The Logic of Cognitive Systems

Proceedings of the Fifth International Conference on Cognitive Modeling

Edited by

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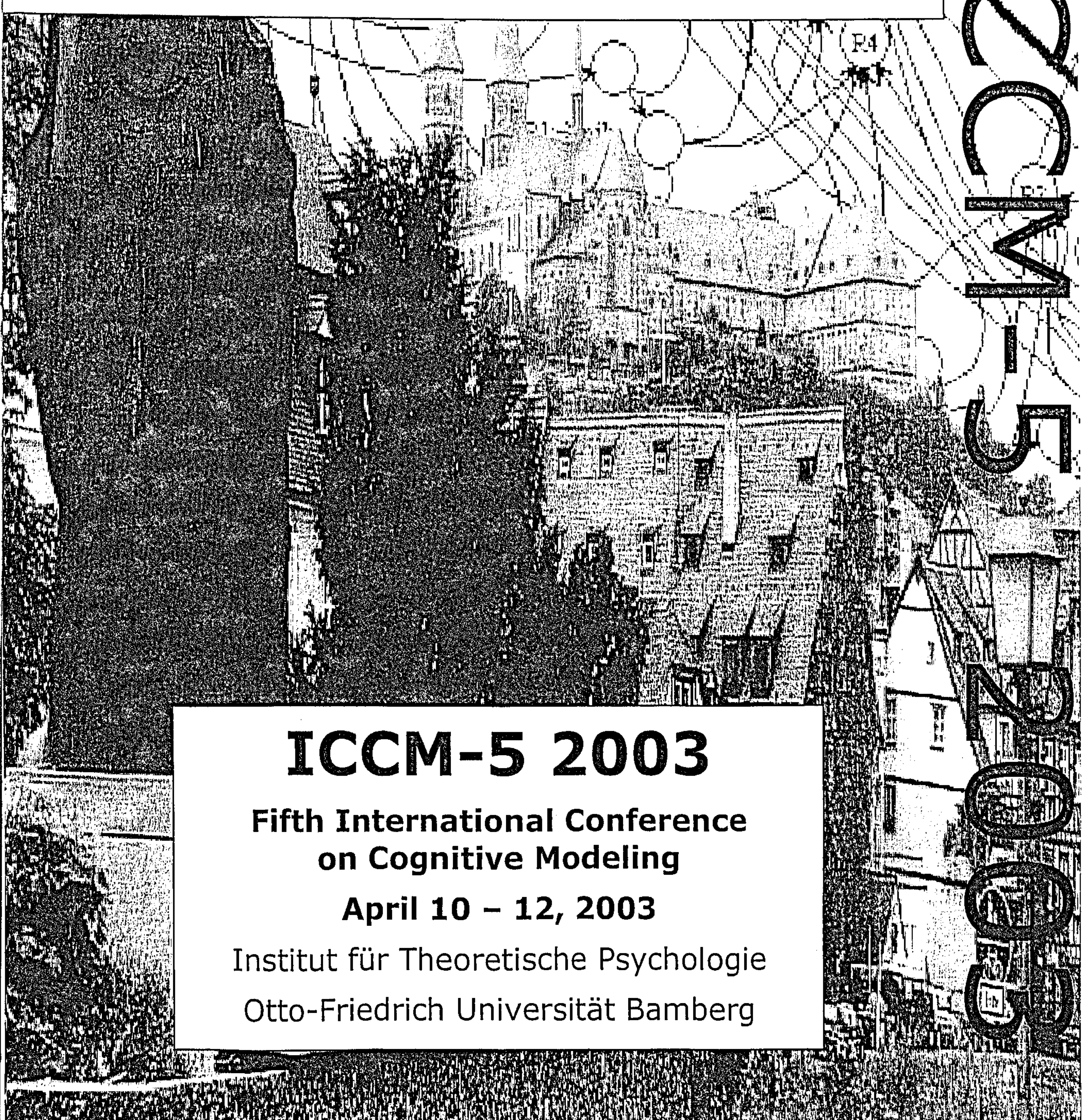

