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What do people think about changes in health behaviors? Differential perceptions of consequences of increases and decreases in health behaviors

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Abstract

Most health decision-making models posit that cost-benefit analyses underlie decisions to make changes in health-related behavioral practices. In a series of studies, participants imagined either increasing or decreasing the frequency of a variety of health behaviors and estimated the consequences of those changes. In Studies 1 and 2, individuals consistently estimated that increasing a health behavior produced greater consequences than did decreasing the behavior by an equivalent amount. The results of Study 3 demonstrated that this effect is due to differences in how individuals judge the impact of health behavior changes which involve not engaging in the behavior at all *versus* other types of changes. Taken together, these findings suggest that perceptions of the outcomes afforded by health behavior changes depend on both the behavioral frequency and direction of changes in behavior an individual is considering. This asymmetry has the potential to help explain patterns of behavior in a range of important health domains and may impact the effectiveness of behavior change interventions.

Keywords

Health decision-making models; health behaviour; close-response asymmetry

Introduction

Individually chosen health behaviors are a central part of the etiology of many common chronic diseases and causes of death (Mokdad, Marks, Stroup, & Gerberding, 2004). Given this fact, a great deal of public health attention is focused on encouraging individuals to change their health behaviors. In addition, individuals frequently consider changes in health behaviors (e.g., eating less, exercising more, quitting smoking) on their own. Given the frequency with which people consider changes in behavior and the importance of such changes for health outcomes, a variety of theoretical models have been developed to capture how individuals think about and make decisions about those potential changes (see Glanz, Rimer, & Lewis, 2002; Salovey, Rothman, & Rodin, 1998, for discussion). A fundamental assumption of many models is that the decision to change or sustain a health behavior ultimately rests on an individual's analysis of the situation and the perceived costs and benefits afforded by alternative behavioral options.

Despite the centrality of cost-benefit analyses, existing health decision-making theories are relatively silent on how individuals determine the potential costs and the potential benefits of different behavioral options; costs and benefits are assumed to be a priori inputs into the decision-making algorithm. In this article, we examine how people estimate the potential costs and benefits of changes in health behaviors and consider the implications that those estimates might have for understanding the dynamics of behavioral decision-making in the health domain.

Are all judgments of behavior change created equal?

How do people think about the potential impact, either favorable or unfavorable, of changes in their health behaviors? Such consideration of consequences requires individuals to mentally simulate the potential behavior change and then, based on that mental simulation, estimate potential consequences of the behavioral change (Connolly & Reb, 2005; Kahneman & Tversky, 1982; Page & Colby, 2003; Roese & Olson, 1993; Sanna, 2000). In this article we focus on the question of whether individuals' estimates of the potential outcomes of a health behavior change differ based on features of the behavior under consideration. In particular, our focus will be on how conceptualizing the direction of change of an equivalent set of behaviors (e.g., thinking about increasing exercise from two times per week to five *versus* considering reducing exercise from five times per week to two) influences perceptions of potential outcomes.

Several lines of research suggest that estimations of expected outcomes of increases and decreases may not be equivalent. First, we know that individuals use knowledge of their own behavior to make inferences about their attitudes, abilities, and personality traits (Bem, 1972). One should be able to make inferences about traits based on either actions or failures to act. For example, a person might decide that he is healthy because he did something (e.g., exercised regularly) or he might decide he is healthy because he failed to do something (e.g., did not smoke). However, individuals do not make equivalent inferences across both types of behavior. When individuals consider a behavior in which they *did* engage, they draw stronger inferences than when considering an informationally-equivalent behavior in which they *did not* engage (see Baron & Ritov, 2004; Fazio, Sherman, and Herr, 1982; Gilovich, Medvec, & Chen, 1995; Ritov & Baron, 1990, for related findings).

How might these findings apply to our question about the consequences of increasing *versus* decreasing one's health behaviors? Given that the outcomes of increasing a behavior are the result of *doing* the behavior more, whereas those resulting from a decrease in behavior come from *not doing* it as much, we might predict that perceived outcomes of a behavior change would differ based on the direction of change. People might assume that more outcomes will accrue from increases in behavior than equivalent decreases (e.g., that one will gain more aerobic fitness from increasing exercise a given amount than one will lose by decreasing it the same amount).

A second line of research suggests that perceptions of outcomes of behavior change may depend on characteristics of the outcome considered. In a series of studies in which individuals imagined making different changes in academically-related behaviors and estimated the impact of those changes, Dunning and Parpal (1989) demonstrated that outcome estimates depended not on whether the behavior itself was increasing or decreasing but on whether the outcome being estimated was facilitated by a change in behavior or inhibited by that behavioral change. For example, aerobic fitness would be facilitated by an increase in physical activity, whereas risk for heart disease would be inhibited (i.e., would become lower). Extending this finding to our question, we might predict that when one is considering an outcome facilitated by an increase in behavior, behavioral increases should be seen as having more impact than behavior

decreases. The opposite might be true when one considers outcomes which are inhibited by an increase (and thus facilitated by a decrease).

