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Omission bias, individual differences, and normality

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Abstract

Omission bias is the preference for harm caused by omissions over equal or lesser harm caused by acts. Recent articles (Connolly & Reb, 2003; Patt & Zeckhauser, 2000; Tanner & Medin, in press) have raised questions about the generality of this phenomenon and have suggested that the opposite bias (action bias) sometimes exists. Prentice and Koehler (2003) have suggested that omission bias is sometimes confounded with a bias toward what is normal, a bias they find. We review this literature and report new data showing omission bias with appropriate methods, as well as a small normality bias that cannot explain the omission bias. The data suggest that the bias is largely based on the distinction between direct and indirect causation, rather than that between action and inaction as such. We report substantial individual differences: some subjects show action bias. We argue, though, that concern about omission bias is justified if only a substantial minority of people show it.
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Introduction

> In 1736, I lost one of my sons, a fine boy of 4 years old, by the small-pox, taken in the common way. I long regretted bitterly, and still regret that I had not given it to him by inoculation. This I mention for the sake of parents who omit that operation, on the supposition that they should never forgive themselves if a child died under it; my example, showing that the regret may be the same either way, and that, therefore, the safer should be chosen.
>
> Benjamin Franklin (1771–1778)

Omission bias is the preference for harm caused by omissions over equal or lesser harm caused by acts. Ritov and Baron (1990) used vaccination to illustrate the bias: many people consider the risk of harm from vaccination as more serious than the risk from omitting vaccination. This bias seems to affect real vaccination decisions (Asch et al., 1994; Meszaros et al., 1996), and it has been found in several other contexts (Baron, 1992, 1996; Baron & Leshner, 2000; Baron & Ritov, 1993, 1994; Cohen & Pauker, 1994; Haidt & Baron, 1996; Petrinovich & O'Neill, 1996; Ritov & Baron, 1992, 1995, 1999; Royzman & Baron, 2002; Schweitzer, 1994; Spranca, Minsk, & Baron, 1991).

Recent articles (Connolly & Reb, 2003; Patt & Zeckhauser, 2000; Tanner & Medin, in press) have raised questions about the generality of this phenomenon, especially in the context of vaccination, and have suggested that the opposite bias (action bias) exists in some conditions. Another article (Prentice & Koehler, 2003) suggests that omission bias is sometimes confounded with a bias toward what is standard or normal, a bias reported in the article. Connolly and Reb (2003, henceforth CR) raise other concerns about the practical implications of the phenomenon of omission bias.

In the present article, we review this literature and report new data showing a small omission bias with appropriate methods, as well as a small normality bias that cannot explain the omission bias. We also report substantial individual differences, with some subjects clearly showing an action bias despite the overall trend toward omission bias. We argue, though, that concern about omission bias is justified if only a substantial minority of people show it, even if, on average, just as many show the opposite bias.

Our primary interest is in decision making, so we concentrate on research concerned with choices (hypothetical or real) and with evaluation of choices.

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However, some research is also concerned with anticipated emotional reactions, and we discuss this literature when it might inform us about how people think about choices.

We try to avoid discussion of the status-quo effect, which we take to be a different effect from omission bias (Ritov & Baron, 1992; Schweitzer, 1994). Omission bias is a greater willingness to accept harms from omission, the default, than harms from action. Status-quo bias is a greater willingness to accept the status-quo than change. Ordinarily, the default and the status-quo are the same, so these two biases work together, but they may be separated in both experiments and the real world (e.g., when all options are new, so none is the status-quo). We do suggest, however, that an important component of the act–default distinction is that between direct and indirect causation (as suggested by Spranca et al., 1991 and Royzman & Baron, 2002). In particular, people seem to treat the risk of vaccine failure as roughly equivalent to the risk of failing to vaccinate, both less serious than the risk of causing harm through vaccination itself.

Methodological criticisms of vaccine studies

CR criticize the methods of several studies showing omission bias for vaccines. The usual result is that subjects are unwilling to take some risk of death or serious side effects from a vaccine, when the alternative is a much greater risk of these same outcomes without vaccination (Ritov & Baron, 1990). Most of these criticisms have been answered in studies using non-vaccination examples (listed in this article's first paragraph), and some were even answered in the articles that CR criticize. We review these criticisms briefly here.

Response scales

Many studies used a limited response scale, in which the highest acceptable response was that the risk of vaccination was equal to that of non-vaccination. A tendency to respond anywhere other than the top of the scale counts as omission bias. The scale itself may suggest that responses at one end are unreasonable or unexpected. However, even in the original article by Ritov and Baron (1990), two results that support omission bias cannot be explained in terms of this scale limitation.

First, we found a large difference between cases in which the children who would die from the vaccine were not necessarily the same as those who would die from the disease and cases in which those who died from the vaccine would have died from the disease anyway, using the same response scale. Subjects were much more willing to vaccinate in the latter case, which serves as a control condition for the effects of the response scale itself. Baron and Ritov (1994, Experiment 4) also found that subjects tolerated greater risk of vaccine death when the vaccine deaths were the result of vaccine failure rather than side effects. These results indicate that direct causation of deaths by the vaccine makes people more reluctant to vaccinate, which is our main claim (as argued by Spranca et al., 1991).

Second, we found omission bias when the response scale was open-ended, in Experiment 4, in which the vaccine risk was given and subjects had to provide a disease risk that was equally unacceptable. We found that the disease risk was higher. CR criticize Experiment 4 because the responses were "bounded below at zero, but unbounded above, so that the means would have been inflated by any large-number responses participants used to register reluctance to vaccinate under any circumstances" (p. 189). They might add that the average ratio of vaccination risk to disease risk and the average ratio of disease risk to vaccination risk might both be greater than one, leading to different conclusions depending on which measure was used. It was exactly to avoid these potential problems that we reported (in Table 4) an analysis based on logarithms, which showed a robust omission bias. Logarithms of ratios are unbounded at both ends, and inverting the ratios changes only the sign of the means of their logarithms, so that it is impossible to obtain positive results for both ratios. Moreover, the fact that subjects were unable to express an infinite ratio is conservative with respect to the omission bias hypothesis. When they were asked to provide a maximum acceptable vaccination risk, many subjects said zero.

