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Getting an Anchor on Availability in Causal Judgment

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The description of a problem in branching structures, such as fault trees and influence diagrams, can be helpful in estimating the contribution of possible causes to a problem. Previous research on the use of branching structures focused on the impact of omissions in the problem structure. Findings indicated that subjects tend to overestimate the importance of the branches they saw, and to underestimate the "catch all" category. The present study investigates the impact of replacing a factor by a number of subcategories belonging to this factor. Findings indicate that effects of these variations in the problem description are similar to the effects of omissions in the description, i.e., replacing a factor by a number of subcategories elevates the estimated contribution for the overall factor. The present study also investigates the effects on estimates of two related corrective techniques: generating additional (sub)categories and providing subjects with additional (sub)categories. The effects of the problem description were, however, not eliminated by providing subjects with additional information about the problem and by making the content of the factors more available by generating subcategories. Generating additional factors reduced the underestimation of the catch all category but this reduction was more pronounced if subjects also rated these self-generated factors. It is argued that availability defined as "ease of retrieval" is not sufficient to eliminate judgmental biases. Results indicate clear effects of availability based on "presence in the environment" and clear effects of anchoring and adjustment; each seems to explain part of the effects of the problem description on judgment.

Problem solving generally entails generating and evaluating hypotheses, followed by the selection of the "best" hypothesis (Mehle, Gettys, Manning, Baca, & Fisher, 1981; Gettys, Mehle, & Fisher, 1986). The task of generating potential hypotheses can be aided or replaced by the use of fault trees (see, e.g., Fischhoff, Slovic, & Lichtenstein, 1978). The top of a fault tree consists of the problem. The first row presents the major

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potential causes of trouble with more specific contributing factors listed below each major cause. In complex problems many factors might contribute simultaneously to the problem, and different factors might influence each other. Problems of this type can be represented as influence diagrams (Howard, 1990).

If one cannot rely upon structural causal diagrams as a decision aid, judgment will be based on self-generated causal factors. Inadequate generation of potential causes may seriously affect the quality of the subsequent analysis. For example, if the decision maker neglects plausible causal factors, or generates a large number of relatively implausible factors, the subsequent analysis is doomed to be suboptimal (Gettys *et al.*, 1986). Similar problems can emerge from using fault trees and other causal branching structures. These structures are usually based on expert knowledge. This, however, does not always guarantee accuracy or adequacy of the structure. In constructing a problem description one inevitably has to decide about the number of causal factors or categories, the amount of detail, and the structural presentation of the categories. Each description of a problem is just one of the many possible structures since most (complex) problems can be related to a more or less indefinite set of possible causes and influences. The way in which a problem is structured or described in a fault tree can have a significant impact on diagnostic judgment (e.g., Fischhoff *et al.*, 1978; Hirt & Castellan, 1988; Dubé-Rioux & Russo, 1988; Van Schie & Van der Pligt, 1990). Two explanations have been put forward to understand the effects of characteristics of causal diagrams or fault trees: these are based on "availability" and "anchoring and adjustment."

As noted by Dubé-Rioux and Russo (1988), availability can be defined in (at least) two different ways. The original definition presented by Tversky and Kahneman (1973) describes availability as "the ease with which relevant instances come to mind" (p. 207) and refers to retrieval from memory or imaginability of events or factors. A second meaning of availability concerns whether a factor or event is present (available) in the environment. This latter definition applies to variations in the problem description as studied in fault trees experiments, i.e., whether or not a potential cause is *listed* in the problem description at the time of judgment.

The anchoring and adjustment heuristic predicts that people, when rating the probability of specific causes, use an anchor value which is based on assigning equal probabilities to each of the categories which have to be rated. This assumption is in agreement with Parducci's (1965; Parducci & Wedell, 1986) "range frequency" model. According to this model, judgments of individual stimuli (branches) are influenced by a tendency to distribute responses fairly evenly over the categories provided. In other words, if there are for example three enumerated causal categories and a "catch all" category than the starting value in a probability estimation task is .25 (1 divided by 4; the number of categories to be judged) for each of the categories. This "anchor" is used as an initial value that is (insufficiently) adjusted to yield the final estimate.