Finally, the perceived impact of changes in behavior can be influenced by the hedonic relevance of the change in behavior. Specifically, individuals often process potentially threatening health information in ways that allow them to reduce the threatening implications of the information (e.g., Croyle, Sun, & Louie, 1993; Ditto & Lopez, 1992; Kunda, 1990). For example, Gibbons and Gerrard (1995) found that adolescents who increased a risky behavior (e.g., unprotected sex, drinking) also increased their perceptions of the positive outcomes associated with the behavior (e.g., positive images of those who engage in the behavior), whereas those who decreased the risky behavior increased their perceptions of negative outcomes. Thus, we might expect perceptions of the outcomes accruing from a behavioral change to depend on whether the change is expected to produce good or bad outcomes for one's health. If increasing a behavior provides good outcomes (e.g., for exercise, an increase in energy, a decrease in body weight), we might expect increasing to be seen as more impactful than decreasing. By contrast, if the behavior provides negative consequences (e.g., an increase in health risk, a decrease in judgment), decreasing might be seen as more impactful than increasing.

Current studies

Given the diverse body of work suggesting that estimates of changes in health behaviors may differ based on the type of behavior being considered, we examined how the direction of behavior change influenced perceptions of the consequences of those changes. In a series of studies, individuals imagined increasing or decreasing their frequency of engaging in several health-related behaviors and then estimated the outcomes that might accrue from those changes.

In Study 1, we examined whether the perceived consequences of health behavior changes differed based on whether the changes being considered were increases *versus* decreases. In Study 2, we explored the generalizability of the perceived consequences of changes over different ways of considering the behavior and of thinking about consequences. Finally, we turned to examining factors that might account for differences in the perceived consequences of increases *versus* decreases in behaviors in Study 3.

Study 1

Overview

This study tested whether the perceived benefits and costs of changes in health behavioral patterns would differ depending on whether people consider increases or decreases in a behavior. Participants assessed the impact of behavior changes that were presented as either increases or decreases in behavior. A range of different health-related behaviors, both those which promote health (e.g., exercise) and those which are detrimental to health (e.g., smoking), were used. In addition, a range of outcome effects, both potential benefits of the behavior (e.g., increases in aerobic fitness) and potential costs (e.g., increases in risk for lung cancer), were considered.

Procedure

Eighty-two participants (50 females, 32 males; average age = 18.9 years) participated in the study in exchange for course extra credit. Participants read eight scenarios, each describing a change in a behavior (e.g., increasing beer consumption from three beers to six beers every Saturday night) and then estimated a potential outcome of each change (e.g., how much better or worse would your judgments be as a result of drinking three more beers each Saturday night?). Participants read scenarios about alcohol consumption, cigarette smoking, exercise,

eating fruits/vegetables, high fat food consumption, number of sexual partners, sleep, and sugar intake.

To prevent the possibility of response sets influencing perceptions of costs and benefits (e.g., the cumulative impact of considering multiple increases in behavior), each participant was given a mix of increasing and decreasing behavior change scenarios. For each individual behavior, however, the type of change was manipulated between-subjects. Half of the participants read a scenario describing an increase in a given behavior (e.g., three beers to six beers), whereas the other half of the participants read about the equivalent decrease in the behavior (e.g., six to three beers).

For each behavior, participants first read the scenario (e.g., “You currently drink 3 [6] beers every Saturday night. Now imagine that you drink 6 [3] beers every Saturday night.”) and were asked to imagine making the indicated change in behavior. They then answered the perceived outcome measure for that behavior (e.g., “How much better or worse would your judgments be as a result of drinking 3 more [fewer] beers each Saturday night?”). Participants reported their perceptions of the impact of the behavioral change by circling the appropriate number on a 13 point scale. Each scale ranged from -6 to +6 with 0 as the midpoint. For each outcome judgment, the two endpoints and the midpoint were labeled with question-appropriate response options (e.g., “-6 = a lot worse; 0 = about the same; +6 = a lot better”). After completing the scenario judgments, participants answered demographics questions and reported on their own behavioral frequencies for each of the behaviors.

Results

Analysis strategy—Our primary hypothesis concerns whether the perceived impact of a behavior change differs depending on whether the frequency of the behavior increases or decreases. Each participant received a questionnaire with a mix of increasing and decreasing scenarios, thus creating a 2 (Questionnaire: Form A, Form B) $\times$ 8 (Behavior) design. Given that design, the omnibus test of our focal hypothesis of differences in judgment is the interaction of Scenario Type and Behavior – across the mix of increasing and decreasing scenarios, does the perceived magnitude of change differ based on whether the behavior considered is increasing or decreasing?

The response scales for each outcome judgment indicate both the valence (whether the number circled is positive or negative) and the magnitude of the change (how far away from 0 the number circled is, regardless of valence). Because our interest is in the perceived magnitude of change, we computed the absolute value of the answers participants provided for each outcome judgment and used this value in all analyses of perceived impact of change.¹

Effect of scenario type on outcomes—Did participants perceive the consequences of a behavior change differently depending on whether that behavior change involved an increase or a decrease? The mean outcome judgments for each behavioral scenario are summarized in Table I. For each behavior, participants perceived a greater impact, when a given behavior was a behavioral increase than when the same behavior decreased. Testing the predicted scenario type by behavior interaction confirmed the consistency of this effect, MANOVA $F(7,74) = 31.03, p < 0.001, \eta^2 = 0.75$.

