Summary

This chapter will discuss the fundamental need for sports performance analysis for high performance managers. In doing so, it will explore the nature of the performance environment and the need for performance management systems that convert multi-disciplinary performance analysis data into an inter-disciplinary end product that can be used by coaches and athletes. This remains a major challenge for performance managers who require strategies to compress unwieldy data sets into meaningful individual and group performance feedback. Finally, the section proposes an integrated model of performance management and analysis that can be applied to design, implement and measure the effectiveness of a performance review.

Introductory concepts

High performance (HP) sport is primarily concerned with winning and change; HP managers must affect the latter to either start or maintain the former. Performance must be managed coherently and analysed in an accurate and formative manner in order to highlight a meaningful direction for both coach and athlete that can deliver world-class performance under pressure. Performance involves a behavioural and an outcome dimension and is dynamic and multi-dimensional in nature; it is a concept that is open to judgemental and evaluative processes (Sonnenstig, 2002) and constantly evolves.

A HP manager needs to lead, enable and develop people, squads, systems and structures in order to optimise performance and, through meaningful performance management and analysis, nurture self-sufficient and self-aware athletes. Jones et al. (2009: 140) indicated that ‘the performance environment the organisation creates is just as important as the people performing in it’. HP managers must create environments that facilitate:

- agreement (on critical targets and needs)
- alignment (between and within all tiers of a HP environment)
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- accountability (for organisational, team and individual targets)
- adjustment (the ability to initiate, and communicate, context-specific change effectively).

HP managers are invariably tasked with monitoring performance trends and improvements across all tiers of an elite sports environment, and it is vital that they possess the capability to synthesise wide-ranging and often unwieldy data sets into key markers that impact upon performance, either directly or indirectly. The measurement outputs and objectivity of performance analysis has the potential to accelerate coach–athlete learning and positive change. As an HP manager, one can often facilitate change without actually being able to control the rate at which it occurs. However, it is imperative to avoid analysis for analysis sake; if the data we generate does not impact upon performance, why are we measuring it in the first place? For a HP manager, sport performance management and analysis are not models but rather applied processes that are undertaken with a clear outcome or target in mind. This chapter will discuss the need for performance management systems that clearly define the framework for multi-disciplinary performance analysis. A system framework can be used to define success markers across a variety of disciplines, develop squads on and away from the competition arena, create visual databases and translate multi-disciplinary data into an inter-disciplinary end product, for both athletes and coaches. Finally, the issue of how to design, implement and measure the effectiveness of a performance review will be explored.

Within elite sport, Gilson et al. (2001) defined Peak Performance Organisation (PPO) theory, which explains how to organise for sustained peak performance. The latter is defined as constantly exceeding organisational best in pursuit of the organisation’s purpose. For most HP managers, this is a realistic target, although not necessarily indicative of a high performance level. Scott (2009) defined a model of high performance management that is athlete-centred, coach-led and scientifically and medically supported. Whilst clear and logical in nature, the fundamental criticism of the model centres on the second tier, in the sense that a high performance sports environment invariably seeks to nurture self-sufficient and self-aware athletes, which contradicts the ethos of a coach-led environment: an ongoing relationship management tension in high performance sport. A more balanced and accurate definition of high performance sport encompasses performance that is consistently higher than that of the majority of peer organisations in the same sector, and over a prolonged time period (Jones et al., 2009). This definition differentiates high performance from peak performance and suggests that the former is consistent and sustainable, and is relative to, and affected by, the performance of other organisations. Jones et al. (2009) attempted to define a performance environment model where high performance is perceived to be both inevitable and sustainable (Figure 15.1).

This model disaggregates into leadership, performance enablers and people factors, represented within three areas, and organisational climate, represented by four aspects containing achievement, well-being, innovation and internal processes. The practical merit of the model reflects its capacity to assess existing strengths and weaknesses of any HP environment and, consequently, highlights strategies for potential improvement. It may also represent a means of objectively assessing predictors of organisational performance. Fletcher and Arnold (2011) are conceptually aligned to the model in the way they discuss four main areas in performance leadership and management in elite sport:

- vision (strategic)
- operations
- people (capability)
- culture (values and behaviours).
Hoye et al. (2006) designed a nine-point model of performance management by adapting the four basic aspects of Kaplan and Norton’s (1992) balanced scorecard. The advantage of their model relates to the fact that it is broad and inclusive, and geared to sport. However, it would need to be adapted in a context-specific manner to a functional HP environment. Smither and London (2009) viewed performance management as a process that contributes to the effective management of individuals and teams in order to achieve high levels of organisational performance. It is a process that establishes shared understanding and should be strategic and integrated in nature, in order to provide an accurate and informed direction for raising performance standards. Performance management can disaggregate into three main processes: setting the objectives; managing performance to objectives; and measuring performance against objectives (Winstanley and Stuart-Smith, 1996). All objectives should be benchmarked externally, in an ongoing fashion, but a HP manager should avoid an over-reliance on measuring performance to the potential detriment of managing performance.