Spranca et al. (1991, Experiments 3 & 4) and Baron and Ritov (1994, Experiments 2–5) used other methods to demonstrate omission bias, in ways not subject to the problem of limited responses scales. Subjects made judgments about which option was better or more advisable. This question allowed subjects to compare cases in different choice sets, so that the same outcome could result from an act or an omission. Cases were counterbalanced, so that, half the time, the act led to the worse outcome, and, half the time, the omission did. In almost all of these cases, we found that acts leading to the worse outcome were rated lower (less advisable) than omissions leading to the worse outcome.

Royzman and Baron (2002, Study 3) also found omission bias using response options that did not favor acts or omissions. For example, in one scenario, if nothing is done, 10 species of rare trees will become extinct because of an insect infestation. One option was to destroy the species in which the insects had nested so far. Subjects were asked, "Would you do this if the action would cut the number of species extinction in half? ... lead to the same number of species extinctions? ... double the number of species extinctions?" In general, subjects tended to favor omission across the three options (and significantly so, whether tested across subjects or scenarios). Interestingly, omission bias was sharply reduced when the effect of action was indirect rather than direct, e.g., when saving the trees involved killing the insects, leading to extinctions as a by-product.

Lability and complexity

CR also point out that the magnitude of omission bias varies considerably from experiment to experiment. We have always thought of the omission bias as resulting from the use of a heuristic, rather than as a psychophysical constant. The use of heuristics is notoriously labile, as shown by much research.

CR also suggest that asking subjects to match vaccine risk to disease risk is too difficult. In several studies (Asch et al., 1994; Baron, 1992; Baron & Leshner, 2000) we first asked whether subjects would vaccinate or not at an intermediate level of vaccine risk. Many would not even vaccinate at this level. We then asked for a maximum risk level, and we eliminated responses in which the maximum risk was inconsistent with the initial response.

Bias toward action

CR and other articles claim to find a bias toward action, opposite to omission bias. (CR do not actually claim this, but they make an effort to control factors that might justify the choice of vaccination over non-vaccination, and they report a preference for vaccination.) Biases toward action clearly exist. What is unclear is when? So far, there seem to be two clear cases. In one, action is sometimes favored over omission as a way to achieve the better of two outcomes. This explanation cannot explain the kind of action bias that CR seem to find. In another, harm from expected actions are not considered to be as bad as harm arising from unexpected actions. The expectation account may help to explain CR's results.

The better outcome

Landman (1987) and Gleicher et al. (1990) found a bias toward action in anticipated emotional responses to good outcomes. They asked people to compare outcomes in different situations, so that it is possible to compare cases in which either an act or an omission leads to the better of the same two outcomes. People expect to be happier if they gamble and win than if they refrain from gambling and win the same amount. "Winning" in these cases is defined as getting the better of two outcomes. The same studies found omission bias for losing: gambling and losing seems worse than not gambling and getting the same outcome. Thus, act/omission and better/worse interact, for anticipated emotion. Spranca et al. (1991, Experiment 3) Baron and Ritov (1994), and Zeelenberg, van der Pligt, and de Vries (2000) replicated this interaction, using judgments of the quality or advisability of the decision, as well as emotion ratings, although some of these studies did not look for an action bias in the better outcomes alone.

Expectation

Ritov and Baron (1994) found an apparent action bias in judgments of appropriate compensation for injuries in a train accident, when action was *expected*. In particular, subjects awarded more compensation in the case of an engineer who decided not to stop the train (thus causing injuries) than in the case of an engineer who tried to stop and failed, or an engineer who actually stopped (with the sudden stop causing identical injuries). We suggested that expectation may, at least partially, mediate the effects of action vs. omission in other studies, since omission is usually expected. Such an expectation may be at work in the vaccination cases studied by CR, at least for some of the subjects.

A related example in which omission bias is reduced or eliminated, but not reversed, is the case of responsibility (Baron, 1996; Haidt & Baron, 1996). When people are in roles that make them responsible, they have an equal responsibility to prevent harm through both action and omission. Perhaps, inaction leading to harm is actually worse than action (trying to do something) in cases of responsibility, although Haidt and Baron did not find any such cases. Another related case involves inaction resulting in failure to change a losing strategy (Zeelenberg, van den Bos, van Dijk, & Pieters, 2002), which increases the regret from a bad outcome. The anticipation of such regret might lead to an action bias in this case.

Other possible examples of action bias

What is still in doubt is whether action bias exists when no other factors are present that would make omissions seem irresponsible or unexpected.

CR cite Ayanian and Berwick (1991) as an example of action bias. In this paper, scenarios were selected in which prior subjects (physicians) were least likely to act. New subjects, given these selected scenarios, were more likely to act than the original subjects were. The paper suggests that this shows a bias toward action, but the result is also explained by regression to the mean, since the cases were selected for extremeness. Another explanation is that the subjects followed a rule such as, "About half the patients with this condition need treatment, so I should set my criterion for action in order to achieve that result," without knowing that the cases were selected because they were the least needy, in the judgment of others.

Tanner and Medin (in press) claim to show an action bias, in a situation in which action is called for. In fact, Tanner and Medin presented four scenarios, one of which asked the subjects to think of themselves as "environmental activists" and "to decide if you want to lobby for the vaccination or not" (with no option to lobby against it). Although no significance test is reported, it appears that this scenario did lead to a preference for action over omission, but (as the paper suggests in a footnote) the wording of the scenario may have favored action. In another situation that showed an apparent action bias involving contamination of the environment with polychlorinated biphenyls (PCB), the action/omission distinction was represented as a choice between two strategies: (1) "make the plant implement a cleanup program to remove PCB from products which have been previously disposed of," or, (2) "if you don't implement the program, the municipality plans to implement a program that should insure proper removal of PCB from future electrical equipment and products." It is possible that subjects favored the former program because the latter would (it seems) leave the company unpunished (a possibility consistent with the findings of Baron, Gowda, & Kunreuther, 1993), although the second program may also have appeared to be less certain than the first. The other two scenarios apparently showed omission bias.

