Judgement and Decision Making as a Topic of Sport Science

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MAXIMIZATION AND OPTIMIZATION IN SPORT

Judgement and decision making (JDM) play a major role in *sport-related activities*, with the adequacy of JDM processes being directly related to success or failure in sport. For example, athletes have to continuously decide between alternative ways of acting during competition, and they must choose between means of performance enhancement which are either permitted or prohibited; coaches select players for their teams and decide on different training programmes and competition strategies; managers make investment decisions, dismiss unsuccessful coaches and evaluate competitors' success or failure; referees categorize game situations as being in line with the rules or not; journalists evaluate current performances and predict the outcome of future sport events – predictions which can be of major significance to spectators and fans who participate in the growing market of sport betting.

The basic metaphor often underlying these examples is that of a machine. In a classic book published almost two decades ago, Hoberman (1992) even conceived athletes in our society as 'mortal

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engines', which reflect the creation of 'men-machines' who attempt by all means to exceed the normal limits of speed and strength. Dissecting the modern Western sport establishments, Hoberman demonstrated how human science and industrial technology have transformed and dehumanized sport, with the emphasis placed on training and development, drug therapies and psychological research. In a more recent publication, Bar-Eli, Lowengart *et al.* (2006) referred to this machine-like metaphor, labelling its underlying principle 'maximization through optimization'. They argued that because the ultimate goal of athletes in elite sport is the maximization of their performance, this pursuit of success and excellence requires them to optimize everything – be it a movement, an arousal state or a decision to be made.

JDM HISTORY

The study of JDM can be traced back to the late 1940s, evidenced mainly by three major, quite independent approaches: the decision- and game-theoretical, the psychological and the social-psychological/sociological approaches. It has been generally assumed that, if individuals are involved in JDM, when engaged in choosing from among several alternative courses of action and if there is an understanding of how JDM processes work – be they related to spontaneous or deliberative decisions and if they are made under conditions of certainty, risk, or uncertainty (March and Simon, 1958; Simon, 1960) – it can increase the efficiency and effectiveness of the decisions. JDM has been studied since the 1940s by researchers from many disciplines. These scholars were especially attuned to the distinctive yet interrelated facets of the normative and descriptive characterizations of the JDM process (Over, 2004) with the implicit and/or explicit purpose of improving their outcome. In this sense, such an approach reflected the abovementioned 'maximization through optimization' principle (Bar-Eli, Lowengart *et al.*, 2006).

Standard normative JDM theories are based on postulates that enable one's optimal gain maximization and loss minimization (Baron, 2004). Despite the fact that the term 'rationality' has more than twenty

different meanings applied in various disciplines (see Elster, 1991), instrumental rationality – which has to do with a person's effective application of means towards successful goal achievement (Weber, 1919/1946) – has become quite salient (Bar-Eli, Lurie and Breivik, 1999). For example, in economics, traditional theories assume that people have well-defined preferences and these can be represented by utility functions; people then maximize their utilities subject to budget constraints (Samuelson and Nordhaus, 2004). Such theories usually assert that economic agents are selfish and care only about their own well-being or the well-being of their household. When economic JDM behaviour takes place where uncertainty is present in the environment, maximizing utility is replaced by maximizing expected utility, using probabilities of the different future states. In short, the theory of rational choice used within economics embodies an instrumental conception of rationality, where the so-called 'homo economicus' is guided by instrumental rationality (Elster, 1989; Sudgen, 1991).

The inherent logic of the systematic approach outlined in such normative models led to the proposal of prescriptions intended to optimize human JDM behaviour. However, it soon turned out that real, living humans are rarely this thorough and precise in their actual JDM behaviour – a fact that was identified by Nobel laureate Herbert Simon (1955, 1960), who suggested the notion of 'bounded rationality'. This concept means that human rationality – when compared to any 'ideal' and/or normatively rational models – is bounded by limited cognitive information-processing ability, by factors such as imperfect information and time constraints, and, last but not least, by emotions. Together with Meehl's (1954) seminal work concerning the differences between statistical and clinical prediction, these ideas caused the area of JDM to become heavily 'psychologized', turning its major focus towards the description of real human JDM behaviour. As a result, JDM psychology has since then concentrated mainly on the gaps between the ideal and actual (i.e., normative and descriptive) facets of JDM in an attempt to understand their causes. Within this framework, it was repeatedly demonstrated that real JDM departs significantly from norms and prescriptions. As the different approaches to JDM reveal

(see, e.g., Koehler and Harvey, 2004), JDM is currently conceptualized mainly in terms of human information processing and is regarded to a large extent as part of social and/or cognitive psychology (Goldstein and Hogarth, 1997).

It should be noted that the terms 'judgement' and 'decision making' are sometimes used quite interchangeably; for example, Drucker (1966, p. 143) – a leading management scholar – viewed a decision as 'a judgement ... a choice between alternatives'. However, the current thought is that the two terms apply to different concepts: judgements refer to 'a set of evaluative and inferential processes that people have at their disposal and can draw on in the process of making decisions' (Koehler and Harvey, 2004, p. xv), with this process being considered as separate from the consequences of the decision itself. In contrast, decision making refers to the process of making a choice from a set of options, with the consequences of that choice being crucial. This broad distinction between 'J' and 'DM' should be borne in mind when the past trends in JDM research, as well as those in the present and future, are considered (Bar-Eli and Raab, 2006a).