Most fault tree studies focused on the impact of presenting subjects with a complete (full) versus an incomplete (pruned) fault tree for a particular event. In Fischhoff *et al.*'s study (1978) this concerned the event "a car fails to start." Compared to the full tree *less* branches were presented in the pruned tree; i.e., some categories were omitted. Subjects were asked to estimate the proportion of starting failures due to each cause. The full tree contained seven factors, while the pruned tree referred to only four factors. In both trees a category "all other factors" was included in the catch all category. Fischhoff *et al.*'s findings indicated that subjects (lay people as well as experts) were quite insensitive to omissions in the fault tree; subjects presented with a pruned tree failed to appreciate how much had been omitted and tended to overestimate the exhaustiveness of the branches they saw. As noted, Fischhoff *et al.* related their findings to the "availability hypothesis" (Tversky & Kahneman, 1973) suggesting, "what is out of sight is out of mind." Using a fault tree of "restaurant failure due to decreasing profits" Dubé-Rioux and Russo (1988) obtained similar results. They concluded that "availability is a major cause" (p. 223) of overestimating the listed categories, and, consequently, the underestimation of the catch all category. It needs to be noted that the availability explanation as used in both studies described above does not refer to the original description of the availability heuristic, i.e., ease of retrieval. What is out of sight is out of mind due to eliminating categories from the problem presentation is related to the "presence in the environment" definition of the availability.

The fault tree studies conducted by Fischhoff *et al.* (1978), Hirt and Castellan (1988), and Dubé-Rioux and Russo (1988) also tested for the impact of providing more details about listed categories, i.e., presenting subcategories. All these studies predicted an effect of the presentation of lower-level categories on the estimates of higher-level categories. Presenting subcategories (or details) of a specific factor makes this factor more salient or available and should lead to an increased estimate for this factor. This hypothesis was generally not supported by the results. It needs to be noted, however, that subjects were *not* required to make probability estimates of these lower-level categories. Results obtained by Van Schie and Van der Pligt (1990) confirm these findings, but also showed that presenting subcategories which have to be *rated* has a substantial impact on subjects' estimates. They related this effect to the anchoring and adjustment hypothesis.

Generally, findings in previous fault tree studies have been related to the availability heuristic and could best be explained by the presence in the environment definition of availability. As we have seen, rating versus not rating also affects causal judgment; this effect could be related to anchoring and adjustment. The purpose of the present study is to investigate whether we have to distinguish between availability effects due to ease of retrieval and presence in the environment. Furthermore, we will investigate to what extent the anchoring and adjustment heuristic could explain effects of the problem presentation.

Another issue is whether the effects of the problem description on judgments can be reduced or corrected. Different corrective methods have been studied to assess the robustness of the effects of omissions in the problem description. The corrective techniques were generally based on the notion that presenting or generating causal categories which were not listed in the problem description, would make these categories available, and hence, *reduce* the effects of the initial problem presentation. Dubé-Rioux and Russo (1988) used a debiasing task, instructing subjects to extend the (pruned) tree by recalling, listing, and assigning probabilities to additional causes of failure. This task reduced the underestimation of the catch all category; the summed estimates of the self-generated causes were higher than estimates for the catch all category obtained when subjects were not requested to list additional causes.

Mehle *et al.* (1981) used a similar technique to increase the availability of unspecified categories. Based on the information about a course in which a student was enrolled, subjects had to estimate the probability of four possible majors, three of which were specified, and a catch all category. Part of the subjects received exemplars of the catch all category, part of the subjects had to generate additional exemplars of the catch all category, and the remaining subjects were just presented with an unspecified catch all category. Results indicated that in those problems for which the veridical probability of the catch all category was relatively high, providing and generating exemplars of the catch all category decreased its underestimation. However, the reduction of this bias was far less pronounced than in Dubé-Rioux and Russo's study (1988). This might be attributed to procedural differences. In Mehle *et al.*'s (1981) study subjects only *estimated* the overall catch all category, while in the other study subjects rated each of the exemplars separately (Dubé-Rioux & Russo, 1988). Hence, this differential effect might be related to the anchoring heuristic.