Tanner and Medin also claim to have found action bias in the subgroup of subjects with protected values, a reversal of the result reported by Ritov and Baron (1999). In fact, their measure of "protected value" was actually a measure of tendency to act. Subjects were given three options: "People should only undertake this action if it leads to some benefits that are great enough"; "People should do this no matter how small the benefits"; "Not undertaking the action is acceptable if it saves people enough money." Endorsement of the second was taken to reflect a protected value. But the definition of protected values used by Ritov and Baron (1999) was neutral with respect to the action/inaction distinction. Following Baron and Spranca (1997), we defined protected values in terms of unwillingness to make a trade-off between a protected value and other values, without reference to whether the trade-off would result from an act or an omission. For example, "letting people die from starvation," could result from both the action and inaction options. Further, Ritov and Baron's definition required that the subject consider the consequence to be so bad that allowing it to happen (or making it happen) would not be worth any benefit, no matter how great. The original definition would have replaced "people should do this no matter how small the benefits" with "people should do this no matter how great the cost," and it would have been neutral with respect to action vs. inaction (e.g., "this outcome is worth any cost").

Still, the results of Tanner and Medin could show that some subjects are biased toward action, namely, those who chose the second option ("do this no matter how small the benefits"). But only one of the two scenarios with wording that clearly did not favor action shows an overall bias toward action, with 62% of those who chose the second option favoring action, which is apparently not significantly higher than 50% (23 out of 37 subjects, $p = .19$). Hence, this paper fails to demonstrate the existence of a bias toward action in any group for any unbiased scenario.

Tanner and Medin cite the work of Patt and Zeckhauser (2000) in support of their claim to find action bias in environmental decisions. Patt and Zeckhauser show that, other things being equal, people prefer to improve the environment from a bad state to a good one in one area (e.g., reducing water pollution) than to prevent a decline from good to bad in another area (e.g., prevent an increase in water pollution). This effect is not about act vs. omission but, rather, about maintaining or changing the status quo. Both options are described as acts. In one case, however, Patt and Zeckhauser include a default option, which will be chosen if no action is taken. (They call this "strong action bias"). As they admit in their fn. 14, however, the action option was always presented second, and was always introduced after presenting the problems of the default option by saying, "There is an alternative," thus suggesting that the alternative is the obvious "way out" of the dilemma.

What about CR's results? Experiment 1 asked subjects, if they would vaccinate their child against a dangerous flu, even if the vaccine could cause dangerous side effects. A majority of subjects favored vaccination, even when the analysis was limited to the subjects who understood that the disease and the side effects were equally serious. However, the questionnaire did not ask about their probability. We find it hard to imagine that subjects would think that a vaccine would be offered that would not reduce the probability of harm. Subjects were faced with a conflict between the implications of the fact that the vaccine was offered at all and the statement late in the scenario saying that the risks were equal. Responses may have been influenced by the implications of the vaccine being offered, even if subjects understood the sentence about equal risk.

CR did show that probability information affected at least some subjects, but only in questions asked after the initial decision. They also did not show that responses were "appropriately related both to relative probabilities and to perceived seriousness." As a first pass, it would seem that an appropriate response is never to vaccinate when the risks of vaccine are equal to, or higher than, those of not vaccinating. It may be that some subjects responded appropriately, and others ignored the probability information.

CR's Experiment 2 used exactly the same wording for vaccine effects and side effects, but subjects still tended to infer, on the average, that flu symptoms were more serious than vaccine side effects. The study used a scale on which subjects had to indicate a risk premium for vaccination, i.e., the maximum risk of vaccination at which they would vaccinate. When the top of the scale was identical to the risk of the disease (10 in 10,000), subjects tended to give responses below the top. But when the scale was extended to double the risk of the disease (20 in 10,000), subjects often went beyond 10, thus supporting CR's criticism of the use of a limited scale in some previous studies. It is difficult to determine, whether Experiment 3 showed action bias on the average or not; the results are not reported separately for those who thought that the effects of disease and vaccine were equally serious. Moreover, it would seem that the risk ratio (or its logarithm) is the relevant measure, and this was not computed, and, indeed, the scale was asymmetric, allowing responses of 0 (infinite ratio) on one side and 21 (ratio of 2.1) on the other.

CR's Experiment 3 shows that the direction of matching (vaccine risk to disease or the reverse) matters, and claims that previous studies used one direction. However, Asch et al. (1994), contrary to the claim, preceded the matching task with a simple choice task. Experiment 3 also does not report on the existence of action bias in subjects who said that the effects of vaccine and flu were the same.[2]

In sum, we have as yet no clear evidence for action bias for negative outcomes that is not explained by expectation or (ir)responsibility. Still, we suspect that pure action bias does exist. In addition to CR's suggestive results and those of Patt and Zeckhauser (2000), Spranca et al. (1991, Experiment 4, Footnote 4) reported that some subjects said that "it was better to do something rather than await the epidemic [in the scenario] passively."

Normality bias

Prentice and Koehler (2003) argued that people may perceive inaction as more normal than action. This explanation agrees with the explanation in terms of expectation, which may amount to the same thing. They report two experiments showing that mock jurors find physicians more blameworthy (by several measures) and more liable in the legal sense when the physicians use a non-standard treatment, compared to a standard one. (The results of the second experiment are not statistically significant, but in the same direction.) They manipulated action/omission by telling subjects that the physician either switched a patient's protocol (action) or did not switch (inaction). This manipulation had no apparent effect in a between-subject design.