HP managers must deal with the perennial problem of change gaps (the ability to innovate and change in a challenging environment) by applying key principles: establishing and deploying the right managers and analysts; refreshing and communicating strategic approaches to analysis and management; managing analysis process skills; improving performance; and managing and applying evolving knowledge (adapted from Paladino, 2011). Fundamental questions for a HP manager include: What types of data exist within the elite sporting environments? Does a positive relationship exist between performance analysis and enhanced sports performance? Does current application of performance management and analysis reflect a multi-disciplinary approach? Can multi-disciplinary data translate into an inter-disciplinary end product that impacts upon performance? How are these data used? What are meaningful performance trends? How can we evidence performance progression? A fundamental requirement for a performance management approach in sport is the joint preservation and support for individualism and teamwork. Moreover, it cannot be a one-dimensional mechanism for ‘policing’ performance, but instead should embrace ethical principles, such as respect for the individual, procedural fairness and transparency of decision making.

![A performance environment model (Jones et al., 2009)](image-url)
Ostensibly, HP sports environments require strategies for integrated, dynamic multi- and inter-disciplinary performance analysis feedback that aims to directly impact upon performance. O’Donoghue (2010: 8) provided a compelling justification by asserting that ‘rather than assuming that supporting a coach with feedback based on (match) analysis will enhance performance, we need evidence to support this theory’. What precisely must be managed and analysed? O’Donoghue (2010) highlighted performance analysis as an area of sport and exercise science concerned with actual sports performance rather than self-reports by athletes or laboratory experiments. The main reason for doing performance analysis is to develop an understanding of sports that informs decision making by those seeking to enhance sports performance. O’Donoghue’s (2010) definition emphasised the fact that successful sports performance is multi-disciplinary in nature and never a result of a single cause and effect. For a HP manager, performance analysis defines essential truths and provides a reality check for the talent development environment; the HP manager must use meaningful data to ensure ongoing talent identification and development occurs, as opposed to the common error of talent selection.

**High performance management systems**

HP environments potentially benefit from a bespoke performance management system (PMS) that allows all key stakeholders to manage, monitor, plan and evaluate performance and, as a consequence, obtain an accurate holistic view of both performance and development. Integrated automated performance alerts and data analysis can be used to provide training direction and performance enhancement. The PMS must align closely to a detailed performance plan that optimises outputs and generates solution-based recommendations to deliver improved performance and development standards. The system shown in Figure 15.2 constitutes a realistic framework for multi-disciplinary performance analysis.

This high performance management system (HPMS) is in keeping with Cleveland et al.’s (1989) view that performance management systems can serve six broad purposes: strategic
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purpose (linking the organisation’s goals with the individual’s goals); administrative purpose (a source of valid evidence that can accelerate accurate and informed decision making); communication; development; organisational maintenance; and documentation. The process also emphasises the types of data that will need to be collected and analysed. From an output perspective, the HPMS can take several data sets and convert them into a fusion of meaningful inter-disciplinary targets for athletes and coaches. This type of system potentially provides transparency, accountability and clarity, whilst promoting quality assurance for quality improvement (Q to Q) in order to elevate performance standards. The key to its success is the way in which data are entered and then structured to enable efficient processing. Therefore, each stakeholder should have a dedicated data manager; this role will ultimately determine the reliability of the data and overall effectiveness of the system. Definition of HPMS capability relates to the optimisation of data use to increase throughput and minimise contention, enabling the largest possible workload to be processed; in doing so, it will need to effectively combine feedback and feed forward information, whilst complying with the Data Protection Act (Department of Health, 1998). The HP manager as a data controller must adhere to eight data protection principles. Moreover, as a data processor, it is the service provider’s responsibility to ensure that the personal information is kept secure and adheres to specifications for a personal information management system (e.g. BSI, 2009). The functional capacity of a HPMS relates to the filters to data mine (the ability to compress large, unwieldy data sets into simple features that provide meaningful knowledge) information into key performance and development questions or to monitor key trends (e.g. athlete loads against injury rates via GPS data). The advantages of a HPMS can be numerous: shared data; reduced redundancy; fewer inconsistencies in data; enforcement of performance standards; security restrictions (data protection provides integrity to the system); ability to balance perennial conflicting requirements; and improved monitoring through automated alerts. Ultimately, a good performance management and analysis tool is not just a control mechanism but a learning system that effectively communicates and informs. Hoye et al. (2006) highlighted the importance of applying a dashboard of critical indicators or key success factors that accurately reflect an organisation’s mission and goals.