The impact of corrective techniques could, thus, be related to the availability heuristic and the anchoring heuristic. The present study investigates the relative contribution of these mechanisms in reducing the impact of the problem presentation.

EXPERIMENT 1

The present experiment tests the effects of replacing a first level factor by a number of subcategories belonging to this factor. Replacing a factor by a *number* of subcategories is expected to affect estimates due to the number of categories to be rated. This first experiment also investigates the impact of generating additional subcategories. It is expected that this "corrective task" makes the content of the branches more available and hence reduces the impact of the presented problem description.

The first experiment tests the following predictions: (a) replacing a factor by a number of separate subcategories belonging to this factor which have to be rated increases the estimated contribution of the overall factor, and (b) providing additional information about the problem structure and generating subcategories reduces the impact of variations in the initial problem description. The first prediction is based on the notion that subcategories listed in the task are present in the environment; rating the presented subcategories is expected to affect the anchor value. The second prediction is based on the ease of retrieval definition of availability. It is expected that the corrective task increases the ease of retrieval of information about the content of the branches, and hence, affects the estimates.

Method

Subjects. Subjects were 121 first-year psychology students of the University of Amsterdam. They participated for credit points.

Material. The task was based on an influence diagram of environmental acidification, also used in previous experiments (Van Schie & Van der Pligt, 1990). To construct a simple structure of the causes of acidification we consulted experts in environmental pollution and used policy papers on environmental acidification (e.g., RIVM, 1988; VROM, 1989). The most important contributor to environmental acidification is industry; almost half of the problem can be attributed to this source. Oil refineries and power stations being the most important industrial sources (19% and 16% of the total contribution to acidification). Two other major contributors are agriculture (22%) and traffic (19%). Governmental plans to combat environmental acidification focus on all the above factors and also pay attention to private households, although the latter factor is responsible for only 4% of the problem (RIVM, 1988; VROM, 1989).

For the sake of simplicity we refer to the problem of acidification as the "acid rain" problem. The basic problem structure of the acid rain problem, used in the experiments reported here, is based on a simplified influence diagram (Fig. 1). The structure consists of four problem sources and the catch all category other factors, each first level factor consists of several subcategories.

Industry	Agriculture	Traffic	Private households	Other factors
oil refineries	animal farming	freight traffic	heating system	
blast furnaces	crop farming	busses	detergent use	
power stations	farming industry	trains	household waste	
mining industry	glasshouse horticulture	airplanes		
other national ind.		private use of cars		
industry abroad				

FIG. 1. Basic problem structure of acid rain.

Design. Subjects were randomly divided over two conditions. In condition 1 subjects received a list containing the four first level factors, and the catch all category other factors. In condition 2 the list consisted of seven factors and the catch all category other factors, the factor "industry" was replaced by four of its lower level subcategories (oil refineries, power stations, other national industry, industry abroad).

Procedure. In both conditions subjects were asked to estimate the contribution of each of the presented factors to the acid rain problem. Subjects were told that the category other factors should be used for other contributors not listed. Subjects gave estimates in percentages, summing up to 100%.

Subjects were asked to rate the following categories.

