Psychology and speed

by Pamela F. Murray

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The author discusses the important role played by Sensory Motor Training in the development of speed in sport and presents a 4 phase programme, designed to achieve the realistic goals of the athlete.

Examples are given of the practical application of this programme to the training of a racing driver, an international rugby player and an international athlete.

Pamela Murray is a lecturer at Wolverhampton University and is completing her doctorate thesis on 'Coaching styles and their affect on performance in co-acting and interacting sports'. She also provides practical assistance for the West Hartlepool's rugby club and at the International Coaching School for Football and is associated with the Integrated Sport Science Strategy (IS4)

1 Background

The role of the coach with regard to the intellectual development of the athlete is undervalued and most certainly underoptimized. The coaching culture within the United Kingdom places importance on tangible inputs, whether coach, athlete or scientist-led. However, there is an area within our coaching menu which we do not manipulate to our advantage, and that is sensory motor training (SMT).

Sport psychology in Europe and North America can contribute so much more to the creation of ethical performance. Eminent scientist, Miroslav Vanek, the grandfather of sport psychology invested time in me this year. Czech and Soviet approaches highlight the non-effective superficiality, with which we may operate elsewhere.

My wish is to give an indication of the common underutilisation of a discipline which was never intended to be perceived as a process of problem solving. I do not work with athletes with problems, but with individuals attempting to optimize every possible ethical component. My intention is to develop the sensory part of performance and thus integrate the physical with the inner mental part of training.

Professional orientation:

To develop

1) Self awareness
2) Self control
3) Intellectual capacity
4) Independent excellence.

2 Introduction

Where does speed begin?

A coach not too far from here once said to me, "If you cannot imagine it, you will never achieve it". My starting place is with the guarded dreams of the athlete:

- dream goals
- realistic goals
- discrepancy.

Closing the perceptual gap

This simple profile reveals much about the athlete, and, indeed, determines whether there is any point in working with the individual. This initial, non-scientific base avoids needless objective measurement, which may serve only to limit potential options. Given that speed = decision making time plus reaction time, this then leads to the following 4 phase program:

1) Discovery
2) Skill Acquisition
3) Reinforcement and Development
4) Integration.

Phase 1 – Discovery

- Get to know the athlete
  life style management
  training behaviour
  competitive behaviour
  role-related behaviour
- Core personality profiling
  create esteem scale
  self esteem scale
  measurement
  observation
- Technical analysis
  skill requirements
  situational needs
  competencies
- Identification of aptitudes
  statistical analysis
  subjective appraisal
  sport-specific skill tests
  sport-specific skill circuits.

Phase 2 – Skill acquisition

- Identification of standard situation
  sensory receptors
- Standard situation learning
  leading sensory complex
- Automaticity
  modified reactions
  - constant practice
  - variable practice
- Inner mental training
  program initiation.

Phase 3 – Reinforcement and development

- Sensory motor training
  part skills
  modified conditions
  feedforward preparations
- Modelling controllable conditions
  time, temperature, altitude etc.
- Coaching continuum
  cognitive capacity
  role interchangeability
  natural integration
- Sensory overloading
  mobilisation of reserves
  mental practice
  observation and monitoring of nervous activity.

Phase 4 – Integration

- Performance management
  long pre-start
  short pre-start
  start
  competitive
  post-competitive
- Self regulation
  cognitive strategies for stages above
- Opposition
  cognitive strategies
- Integration of competitive and training states.

The study of motor learning is different from the study of performance, in that it concentrates on the changes in performance resulting from practice (SCHMIDT 1988). Motor learning is accepted as a set of internal processes, associated with practice or experience and leading to a relatively permanent change in the capacity for skilled behaviour. Skills are regarded as movements dependent on practice and experience as opposed to genetically inherited abilities and traits.

The coach can look forward to the creative development of aptitudes central to movement technique and performance. To do so using motor learning is to emphasise the sensory part of reactions and the awareness and accompanying control required (VANEK and MURRAY 1995).

The tennis coach, for example, will take into account the sports sensory dominance and environmental conditions, and pay particular attention to the different sounds from the racquet head on contact with the ball. The blindfolded player learns to identify the shot through associated sound., linking this with appropriate action. In time, with the use of progressive conditions, this skill becomes automated, referred to as a standard situation within the psychological program. Reactions cannot simply be one-off responses, if they are to assist the performer to achieve consistency.

Cognitive psychology pays much attention to the activity occurring within the 'processing' box. However, this would appear to be an abstract way in which to study human behaviour, given that the central focus consists of a non-directly observable process. The output is then classed as the overt behaviour, from which to make inferences with regard to human/athletic behaviour. Only a limited number of options are readily available, due to the lack of information regarding the neural processes and locations. See *Figure 1*).

