SECOND EDITION

Psychology Press

straight choices

THE PSYCHOLOGY OF DECISION MAKING

Ben R. Newell
David A. Lagnado
David R. Shanks

'This excellent book is a rare combination
– an enjoyable read that beginners will like and a serious text that scholars will study.'
DANIEL KAHNEMAN, author of *Thinking, Fast and Slow*

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Straight Choices

Should I have this medical treatment or that one?
Is this computer a better buy than that one?
Should I invest in shares or keep my money under the bed?

We all face a perplexing array of decisions every day. Thoroughly revised and updated throughout, the new edition of *Straight Choices* provides an integrative account of the psychology of decision making, and shows how psychological research can help us understand our uncertain world.

Straight Choices emphasizes the relationship between learning and decision making, arguing that the best way to understand how and why decisions are made is in the context of the learning and knowledge acquisition which precedes them, and the feedback which follows. The mechanisms of learning and the structure of environments in which decisions are made are carefully examined to explore their impact on our choices. The authors then consider whether we are all constrained to fall prey to cognitive biases, or whether, with sufficient exposure, we can find optimal decision strategies and improve our decision making.

Featuring three completely new chapters, this edition also contains student-friendly overviews and recommended readings in each chapter. It will be of interest to students and researchers in cognitive psychology, behavioural economics and the decision sciences, as well as anyone interested in the nature of decision making.

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Dedicated to:
Sandra, Zoila, Isabella and James
Tracy Ray
and
Ella, Will and Miranda

Preface to the second edition

In *Straight Choices* we present a scholarly yet accessible introduction to the psychology of decision making, enhanced by discussion of relevant examples of decision problems faced in everyday life. We provide an integrative account in which clear connections are made between empirical results and how these results can help us understand our uncertain world. An innovative feature of *Straight Choices* is the emphasis on an exploration of the relationship between learning and decision making. Our thesis is that the best way to understand how and why decisions are made is in the context of the learning that precedes them and the feedback that follows them. Decisions don't emerge out of thin air but rather are informed by our prior experience, and each decision yields some information (did it work out well or badly?) that we can add to our stock of experience for future benefit. This novel approach allows us to integrate findings from the decision and learning literatures to provide a unique perspective on the psychology of decision making.

In the eight years since we wrote the first edition of *Straight Choices* a lot has happened in the field of judgment and decision making. In this new edition we have tried to include a flavour of these new developments and have added three new chapters: one on *decisions from experience*, one on the *two-systems* approach, and a final chapter that ties together key findings from the book and presents a summary of our perspective. In addition to these new chapters, all the chapters have been updated with new sections and new references reflecting the advances in understanding. The book is divided into eighteen easily digestible chapters and the material is presented in as non-technical a manner as possible. Each chapter begins with a 'highlights' section and concludes with some suggestions for further reading. The book is highly appropriate and accessible for any students with an interest in decision making – be they students of psychology, economics, marketing or business. The book should also appeal to more senior scholars of decision making, or indeed any cognitive psychologists who are seeking an up-to-date review of current research and are interested in the novel learning-based perspective which we provide.

Throughout the book we have also tried to emphasize the practical applications of much of the research on decision making. We hope that by reading this book you will gain a greater understanding of the psychology of how – and how well – we make decisions and that you will apply that understanding to improve your own decision making.

Acknowledgements

It is, of course, impossible to acknowledge all the people who have influenced our thinking about the issues discussed in this book, so we will not attempt to name them for fear of missing some.

Very special thanks are due, however, to Peter Ayton and John Maule who provided insightful and very helpful criticism of a draft of the first edition and to Ken Manktelow and Linden Ball who provided very useful feedback on the proposal for this second edition. We would also like to thank the editorial team at Psychology Press for their excellent assistance throughout the publication process.

Ben Newell would like to thank his co-authors for agreeing to 'get the band back together' and write this new edition. As with the first edition it has been very educational and a pleasure to have shared the experience with two such wonderful colleagues. Thanks are also due to members of the lab over the last 8 years for many stimulating discussions. The continuing support of the Australian Research Council is gratefully acknowledged.

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David Shanks would like to thank the UK Economic and Social Research Council, who for several years have provided funding for his research, and members of his research group and in particular Maarten Speekenbrink for many enlightening discussions about aspects of decision making and learning.

Ben Newell, David Lagnado, and David Shanks,
Sydney and London, September 2014.

Contents

1 Falling off the straight and narrow

Chapter highlights

- An overview of the book
- Insights into decisions about health, wealth, and guilt versus innocence.