Condition 1	Condition 2
··· Industry	··· Oil refineries
··· Agriculture	··· Power stations
··· Traffic	··· Other national industry
··· Private households	··· Industry abroad
··· Other factors	··· Agriculture
	··· Traffic
	··· Private households
	··· Other factors
100%	100%

To investigate the perseverance of the impact of the problem description, we used a corrective technique, which aimed to increase the availability of the content of the (presented) factors. *All* subjects received a list presenting the four first level factors and the category other factors. The first level factor industry was specified by the four second level factors. Subjects were asked to specify the possible contributing aspects of each factor (i.e., the four second level factors of the major branch industry, the three remaining first level factors, and the category other factors) to acid rain. The instruction stated "here we present a list with possible contributors to acid rain. Could you please, list for each source as many specific aspects you could think of, that might play a role in environmental acidification. If you think a factor does not contribute to environmental acidification, you can continue with specifying the next factor." Thus subjects were presented with the following list of categories:

- Industry
  - Oil refineries
  - Power stations
  - Other national industry
  - Industry abroad
- Agriculture
- Traffic
- Private households
- Other factors

Each category (except industry) was followed by a dotted line on which subjects were asked to list relevant subcategories which contribute to the problem of acid rain.

Finally, subjects had to repeat the estimation task, receiving the list of factors initially presented.

Results and Discussion

Initial and final estimates are presented in Table 1. First we discuss the results of the initial estimation task. In condition 2 the estimates for the separate subcategories of the first level factor industry are summed to

TABLE 1
INITIAL AND FINAL ESTIMATES (AFTER THE CORRECTIVE TASK; EXPT 1)

	Estimated contribution (%)			
	Five factors		Eight factors	
Factor	Initial estimates (N = 61)	Final estimates (N = 60)	Initial estimates (N = 60)	Final estimates (N = 59)
Industry	36.9	36.8	55.4	53.9
Oil refineries			(15.1)	(14.5)
Power stations			(12.2)	(11.2)
Other national ind.			(15.7)	(15.5)
Industry abroad			(12.5)	(12.7)
Agriculture	21.0	21.4	14.0	14.9
Traffic	19.6	19.8	14.8	15.6
Private households	12.9	13.2	9.5	9.6
Other factors	9.1	8.1	6.1	5.9

allow a comparison with the estimates for the overall factor in condition 1. The estimates of the four listed subcategories in condition 2 are presented in parentheses. The results show clear differences between the estimated contribution of the factors. Results of one-way analysis of variance showed that the summed estimates of the subcategories for the factor industry was significantly higher than the estimate for the overall factor industry ($F(1,119) = 57.61$, $p < .001$). Not surprisingly, the remaining factors were affected by replacing the factor industry by four separate (sub)categories. In condition 2 the estimates for *each* of the other factors was significantly lower than in condition 1 (agriculture: $F(1,119) = 17.90$, $p < .001$; traffic: $F(1,119) = 10.00$, $p < .01$; households: $F(1,119) = 7.81$, $p < .01$; other factors: $F(1,119) = 10.57$, $p < .01$).

The obtained effect might be explained by the availability hypothesis. The availability hypothesis suggests that presenting either first level factors or subcategories would lead to paying (more) attention to these factors or subcategories as contributors to the problem. An alternative explanation is based on the anchoring and adjustment heuristic. According to this explanation subjects start their estimates with an anchor value which is based on the number of categories that have to be rated. The present results do not provide clear evidence for the relative contribution of the availability heuristic (i.e., presence in the environment) and the anchoring and adjustment heuristic.

In the corrective task we presented subjects with additional information about the problem structure. We asked subjects to specify how each of the listed factors contributes to acid rain, by generating relevant subcategories. Two independent judges coded the generated subcategories as relevant or irrelevant contributors to the problem. All generated subcategories which contribute to acid rain and which belong to the overall factor were judged as relevant. Aspects which did not meet these criteria were coded as irrelevant. For example, "bicycle" is part of the factor "traffic," but does not contribute to acid rain, hence, this category would be coded as irrelevant.

The total number of (sub)categories specified by the subjects was 11.44; an average of 1.43 for each of the eight listed (sub)categories. The average number of listed *relevant* subcategories per factor was 1.35. For the factors "other national industry," "industry abroad," and "private households," subjects listed the highest number of relevant subcategories (respectively 1.76, 1.75, 1.90). For the factor "oil refineries" subjects listed 1.45 relevant categories, for the factor "power stations" .91, for the factor "agriculture" 1.50 and for the factor "traffic" the mean number of relevant subcategories was 1.29. Subjects generated a limited number of subcategories for the category other factors (mean .48). These results suggest that subjects are capable to construct a relatively adequate problem structure, i.e., a structure that corresponds to the problem presentation based on expert knowledge. It has to be noted, that in this "generating" task the total number and the number of generated subcategories for each factor was *not* affected by the initial problem description, i.e., no differences between condition 1 and 2 were found.