Switching vs. not switching has been used in several previous demonstrations of the effect of omission bias (Baron & Ritov, 1994; Kahneman & Tversky, 1982; Ritov & Baron, 1992). Most of these results make no distinction between what is normal and what is not. For example, they involve switching from owning one investment to owning another, when it is clear that some people own each. Thus, Prentice and Koehler's failure to find an effect may result from their use of a between-subject design, which did not call sufficient attention to the experimental manipulation. (It is interesting, though, that the normality effect was significant anyway, in one study. At least in this context it seems that the normality manipulation is quite salient.) The kind of omission bias we have shown is clearly not a form that disappears when subjects are aware of it. It is a "bias" in the sense that it deviates from the best outcome, not in the sense that it deviates from the subjects' own standards. The contrast between within-subject and between-subject designs—if it is real—is, however, interesting in its own right.[3]

Experiment 1

We report two new experiments, which address several issues. First, does omission bias occur when the risks of action are equal to those of omission? That is, when people are given a choice between two options with equal risks, one of which is "doing nothing," do they favor that one. We also ask whether this result is found in anticipated blame and regret. We also look at cases in which the action that causes deaths causes fewer deaths than the alternative option. (Experiment 2 addresses the general issue of symmetry in another way.)

Second, do people favor what is normal or standard? Like Prentice and Koehler (2003), we manipulate normality and omission orthogonally, but within subjects.

Third, is omission bias greater for curing than preventing diseases, as suggested by CR.

Fourth, is action as such the critical difference that accounts for omission bias, or (as suggested by Royzman & Baron, 2002, and by Spranca et al., 1991), is it the perceived direct causal link between action and bad outcomes? To answer this question, we compare a direct-cause condition, an act, to two different indirect-cause conditions. In the direct-cause condition, a treatment causes harm directly from its side effects. One indirect-cause condition is an omission: the omission

[2] The reported follow-up studies provide little new information. The absence of references to action and omission in open-ended explanations does not imply that this factor is irrelevant.

[3] N'gbala and Branscombe (1997) found a between-subject effect of action vs. inaction on anticipated regret, and, in one experiment, on a composite evaluation of the decision maker. The composite measure that showed this effect, however, consisted of "decision making ability, along with cautiousness and carefulness." Inactions are more obviously cautious and careful than they are good as decisions.

of a treatment leads to death (or brain damage, in Experiment 2) from disease. The other indirect-cause condition is a treatment that fails, again leading to harm from the natural disease. When the indirect-cause condition is an omission, the term "omission bias" has its usual meaning. We continue to use the term "omission bias" for a bias toward indirect-cause, however, even when the indirect-cause item is an act, because we argue that the distinction between direct and indirect causation accounts for most of the omission bias in general, and we do not want to change terms at this point.

Method

One-hundred twelve subjects completed a questionnaire on the World Wide Web, for $3 (paid by check, so that they had to provide their email address, name, address, and, if in the US, their Social Security Number). They were part of a panel that did other studies. They ranged in age from 20 to 70 (median 39), and 24% were male. Previous studies in which more detailed information was collected from members of this panel indicated that they were roughly representative of the U.S. population in education and income (although both extremes of income were underrepresented).

The instructions began:

Medical cases

This is about decisions made about treating and preventing disease. Imagine that they concern a very serous viral disease. In each case, imagine that you are a doctor who must decide which of two options to recommend. The patient will accept your recommendation.

The two options you see each time are the only treatment options. You cannot switch from one to the other, for example.

Both options have a risk of death. Sometimes the death is from the disease, and sometimes it is from the treatment. When the treatment causes death, it is because the treatment can cause the disease itself. Thus, death from the treatment and death from the disease are equally bad.

There are 32 screens, with 3 questions each. The screens differ in:

- whether the treatment is a vaccine that can prevent the disease or a drug that can cure it;
- whether the deaths in case of treatment are caused by the treatment or by its failure to cure or prevent the disease;
- whether one option is to do nothing;
- the probabilities of death, given as the number of deaths out of 100,000.

You do not need to answer similar questions the same way.

An example of a screen (with some options in brackets) is as follows:

A group of 100,000 people have been exposed to [contracted] a new and serious viral disease.

The standard treatment is to give a vaccine [drug]. If this were given to all 100,000, it would cause no deaths from side effects, but 15,000 [10,000; 3000; 2000] would die from the disease, because the vaccine [drug] is not completely effective.

The alternative is another vaccine [drug]. If the alternative were given to all 100,000, it would prevent [cure] the disease in all 100,000, but it would cause death from side effects in 10,000 [2000].

How would you make this decision for your patient?

- I would choose the standard treatment.
- It is a toss-up.
- I would choose the alternative.

Who do you think would feel more regret if a patient died?

- A doctor who chose the standard treatment.
- Both would feel the same amount of regret, or no regret.
- A doctor who chose the alternative.

Who do you think would more likely to be blamed if a patient died?

- A doctor who chose the standard treatment.
- Equally likely, or not likely at all.
- A doctor who chose the alternative.

The experiment consisted of 32 conditions, in a $2 \times 2 \times 2 \times 2 \times 2$ design, in an order chosen at random for each subject. Each case presented a direct-cause option, an act that could cause death, and an indirect-cause option.

- The indirect-cause option was either an imperfect drug or vaccine or no treatment (an omission), e.g., "The standard treatment is to do nothing. If nothing were done for the group of 100,000, 10,000 would die..."
- The number of deaths from the direct-cause treatment (act) was either 2000 or 10,000.
- The number of deaths from the indirect-cause condition (either an omission or a treatment that failed) was either the same as the number of deaths from the treatment that caused deaths (on half the trials) or 50% more (e.g., 15,000 when the other number was 10,000).
- The standard treatment was either direct-cause (unlike the example above) or indirect-cause. The standard treatment was always presented first.
- The treatment was either a vaccine that prevents the disease or a drug that cures it.