¹This strategy does raise the possibility that participants who made objectively “incorrect” judgments (e.g., said that drinking more beer would improve judgment or that exercising more would increase heart disease risk) would be washed out in the analysis. We also ran analyses for each behavior change scenario with only “correct” judgments included – results were identical to those presented here for all participants.

We separately compared the perceived impact of the increasing scenario to the perceived impact of the decreasing scenario for each of the behaviors. These results are also summarized in Table I. For seven of the eight behaviors, the difference in judgment for increasing *versus* decreasing scenarios was statistically significant; t_s (80) range from 3.04 to 8.05, all $p_s < 0.01$. The only exception was sugar consumption; although the direction of the means was consistent with those of the other behaviors, the effect was not significant; $t(80) < 1$, ns.

Consideration of absolute changes in behavior *versus* percentage changes in behaviors—To this point, we have been assuming that individuals conceptualize changes in behavior in absolute, unit-based terms (i.e., an increase from 3 to 5 is an increase of two units of behavior; a decrease from 5 to 3 is a decrease of two units). In this case, the impact of increasing and decreasing behaviors should be logically equivalent – they have the same unit “dose” and thus should have the same consequent “response.” However, individuals might think not in absolute terms but rather in terms of percentage change in behavior (i.e., the ratio of the starting to the ending point). In that system, an increase of 3–5 would be a 66% increase (two units change/three beginning units = 66%), whereas a decrease of 5–3 would be only a 40% decrease (two units change/five beginning units = 40%). Since the increasing scenarios in our study are always a higher percentage of change than the decreasing scenarios, the percentage change alternative explanation would argue that the asymmetry in judgments is not due to increasing *versus* decreasing scenarios but rather due to differences in the percentage change involved.

We conducted an exploratory analysis to see if relative percentage change related to perceived magnitude of consequences *across* behaviors. If the percentage change alternative explanation is correct, individuals should see the biggest difference in magnitude of consequences between increases and decreases (indexed by the effect sizes reported in Table I) for those behaviors with the greatest percentage differences between the increasing and the decreasing scenario. Because eight observations is a small sample, we used a nonparametric correlation test, Kendall’s Tau (Howell, 1997) to test the prediction. There was no significant relation between the percentage difference and the size of the effect for a given behavior, $\tau(8) = -0.23$, ns. Indeed, if anything there was an *inverse* relation – the greater the difference in percentage size the smaller the judgment asymmetry.

Influence of actual behavioral practices on the judgment asymmetry—Because our scenarios involve common behaviors which many participants were already doing, we examined whether participants’ own behavioral practices influenced judgments. Participants who already engage in a behavior to a greater degree are making inferences about consequences based on different prior knowledge (the past outcomes of their own behavior) than are those who engage in a behavior to a lesser degree. Because prior behavior is a determinant of outcome perceptions (Fazio & Zanna, 1978; Knoblich & Flach, 2001), we examined whether the participants’ self-reported behavioral practices influenced their responses. Specifically, we included the interaction of scenario type and self-reported behavior in a regression model in which the main effects of scenario type and behavioral frequency were entered on Step 1 and the interaction of the two was entered on Step 2. This interaction test was conducted for all behaviors except smoking – there were too few smokers in the sample ($n = 8$) to conduct a valid test. The interaction was not significant for any of the behavioral scenarios, all $F_{\text{CHANGE}}(1,78) < 2.56$, ns. This lack of interaction indicates that individuals’ own behavioral practices do not influence the judgment asymmetry.

Size of asymmetry for healthy *versus* unhealthy behaviors—Given that the scenarios include both behaviors that promote health (e.g., exercise) and behaviors that have an adverse effect on health (e.g., consumption of high fat foods), it is possible that the asymmetry effect might be moderated by the type of behavior in question. From a defensive

processing perspective (see *Introduction*), one might predict that anticipating greater effects of increasing *versus* decreasing healthy behaviors but of decreasing *versus* increasing unhealthy behaviors would be adaptive. We therefore examined the possibility that the magnitude of the asymmetry effect might depend on whether engaging in the behavior was healthy or unhealthy. Because of the mix of healthy and unhealthy behavior scenarios in each between-subjects condition (see *Procedure*), it is not possible to directly test this in a factorial design. We therefore used statistical techniques from the meta-analysis literature to test whether the effect sizes for the difference between increasing and decreasing scenarios reported in Table I differed for healthy *versus* unhealthy behaviors (Hedges, 1982; Lipsey & Wilson, 2001, for a description of how to implement this analysis). The average effect size for healthy behaviors (mean weighted $ES = 1.04$) did not differ from that for unhealthy behaviors (0.95); $Q < 1$, ns.