The cult film *Donnie Darko* begins with the hero Donnie narrowly surviving (or does he?) a bizarre accident. Donnie is lying in bed in his suburban family home when he is woken by a strange voice. The voice 'leads' him down the stairs, out of the house and into the street. Moments later a horrendous screeching noise signals the arrival of an aeroplane's jet engine crashing through the roof of the house. The engine completely destroys Donnie's bedroom.

Most of us would agree that being killed by a falling jet engine is an extremely unlikely, freak occurrence. Indeed, if we were asked the question, which is more likely: being killed by falling aeroplane parts or being killed by a shark? – the majority of us would probably think a shark attack more likely (Plous, 1993). But we would be wrong. According to *Newsweek* ('Death Odds', 1990), we are 30 times more likely to be killed by falling aeroplane parts than by sharks. The reason (or reasons) why we tend to err in answering this question is just one of the many intriguing, challenging and fundamentally important issues that are addressed in this book. Understanding the psychology of how – and how well – we make decisions can have a significant impact on how we live our lives (and how to avoid freak deaths).

Even for a decision as simple as buying a book (a decision that you may well be contemplating right now) we can engage in a series of quite complex thought processes: noting the attributes of different alternatives (cost, appearance, recommendations), comparing different alternatives by making 'trade-offs' on these attributes (e.g. this one is cheaper but it wasn't recommended), and deciding how to allocate our limited resources (e.g. money for books or beer). These processes, and many more besides, can be investigated in systematic ways to discover what leads us to make the decisions we do, how we should make decisions given the preferences we have, and why our decision making sometimes goes awry.

OUR APPROACH AND THE PLAN OF THIS BOOK

In this book we provide a novel perspective on judgment and decision making along with an accessible review and integration of many of the key research findings. Our perspective is novel in that we view judgment and decision making as often exquisitely subtle and well tuned to the world, especially in situations where we have the opportunity to respond repeatedly under similar conditions where we can learn from feedback. We argue that many of the well-documented errors or biases of judgment often occur in one-shot decision situations where we do not have the chance to learn adequately about the environment. Focusing on errors in these one-shot situations can be a very fruitful research strategy, as the 'heuristics and biases' approach which has dominated the field has demonstrated (Kahneman, Slovic & Tversky, 1982). However, the downside of this approach is that it can lead to an overly pessimistic view of human judgment and decision making (Gigerenzer, 1996). Our perspective aims to reclaim the original reason for emphasizing errors, namely that errors can be thought of as quirks akin to visual illusions. Like visual illusions, they arise in a system which is in general extremely accurate in its functioning.

Take the sharks versus falling aeroplane parts example. In a one-shot decision about the likelihood of death, we might choose sharks erroneously. One explanation for such a choice is that we base our decision on the ease with which we can recall instances of people being killed by sharks or by falling aeroplane parts. Shark attacks are likely to be easier to recall – presumably because they receive wider coverage in the media – and so we answer 'sharks'. In general, using the ease-of-recall or 'availability' heuristic will serve us well, but in certain situations, particularly when we are insensitive to the distribution of information in the environment (i.e. insensitive to the fact that shark attacks receive more media coverage than falling aeroplane parts), we make errors (cf. Tversky & Kahneman, 1974). One of the key messages of our approach is that being given the opportunity to learn about information in the environment through repetition and feedback often gives rise to exceptionally accurate judgments and decisions.

This message is pursued most directly in Chapters 7 'Associative thinking', 10 'Decisions from experience', 12 'Learning to choose, choosing to learn' and 13 'Optimality and expertise', although the theme of learning runs throughout the book. Some readers might find these chapters a little more challenging than the others, but we encourage you to persevere. Chapters 1 and 2 introduce many of the concepts that will be relevant to our exploration of judgment and decision making, through considering some practical decisions (e.g. Which medical treatment should I choose?) and by giving a brief historical overview of the field. Chapters 3 and 4 take us on a journey through the stages of judgment from the discovery of information to the role of feedback. Chapter 5 presents some formal ways of appraising our probability judgments and then in Chapter 6 we look at how people actually make judgments. In a similar

fashion, Chapter 8 presents formal methods for analysing decisions and then Chapter 9 examines how people actually make decisions and choices under uncertainty. Chapter 11 extends this analysis to examine the influence of time on decisions.

