Business Intelligence: How Sport Scientists Can Support Organization Decision Making in Professional Sport

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The application of scientific principles to inform practice has become increasingly common in professional sports, with increasing numbers of sport scientists operating in this area. The authors believe that in addition to domain-specific expertise, effective sport scientists working in professional sport should be able to develop systematic analysis frameworks to enhance performance in their organization. Although statistical analysis is critical to this process, it depends on proper data collection, integration, and storage. The purpose of this commentary is to discuss the opportunity for sport-science professionals to contribute beyond their domain-specific expertise and apply these principles in a business-intelligence function to support decision makers across the organization. The decision-support model aims to improve both the efficiency and the effectiveness of decisions and comprises 3 areas: data collection and organization, analytic models to drive insight, and interface and communication of information. In addition to developing frameworks for managing data systems, the authors suggest that sport scientists’ grounding in scientific thinking and statistics positions them to assist in the development of robust decision-making processes across the organization. Furthermore, sport scientists can audit the outcomes of decisions made by the organization. By tracking outcomes, a feedback loop can be established to identify the types of decisions that are being made well and the situations where poor decisions persist. The authors have proposed that sport scientists can contribute to the broader success of professional sporting organizations by promoting decision-support services that incorporate data collection, analysis, and communication.

Keywords: sport science, sports analytics, data analytics

Sport science, the application of scientific principles to inform practice, has become increasingly common as professional sporting organizations seek to gain a performance advantage. These organizations increasingly employ sport scientists from varying backgrounds including physiology, strength and conditioning, biomechanics, performance analysis, biostatistics, and data science. Regardless of their foundation and specific job title, we believe that effective sport scientists working in professional sport should be able to develop systematic analysis frameworks to enhance performance within their organization. Although statistical analysis is critical to this process, it depends on rigorous data collection, integration, and storage. The purpose of this commentary is to discuss the opportunity for sport science professionals to contribute beyond their domain-specific expertise and apply these principles in a business intelligence function to support decision makers across the organization.

Key personnel in professional sporting organizations are often faced with complex decisions, which can range from regular process decisions to infrequent strategic decisions. By definition, decisions arise when there are multiple realistic alternatives, with the risk of negative outcomes from taking the wrong position. A prerequisite for effective decision making is reducing uncertainty surrounding the best course of action. Business intelligence units turn data into knowledge and have become an important mechanism to remove uncertainty and enhance organizational decision across many industries. Although individuals from other disciplines, such as economics, could also serve this function, we suggest that sport science professionals are positioned to lead this business intelligence service in professional sporting organizations due to their scientific training and knowledge of human performance. Assisting other departments within the organization, such as medical, coaching, physical preparation, and recruitment, with their decision-making processes offer sport scientists an opportunity to contribute more broadly to improving sport performance.

Principles of Decision-Support Services

Using a decision support services framework, we will outline how sport scientists cannot only embed these processes in their own sphere but also support other major decision-making departments across the organization. The decision support model aims to improve both the efficiency and effectiveness of decisions and comprises 3 areas (Figure 1): (1) data collection and organization, (2) analytic models to drive insight, and (3) interface and communication of information.5

1. The collection of performance data derived from an ever expanding array of technology is a primary role for applied sport scientists. Although these data permit novel insights, it is critical that there are sound structures in place to process the range of data streams. It is becoming necessary to learn from other disciplines such as computer science to manage the increased volume of data that is now being generated in professional sporting organizations. A key component of the data collection process is preventing data silos forming within the organization, as the integration of data sources permits a holistic understanding of performance. For example, when match analysis data are drawn from multiple sources (such
as player tracking, physiological, player technical involvement, and tactical strategy), the combination of these data allows for a deeper understanding than trying to analyze match performance through a single lense.7 Rigorous data collection processes and maintaining a data legacy permit the transformation of this operational data into an important asset, which we believe has often previously been undervalued.