Discussion

Study 1 provided initial evidence that “all changes in behavior are not perceived equally.” More specifically, the outcomes that participants perceived would result from increasing behaviors were seen as having more impact than those they perceived would result from equivalent decreases in the same behavior. The asymmetry in perceptions of magnitude for increasing health behaviors *versus* decreasing health behaviors was quite robust. For all eight behaviors, the effect was in a consistent direction; the effect was significant for seven of the eight. This consistency occurred even though both the set of behaviors considered and the set of outcome judgments were quite heterogeneous. The behaviors covered a range of health domains and included both health-promoting (e.g., exercise) and health-damaging (e.g., smoking) behaviors, and each behavior had a unique outcome judgment associated with it. Moreover, the asymmetry seems to be a function of the difference between increasing or decreasing a behavior rather than a difference in the perceived amount of change involved. Finally, the asymmetry is not influenced by participants’ own behavioral practices.

However, the way in which the outcome judgments were made in Study 1 is potentially different from the way in which such considerations of behavioral consequences influence judgment and behavior in everyday life. In Study 1, participants were provided with the outcome dimensions on which they assessed consequences of the behavior change. By contrast, in more naturalistic settings people not only think about whether there are consequences but also determine on what outcome dimensions they wish to evaluate the effects of the change.

As an analog to this situation, we conducted a study in which participants self-generated the outcomes on which they would judge the impact of the change in health behavior. Participants imagined either an increase or a decrease in each of six health behaviors. After imagining each scenario, participants generated up to seven outcomes that they thought were likely to result from the behavior change. After generating outcomes for all of the behaviors, participants went back and rated the magnitude of the change in each outcome.

Study 2

Procedure

One hundred and sixteen participants (75 females, 41 males; average age 20.3 years) took part in the study in exchange for extra course credit. Participants received one of two packets. Each packet contained six health behavior change scenarios and as in Study 1 each contained a mix of increasing and decreasing scenarios. However, for each individual behavior, direction of change was varied between-subjects.

Participants were instructed to imagine making the change in behavior and then to think about “various specific outcomes” that might result from the change. Following each scenario was a set of seven boxes. Participants were asked to write down as many outcomes as came to mind and to write one specific outcome in each box. Participants were told that they could think of both positive outcomes (e.g., good things that happen or bad things that stop happening) and negative outcomes (e.g., bad things that happen or good things that stop happening) that might result from the change in behavior.

After participants completed the outcome generation task for each of the six behavior change scenarios, they went back over their responses and rated each outcome on two dimensions. First, participants indicated their perceptions of how strongly the outcome would affect their daily life ($-6 =$ very strong negative influence, $0 =$ no influence, $6 =$ very strong positive influence). Next, they indicated how strongly the outcome would affect their overall health using the same response scale. After completing the outcome ratings, participants reported demographics and their own behavioral frequencies and were then fully debriefed.

Results

We initially examined participants’ perceptions of the impact of the outcomes generated in response to the behavior change frame. As was the case in Study 1, each questionnaire packet contained a mix of increasing and decreasing framed scenarios, so for a given behavior the questionnaire form a participant received indexed whether the scenario was increasing or decreasing. Therefore, the omnibus test for the judgment asymmetry is again a questionnaire form $\times$ behavior interaction (see *Analysis Strategy* in Study 1).

To examine perceived impact, we first aggregated impact ratings by averaging the overall health and the daily life impact ratings to form an overall impact measure. Overall, participants perceived that the outcomes they generated in response to an increasing framed scenario would have greater impact than would the outcomes they generated in response to a behavioral decrease; $F(5, 104) = 11.44, p < 0.001, \eta^2 = 0.36$. Examination of each individual behavior revealed that the effect was significant for three of the six individual behaviors (fruit and vegetable consumption, aerobic exercise, cigarette smoking); all F ’s(1, 108) > 3.6 , all p ’s < 0.05 . For alcohol consumption, the effect was marginally significant; $F(1, 108) = 3.05, p = 0.08$. For the remaining two behaviors, high fat food consumption and sexual behaviors, the effect was nonsignificant; both F ’s < 1 , ns. Means and SDs for each judgment and effect sizes for the increasing–decreasing difference can be found in Table II. As with Study 1, we also examined whether participants’ own behavioral practices influenced the magnitude of the asymmetry. In no case was there a significant interaction between self-reported behavior and the asymmetry effect, all F ’s(1, 100) < 2.09 , ns. Also following the analysis strategy for Study 1, we examined whether the magnitude of the effect differed for healthy *versus* unhealthy behaviors; there was no effect of type of behavior, $Q = 1.35$, ns.

Finally, as an exploratory test we examined whether the number of outcomes individuals generated depended on how the behavior change was framed. Across the six behaviors there was a significant difference in the number of outcomes generated based on whether the scenario was framed as a behavioral increase or a behavioral decrease; $F(5, 100) = 10.73, p < 0.001, \eta^2 = 0.33$. Examination of each of the individual scenarios revealed that, in each case, participants generated more outcomes for increasing than for decreasing scenarios. This effect reached conventional levels of statistical significance for the alcohol consumption behavior; beer $F(1, 114) = 5.41, p < 0.05$. The effect was marginally significant for three of the remaining behaviors, fat food consumption, unprotected sex, and exercise behavior; F ’s(1, 114) range from 2.53 to 3.51, p ’s range from 0.06 to 0.11. Finally, the effect was nonsignificant for cigarette smoking and fruit and vegetable consumption; both F ’s < 1.1 , ns. In every case, the patterns of means supported the judgment asymmetry; participants generated more outcomes

when they considered an increase in behavior relative to the equivalent behavioral decrease. Means and standard deviations for the number of items generated can be found in Table II. Here, too, participants' behavioral practices did not influence the magnitude of the judgment asymmetry, all $F_s(1, 100) < 3.7$, ns, nor did whether the behavior in question was healthy or unhealthy, $Q < 1$, ns.