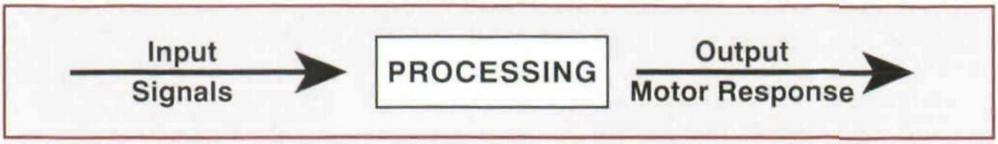

Figure 2: Simplified information processing model (SCHMIDT 1988)

Example 1: Racing driver

Using modelling (Replication of directly controllable conditions)

Working conditions

- physiological - high body temperature, heart rate within training zone.
- environment - seated position, limited working space, headgear.

sensory receptor –> identification of alternatives –> decision made

visual signal –> driver ahead –> evaluation of options –> motor movement

Response specifications to run motor program, sensory consequences (feedback).

Example 2: Rugby international

visual signal –> acanning of play –> skill execution

ball in air –> support available –> execution and follow through

Example 3: International athlete

auditory signal –> automatic –> drive from blocks

fire of gun –> reaction response

Within phase 1 of the psychological program (discovery), a range of standard situations is identified by talking to the coach and the athlete, analysing the event in its competition form, and reviewing the training forms. The example of an international rugby player shows the following standard situations (technical, tactical or psychological):

- difficulty in settling in first 10 minutes
- loss of focus after poor decision by self, team member or referee
- interruption to play, stop-start activity
- quick restart after penalty
- loss of concentration after a try by either team
- drop in motivation during periods of fatigue.

This immediately shapes the program for skill automatization. Each skill is broken down into the components which have the greatest influence on sensory reception. The dominant senses (leading sensory complex) are established, allowing the creation of modified sensory rehearsal routines. Modified rehearsal conditions are manipulated in various forms, until the athlete gradually begins to react to the given signals and follow through with one or more appropriate motor patterns. Such patterns are activities which lead to effective play, or efficient movement, and are predetermined by the coach and the athlete within the technical analysis. The follow-through phase is just as important as the initial response, since the conditions must be as realistic as possible. Only be rehearsing the entire sequence will instinctive tendencies be reproduced.

One of the ways of ensuring that a science-related programme is effectively integrated with the athletic performance is to use the Coaching Continuum (DICK 1992, cf. *Figure 2*). The range of coaching styles - Directing, Coaching, Supporting, Counselling - exposes the athlete to a dynamic coaching environment, provides for personal development and progressively works towards athlete independence.

The athlete learns psychological skills initially within the directive mode. A simple response is predetermined, so that the athlete may learn how to begin to read additional sensory information. Phase 1 makes predominant use of the Directing Style, to ensure that the psychological training base is both comprehensive and secure. Phase 2, Skill Acquisition, also uses the Directing

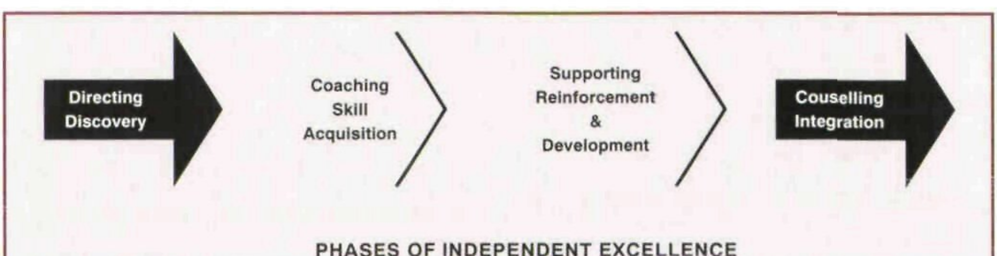

Figure 2: Coaching continuum (DICK 1992)

Style but adds to it the Coaching Style; the athlete is now aware of basic processes, asks questions, and begins to use other available inputs simultaneously (such as biomechanical information, nutritional advice). The athlete is gaining confidence and realising that psychological preparation is just like any other supporting science. The Supporting Style is used throughout Phase 3, Reinforcement and Development. Value judgements are now informed by experience and a growing network of information contributing towards the athlete's performance-specific knowledge. Finally, the integration of the psychological programming with the Coaching Continuum should produce a mature competitor, able to control training and competition behaviour. Sensory perception has, at this point, been successfully combined with knowledge of what is actually going on in the body – resulting in complete consciousness and control.