To investigate whether the elimination of differential information about the problem structure between conditions 1 and 2 and specifying the factors had an impact on the estimated contribution, subjects were asked to repeat the initial tasks. As can be seen in Table 1, no significant differences were found between the initial and the final estimates (agriculture: $t(118) = 1.13$, ns; for all other factors: $t(118) < 1$). To investigate whether the number of self-generated subcategories of a particular factor was related to the difference between the initial and final estimates, we conducted a regression analysis. This analysis showed no relation between the number of generated subcategories and the subsequent change in estimation.

Our findings showed that the final estimates remained significantly different between the two conditions (industry: $F(1,118) = 54.77, p < .001$; agriculture: $F(1,118) = 16.64, p < .001$; traffic: $F(1,118) = 8.32, p < .01$; households: $F(1,118) = 10.20, p < .01$; other factors: $F(1,118) = 7.74, p < .01$), indicating that the intermediate corrective task was not effective in eliminating the judgmental bias. It seems that subjects did not accommodate to new information, and more or less stuck to their initial estimates. It could be argued that in the final estimation task all subjects could rely on the same amount of information about the contributors to 'acid rain' (subjects in both conditions had received the same list and generated an equal number of subcategories). Thus, the availability (ease of retrieval) of contributors was expected to be similar in both conditions. Hence, the present findings do not support the 'ease of retrieval' hypothesis as an explanation for the effects of the problem presentation.

The next experiment again investigates the impact of a corrective technique. In this experiment we take a closer look at two possible explanations for the effects of the problem presentation on judgment; i.e. comparing the 'presence in the environment' hypothesis with the 'anchoring and adjustment' hypothesis.

EXPERIMENT 2

In this experiment we investigate whether making more factors available is sufficient to reduce the effects of the presented problem description. Similar to Dubé-Rioux and Russo's (1988) study, subjects receiving a pruned causal structure were asked to *generate* additional factors. The present experiment tests whether generating (unlisted) factors and including these self-generated factors in the problem description reduces the effects of the provided problem description. Next, we also investigate the effects of *rating* versus *not rating* these self-generated factors on subjects' estimates. The presence in the environment hypothesis predicts that generating additional (sub)categories affects subsequent estimates if these are incorporated in the estimation task. This effect is expected irrespective of whether the categories have to be rated. The anchoring heuristic predicts that generating additional (sub)categories *only* affects subsequent estimates if these additional subcategories have to be rated in the subsequent task.

The design of Experiment 2 also provides the opportunity to address another issue. One could assume that subjects expect the factors which are presented by the experimenter to be relatively major contributors as compared to unlisted (and self-generated) factors. To control for this possibility, part of the subjects were presented with additional factors and part of the subjects were asked to generate additional factors themselves. In this way we can test whether factors presented by the experimenter are perceived as more important contributors to the problem as compared to the self-generated (and related) factors.

Method

Subjects. Subjects were 153 first-year psychology students of the University of Amsterdam. They participated for credit points.

Material. In this experiment instruments were based on the acid rain problem structure and consisted of (incomplete) lists of first and second level factors.

Procedure. Subjects were randomly divided over four conditions. In condition 1 subjects received a list containing three specified factors (oil refineries, other national industry, and private use of cars) and the category other factors. In condition 2 the problem description consisted of the same list, but in this condition subjects were required to generate four subcategories of the category other factors. Condition 3 was identical to condition 2, except that subjects were asked to estimate the contribution of the factors they had just generated. In condition 4 the list of factors was extended with four specified factors (agriculture, power stations, public transport, and private households). The four conditions are summarized in Fig. 2.