THE DEVELOPMENT OF JDM RESEARCH IN SPORT

Most of the above work has not been reflected in either the 'micro' level of sport psychology (Bar-Eli and Raab, 2006a) or the 'macro' level of sport management (Slack and Parent, 2006), with the study of JDM in sport substantially lagging behind its potential. A seminal work in this area was an edited book by Straub and Williams (1984) – a collection of theoretical and applied book chapters on cognitive sport psychology. At that time, Gilovich (1984) stated that the world of sport was a potential laboratory for the study of cognitive processes associated with humans and, therefore, it was most appropriate for JDM research. Several years later, Ripoll (1991) edited a special issue on information processing and decision making in the *International Journal of Sport Psychology*, stating that the mechanisms dealt with in this special issue were concerned with the processes that intervene between the intake of

information and the subsequent behavioural response (i.e., between the input and the output, which corresponds to one's 'software'). Accordingly, Ripoll (1991) focused on cognitive psychophysiology, priming, attention orientation, timing accuracy and decision time, anticipation and control in visually guided locomotion, semantic and sensorimotor visual function and visual search.

Another important publication in this area was Tenenbaum and Bar-Eli's (1993) chapter on DM, included in Singer, Murphy and Tennant's (1993) *Handbook of Research on Sport Psychology*. In line with Ripoll (1991), Tenenbaum and Bar-Eli (1993) discussed cognitive processes such as sensation and memory, short-term store, visual search, attention and concentration, anticipation, field dependence/independence, sport intelligence, problem solving and expertise. However, Tenenbaum and Bar-Eli (1993) also made a unique contribution *to sport psychology* through being among the first scholars in this area to discuss the possible disturbances and distortions in competitive DM, proposing Bayes's theorem (see Baron, 2004) as a normative model for coping with inefficient decision processes. Later, Tenenbaum and Bar-Eli (1995) systematically presented the Bayesian approach as a novel device for the advancement of sport psychology research, and conducted a series of studies using it to establish a crisis-related aid for decisions made during athletic competitions (for a review, see Bar-Eli, 1997). More recently, Bar-Eli and Tenenbaum (in press) presented the Bayesian approach of measuring competitive psychological crises in a new edited book – the *Handbook on Measurement in Sport and Exercise Psychology* (Tenenbaum, Eklund and Kamata, in press).

JDM in sport were further addressed by Tenenbaum (2003), who discussed highly skilled athletes' performances using the cognitive approach. He emphasized the stages of information processing which underlie JDM, proposing a conceptual scheme of accessing DM in open-skill sports, and describing several DM topics and their corresponding cognitive components. From an applied perspective, Tenenbaum and Lidor (2005) focused on how mechanisms, which determine the quality of JDM, are acquired and modified through deliberate practice and expertise development. These authors emphasized

the important role played by visual attention in affecting anticipation; they also stressed the major significance of an efficient, interactive collaboration between knowledge structure and working memory. In addition, Tenenbaum and Lidor (2005) elaborated on the efficacy of cognitive strategies (e.g., attentional control, pre-performance routines and simulating training) by improving the quality of JDM in sport. More recently, Williams and Ward (2007) discussed DM as a derivative of anticipation processes.

As mentioned above, the study of JDM in sport has substantially lagged behind its potential – except for what we elsewhere called 'the Ripoll–Tenenbaum tradition' (see Bar-Eli and Raab, 2006a). This, for example, was quite surprising, because in 1985 one of the most provocative investigations in the history of JDM was published, namely, Gilovich, Vallone and Tversky's (1985) study on the 'hot hand' in basketball. This investigation was (one) part of the research programme on heuristics and biases (see, for review, Gilovich, Griffin and Kahneman, 2002), which culminated in the Nobel Prize being awarded to Daniel Kahneman in 2002. Gilovich, Vallone and Tversky (1985) showed how the use of the representativeness heuristic (Tversky and Kahneman, 1982) led to deficient perceptions of random occurrences during top-level athletic events (i.e., professional basketball games) and how such deeply rooted misconceptions can dominate human JDM behaviour. Their provocative findings inspired a great deal of research (see, for review, Bar-Eli, Avugos and Raab, 2006), but were generally disregarded in the sport and exercise psychology literature, despite their great theoretical and practical potential for advancing this discipline.