Chapter 14 assesses the popular idea that there are two 'systems' for decision making, a deliberative one and an intuitive one, that operate in rather different ways. The next three chapters provide some insights into the role that emotion plays on our decisions (Chapter 15), the way groups make decisions (Chapter 16) and an investigation of some of the more practical methods for implementing what we have learned about decision making in the laboratory to the world outside (Chapter 17). Chapter 18 revisits the key questions about when, why and how to make good decisions in light of the major findings and theories discussed in the preceding chapters. The book can be read as a whole – cover to cover – or if you have particular interests, then the chapters are, for the most part, self-contained enough to enable you to dip in and choose the parts that appeal. Our aims are twofold: to introduce you to this exciting field, and to help you improve your own decision-making skills.

DECISIONS, DECISIONS . . .

We are faced by a plethora of decisions, choices and judgments every day and throughout our lives: what to have for lunch, where to go on holiday, what car to buy, whom to hire for a new faculty position, whom to marry, and so on. Such examples illustrate the abundance of decisions in our lives and thus the importance of understanding the how and why of decision making. Some of these decisions will have little impact on our lives (e.g. what to have for lunch); others will have long-lasting effects (e.g. whom to marry). To introduce many of the relevant concepts, in this first chapter we consider three important decisions that we might face in the course of our lives: (1) which medical treatment should I choose, (2) is this person guilty or innocent, and (3) how should I invest my money? For each situation we examine some of the factors that can influence the decisions we make. We cover quite a bit of ground in these three examples so don't worry if the amount of information is rather overwhelming. The aim here is simply to give a taste of the breadth of issues that can affect our decision making. There will be ample opportunity in later chapters to explore many of these issues in more depth.

Which medical treatment should I choose?

Martin and Simon have just received some devastating news: they have both been diagnosed with lung cancer. Fortunately their cancers are still at relatively early stages and should respond to treatment. Martin goes to see his doctor and is given the following information about two alternative therapies – radiation and surgery:

> Of 100 people having surgery, on average, 10 will die during treatment, 32 will have died by one year and 66 will have died by five years. Of 100 people having radiation therapy, on average, none will die during treatment, 23 will die by one year and 78 will die by five years.

Simon goes to see his doctor, who is different from Martin's, and is told the following about the same two therapies:

> Of 100 people having surgery, on average, 90 will survive the treatment, 68 will survive for one year and 34 will survive for five years. Of 100 people having radiation therapy, on average, all will survive the treatment, 77 will survive for one year and 22 will survive for five years.

Which treatment do you think Martin will opt for and which one will Simon opt for? If they behave in the same way as patients in a study by McNeil et al. (1982), then Martin will opt for the radiation treatment and Simon will opt for surgery. Why? You have probably noticed that the efficacy of the two treatments is equivalent in the information provided to Martin and Simon. In both cases, radiation therapy has lower long-term survival chances but no risk of dying during treatment, whereas surgery has better long-term prospects but there is a risk of dying on the operating table. The key difference between the two is the way in which the information is presented to the patients. Martin's doctor presented or *framed* the information in terms of *mortality*, namely how many people will *die* from the two treatments, whereas Simon's doctor framed the information in terms of how many people will *survive*. It appears that the risk of dying during treatment looms larger when it is presented in terms of mortality (in the framing adopted by Martin's doctor) than in terms of survival (in the framing chosen by Simon's doctor) – making surgery less attractive for Martin but more attractive for Simon.

This simple change in the framing of information can have a large impact on the decisions we make. McNeil et al. (1982) found that across groups of patients, students *and* doctors, on average radiation therapy was preferred to surgery 42% of the time when the negative mortality frame was used (probability of dying), but only 25% of the time when the positive survival frame (probability of living) was used (see also Tversky & Kahneman, 1981).

Positive versus negative framing is not the only type of framing that can affect decisions about medical treatments. Edwards et al. (2001), in a comprehensive review, identified nine different types of framing including those comparing verbal, numerical and graphical presentation of risk information, manipulations of the base-rate (absolute risk) of treatments, using lay versus medical terminology, and comparing the amount of information (number of factual statements) presented about choices.

The largest framing effects were evident when *relative* as opposed to *absolute* risk information was presented to patients (Edwards et al., 2001). Relative and absolute risks are two ways of conveying information about the efficacy of a

treatment, but unlike the previous example they are not logically equivalent. Consider the following two statements adapted from an article about communicating the efficacy of cholesterol-reducing drugs (Skolbekken, 1998; see also Gigerenzer, 2002):

1. 'Savastatin is proven to reduce the risk of coronary mortality by 3.5%.'
2. 'Savastatin is proven to reduce the risk of coronary mortality by 42%.'