ICCM-5 2003

Fifth International Conference on Cognitive Modeling

April 10 – 12, 2003

Institut für Theoretische Psychologie
Otto-Friedrich Universität Bamberg

Impressum

Produktion: Institut für Theoretische Psychologie
Gestaltung: Institut für Theoretische Psychologie
Druck und Gesamtherstellung:
creo Druck & Medienservice GmbH, Bamberg
Printed in Germany

ISBN 3-933463-15-7

Modeling the Hindsight Bias

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Abstract

Once people know the outcome of an event, they tend to overestimate what could have been anticipated in foresight. Although typically considered to be a robust phenomenon, this *hindsight bias* is subject to moderating circumstances. In their meta-analysis, Christensen-Szalanski and Willham (1991) observed that the more experience people have with the task under consideration, the smaller the resulting hindsight bias is. In a series of simulations we investigated whether the recently proposed RAFT model (Hoffrage, Hertwig, & Gigerenzer, 2000) can account for this "expertise effect." Indeed, we observed that the more comprehensive people's knowledge is in foresight, the smaller their hindsight bias is (Hertwig, Fanselow, & Hoffrage, in press). In addition, we made two counterintuitive observations: First, the relation between foresight knowledge and hindsight bias appears to be independent of how knowledge is processed. Second, even if foresight knowledge is false, it can reduce hindsight bias. In conclusion, our investigations confirm the utility of developing and testing precise process models of hindsight bias.

The Expertise-Effect in Hindsight Bias

Hindsight bias can occur when people make a judgment or choice and are later asked to recall what their judgment had been. If, in the interim, they are told what the correct judgment would have been, their memory of their own judgment tends to become biased toward the new information. In a meta-analysis of hindsight bias research, Christensen-Szalanski and Willham (1991) identified important moderator variables of the phenomenon. One of them is people's familiarity with the task: "The more familiar the subject is with the task, the smaller the effect of the hindsight bias" (p. 155). By identifying this effect, henceforth the *expertise effect*, their meta-analysis has provided hindsight bias research with a key empirical benchmark against which the explanatory power of models of hindsight bias can be evaluated.

The RAFT Model

The RAFT model (*R*econstruction *A*fter *F*eedback with *T*ake The Best; Hoffrage et al., 2000) is the first formalized process model of the hindsight bias obtained in choices. It makes three assumptions: First, if the original choice (made at Time 1) cannot be retrieved from memory, it will be reconstructed (at Time 3) by applying the same inference mechanism that led to this choice. (According to the model, this mechanism is the so-called Take The Best heuristic, which assumes a subjective rank order of cues according to their validities and makes the inference on the basis of the best, i.e., most valid cue that discriminates.) Second, the reconstruction involves the attempt to recall the knowledge on which the original choice was based. Third, the outcome information received (at Time 2) is used to update old knowledge, in particular knowledge that was elusive and missing at Time 1. Updating is an important adaptive process because maintaining access to an unbounded number of items is too expensive. Moreover, it increases the coherence of our knowledge and – if more recent knowledge, as compared to older knowledge, is more likely to be true – also the accuracy of our inferences. In conjunction, these three assumptions suffice to explain the occurrence of hindsight bias.

Implementation in the Present Simulation

Using simulations in a real-world environment (all possible pairs among the largest German cities which had to be compared with respect to their populations), we investigated possible determinants of the expertise effect (Hertwig, Fanselow, & Hoffrage, in press). Specifically, we examined the impact of the amount of foresight knowledge (what proportion of cue values in the matrix of 82 cities and 8 cues is known to a person at Time 1), knowledge processing, and knowledge accuracy on hindsight bias. The updating probability for unknown cue values was set to be 10%. Hindsight bias was expressed as 100*(*hindsight accuracy – foresight accuracy*)/(100 – *foresight accuracy*).

Simulation 1: How Does Amount of Knowledge Affect Hindsight Bias?

