AROUND THE WORLD

Why applied sport scientists need a theoretical model of the performer

Ian Renshaw, Dr Tony Oldham, Paul Glazier and Prof Keith Davids respond to recent criticisms of sports science by one of cricket's greats, Greg Chappell.

The saying ' Nothing is more practical than a good theory' warrants greater attention from sport scientists if we are to accept the opinions of Greg Chappell, former Australian international cricketer captain. Interviewed by the 'Trinidad & Tobago Express', and reported on cricinfo.com (June 22nd, 2004), Chappell expressed little enthusiasm for the contribution of sports science to the development of the next generation of Australian cricketers. His comments highlight to us the need for a theoretical model of the performer and learner to underpin training, practice and sports science support applications. First, he suggested that a 'mafia' of academics and sports scientists with little playing experience, had over-complicated training, creating regimented coaching structures, leading to the development of cricketers with little understanding of the game. Second, he argued that giving young players too much technical information may only confuse them. On teaching players he said, "To try to explain to them the biomechanics of it all would just confuse them. The more structure you get at an early age, the more it messes you up." Third, he was critical of the role of bowling machines during practice, emphasising the importance of the batter adapting movements to key task information sources, especially the actions of bowlers who often deliver the ball idiosyncratically. Chappell concluded, "We should not replace them [the old fashioned methods of learning to play cricket] with unproven approaches like biomechanics that are not yet proven to be workable….". Chappell's analysis highlighted to us the need to adopt a multidisciplinary approach in sports science that is guided by theoretical principles and a theoretical model of the human performer.

A constraints-led framework for sports science support

One potential theoretical framework emphasises the interacting constraints, or factors that shape movement behaviour, on each individual performer (Davids, Button & Bennett, in press). Three main constraints on performance and skill acquisition exist. Performer constraints include factors like height, flexibility, cognitive attributes and past experience. Coaches need to develop a profile of each individual performer based on these physical, psychological and experiential constraints.

The constraints-led approach emphasises the significance of individual differences and the functional role of variability as each performer attempts to satisfy the constraints on him/her. Environmental constraints include both physical and social environmental factors. Physical factors include ambient temperature, natural light, and altitude (e.g., weather conditions). Social environmental factors include cultural norms, expectations and preferred performance styles (e.g., the expectation that children may prefer to learn rugby in New Zealand, soccer in England and become wrist spinners in India). Task constraints are closely related to specific performance contexts, including the rules of the sport, equipment and pitch sizes. Task constraints are very important for sport scientists because they capture the specific demands on performers, including the information used to organise movements, specific intentions and goals.

A major focus for practitioners should be to identify and manipulate key task constraints to direct the discovery learning of players. Adoption of this conceptual framework by sport scientists would provide the basis for a multidisciplinary approach and a powerful rationale for designing training and practice programmes for athletes. Knowledge of the interacting constraints that affect performance means that coaches can deliberately manipulate constraints on individual players to help them attain unique performance solutions. After developing a broad understanding in a wide range of sports, it would be advisable for sport scientists to apply their scientific knowledge to developing an empathetic understanding of the task constraints in a limited number of specific sports.

Chappell also berated the "over complication" of support work. From a constraints-led approach, the aim of coaching is to create environments that allow players to seek functional movement patterns and discover individualised solutions to achieve task goals. In sport, there are no common optimal movement patterns which should be imitated by all players because the constraints differ for each individual performer. A key idea in a constraints framework is that one size does not fit all, since even expert performers are unable to repeat the same movements from training session to training session. Over-structured coaching to provide off-the-shelf coordination solutions may have limited value, as the best players find specific solutions, often unconventional, to performance problems. In developing learning programmes we need to understand that variability is not error or noise to be eradicated but can be functional to successful performance (Glazier *et al*., 2003).

Keeping the individual learner's needs central

These ideas have implications for the regimented coaching and over-structured development programmes for children, deplored by Chappell. An important role of practice is to educate learners to pick up the key constraining information sources. However, practice environments have traditionally been adapted to manage the information load on learners by decomposing movement patterns into micro-task components. It was this type of management strategy in cricket that induced Chappell's anger, i.e., using bowling machines for standardised projection of cricket balls to enable batting skill acquisition in splendid isolation from game contexts. Chappell is correct in this regard, as experienced performers actually home in on pre-ball flight information to constrain coordination modes. In a recent study, we demonstrated that performers play different shots when playing against a bowling machine compared to similar deliveries from a bowler (Renshaw, 2004). The implication for sport scientists is that practice constraints involving projectile machines should be restricted to complete beginners for a short period at the early stage of developing a very basic coordination pattern, or when coordination needs to be re-stabilised after absence due to illness or injury. Batting against bowlers allows players to develop greater skill in attuning to relevant body part movement and orientation.

In conclusion, the criticisms by Greg Chappell provide a timely wake-up call, but do not signal the death knell of sport science support. The comments signify that sport scientists need a powerful theoretical model of the performer to rationalise their work. We proposed one model which exemplified how understanding the interacting constraints between the performer, the environment and the task is of vital importance in designing development programmes to shape performance. The constraints-led approach has a multidisciplinary focus enabling a conceptual framework for the holistic development of skilled performance. This is essential so that 'technical' skills are developed alongside the psychological and physiological requirements of the sport. ■

References

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