A HPMS must be compelling and user-friendly, functionally and cognitively interactive and constitute a viable means of facilitating person-to-person dialogue. It is essentially a knowledge management and sharing system that should embody three levels of knowledge flow (from tangible to intangible) with regard to performance analysis outputs: the transfer of tangible resources (team and individual performance indicators); the transfer of activity plans (performance plans and targets); and the transfer of material prototypes (innovative amalgamation of coded data with other multi-disciplinary outputs) (Carroll et al., 2003). For a HP manager, knowledge management can entail collective learning, learning how to learn and idea facilitation (Lin and Chen, 2009).

If the start point for any high performance sport is winning, a HP manager must initially have a completely accurate picture of win–loss ratios for all relevant tiers and squads for an annual, four-yearly, decade or more longitudinal period. In 19 FIFA World Cup football tournaments and 97 games, Brazil, as the number one-ranked side over that period, exhibit a 78 per cent win ratio (FIFA, 2010), but a HP manager must still explore whether this constitutes consistency of performance or under-achievement. In terms of broad performance indicators, analysis of three IRB Rugby World Cup tournaments indicate that, in a 12-year period (three tournaments) within the pool stages, there was a 21 per cent decrease in the overall number of tries scored; this pattern was magnified at the knockout stages with a 33 per cent drop. A similar pattern emerges when analysing the last four FIFA Football World Cups; a 12-year period has seen a 15 per cent decrease in the total number of goals scored. The issue for the HP manager is to ask
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the right question in attempting to understand the trend; are these patterns a result of improved
defence, weaker attacking play, rule changes, more conservative coaching philosophy, financial
pressure or a combination of all of these variables? Examination of both the Tri Nations and Six
Nations competitions over the last ten years shows that there has been a steady reduction in the
number or tries being scored in each competition. In brief, there were around 60–70 per cent
more tries being scored at the beginning of the decade than at the end. The possible reasons for
this decrease in tries could be the result of many diverse factors or relatively few. For example,
a reduction in the number of kicks from hand (2009 saw 60 per game; 2010 averaged 37) or
a change in type of kick made. Further factors included rucks and mauls, increasing by over
40 per cent, with passes elevated by 35 per cent (IRB, 2010). A HP manager must examine
whether this trend has application to other tiers of the performance environment. A common
but nevertheless key conceptual issue to address for many HP managers relates to successful elite
age-grade performance not translating to the senior elite environment.

The HPMS has the potential to alleviate a practical problem of athlete support services
working in an incoherent and disjointed manner. The system can clarify the challenge facing
athlete support staff in aiming for sustained performance excellence. Relative success hinges on
the fact that a ‘climate of cooperation and collaboration needs to be actively fostered in what
is potentially an environment that fosters competition and conflict’ (Reid et al., 2004: 205).
Proactive multi-disciplinary teams (M-DTs) have impacted on sport but their existence raises a
number of practical questions: What are the outputs and deliverables? Are they an incidental bi-
product of larger budgets, imitation or the need for more individualised athlete support? Are the
backroom staff isolated or integrated within the environment? Do the elements function within
silos? What constitutes the key elements of a M-DT? In elite sport, M-DTs embody profes-
sional practice that constitutes ongoing decision-making and athlete management. Within elite
sports environments, conflict can be personal, idiosyncratic, a function of the group dynamic or
specific to the sport. Conflict may take the shape of interpersonal, to individual-group conflict
(one individual’s needs differ from the group), to conflict between groups. With the ever-
expanding M-DTs, HP managers have to manage structural risk factors, such as the coach’s
perception of the efficacy of each service, competition for resources (in partially accountable
environments), implicit or explicit pressure (discrediting an alternative approach in an effort
to justify one’s own), task interdependence and jurisdictional ambiguity (Reid et al., 2004).
Integrated performance management data must provide empirical evidence that highlights the
value of the many components within an elite sporting environment and balances the perceived
value of each.