Discussion

Study 2 replicates the increasing/decreasing judgment asymmetry – with the exception of high fat foods, when participants imagined increasing health behaviors, they perceived that the outcomes of those changes would have greater impact than would the outcomes resulting from equivalent decreases in the behavior. This held true even when participants self-generated the outcomes they assessed; participants perceived the magnitude of their self-generated outcomes to be greater, when a behavior was increasing than when it was decreasing. In addition, Study 2 revealed another interesting facet of the judgment asymmetry. Not only do people attribute greater impact to increasing than to decreasing behaviors, but they also report a greater number of conceptually distinct outcomes resulting from increases than from equivalent decreases.

Taken together, Studies 1 and 2 provide strong evidence for the robustness of the increasing/decreasing judgment asymmetry and collectively demonstrate that the effect generalizes over different types of health behaviors, outcomes of behavior, and ways of generating and considering those outcomes. In these studies, however, the scenario for a given behavior always used the same behavior frequencies (e.g., the change for alcohol consumption was 3–6 or 6–3 in all three studies). A remaining question about the nature of the judgment asymmetry effect is whether the effect will be consistent across different frequencies of behavioral engagement. The scenarios in the first two studies all concerned relative changes in the frequency of an ongoing behavior, but many health decisions involve either initiation of a behavior in which one is not already engaging (e.g., beginning an exercise program) or completely eliminating a behavior in which one currently engages (e.g., smoking cessation). Thus, an important question is whether one observes the same asymmetry when a scenario involves either initiating or completely eliminating a behavior. Will the judgment asymmetry be the same, for example, when the change being considered is a change from three servings to six servings (or 6 to 3) as when the change is from zero servings to three servings (or 3 to 0)?

There are findings from other areas of perception and judgment which would suggest that the overall frequencies of behavior being considered might influence how individuals view the outcomes of those changes in behavior. Research in behavioral economics has shown that the perceived marginal utility of a commodity (the benefit one gets from having a given unit; e.g., one car or one house) changes as the number of units one possesses change – one does not perceive the same increased benefit from having three houses vs. two as one perceives from having two houses *versus* one (Perloff, 1999; Yates, 1990). In a related vein, examination of perceptions of the magnitude of differences in numbers has shown that the absolute size of the numbers influences perception of the magnitude of the difference. When the numbers are close to zero (e.g., the difference between two and three) the difference is perceived as being of greater magnitude than when the numbers are further from zero; (e.g., 10 *versus* 11; Fairbank, 1974; Holyoak, 1978). Although this work considered “raw”, abstract numbers, similar differences in magnitude perception might occur for judgments about differences in behavioral frequency.

All of these findings suggest that there may be differences in how people perceive the outcomes of behavior changes based on the absolute frequency of the behavior being considered. Whether this will lead to changes in the nature of the increasing/decreasing judgment asymmetry, however, is an open question. In Study 3, we examined whether people's perceptions of outcomes of behavioral changes depend on the absolute behavioral frequencies. Both the

behavioral economics and the psychophysics of numbers research suggests that a determinant of judgment may be how close the change is to having none of a commodity or to the number zero. Also, changes involving not engaging in the behavior at all (i.e., initiation or cessation of behavior) are of particular public health interest. Given this, we focused on differences based on whether the changes under consideration were simply changes in the level of on-going practices or included initiation or elimination of a behavior. The tests of the asymmetry in the first two studies involved changes in on-going behavioral practices (e.g., 3 to 6 *versus* 6 to 3). It may be the case that behavioral changes that involve initiating or eliminating a behavior may not reveal an asymmetry consistent with those found in our prior studies. To test this possibility, in Study 3 we presented participants with behavior change scenarios which either included or did not include a zero point – not engaging in the behavior at all.

Study 3

To examine the possible moderation of the judgment asymmetry by whether or not the behavior change under consideration included not doing the behavior at all, we gave participants increasing or decreasing behavior change scenarios that either did or did not start/end at zero times per day/week (all within participants). For instance, when considering alcohol consumption, participants were asked to imagine increasing from 0 to 4 drinks per weekend, decreasing from 4 to 0, increasing from 4 to 8, and decreasing from 8 to 4. The key test of this hypothesis is examination of the interaction between the effects of direction of change (increasing or decreasing) and whether or not the change includes not engaging in the behavior at all (e.g., 0–4 *versus* 4–8).

Method

Thirty-eight participants (mean age = 18.7 years) took part in the study in exchange for course extra credit. An experimental error resulted in gender not being recorded for approximately 1/2 of the participants. Of those for whom gender was recorded, 13 were females and five were males.² Participants took part in the study in small groups of one to three participants.