Because each question had three answers, one of which was neutral, we treated all measures as 1 (favoring the hypothesis of omission bias or normality), 0, or -1 (opposing the hypothesis). We calculated the mean score for each subject of the relevant cases. The means thus ranged from 1 to -1.

Results

Omission bias when consequences of both options are the same

Choice. When the consequences of the two options were the same, the choice question showed omission bias on the average (mean 0.09, $t_{111} = 2.57$, $p = .0114$). There was no significant difference between "cure" and "prevent" (vaccinate) in the magnitude of the bias (0.10 and 0.08, respectively), no significant difference between treatment failure and omission as indirect causes of death (0.11 and 0.08, respectively), and no effect of probability (.09 with both probability levels).

Blame and regret. The corresponding bias for the blame and regret questions was smaller and not significant overall (means of 0.05 and 0.04, respectively), but the mean of all three questions (choice, blame, and regret) was still significant overall ($t_{111} = 2.44$, $p = .0161$). Because the blame and regret questions were highly correlated, they were combined for analysis. (The main difference was that regret had more "equally likely" responses: 82 vs. 69%.)

The blame-regret questions, like the choice question, showed no significant effect of cure vs. prevent, but, unlike the choice question, they showed a large effect of whether the indirect option was "do nothing" (omission) or treatment failure (action). Omission bias was higher for the treatment-failure items than for the omission items (means of 0.10 and −0.01, respectively; $t_{111} = 3.83$, $p = .0002$), and it was significant for the treatment-failure items alone ($t_{111} = 3.83$, $p = .0002$). In comments, some subjects said that they thought that a doctor ought to do something. But when both options involved action, the causal role of one option in causing death led to greater regret and blame. Thus, some subjects seem to think of a doctor "doing nothing" as blameworthy and regrettable. The blame and regret questions showed no effects of probability (number of deaths in the base case).[4]

Omission bias when the indirect-cause option leads to more deaths

Choice. When the indirect-cause option led to more deaths than the direct-cause option (e.g., 15,000 compared to 10,000), subjects generally preferred the direct-cause option (the action), as shown in much lower scores on omission bias: −0.74, where −1 would represent always choosing the best consequences.

The scores on these items were higher (less in favor of the direct-cause option) for the cure items than for the prevent items (−.72 vs. −.76, $t_{111} = 2.39$, $p = 0.0184$); we cannot explain this difference. The nature of the indirect option (treatment failure or omission) had no effect. The scores were also higher for the low probability items than for the high probability items (−.72 vs. −.76, $t_{111} = 2.12$, $p = .0359$). This probability effect might be explained in terms of expectations. High probability of the bad outcome makes it more expected, therefore less bad (although it is hard to say this about death). At the same time if the better outcome occurs it generates more extreme good feelings. The difference (in negative emotions) between a bad outcome of omission and of action may be outweighed by the difference (in positive emotions) of a good outcome of action and of omission. Alternatively, it could more simply be the case that in general, the greater the risk of a bad outcome the more people feel that they have to do something about it.

Blame and regret. The results for blame and regret (again, combined) for these items (where the direct-cause option lead to fewer deaths) also showed a strong effect of less blame and regret for the direct-cause option (mean −.28, $t_{111} = -6.26$, $p = .0000$). Blame and regret showed no effect of probability and cure vs. prevent. But blame/regret for the direct option was relatively greater when the indirect option was treatment failure than when it was omission (−.24 vs. −.32, $t_{111} = 3.42$, $p = .0009$). This result parallels the result in the equal-consequences condition.

Normality

We found no significant normality effect for choice. The mean score was 0.01 ($t_{111} = 1.08$). There was also no effect for regret (mean 0.01). However, we did find a normality effect for blame (0.03, $t_{111} = 2.44$, $p = .0163$—and the combined effect for all three measures was also significant: $t_{111} = 2.50$, $p = .0139$).

Individual differences

Although subjects strongly favored action on these items (where action led to better consequences), a few subjects seemed to show consistent omission bias even when the consequences were worse. Other subjects seemed to show an action bias even when consequences were equal, going against the mean results. To test whether any subjects showed significant action bias, we carried out a *t* test for each subject and then adjusted the *p*-levels for multiple tests, using the step-down resampling procedure of Westfall and Young (1993) as implemented by Dudoit and Ge (2003).

Same consequences. By this test, 6 subjects showed significant action bias at $p < .05$ (one tailed—$p = .0132$ for the weakest of these 6), compared to 14 subjects who showed significant omission bias (again, one tailed, with $p = .0368$ for the weakest).

To display these result graphically, we treated the experiment as a test with 16 items, and we estimated each subject's true score, that is the mean of the 16

[4] The pattern of results and statistical significance described in this paragraph was also found in another study, which we do not report because of flaws in a part of the design that does not affect this pattern.

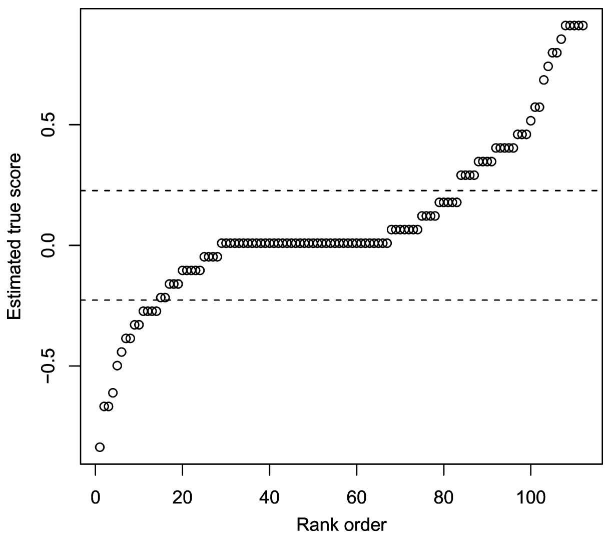

Fig. 1. Estimated true scores of omission bias for cases with equal consequences (possible range −1 to 1), Experiment 1.