The mode of performance analysis feedback is key. Learning from dynamic representations
is improved when learners are able to control the pacing of the presentation because new infor-
mation can be integrated into existing knowledge structures at a rate that reflects the capabilities
and needs of the learner. Three levels of interactivity exist: the control of the information deliv-
ery; manipulation of the content; and control of the representation (Kalyuga, 2007). A HPMS
should reflect such functional interactivity.

O’Donoghue (2010) identified three key purposes of performance analysis that underpin the
type of data sets generated: technique analysis, technical effectiveness and tactical evaluation.
The three approaches form the performance analysis base for the HPMS. Performance analysis
data on team and individual levels can be monitored against pre-determined performance tar-
gets within attacking success and defensive completion rates. Bracewell et al. (2003) argued that
performance could be condensed into contextual ratings on a game-by-game basis from match
data using a combination of dimension reduction techniques and an adaptation of multivariate
control methodology. A performance screening process must be monitored for trends relating
to medical (cardiac and musculo-skeletal), physical (functional and biomechanical) and psychological aspects. Analysing training loads against the extent of injury can generate trends that form the basis for a very specific model for injury prevention.

In terms of capability development, HP managers focus on succession planning for coaches, athletes and athlete support staff. The HPMS will include evaluation data relating to high performance coaches and based on athlete questionnaire, coach observation and summary reports (Mallett and Côté, 2006).

The HPMS will also synthesise data into individual psychological and performance profiles: a collection of related variables brought together to represent an athlete. From a group or squad perspective, a sports performance profile can be used to represent a typical performance based on multiple match data. Where a typical profile is produced for a team or an athlete, it is also necessary to represent the variability in performance indicator values, showing where the team or athlete is consistent or inconsistent. A team profile helps an athlete to apply their role understanding back into a team or squad context. Athletes can assess their group against seven characteristics of high-performing teams: performance; empowerment; relationships; flexibility; output; recognition; and morale (Blanchard, 2006).

Individual assessment of athletes via real and lapsed time training and competition monitoring is central to high performance management and analysis. Application of a Global Positioning System (GPS) will provide objective data on athlete workloads via quantitative measurement of activity profiles. Real-time measurement of athlete movements is vital to the process of performance analysis. GPS measures specific workloads in terms of total distance, heart rate and velocity per game, half, quarter or smaller unit. In contact sports, 10 Hz GPS units that possess accelerometers, gyroscopes, and magnetometers and heart rate measures enable impact forces to be assessed. Synchronising such data with coded computerised performance analysis constitutes a vital form of formative, inter-disciplinary performance feedback that has huge relevance for coach and athlete; a type of data that prevents barrier-impact from negating performance progression.

A constant challenge involves the need to compress unwieldy multi-disciplinary data sets into meaningful individual and group performance feedback. One potential solution is a performance analysis dashboard that equates to an all-embracing fusion of key performance data trends. Few (2006) suggested that ‘a dashboard’s success as a medium of communication is a product of design, a result of a display that speaks clearly and immediately’. A dashboard must be tailored specifically to the requirements of a given person, group or function. The condensing of salient information to one screen enhances whatFew (2006) referred to as the ‘simultaneity of vision’: viewing all data together facilitates comparative analysis and possible recognition of key trends. A dashboard approach may also enhance an organisation’s ability to arrive at accurate, informed and rapid decisions by integrating data from all of its constituent parts on to a single, centralised platform in order to obtain an accurate, holistic view of performance. However, any HPMS will need to be sensitive to the potential barriers to successful implementation of performance management and analysis within a high performance environment: inability to prioritise; silo mentality; self-interest; ex-athlete mentality; complicated, uninspiring and non-innovative performance management and analysis; overcoming simple tools that create complex results; resistance, or lack of desire, to change; and a lack of shared values (Cameron and Green, 2009).

**Performance reviews: integrating performance management and analysis**

In many respects, integrated performance management and analysis is a direct antidote to the five dysfunctions of a team (Lencioni, 2002): inattention to results; avoidance of accountability;
lack of commitment; fear of conflict; and absence of trust. Figure 15.3 highlights the transition from the outer ring of how to manage performance via the middle ring of what needs to be managed and analysed, to the inner ring of how to analyse and impact directly on athlete and squad (including the management team of coaches).