The study was conducted via Macintosh computer using PsyScope software (Cohen, MacWhinney, Flatt, & Provost, 1993). In a within-subjects design, each participant made all four types of judgments for each of six behaviors. Scenarios were presented in two blocks. Each block contained either the increasing or decreasing scenario for each of the zero or nonzero judgments. The corresponding scenario was in the other block. The order in which behavioral scenarios were presented was also counterbalanced to create four order of presentation groups. Order of presentation had no influence on outcomes and is therefore not discussed further.

Participants completed judgment scenarios for each of the six health behaviors used in Study 3. For each behavior, the participant estimated (in separate scenario blocks) the perceived impact of increases which started from zero (e.g., 0–4 servings), increases which did not start from zero (4–8 servings), decreases which ended at zero (e.g., 4–0 servings), and decreases which did not end at zero (e.g., 8–4 servings). In each case, the scenario was constructed such that the magnitude of change for the zero and nonzero scenarios was equivalent (e.g., in the example above, all scenarios inquire about a change of four serving units).

After each scenario, participants were asked to judge how much each change would “increase or decrease your overall health”. Participants answered on a 13-point scale with endpoints of

²Gender did not influence any reported results.

“would greatly decrease” and “would greatly increase”. In between the two blocks of scenarios, participants completed demographics and behavior reports.

Results

To examine the effect of including zero in a behavioral change on the judgment asymmetry, we examined the two-way interaction between direction of behavior change (increasing/decreasing, the index of the judgment asymmetry) and scenario type (includes/does not include zero). There was a significant direction $\times$ scenario type interaction, $F(1, 32) = 99.37, p < 0.001, \eta^2 = 0.73$. Follow up examination of the means for each individual behavior indicated that, for scenarios which did not include zero the traditional increasing/decreasing asymmetry was observed – participants perceived greater impact to increasing a behavior than to decreasing the same behavior by an equivalent amount. By contrast, for those scenarios which included zero, the pattern of the asymmetry was reversed – eliminating the behavior was perceived to be more impactful than was initiating the behavior. This pattern was consistent across all behaviors except aerobic exercise. For exercise, the magnitude of the asymmetry was greatly reduced but did not reverse. For all behaviors, the direction $\times$ scenario type interaction was significant, all $F_s(1, 37) > 20.59$, all $p < 0.001$, η^2 s all > 0.36 . Means, SDs, and effect sizes for each individual behavior are reported in Table III. In no case did participants' own behavioral practice moderate the effects, all $F_s < 2.6$, ns; nor did the magnitude of either the zero or the nonzero judgment asymmetry effects differ for healthy *versus* unhealthy behaviors, both Q s < 1 , ns.

General discussion

In the first two studies, we found a systematic asymmetry in judgments of consequences of changes in health behaviors – individuals persistently see the consequences of increasing a health behavior as greater than those of an equivalent decrease in the behavior. In Study 3, we identified an important boundary condition of the effect – when judgments involve either initiating or completely eliminating the behavioral practice, the judgment asymmetry reverses and decreases in behavior are seen as being more impactful than are equivalent increases.

What can we conclude from our studies of the judgment asymmetry? First, the asymmetry is a robust phenomenon for ongoing behaviors. Because the effect occurs with equal magnitude for both healthy and unhealthy behaviors, we can conclude with some confidence that the asymmetry is not due simply to individuals wishing to maintain the sense that they are healthy in the face of potentially threatening information about their behaviors (e.g., Croyle et al. 1993; Liberman & Chaiken, 1992). Given that the asymmetry was obtained across a range of behaviors, including diet, exercise, alcohol consumption, and sexual behaviors, it would appear that it is not specific to a particular behavioral domain, but rather reflects a more general cognitive process. Although there are occasional differences in the magnitude and statistical significance of the effect, a compelling overall pattern emerges which demonstrates that when estimating the outcomes of an ongoing behavior, independent of its hedonic or health value, individuals see increases in behavior as having more impact than decreases.

Accounting for the asymmetry

Why did individuals perceive increases in behaviors as having more impact than decreases in Studies 1 and 2 and why was the effect reversed in Study 3, when examining scenarios which involved initiating or completely eliminating a behavioral practice? Although a strong answer to this question is a matter for future research examining the mechanisms underlying the asymmetry we have documented here, there are some interesting possibilities raised by the data from Study 3 (Table III). For example, examining the means for smoking reveals that when individuals estimate the health impact of increasing cigarette consumption from zero

packs per day to one pack per day (one pack unit increase) they perceive its health impact as being 4.61 units (units here are perceived amount of increasing or decreasing “healthiness”). However, when they consider increasing from one pack per day to two packs per day (also a one pack unit increase), they perceive the health impact of that change as being 5.05 units. By contrast, when considering decreases in behavior, participants perceive the impact of going from two packs per day to one pack per day (one pack unit decrease) as being 2.50 units but the impact of one pack to no packs as being 5.44 units. In other words, when considering an increase in behavior, initiating a behavior from a starting point of not engaging in the behavior at all is not perceived as having as great an impact as an equivalent increase from a starting point of already engaging in the behavior. By contrast, when considering decreasing a behavior, a decrease which reduces but does not eliminate the behavior is not seen as being as impactful as decreasing with an endpoint of completely eliminating engaging in the behavior. Examination of the means in Table III reveals that a similar pattern of perceived impact is found for the other behaviors.

