total, two positives ("gain scenarios") and two negatives ("loss scenarios"). The questions were presented as forced-choice (i.e., the instructions stated that participants must choose one of the two options) as in the previous studies.

RESULTS

The percentages of participants stating a preference for the separated gains and separated losses in each domain across the Linville and Fischer study and the present study B are shown in Table 2.

Multiple Gains

As we hypothesized, participants did not demonstrate a preference for separation of gains; instead, in three of the four domains, they demonstrated a preference for combining gains.

Academic Achievement Domain. Consistent with H1, only 32% of participants chose the separated gain (i.e., to receive each assignment back on a separate day), compared with 80%

in the Linville and Fischer (large) academic gain condition. Preference for *combining* gains in the academic achievement domain was significant at $p < .005$.

Financial Domain. Consistent with H1, only 40% of participants chose the separated gain (i.e., to receive each lottery win on a separate day) compared with 84% in the Linville and Fischer (large) financial gain condition. Preference for *combining* gains in the financial domain was significant at $p < .01$.

Social Domain. Consistent with H1, only 28% of participants chose the separated gains (i.e., tell each friend the good news on a separate day), compared with 70% in the Linville and Fischer (large) social gain condition. Preference for *combining* gains in the financial domain was significant at $p < .001$.

Physical Domain. Contrary to H1, 75% of participants chose the separated gain (i.e., to be told at each visit that they had lost 0.5kg). Preference for *separating* gains in the physical domain was significant at $p < .001$.

Multiple Losses

As we hypothesized, participants did not demonstrate a preference for separation of losses; instead, in three of the four domains, they demonstrated a preference for combining losses.

Academic Achievement Domain. Consistent with H2, only 27% of participants preferred to separate the losses (i.e., to receive each failed assignment one at a time), compared with 63% in the Linville and Fischer (large) academic loss condition. Preference for *combining* losses in the academic achievement domain was significant at $p < .001$.

Financial Domain. Consistent with H2, only 29% of participants preferred to separate the losses (i.e., to pay each fine one at a time), compared with 78% in the Linville and Fischer (large) financial loss condition. Preference for *combining* losses in the financial domain was significant at $p < .001$.

Social Domain. Consistent with H2, only 21% of participants preferred to separate the losses (i.e., to have each friend get mad on a separate day), compared with 74% in the Linville and Fischer (large) social loss condition. Preference for *combining* losses in the social domain was significant at $p < .001$.

Physical Domain. Consistent with H2, only 9% of participants preferred to separate the losses (i.e., to have each filling one at a time). Preference for *combining* losses in the physical domain was significant at $p < .001$. (This domain was not examined by Linville and Fischer.)

Potential Mediators

Gender. There were no significant effects of gender on preferences for combination or separation across seven of the eight scenarios. In the physical health loss scenario (dental fillings), the gender difference was significant at $p < .01$, with 100% of men choosing the combined option, compared with 84% of women, though majorities of both genders chose to combine the losses.

Nationality. It was originally intended to compare the outcomes between Australian and non-Australians. However, given that only 28 of the participants were born outside Australia, and only 12 of these had lived in Australia less than 10 years, such comparisons were not made.

Income. Income was measured as this was seen to be a potential mediator B at least in terms of the financial domain B and participants were divided into three categories of monthly income: those earning less than AUD\$500 (47%); those earning \$500-999 (34%); and those earning more than \$1,000 (19%). The only significant income-related difference across all eight scenarios was in relation to the academic loss scenario, with the proportion of participants choosing the combined outcome increasing consistently with income (61%; 83%; 93%; $p < .05$). There was no income effect for the financial scenarios.

DISCUSSION AND CONCLUSIONS

The findings of the current study suggest that the preference for combining gains applies in three of the four domains, which is contrary to the Renewable Resources Model (and also contrary to the PT, HEP and QHEP prediction). Also, the preference for combining losses, in all four domains, does not support the Renewable Resources Model (and it supports the PT and HEP but not the QHEP predictions).

As discussed in the methodology section, the scenarios in the present study were deliberately designed to favor the theory of Renewable Resources, which predicts separation. We used three events, rather than two, which should have been more depleting of participants' resources. However, what we found B in relation to both gains and losses B was a strong preference for combination. It is proposed that the most likely explanation for Linville and Fischer's findings is found not in the Renewable Resources Model, but in Kahneman and Tversky's (1984) "mental accounting" theory. Linville and Fischer employed somewhat dissimilar choice options that participants probably assigned to separate mental accounts, whereas we were careful to keep the options in exactly the same dimension.

Moreover, the preference for separation that they observed may have been increased by the manner of presentation of the questions. Their participants rated each event separately, before completing 38 questions, each question requiring them to state a preference for having two specified events occur on the same or different days. Several of the events were seen more than once, in conjunction with other events, and in the same or different domains. Moreover, the pairs of events in their choice scenarios were presented quite separately (as separate paragraphs) whereas we presented them together (in one paragraph). Thus, it is quite likely that the way in which the events were presented in their study design encouraged participants to consider them separately. On the other hand, it is possible that our presentation may have encouraged combination. But even if so, the Renewable Resources Model should not be so sensitive to lexical differences in task presentation, recalling that our results were the reverse of theirs.

A limitation of our study was that we did not collect process data, relating to subjective perceptions of resource expenditure, as they did. However, it is quite typical not to do so in studies of preferences (e.g., Thaler 1985; Thaler and Johnson 1999) and, in any case, process data might shed light on, but would not alter, the fact of the failure to replicate.

Of great interest to those in the health behavior area is our finding that the strongest tendencies for combination of losses, and the only (and very strong) tendency for separation

of gains, were found in the domain of physical wellbeing. This may have occurred because the particular event chosen in the gain condition (weight loss) was perceived by participants as rewards for progress and thus was separated. Nevertheless, the physical (health) domain does appear to be different from the other domains of social, academic and financial, and will be separately investigated by the author in a series of future studies.

Clearly, the Renewable Resources Model is not robust. It does not provide a complete account of the way people evaluate multiple, temporally separable choices. Future studies will need to be alert to and control for other influences, such as mental accounting.

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