This model has additional value in the sense that it can be applied to form the basis for a performance review that should embody: a people-centred approach; an ethos based on sustained excellence; the recognition of the need to provide leadership during and post review; and totally transparent integrity (i.e. implementation of a completely ethical and professional process). A performance review should gather data according to three main themes:

1. Structure – which relates to how elite performance is implemented, specifically the key objectives and management of the programme.
2. Process – how elite performance is delivered; service provision, philosophies and personnel capability.
3. Outcome – the manner in which elite performance is evaluated for effectiveness.

The objectives of a review could incorporate: a critical assessment of the existing governance, management, structure and performance standards of elite performance; and solution-based recommendations to deliver improved performance standards, a comprehensive governance framework and management structure for elite sport that addresses the needs of affiliate organisations and stakeholders. These recommendations may include adjustments to existing governance systems and/or integration of activities and operations; identification of potential impediments to reform and strategies to overcome those impediments; and a plan to implement the recommendations. Data collection will primarily involve two types:

Figure 15.3 An integrated model of performance management and analysis
1. Secondary data – data which already exist and which were collected for some other (primary) purpose but which can be used a second time in the current project (previous high performance strategic and analysis reports).

2. Primary data – qualitative and quantitative data consisting of original information that comes from people and includes information gathered from surveys, focus groups, independent observations and questionnaire results.

Interviewing key stakeholders will be integral to successful completion of the review process, and focus questions would include: Is the performance environment fit for purpose? Can the current athlete demands deliver consistency of performance? What changes need to be made to the performance environment, and why? How do we ensure improved standards of performance? What actually matters?

Broad outcomes for the review will link to defining management frameworks that align to principles of outcome-driven investment and data outputs that measure the effectiveness of the organisation. This could incorporate a new best-practice high performance structure or model and a plan that highlights the main strategic imperatives to move elite performance forward. The specific performance plan might include some key targets to improve a performance environment: capability development (right people with the right skills); redefined structures and systems; strategic leadership; behavioural congruence; application and transference of knowledge and understanding; world-class physical and human resources; outcome-driven investment; athlete welfare; talent development environment; coach development; multi-disciplinary athlete support provision; commitment to long-term applied research and development; and a sustainable continuing professional development culture. This framework for the review outputs can be used to assess an elite performance environment in terms of a balance of competencies in performance, coach education, sports science, commercial and operational management plans, and overall performance management and analysis. The latter impacts upon the overall management quality of the eight concurrent lines of capability within any performance environment: training; equipment; personnel; information; organisation; infrastructure; logistics; and values. Future improvements in elite sports performance will rely on improved technology and coaching. The latter relies on coaches being better developed scientifically and on the use of better technical analysis systems. Compressing large, unwieldy multi-disciplinary data sets into simple inter-disciplinary outputs that provide meaningful knowledge will assist the change process in elite sport by answering key performance questions and monitoring key trends.

The integrated model of performance management and analysis can help to facilitate: individual long- and short-term targets; squad threshold bands to review performance and for squad selection; use of threshold bands longitudinally to monitor performance over time; and age-related thresholds for talent identification and development purposes. These areas demand that HP managers work to a set of clear general priorities: to provide clear direction; to be simple and focused; to clarify roles; to be outcome-orientated; and to prioritise in areas that make the greatest difference. Such an approach will help support a HP manager to produce evidence that performance analysis enhances sports performance; this will demand that the manager critically evaluates the multi-disciplinary nature of performance analysis and how this translates into formative feedback as an accelerator in performance analysis and management. Coherent performance management and analysis underpins and promotes competitive success of an elite sport, which can be critically important for a number of reasons: it helps attract high-profile sport to a given country; it may be the single most important financial factor underpinning the high performance environment; it can be fundamental to the creation of a sense of national
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identity and pride; it encourages a nation to be more active and improves concomitant health-related fitness levels; and it develops a positive image to market a country’s products overseas.

Concluding remarks

In conclusion, there will be an increasing demand for HP managers to apply performance analysis to answer cutting-edge performance issues via a research and development strategy: sports behaviours and sports outcomes; relative significance of contextual sports behaviours (McGarry, 2009); team interactions and game behaviour; principal component analysis; and real-time interventions (O’Donoghue, 2009). Ultimately, the main focus for any HP manager is winning performance and, as such, the most fundamentally important question will remain: Tactically, are we performing the right skill and, technically, are we performing the skill right (O’Donoghue, 2011)? Converting the multi-disciplinary reality into an inter-disciplinary end product that can be used by coaches and athletes remains a major challenge, which can be overcome by applying a HPMS and an integrated model of performance management and analysis.

References