How might this observation account for the results of our three studies? Our observation of the means in Study 3 suggests that individuals’ perceptions of the impact of changes in health behaviors are potentially curvilinear – the perceived consequences that accrue from a given unit change in behavior are not equivalent across levels of the behavior. Figure 1 presents a hypothetical model of what a *dose – response* model for perceived consequences per unit change might look like based on our observation about the data from Study 3. In Figure 1, the vertical dashed line represents a hypothetical “break point” at which the perceived outcome per unit change for increases *versus* decreases changes. To the left of the break point, the slope for the decrease-behavior dose response curve is steeper than that for the increase dose – response curve. To the right of the line, the increase dose – response slope is steeper. Because the scenarios in the first two studies were all at some distance from not engaging in the behavior at all, they may have fallen on the right side of the break point line. Thus, for each of our scenarios, increasing was perceived as having more impact than decreasing because the dose – response relation was steeper for the increasing scenario. By contrast, when the behavior change included zero, participants may have been considering changes which were to the left of the break point. To the left of the break point, the slope for decreasing behaviors is greater than the slope for increasing the same behavior, and thus the judgmental asymmetry reverses. Such a dose – response model would thus account for the findings from all three of our studies.

Alternative explanations

There are, of course, potential alternative explanations for these findings. Given that individuals weight actions more strongly than they do failures to act (Fazio et al., 1982), it could be that our judgment asymmetry occurs because individuals see increases in behaviors as actions, whereas they see decreases in behaviors as failures to act. Confidently concluding this, though, would require examining whether those perceptions are true – many individuals who have tried to quit smoking or reduce their consumption of high fat foods might beg to differ with the assertion that reducing a behavior involves simply a lack of action. In addition, this analysis would not account for our finding that the asymmetry reverses when change scenarios include eliminating a behavioral practice as found in Study 3.

A second potential alternative explanation is the percentage change account we tested in Study 1. It might be the case that rather than individuals seeing a change from 3 to 5 behavioral units as being the same “amount of change” as a change from 5 to 3 units because the units added or subtracted are the same, individuals might perceive change in terms of the relative percentage of change. In that case, the change from 3 to 5 would be seen as larger (a change of 66%, given that two units from a starting point of three units = 66%) than would the change from 5 to 3 (a change of two units from a starting point of five = 40%). If this were the case, the judgment

asymmetries found in the first two studies might be quite reasonable – in each scenario in the two studies, the increasing scenario would involve a greater magnitude of change than the corresponding decreasing scenario. However, two factors argue against this alternative interpretation. First, we examined this interpretation in Study 1 and found no evidence to support it. Second, although this perspective does provide an alternative explanation for the data obtained in Studies 1 and 2, it cannot account for the reversal in behavioral patterns found in Study 3. By contrast, a dose – response interpretation can adequately account for both types of findings.

Implications

What are the implications of the asymmetry in outcome judgments and of the evidence for reversal of the asymmetry for initiation/elimination of behaviors? One implication of this work is that models of health decision making need to consider how individuals “compute” the potential benefits and costs of engaging in a behavior. At present, most health decision-making models begin with a point at which individuals have already determined their perceptions of the costs and benefits of a particular behavioral pattern. Thus, actually determining those costs is an a priori input into the decision-making process. Because perceptions of costs and benefits play a central role in many conceptualizations of health decision making (Weinstein, 1993) and because our work demonstrates that those perceived costs and benefits are malleable depending on how the behavior is framed, decision-making models could be strengthened by considering how costs and benefits are computed as a formal part of the decision-making process.

A second important implication is the possibility that the judgment asymmetry observed in our studies may help to account for yo-yo patterns of behavior change. Across a range of behaviors, including smoking, diet, and exercise, individuals display yo-yo patterns – initiating a behavior change only to subsequently stop the behavior change and return to previous patterns of behaviors (Kumanyika et al., 2000; Marcus et al., 2000; Ockene et al., 2000).

The judgment asymmetry phenomenon suggests a possible explanation for this. Although such an explanation is clearly speculative until examined empirically, one can consider a hypothetical person who is exercising two times per week and is considering increasing to exercising five times per week. Existing models of decision-making suggest that her perceptions of the benefits of going from two sessions to five sessions per week will be an important determinant of whether she actually makes the change. In its simplest version, our judgment asymmetry suggests that, because two to five is an increase in behavior, she will perceive a relatively large number of benefits to the increase in behavior and will be likely to initiate the change. However, once she is exercising at a rate of five times per week, she may begin to consider what would be lost if she returned to exercising two times each week. At this point, the simulated change in behavior is a decrease and according to our data, she will perceive relatively few costs (or lost benefits) to that decrease in behavior and will likely again make the change.

Thus, given the cost-benefit focus of many models of health decision-making, our findings might help explain why yo-yo patterns exist. The judgment asymmetry might indicate a cognitive decision-making mechanism that would explain yo-yo patterns in behavior, which are an area of growing interest as health behavior researchers consider how and why individuals often fail to maintain health behavior changes (Rothman, 2000).

