Judgments of confidence also show mixed results. Answering questions about real-world knowledge, people show little bias in estimating the validity of individual cues to an estimate, but they do not learn that the confidence intervals they derive from those cues are almost always too narrow. They also seem to mis-learn the relationship between information and accuracy: Experienced judges become more overconfident as they get more information (Tsai, Klayman & Hastie, 2008).

Contrasts like these provide interesting puzzle pieces, but we still don't know enough about *why* some aspects of JDM are more amenable to learning (or mis-learning) than others. Moreover, learning from experience and learning from testing hypotheses are hardly the only processes that shape JDM behavior. Direct instruction, social and cultural transmission, and sheer practice also play important, under-studied roles. A greater understanding of how decision makers "get that way" would reveal much about the nature of judgment and decision processes, and about how we might be able to change people and their environments to make things go better.

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Although some important decisions allow time for reflection before action is required, there are important life-and-death decisions that must be taken in fractions of a second. For example, when driving a motor vehicle, it takes skill to decide whether to apply gas or brakes, to turn the wheel left or right, or to do something else. There is little debate that controlling a motor vehicle requires knowledge and skill that can be improved through maturation, education, training, and practice. We have laws that regulate the minimal age, minimal performance at the task, and minimal knowledge of the rules of the road that are required for a license. Few dispute the premise that these regulations save lives.

If some studies have not viewed such JDM tasks as skills, I think it is because so much research is done on people who are nearly of the same age and level of education using tasks that can be completed by a person within a brief period of time. As soon as one studies human behavior over a longer span of time, one finds that behavior changes with maturation, experience, and practice. Once such a wider perspective is taken, the goal should be to identify the laws of nature by which behavior measured at one time in one environment can be used to predict behavior at another time and environment.

When people are asked to judge the magnitude of numbers in a between-subjects experiment, it is possible to show that the number 9 is judged to be significantly greater than the number 221 (Birnbaum, 1999). However, when the same people are asked to judge the same two numbers

within the same study, no one rates 9 above 221. By manipulating the distribution of numbers presented to a participant, one can show that the judgment of one stimulus depends on the other stimuli that are presented. Such phenomena are known as *contextual* effects (Parducci, 1995). Contextual effects demonstrate a type of learning, because people respond differently when exposed to different distributions of stimuli. People must learn the distributions from experience in the lab.

Another type of learning occurs when feedback is given to people in order to "teach" a functional relationship (Birnbaum, 1976). In this type of paradigm, the person is given feedback and a scoring rule, intended to modify behavior. As the person acquires more information via experience, behavior changes. One can analyze the sources of this improvement: Are the changes in behavior due to reduction in random errors, to learning of functional relations, to learning the aggregation rules, or to mapping subjective value to response?

In tasks in which the context is not altered and there is no explicit request to improve performance, it is also found that people change behavior when behavior is analyzed over a period of time. In such cases, it is tempting to suppose that as they perform the task, people may become "better" at a task by supplying their own internal feedback. In these cases as well as those in which participants are given an explicit scoring rule, the goal of the research should be to understand what is changing and why.

In summary, I think it quite reasonable to view many tasks in JDM as ones in which behavior will change with experience and training. I think the goal now is not merely to show that people change over time, but to investigate the loci of such effects. We need to know whether people change how they perceive the stimuli, change how they combine information, change their personal parameters, change the mapping from subjective value to response, or if they reduce variable error in responding.

References

Baron, J. (1990). Thinking about consequences. *Journal of Moral Education*, **19**, 77–87.

(1993). *Morality and rational choice*. Dordrecht: Kluwer.

(2010a). Cognitive biases in moral judgments that affect political behavior. (Special issue of on the foundations of the decision sciences, H. Arló-Costa & J. Helzner (eds)). *Synthese*, **172**, 7–35.

(2010b) Origins of some non-utilitarian moral rules. In J. Krueger (ed.), *Frontiers of social psychology: Social judgment and decision making*. London: Psychology Press.

Baron, J. & Brown, R. (eds), (1991). *Teaching decision-making to adolescents*. Hillsdale, NJ: Lawrence Erlbaum Associates.