In the first simulation, we operationalized expertise in terms of the amount of knowledge about cue values at Time 1 (all of which are correct). As shown in Figure 1, more knowledge reduces hindsight bias. An intuition that helps to explain this result is that less knowledge leaves more "room" for updating to affect the reconstruction process at Time 3 (for a detailed analysis of the underlying mechanism see Hertwig et al., in press). This explanation gives rise to an interesting question: Would this effect of foresight knowledge on hindsight bias also occur if cues were processed in a completely different way?

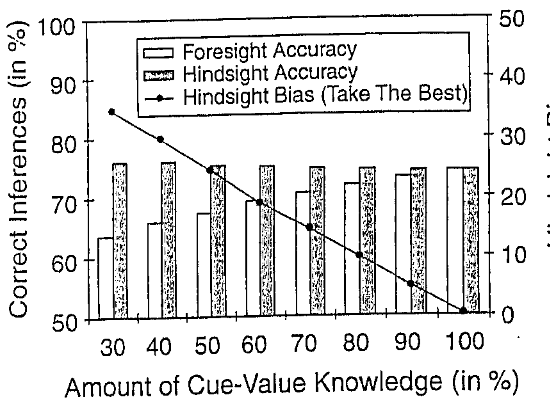

Figure 1: Foresight and hindsight accuracy (i.e., amount of correct inferences at Time 1 and Time 3) achieved by Take The Best, and hindsight bias as a function of amount of knowledge

Simulation 2: Is the Effect of Knowledge on Hindsight Bias Robust Across Different Heuristics?

It may be the case that those experts who attempt to look up all available information exhibit a different relationship between foresight knowledge and hindsight bias than those who employ a one-reason decision-making strategy such as the Take The Best heuristic. Indeed, if a choice has initially been made on the basis of a set of cues rather than on one single cue, it may prove to be more robust toward slight changes in the updated knowledge state. Take The Best, in contrast, may amplify the effects of updating because a single updated cue value can lead to the opposite choice.

What strategy integrates multiple pieces of information while still being psychologically plausible? Robyn Dawes suggested a compensatory strategy that simply adds up the number of positive cue values and subtracts the number of negative cue values (ignoring missing values). Unlike Take The Best, this simple unit weight linear model, which we refer to as *Dawes' rule*, is far from being frugal – it bases its choice on all available pieces of information.

Does more knowledge involve less hindsight bias if it is processed by Dawes' rule? No, on the contrary, across all degrees of knowledge, the average hindsight bias was 18.4% for Dawes' rule and 17% for the Take The Best heuristic. Except for this slight difference, Take The Best and Dawes' rule produce the same linear relation between foresight knowledge and hindsight bias (albeit for different reasons – see Hertwig et al., in press).

Simulation 3: How Does Accuracy of Knowledge Affect Hindsight Bias?

Up to this point in our investigation, we assumed knowledge of cue values to be completely accurate. Knowledge, however, may not always be accurate and, possibly, experts' knowledge may be more exact than that of novices. In the final simulation, we replicated Simulation 1 and introduced one additional variable, namely, the accuracy of knowledge.

Not surprisingly, false knowledge reduces the percentage of correct inferences in foresight (from 69.7% for completely accurate knowledge about cue values to 59.5% for 35% false knowledge). However, false knowledge does not result in a larger hindsight bias. On the contrary, the more flawed foresight knowledge is, the smaller the size of hindsight bias is. For instance, a person whose knowledge is veridical displays a hindsight bias that is almost one and a half times larger than the bias of a person with 35% false knowledge – 15.2 versus 9.7% (for a closer inspection of the underlying mechanisms that could explain this counter-intuitive result see Hertwig et al., in press).

Conclusion

Our investigations confirm the utility of developing and testing precise process models of hindsight bias. In addition, they provide further empirical support for the RAFT model insofar as the model can predict and account for the well-known expertise effect. Finally, our results are also of importance as an existence proof that cognitive strategies – though different in makeup – can yield similar predictions, thus suggesting the possibility that a particular judgment or memory phenomenon may be robust across a variety of different processing strategies.

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