Subjects in all four conditions were asked to indicate the contribution of each factor. Subjects had to give estimates in percentages, summing up to 100%.[1]

[1] Subjects were also asked to estimate the relative contribution of the factors on continuous scales. The continuous scales were included because it has been argued that this method constitutes a superior measurement procedure. This latter task is similar to Mehle

Condition 1	Condition 2	Condition 3	Condition 4
... Oil refineries	... Oil refineries	... Oil refineries	... Oil refineries
... Other national industry	... Other national industry	... Other national industry	... Other national industry
... Private use of cars	... Private use of cars	... Private use of cars	... Private use of cars
... Other factors	... Other factors	... _______	... Power plants
	a_______	... _______	... Agriculture
	b_______	... _______	... Public transport
	c_______	... _______	... Private households
	d_______	... Other factors	.. Other factors
100%	100%	100%	100%

FIG. 2. Judgmental task in Experiment 2.

Results and Discussion

Table 2 summarizes the findings based on the probability estimation task. In condition 3 the estimates for the self-generated categories and the category other factors were summed. In condition 4 we used the summed estimates of the category other factors and the factors "agriculture," "power stations," "public transport," and "private households," which were provided additional to the factors also presented in the other conditions. The estimates of these four listed additional categories are presented in parentheses. Differences between conditions were analyzed with one-way analysis of variance (and orthogonal contrast). The estimates for the overall category other factors were influenced by specifying this factor. In condition 2 subjects estimated the contribution of the category other factors higher than in condition 1 ($t(142) = 1.92, p < .05$). As compared to condition 1, in condition 2 subjects had to specify the content of the category other factors, by generating four subcategories. The availability of these specified factors seemed to reduce the underestimation of the category other factors.

In condition 3 the estimates for the category other factors were more strongly affected by the generating task than in condition 2. In condition 3 subjects had to generate subcategories, *and* to rate these as separate categories. This resulted in higher values for the category other factors. The difference between conditions 2 and 3 is highly significant ($t(142) = 9.47, p < .001$). No differences were obtained between conditions 3 and 4 ($t(142) < 1$, ns). This result indicates that self-generated and provided specifications were judged equally important as contributors to the problem. This suggests that subjects did not expect the factors presented by the experimenter to be more important contributors than the self-generated factors.

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et al. (1981). All subjects evaluated the factors using both rating procedures, the order of the two procedures was counter-balanced. The results of the two rating methods were basically the same. In this paper we only report findings obtained with the proportion estimation task.

TABLE 2
ESTIMATES OF FACTORS IN "ACID RAIN" PROBLEM (EXPT 2)

	Estimated contribution (%)			
Factor	Condition 1 ($N = 39$)	Condition 2 ($N = 38$)	Condition 3 ($N = 39$)	Condition 4 ($N = 37$)
Oil refineries	24.4	19.9	13.9	16.8
Other national industries	32.7	35.4	23.4	20.5
Private use of cars	21.3	18.9	13.9	16.8
Other factors	20.9	26.3	45.2[a]	47.8
Agriculture				(13.5)
Private households				(8.8)
Power stations				(8.1)
Public transport				(10.1)

Note. condition 1: three specified factors + "catch all"; condition 2: three specified factors + "catch all", generating four unspecified factors; condition 3: three specified factors + "catch all", generating and rating four unspecified factors; condition 4: seven specified factors + "catch all."

[a] This estimate is based on $n = 32$ because of missing values; seven subjects generated less than four subcategories.

In conditions 3 and 4 subjects had to rate eight categories as compared to rating four categories in conditions 1 and 2. As can be seen in Table 2, the estimations show considerable differences between on one hand conditions 1 and 2, and on the other hand conditions 3 and 4 (other factors: $t(142) = 14.21, p < .001$). This result suggests that rating categories plays a major role in estimating the contribution of various factors to a problem.