It could be observed that, in general, relatively minor attention was paid to JDM issues in the sport/exercise psychology literature until the middle of the first decade of the 2000s. This state of affairs was evident in sport/exercise psychology textbooks (e.g., Bakker, Whiting and van der Brug, 1990) and/or handbooks (e.g., Singer, Murphy and Tennant, 1993; Tenenbaum and Eklund, 2007) in which DM was treated – if at all – only negligibly, with the 'J' component as good as non-existent. To rectify this situation and to stimulate new theories, research and

application in this area, Bar-Eli and Raab (2006b) initiated the publication of a special issue of the journal *Psychology and Exercise* in which they introduced different approaches to JDM that had not been sufficiently *related to* sport/exercise psychology and/or sport management up to that time. This thematic issue included eight articles – three in the 'J' and five in the 'DM' category. The articles on judgement were classified (i) by a theoretical approach, as either economics- or (social) psychology-based and (ii) by application, whether the subjects were judges and referees or other participants in the sport scene such as athletes, spectators, coaches, managers and bettors. The taxonomy of DM articles in this special issue was in fact an extended version of a matrix originally proposed by Townsend and Busemeyer (1995); DM articles were classified according to their (i) nature – deterministic (i.e., given a set of options, the one with the highest product of utility and expected success is always chosen), probabilistic (i.e., in most cases the option with the highest utility is chosen), or deterministic/probabilistic; and (ii) characterization – static (i.e., all options compared at one time), dynamic (i.e., where there is an interdependency of decisions or actions over time, with the time of their occurrence being crucial) or static/dynamic.

Bar-Eli and Raab (2006a) suggested that the taxonomical model used in their special issue (Bar-Eli and Raab, 2006b) could also be a useful approach for stimulating further JDM theory, research and application in sport and exercise. Indeed, in a more recent edited book on cognition and action in sport (Araújo, Ripoll and Raab, 2009), in which a section with six chapters on JDM was included, it was demonstrated by Bar-Eli and Raab (2009), who concisely reviewed the developments in this area, that this taxonomical model was indeed very useful. These authors pointed out a number of changes in progress that could inspire future research. First, the different approaches included in the JDM section of Araújo and colleagues' book represented the entire range of dimensions described above. In addition, a tendency could be observed according to which the theories and models derived from them were becoming increasingly dynamic and probabilistic. Second, a move towards integrating a number of different description levels in current theorizing

and modelling was noted. Third, a number of theory-led applications of knowledge in the sports arena were revealed and direct cooperation with people in sports and their organizations was evident.

Bar-Eli and Raab (2009) felt that the broader theories of cognition and action were being applied far too slowly in sport, but that there were some instances in which this time lag was not as pronounced. In general, they believed that the developments in theories of decision-making processes were not quickly adopted by researchers in sport. Bar-Eli and Raab viewed this state of affairs as being unfortunate, because it is the nature of sport to involve both cognition and action. Therefore, they expected that JDM research, focusing on both what people decide and how they implement their decisions through movements, may come to play an important role in integrating research to be presented elsewhere in the future. In this book, we make an attempt to fulfil these expectations.

RATIONALE AND STRUCTURE OF THIS BOOK

As repeatedly stated by Bar-Eli and Raab (2006a, 2009), it was evident that although the analysis of JDM processes has received attention in different fields of psychology and management for quite a long time, JDM in sport has developed into an independent field of research only recently, with some excellent studies on JDM behaviour of athletes, coaches, referees and observers being published in the last several years, among others in Bar-Eli and Raab's (2006b) special issue and in Araújo, Ripoll and Raab's (2009) edited book. Today, JDM presents itself as an important topic in sport, but this fact is hardly reflected in current sport psychology and/or sport management textbooks or handbooks, as the above review demonstrated. The present book is meant to fill this gap by providing a general overview of JDM in sport. It introduces the fundamental approaches of JDM research in psychology and applies them directly to JDM problems in sport. Thus, this book offers a coherent basis for the study of JDM within both sport psychology and sport management, and by virtue of a specific

compilation of interesting JDM phenomena, it can also be used as an essential reading for the study of general psychology and management.

Moreover, this book is also an important source of information for all those who are interested in the possible causes and reasons for success and failure in sport, for example, individuals and groups of people – researchers, lecturers, students and practitioners who are interested in psychology, management, sport psychology and behavioural aspects of sport management. It should be noted that studies on JDM in sport have recently been of interest to people engaged in behavioural economics and/or economic psychology. This is evident, for example, in Bar-Eli *et al*.'s (2007) recent study on penalty kicks in football published in the *Journal of Economic Psychology*. In addition, societies that might be interested in this book include, among others, JDM as well as sport psychology and/or sport management associations, and societies engaged in behavioural economics and/or economic psychology.

The first part of the book presents the basics of JDM. It begins with Chapter 2, which focuses on the most important 'J' theories, goes on with Chapter 3, which deals with the leading DM theories, and finally, discusses JDM expertise within this framework in Chapter 4. The second part of the book is arranged according to the different groups in whom JDM behaviour is analysed, that is, athletes (Chapter 5), coaches and managers (Chapter 6), referees (Chapter 7) and observers (Chapter 8). Each of these chapters includes a presentation of the specific JDM problems of that group, and follows with recommendations for dealing with these problems in practice. In fact, we hope that by applying these recommendations the performance of these groups can be maximized through the optimization of their JDM processes, without – to use Hoberman's (1992) conceptualization – causing any dehumanization whatsoever.