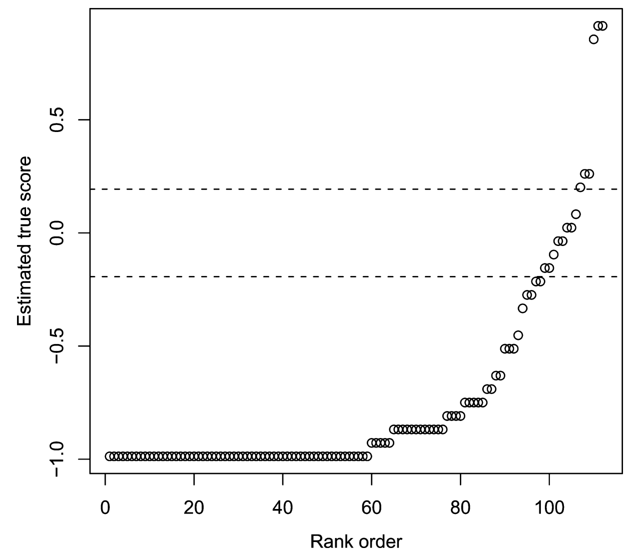

Fig. 2. Estimated true scores of omission bias when consequences of direct-cause items are better (possible range −1 to 1), Experiment 1.

items, taking into account regression to the group mean.[5] Fig. 1 shows the estimated true scores of the subject plotted as a function of their rank order. The two horizontal dashed lines represented two standard errors above and below zero.[6]

Consequences of direct-cause option better. We applied the same analysis to the cases in which the consequences of the direct-cause option were better. The results are shown in Fig. 2. It is apparent that most subjects always decided consistently in favor of the better consequences. Three subjects, however, significantly favored the omission even in this case (adjusted $p = .0001$ for all three).

Normality. Fig. 3 shows the analysis of normality for individual subjects choice responses (with reliability, .63, computed after combining cases that were identical except in whether the normal case was the act or omission). Only one subject showed the hypothesized effect significantly (upper right) and only two showed the reverse effect (lower left).

In sum, Experiment 1 found omission bias for choice when consequences are equal. For regret and blame, omission bias was largely limited to cases in which the indirect-cause option was treatment failure (rather than inaction). The same effect of treatment failure vs. inaction on regret/blame was found when the direct-cause option led to fewer deaths. We found an effect of normality, but only for blame. We also found strong individual differences in omission bias, with some subjects showing a consistent opposite bias favoring action when consequences were equal.

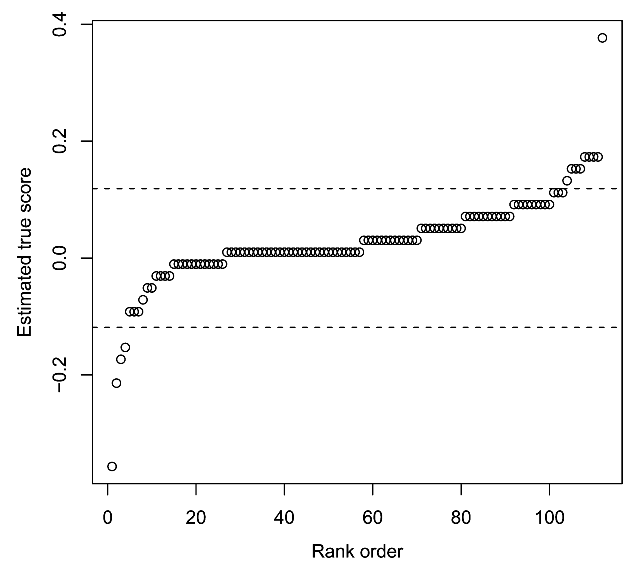

Fig. 3. Estimated true scores of normality (possible range −1 to 1), Experiment 1.

Experiment 2

The results for omission bias in Experiment 1 were significant but weaker than those we have obtained in other studies. Several features of Experiment 1 might have led to less omission bias. For one thing, the response was a simple choice that did not emphasize the numerical risks. For another, our inclusion of cases in

[5] To do this, we computed the reliability (α) of the score. Then, we used the α to estimate each subject's true score, which is closer to the group mean than the observed score because of regression to the mean. (αs were .89 for omission bias and .63 for normality). In particular, the estimated true score T_i for subject i is $\alpha(X_i - M) + M$, where α is the reliability, X_i is the observed score, and M is the group mean.

[6] The standard error of the true score was estimated as $S_T\sqrt{(1-\alpha)}$, estimating the standard deviation of the true scores S_T as αS_X (Lord & Novick, 1968, ch. 3.7).

which the direct-cause option was clearly better may have led to a general tendency to choose it without attending to the numbers. (This was also true of many of the studies cited by CR, but those studies also used asymmetric response measures, e.g., giving choices that mostly reflected omission bias.) We thus did another experiment using a method more like that used in Ritov and Baron (1990), in which the response scale emphasized the numbers, and we made the experiment completely symmetric between the two options.

Method

The study was completed by 105 subjects, including 27% males, ranging in age from 19 to 65 (median 39). Five other subjects were omitted because they responded much more quickly than others, possibly without fully reading the items. The instructions read:

Vaccination choices

Imagine that many people have been exposed to a very serious viral disease, which can cause permanent brain damage.

A vaccine can prevent the disease in those exposed. But the vaccine can also cause permanent brain damage of exactly the same sort.

Sometimes the vaccine, or the disease, has different types with different risks, but all anyone can know is the average risk. You cannot predict which type of disease or vaccine anyone will get.

In some cases, you take the role of a public health official who must decide whether to require the vaccine (except for those who get an exemption from a doctor).