Not surprisingly, generating and rating specifications of the category other factors also affected the estimates for the remaining factors (i.e., oil refineries, other national industry, and private use of cars). The essential difference was that the estimates for these specified categories were lower when subjects had to rate eight categories, as compared to those conditions in which subjects had to rate four categories.

Next we turn to the content of the specified categories in conditions 2 and 3. The mean number of generated categories was 3.6 in condition 2 and 3.8 in condition 3. In contrast to the first experiment, subjects were presented with an incomplete problem description and were asked to elaborate on the content of the category other factors, i.e., they were required to extend the problem description with additional factors. In general, subjects generated second level categories that were omitted from the basic problem structure and not presented in the problem description. These generated categories were distributed over the first level factors of the problem structure as follows: industry 16%, agriculture 20%, traffic 23%, private households 28%, and other factors 13%.

In general, results indicate that subjects are capable to retrieve from memory categories that are relevant contributors to acid rain. The availability of these categories reduced the underestimation bias of the category other factors only slightly. Rating the generated categories seems to have an additional and more profound impact on reducing the bias.

GENERAL DISCUSSION

The results of the experiments reported here demonstrate a substantial influence of the problem description on estimates. Earlier studies on the use of fault trees (cf. Fischhoff *et al.*, 1978) indicated that factors or branches that are not listed in the problem description tend to be neglected as indicated by the relative low estimates for the catch all category when subjects were presented with pruned fault trees. In our first experiment we did not eliminate major branches from the problem structure, but varied the number of branches by replacing higher-level factors by lower-level factors (subcategories). Results of both experiments demonstrate that eliminating (or listing) subcategories had a similar impact on estimates as eliminating (or listing) whole branches.

In previous research the effects of variations in the problem presentation are generally explained with the availability heuristic (e.g., Fischhoff *et al.*, 1978; Dubé-Rioux & Russo, 1988). This research typically studies the impact of listing versus eliminating categories from the presentation. This is in accordance with the presence in the environment definition of availability. In our studies, we also used a corrective technique affecting ease of retrieval. The perseverance of the effects obtained in our first experiment demonstrates that knowing more about the problem does not necessarily counteract the impact of the initially presented problem description. Thus, these results failed to support the predicted impact of this type of availability, i.e., *ease of retrieval*.

Providing or generating causes which are *present in the environment* (i.e., listed in the estimation task) affects estimates and reduces the underestimation bias (Exp. 2). Moreover, asking subjects to rate these provided or self-generated causes turned out to be even more effective as a corrective method. These results are in accordance with Dubé-Rioux and Russo's (1988) findings, but contradict their conclusion. Dubé-Rioux and Russo argued that the estimation bias could be easily reduced by asking people to generate factors not listed in the structure. They assumed that generating more factors would make these more available and reduce the underestimation bias. In their study, however, the generated causes were present in the environment *and* had to be rated. This suggests that the reduced bias in Dubé-Rioux and Russo's study cannot simply be attributed to the ease of retrieval hypothesis. Our second experiment shows that presence in the environment of generated factors has some impact on estimates, but that rating these factors had an additional and more profound impact.

The impact of variations in the number of factors to be rated could also explain effects obtained in the previous studies on causal judgment. For example, Gettys *et al.* (1986) had difficulty explaining the effects between two conditions. In one condition subjects were required to estimate four categories and in the other condition subjects estimated one of these four as a separate category and for the other three factors subjects were requested to give an overall estimation. The effects due to this manipulation can be related to the number of categories to be rated, and hence to the anchoring and adjustment heuristic.

Taken together, our results indicate that the effects of the problem presentation on judgment seem to be (partly) related to availability, and specifically to the presence in the environment meaning of availability. The present results *and* findings obtained in previous fault tree studies demonstrate that rating versus not rating causal factors have a profound impact on estimates. These effects seem to be related to the anchoring and adjustment heuristic. It needs to be noted, however, that rating requires attention and might make the factor more available. Hence, the impact of rating might also be explained in terms of availability. Further research is needed to provide more conclusive evidence whether anchoring or availability explains the effects.

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