2. Once data have been collected and aggregated, they can be analyzed to provide insights that inform decisions. A conceptual model for analysis comprising 2 complementary functions, fast and slow analysis, reflects the range of decision tasks in professional sporting organizations.8 Fast analysis is suited where decisions are required immediately, often for repeated process problems that arise in the high-pressure daily training environment. Basic dashboards and reports underpinned by heuristics may be most effective in this area.9 The slow approach more closely reflects critical scientific inquiry—leading to higher order understanding of the problems faced in the professional sports environment.8 Although this approach is often overlooked in professional organizations due to time constraints or the lack of analytical expertise, these “slow” activities may help solve complex problems. They can also guide key strategic decisions and organizational philosophies, which are paramount to the long-term success of the program. Finally, insights derived from slow analyses can improve the system approaches employed in the day-to-day work flow of fast analysis.8

3. Communicating knowledge derived from analyses is the critical step in enhancing decision-making processes.10 Data visualization and performance dashboards that utilize commercially available business intelligence software have become common. These visualizations allow data to be displayed in simple, attractive formats and provide coaches and managers with a powerful decision-making tool to address specific problems.11 Dashboards can also be structured to allow interaction with the data, moving us away from structured report formats, and allowing intuitive investigation of data.11 Although software now provides an avenue for visualizing information, effective verbal communication between the sport scientist and decision makers remains critical to provide context to the information. Furthermore, the sport scientist requires both subject matter knowledge and strong interpersonal relationships to ensure that information is effectively incorporated into the decision-making process. These relationships are cultivated through time and effort spent within the organization and require sport scientists to be selfless, humble, and open-minded in these interactions.12

Enhancing Decision-Making Processes

In addition to managing data systems, we suggest that the sport scientist’s grounding in scientific thinking and statistics positions them to assist in the development of robust decision-making processes across the organization. Although the broad stream of decision-making research falls beyond the scope of this commentary, we will draw attention to some important concepts that can guide the sport scientist in this area.

Fallibility theories in medical science suggest that failures in decision-making processes can arise due to ignorance or ineptitude.13 Failures of ignorance arise when limitations of current scientific understanding restrict our ability to fully comprehend an entity. These situations are common in the complex world of human physiology and sporting performance. Furthermore, constructing advanced models, utilizing large data sets that are now being collected, and applying sophisticated analyses such as machine learning and artificial intelligence can improve our understanding. Paradoxically, even with growing data sets that permit advanced models, we risk drawing false confidence in our understanding of complex phenomena if we rely on models that are overfit to the data. Rather, when the
underlying relationships between factors are not well understood, simple heuristics should instead be employed to assist decision making.\textsuperscript{14}

Failures of ineptitude occur when knowledge exists, but it is failed to be applied correctly. This type of decision failure can arise when memory and attention are diverted from routine processes by the strain of stress or other distractions.\textsuperscript{15} Failures of ineptitude can also arise when important steps are missed or ignored in favor of less relevant information. Sport scientists can proactively reduce failures of ineptitude by developing robust decision-making processes. For example, the development of checklists, which have become a crucial method for reducing decision-making processes. For example, the development of checklists, which have become a crucial method for reducing decision-making processes. For example, the development of checklists, which have become a crucial method for reducing decision-making processes. For example, the development of checklists, which have become a crucial method for reducing decision-making processes.

Finally, sport scientists can audit the outcomes of decisions made by the organization. By tracking outcomes, a feedback loop can be established to identify the types of decisions that are being made well and the situations where poor decisions persist. A secondary audit layer can examine the decision-making process, irrespective of outcome. The nature of uncertainty dictates that not all decisions will lead to the optimal outcome. However, bringing scientific rigor to the decision-making process and analyzing its effectiveness can ensure better outcomes over the long-term.

Conclusions

Navigating complex problems in professional sport requires making decisions in the face of uncertainty. We have proposed that sport scientists can contribute to the success of these organizations by promoting decision support services that incorporates data collection, analysis, and communication. Furthermore, sport scientists can facilitate the application of rational scientific principles to develop robust decision-making processes and provide feedback on the efficacy of these processes by auditing the outcomes. The ultimate success of this service requires the sport scientist to build meaningful relationships with key personnel across the organization and to demonstrate the benefits of this decision support.

References