In other cases, you are a parent who must decide whether to vaccinate your child. There is no requirement in these cases.

You cannot get any more information. Nobody can know whether an individual is at higher or lower risk of brain damage from either the vaccine or the disease. Nobody can reduce these risks for anyone.

The vaccine has been tested. There is nothing further to learn about it.

There are 32 screens, with 2 questions each. Some of the items might seem to have obvious answers. There is no trick. Just give the obvious answers.

A typical item was as follows:

In this case you are a public-health official making the decision for everyone exposed. You have the following options (and no others):

Option A: No vaccination.

The chance of brain damage from the disease is the same for everyone and is exactly 5%.

Option B: A vaccine that can cause brain damage directly.

The chance of brain damage from the vaccine is the same for everyone.

Indicate the first acceptable response about whether you would choose Option B

("A vaccine that can cause brain damage directly."):

- Yes, even if it led to a 5% risk of brain damage.
- Yes, if it led to a 4% risk of brain damage.
- Yes, if it led to a 3% risk of brain damage.
- Yes, if it led to a 2% risk of brain damage.
- Yes, if it led to a 1% risk of brain damage.
- I would not choose Option B if it led to any risk of brain damage at all.

How do you think the average person would be expected to respond to the last question? [same options]

The expectation question at the end was included to test directly the hypothesis about expectation, but most subjects gave the same answer as they gave in the first question, so we do not analyze it further.

For parent decision, the beginning read, "you are a parent making the decision for your child." For half of the cases, the indirect-cause option (in which brain damage resulted from the disease) was "A vaccine that can fail, resulting in brain damage from the disease," rather than no vaccination. In addition, for half of the cases of each type (indirect-cause, direct-cause), the probability was presented as a range, e.g., from 0 to 10%, or from 0 to 2%, along with the average (5 and 1%, respectively, for these examples). This was to test the ambiguity effects found by Ritov and Baron (1990), but these manipulations did not have a significant effect (in subjects who showed omission bias), possibly because the wording was confusing and some subjects focused on the possibility of zero risk, so we do not discuss these manipulations further, although we include all items in the analysis of other effects.

For half of the cases, the vaccine that caused brain damage (the direct-cause option) was first (Option A), but the main question was still about Option B. Hence, the cases were completely symmetric about whether the active-cause or inactive-cause option was associated with the response scale. The overall design manipulated the 5 variables (parent/official, direct-cause option in A vs. B, indirect-cause option inaction vs. vaccine failure, and the two probability-range conditions) orthogonally for a total of 32 items, with order randomized for each subject.

Results

Omission bias is defined as going further down the response list when the direct-cause option is B than when it is A. The most extreme bias is to respond with the first response ("Yes, even if it led to a 5% risk of brain damage") when B is indirect-cause and with the last response ("I would not choose Option B if it led to any risk of brain damage at all") when Option B is direct-cause. We measured omission bias as a proportion of this extreme difference (counting the steps on the scale as equal). Identical responding throughout would lead to a bias of 0, and the range could possibly extend from −1 to 1.

On this scale, the mean omission bias was .11, which was significant across subjects ($t_{104} = 4.67$, $p = .0000$). However, many subjects went far down the scale regardless of what was assigned to Option B: the mean response was 4.1 on the 1–6 scale provided. In comments, a few subjects said that they did not find any of the options "acceptable," so, evidently, at least some subjects were answering the question about entire choice set of two options rather than Option B relative to A. A better measure of omission bias, then, might be the ratio

$$\frac{Direct - Indirect}{6 - Indirect}$$

where *Direct* (*Indirect*) refers to a subject's mean scale score on the direct-cause (indirect-cause) option. This measure would be 1 with complete omission bias, 0 with no omission bias, and it is unbounded on the negative side for subjects showing an action bias. Considering only subjects who show an omission bias (which removes those for whom the measure is negative, and which was done in some of our earlier studies when we report the magnitude of the bias), the mean of this measure was .46, which is more in line with results from our earlier studies.

Perhaps more to the point, 58% of the subjects showed omission bias on the average, and 22% showed the reverse bias. When we corrected for multiple tests, as described in Experiment 1, 22 subjects showed a significant omission bias (at $p < .05$) and 3 subjects showed a significant reverse omission bias. Fig. 4 shows the results in a way that corresponds to Fig. 1.

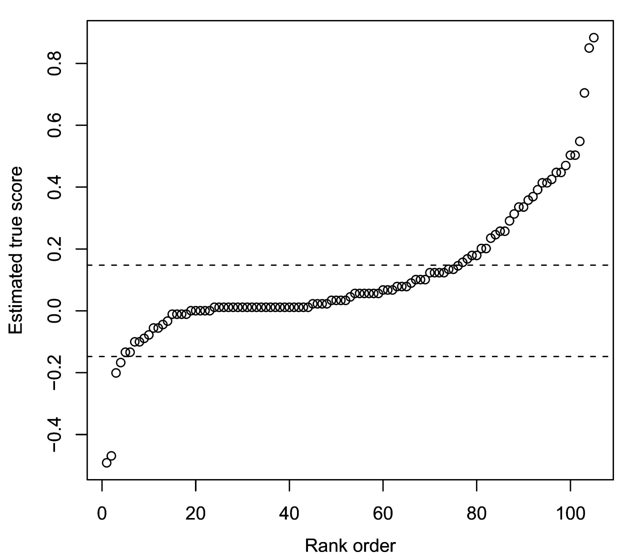

Fig. 4. Estimated true scores of omission bias for cases with equal consequences (possible range −1 to 1), Experiment 2.

None of the manipulated variables had any effect on omission bias. The fact that the type of indirect-cause option does not matter is significant in that it provides further support for a major role of perceived causality.

Discussion

Our results should yield some convergence on basic issues.