Conclusion

Making decisions about changing health behaviors requires assessment of the costs and the benefits of potential changes. Our studies suggest that the outcomes of this assessment are

contingent on both how the behavior change is framed and where the individual is in terms of absolute magnitude of behavioral frequency (i.e., relatively close to not doing the behavior or engaging in the behavior at a relatively high frequency). Given its demonstrated impact on the process of judging potential changes in health behaviors, further research is needed to specify the cognitive mechanisms underlying the asymmetry, how it influences patterns of health behavior over time, and how it might influence responses to health behavior change interventions.

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Figure 1.
Dose – response model with hypothetical “break point”.

Table I

Outcome judgments by behavior frame, Study 1.

Behavior	Increasing frame mean (SD)	Decreasing frame mean (SD)	<i>t</i> -test (80 df)	Effect Size (<i>d</i>) (Uncorrected)
Alcohol consumption	-3.82 (1.75)	2.32 (2.09)	3.67***	0.81
Fruit and vegetable consumption	3.73 (1.94)	-2.46 (2.20)	3.04**	0.67
Sugar consumption	1.22 (2.45)	-1.07 (2.19)	<1	0.17
Sleep	3.41 (2.17)	-2.32 (1.68)	3.36***	0.74
Aerobic exercise	3.85 (1.51)	-1.61 (1.22)	8.05***	1.78
Sexual partners	3.10 (2.83)	-1.90 (2.17)	4.28***	0.95
Fat food consumption	-3.90 (2.40)	2.51 (1.58)	6.01***	1.33
Smoking	4.37 (1.56)	-1.83 (1.50)	7.55***	1.67

Note: Raw means are presented. For inferential statistics and effect size estimations, the absolute value of each mean was used. All outcome judgments were made on a scale that ranged from -6 to +6.

**
 $p < 0.01$;

 $p < 0.001$.

Table II

Dependent measures, Study 2.

Behavior	Dependent measure	Increasing	Decreasing	Effect size (<i>d</i>)
Alcohol	Number generated	5.05 (1.60)	4.38 (1.52)	0.43
	Daily life magnitude	3.40 (1.39)	3.05 (1.39)	0.25
	Health magnitude	2.92 (1.40)	2.50 (1.16)	0.33
Fruit/vegetable	Number generated	4.16 (1.41)	3.88 (1.79)	0.17
	Daily life magnitude	3.77 (1.51)	2.92 (1.42)	0.58
	Health magnitude	4.04 (1.34)	3.11 (1.48)	0.65
Sexual partners	Number generated	3.88 (1.58)	3.27 (1.89)	0.35
	Daily life magnitude	4.05 (1.33)	3.75 (1.50)	0.21
	Health magnitude	3.19 (1.35)	3.32 (1.66)	−0.09
Exercise	Number generated	4.68 (1.80)	4.20 (1.47)	0.29
	Daily life magnitude	3.94 (1.32)	2.97 (1.03)	0.82
	Health magnitude	3.75 (1.36)	2.62 (1.23)	0.87
Fat food	Number generated	4.54 (1.50)	4.02 (1.64)	0.33
	Daily life magnitude	3.59 (1.42)	3.66 (1.45)	−0.05
	Health magnitude	3.69 (1.33)	3.76 (1.44)	−0.05
Smoking	Number generated	4.63 (2.04)	4.29 (1.57)	0.19
	Daily life magnitude	3.79 (1.37)	3.65 (1.53)	0.10
	Health magnitude	3.80 (1.42)	2.99 (1.40)	0.57

Note: Number generated indicates the number of outcomes self-generated for each scenario (from 0 to 7). Daily life and health magnitude judgments range from −6: very strong negative influence to +6: very strong positive influence. Numbers presented are the absolute values of the ratings.

Table III

Outcome estimation by scenario type and inclusion of zero, Study 3.

Behavior	Inclusion	Increasing scenario	Decreasing scenario	Effect size (<i>d</i>) (Uncorrected)
Alcohol consumption	Nonzero	3.95 (1.53)	2.08 (1.32)	0.75
	Zero	3.47 (1.52)	3.95 (1.72)	−0.30
Fruit and vegetable consumption	Nonzero	3.76 (1.15)	2.29 (1.21)	0.81
	Zero	3.42 (1.27)	4.00 (1.63)	−0.40
Aerobic exercise	Nonzero	4.00 (1.51)	2.03 (1.20)	1.44
	Zero	3.50 (1.37)	3.37 (1.81)	0.08
Sexual partners	Nonzero	3.05 (1.77)	2.13 (1.58)	0.55
	Zero	2.34 (1.83)	3.37 (2.22)	−0.51
Fat food consumption	Nonzero	4.59 (1.19)	3.00 (1.41)	1.22
	Zero	4.00 (1.27)	4.30 (1.61)	−0.21
Smoking	Nonzero	5.05 (1.11)	2.50 (1.43)	1.99
	Zero	4.61 (1.50)	5.44 (0.83)	−0.68

Note: Ratings were made on a scale ranging from −6 (will significantly decrease) to +6 (will significantly increase). Values in the table are the absolute value of participants' ratings.