A person suffering from high cholesterol would presumably be far more willing to take the drug Savastatin when presented with statement 2 than when presented with statement 1. Moreover, a doctor is more likely to prescribe the drug if presented by a pharmaceutical company with statement 2. But is this willingness well placed?

Implicit in statement 1 is that the risk referred to is the *absolute risk reduction* – that is, the proportion of patients who die without taking the drug (those who take a placebo) minus the proportion who die having taken the drug (Gigerenzer, 2002). In the study discussed by Skolbekken (1998), the proportion of coronary mortalities for people taking the drug was 5.0% compared to 8.5% of those on a placebo (a reduction of 3.5%). In statement 2 absolute risk has been replaced by *relative risk reduction* – that is, the absolute risk reduction divided by the proportion of patients who die without taking the drug. Recall that the absolute risk reduction was 3.5% and the proportion of deaths for patients on the placebo was 8.5%, thus the 42% reduction in the statement comes from dividing 3.5 by 8.5.

Table 1.1 provides some simple examples of how the relative risk reduction can remain constant while the absolute risk reduction varies widely. Not surprisingly, several studies have found much higher percentages of patients assenting to treatment when relative as opposed to absolute risk reductions are presented. For example, Hux and Naylor (1995) reported that 88% of patients assented to lipid-lowering therapy when relative risk reduction information was provided, compared with only 42% when absolute risk reduction information was given. Similarly, Malenka et al. (1993) found that 79% of hypothetical patients preferred a treatment presented with relative risk benefits, compared to 21% who chose the absolute risk option. As Edwards et al. (2001) conclude, 'relative risk information appears much more "persuasive" than the corresponding absolute risk . . . data' (p. 74), presumably just because the numbers are larger.

So what is the best way to convey information about medical treatment? Skolbekken (1998) advocates an approach in which one avoids using 'value laden' words like risk or chance, and carefully explains the absolute rather than relative risks. Thus for a patient suffering high cholesterol who is considering taking Savastatin, a doctor should tell him or her something like: 'If 100 people like you are given no treatment for five years, 92 will live and eight will die. Whether you are one of the 92 or one of the eight, I do not know. Then, if 100 people like you take a certain drug every day for five years, 95 will live

Table 1.1 Examples of absolute and relative risk reduction.

Treatment Group		*Placebo Group*			
Survivals	*Mortalities*	*Survivals*	*Mortalities*	*Relative Risk Reduction (%)*	*Absolute Risk Reduction (%)*
9000	1000	8000	2000	50	10
9900	100	9800	200	50	1
9990	10	9880	20	50	0.1

Note: Adapted from Skolbekken, J. A. (1998). Communicating the risk reduction achieved by cholesterol reducing drugs. *British Medical Journal, 316*, 1956–1958.

and five will die. Again, I do not know whether you are one of the 95 or one of the five' (Skolbekken, 1998, p. 1958). The key question would be whether such a presentation format reduces errors or biases in decision making.

Is this person guilty or innocent?

At some point in your life it is quite likely that you will be called for jury duty. As a member of a jury you will be required to make a decision about the guilt or innocence of a defendant. The way in which juries and the individuals that make up a jury arrive at their decisions has been the topic of much research (e.g. Hastie, 1993). Here we focus on one aspect of this research: the impact of scientific, especially DNA, evidence on jurors' decisions about the guilt or innocence of defendants.

Faced with DNA evidence in a criminal trial many jurors are inclined to think 'science does not lie'; these jurors appear to be susceptible to 'white coat syndrome', an unquestioning belief in the power of science, which generates misplaced confidence and leads to DNA evidence being regarded as infallible (Goodman-Delahunty & Newell, 2004). Indeed, some research confirms that people often over-estimate the accuracy and reliability of scientific evidence (in comparison with other types of evidence, such as eyewitness testimony or confessions), thus assigning it undeserved probative value. For example, mock-jurors rated blood tests as significantly more reliable than testimony from an eyewitness (Goodman, 1992).

Is it simply because we have so much trust in science that DNA evidence is so compelling, or are there other reasons? Consider the 2001 trial of Wayne Edward Butler in which he was convicted of murdering Celia Douty in Brampton Island, Queensland, Australia in 1983. Police had suspected Butler for a long time but it was not until DNA profiling was used that a case was brought against him. The victim's body had been found covered by a red towel stained with semen. DNA profiling techniques unavailable in 1983 established