First, we continue to find omission bias even when consequences are equated. Our effect is small in Experiment 1. It is therefore likely to be labile.[7] We think, though, that the weight of evidence at this point is that vaccination is not different qualitatively from other cases in which omission bias is found when consequences of action and omission are equated. The bias may be smaller, however, because people are used to the idea of vaccinating even when vaccination carries small risks of serious consequences, just as they are used to the idea that drugs for dangerous diseases may have dangerous side effects. Moreover, while the effect of vaccinations and drugs are causally direct, the causal chain may be longer than that in other cases of omission bias, where harm is more immediate. For example, Baron (1992) found extremely strong omission bias in a scenario that involved shooting one person to save others, and much weaker omission bias in a vaccination scenario.

Second, we think that we have shown action bias clearly, in a way that cannot be explained by other factors such as expectation or normality. The preponderance of omission bias in our study, and others, is likely the result of a mixture of approaches, in which omission bias predominates but is not universal. In agreement with CR's findings, we think that some subjects think that it is better to act. The regret and blame questions seemed to be especially sensitive to concerns that "doing nothing" is wrong.

The source of action bias is a topic for further study. But we suggest that it could arise from over-application of a heuristic. Omission bias seems to arise from a basic view that what is to be avoided is the direct causation of harm (Baron, 1986). This is a kind of simple moral principle that is easily taught to children, because it is easy to observe cases in which children cause harm in this way, in contrast to cases where their causal role is

[7] In one unreported experiment, we did not find significant omission bias effects. Some subjects said (in comments) that the side effects of drugs or vaccines would not be as bad as the disease, so they favored action. Another unreported experiment showed omission bias. Like Experiment 1, this experiment explained that the two bad outcomes are equally bad. If subjects are left free to estimate the seriousness of consequences, then we cannot really speak of bias at all. Of course, it is also possible that this variable is less important than we think and that the results of Experiment 1 are a fluke, and this is one reason why we did Experiment 2.

indirect. Action bias could result as a kind of reaction to obvious passivity and irresponsibility, as exemplified in the imperative, "Don't just sit there. Do something!," or the 1960s slogan, "If you aren't part of the solution, you're part of the problem." But action does not always produce the best consequences, so this kind of heuristic can also be over-applied, that is, it can be applied even when it makes things worse. We would expect the action-bias heuristic to be slower to develop, since it is a reaction to less obvious circumstances.

Third, we find omission bias even when normality is controlled. In half of our cases, the omission is normal, and in half the action is normal. As we suspected on the basis of previous results, in which normality was left undefined, normality does not account fully for all cases of omission bias.

Fourth, we found a normality effect. This effect, however, was confined to the question about blame. As it happens, this was closest to the kind of question used by Koehler and Prentice, which put the cases in a legal context. We are reminded of the advertisement, "Nobody gets fired for choosing IBM" (from the days when IBM was the normal choice). It is as though doing the normal thing is a defense against blame, even if it is not the best thing to do. And, in legal contexts, this is sometimes literally true.

Public policy implications

CR suggest that omission bias may not be a general problem in public policy. It is, however, possible to find many cases where policies institutionalize omission bias. Examples are the drug-approval policies of the U.S. Food and Drug Administration (Bazerman, Baron, & Shonk, 2001); the implicit bias of tort systems toward harms resulting from action rather than omission (Baron & Ritov, 1993); the resistance to presumed consent in organ donation (Bazerman et al., 2001); the resistance to active euthanasia (Baron, 1998); the resistance to beneficial trade agreements (Baron, 1998; Bazerman et al., 2001) and the neglect of world poverty (Bazerman et al., 2001; Unger, 1996). Indeed, reliance on laboratory studies alone has its dangers, and it is important to show that biases discovered in the laboratory may exist in the real world as well. The real world phenomenon may have other explanations, but the total pattern of support from different methodological approaches may be the best that social science can do.

Of course it is quite possible that examples of action bias in public policy could be found.

With respect to the vaccine case itself, CR claim that we need not worry about the practical implications. Yet they, too, find individual differences, with some people showing omission bias and some showing the opposite bias.

In fact, our results are not in great disagreement. The two most relevant previous articles (Asch et al., 1994; Meszaros et al., 1996) examined differences between vaccinators and non-vaccinators (by their own admission). The vaccinators showed little or no omission bias by our measures. The non-vaccinators showed the bias. Our concern in these papers was with the individual differences.

A substantial number of non-vaccinators can constitute a problem for public policy, even if they are a minority. We think that this is the important lesson for vaccination policy. Clearly, a majority of citizens willingly accept all recommendations for vaccination. But the resistance of a minority can lead to epidemics, such as the whooping cough epidemics that have occurred when pertussis vaccination rates fell. And, in a democratic society, the respect for minority rights can weaken public health policy, putting everyone at risk.

Conclusion

What accounts for differences among people and cases in the strength and direction of omission/action bias? CR make a distinction between moral and personal cases, and they include vaccination in the latter. This is an interesting idea, but we suspect that the line is hard to draw. Ritov and Baron (1990) presented parallel cases involving individual vaccination decisions and public policy choices. We found that these two types of cases did not differ on the average in the extent of omission bias. This would seem to contradict CR's claim. On the other hand, we also found that subjects did not simply give the same answer. Some favored omissions more in the personal case, some in the public case. We suspect that some people regard their bias toward harms of omission as a personal moral rule, not to be imposed on others who might not accept this rule, while other people regard it as a moral rule that must be adhered to even more strictly when making decisions that affect others.

Although perception of a case as moral may be one moderator of omission bias (which may affect the bias in different directions for different people), another may be emotion. In our current research, we are exploring the role of emotion as a moderator of several biases.

Our results concerning individual differences suggest that there are heuristics that favor doing nothing, as illustrated by the injunction "do no harm," and perhaps other heuristics that oppose these, such as (to give one more aphorism) "nothing ventured, nothing gained." Either type of heuristic can lead people away from decisions that yield the best outcomes. But the determinants of when these are used remain to be studied.

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