3 Feedforward

Most athletes and coaches use feedback and knowledge of results by comparing performance with predetermined goals. However, there is no need to rely alone on delayed sensory consequences (feedback), when both coach and athlete can prepare for rehearsed anticipation. The reaction response varies according to the momentary situational requirement of the activity. The firing of the gun to the moment of the drive from the blocks denotes the necessary time for the sprinter. Given that reactions occur in an orderly way, the efficiency of this process can be improved. Conventional body reaction tests are concerned with nerve reaction and muscle contraction time. Each athlete, therefore, has a range of objective tests applied, which reflect the situational requirements of the sport (for example, 'spaghetti mix' developed by DICK for rugby players). Such tests are of limited value, unless the nature of the sport is replicated within the context of necessary responses.

Feedforward, information sent ahead in time to prepare for following sensory feedback, has been shown, through research on visual perception, to provide effective advance information (GALLISTEL 1980). The motor command sent to the eye muscles is also sent to a location in the brain. The visual perception system is thereby informed about the imminent movement of the eye. EVARTS (1973) reported neurological evidence, indicating that sensory information to be received by the muscles is also sent to a location in the brain. The aim of the motor program, integrated with the Coaching Continuum, is to provide information to the sensory system within a range of conditions, thus reducing the abstract nature of activities. Modelling of controllable conditions which

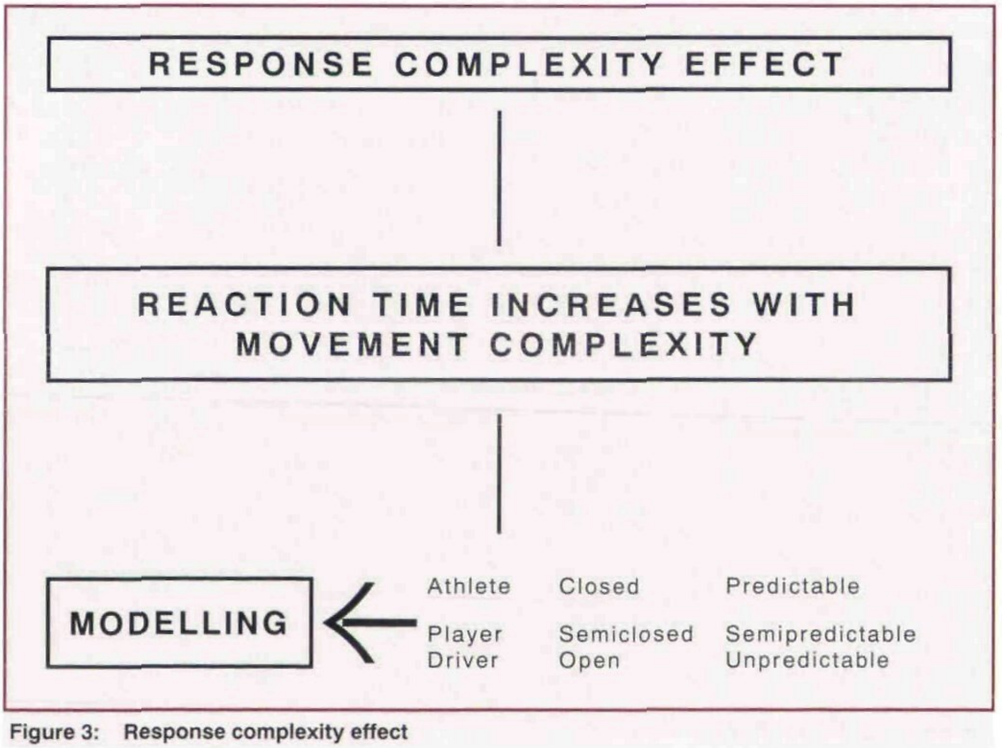

Figure 3: Response complexity effect

- Analysis of motor program
- Movement precuing procedure
- Athlete's response preparation
- Reaction time obtained

↘ **Information sent ahead in time to prepare for following sensory feedback**

Figure 4: Development of feedforward

directly affect the athlete ensures that this is genuine (*Figure 3*).

There can be no stating of cause-effect relationships, since I work with a fairly small number of athletes. However, I can infer reaction time performance relationships in real terms: for example, the rugby player is quicker off the ground, responds with greater motor precision following gross explosive activity and is able to refocus after stop-start conditions. The result is a consistent first division player, who retains his position in the England squad. Perhaps the consequences for the racing driver are rather more vital, in that the ability to maintain concentration under varying conditions means survival on the circuit. The innate confidence resulting from the reduction of reaction time to a range of stimuli produces a definite increase in speed. The track athlete is comfortable, in the knowledge that all performance conditions are prepared for and the mental skills are compatible with the physical skills – not a common marriage in my country.

The development of feedforward (cf. *Figure 4*) is of great benefit to any co-acting or interacting athlete. Likewise, the leading sensory analyser, identified under modified or part skill conditions, is potentially advantageous. The experience and skills of both coach and athlete are necessary for the successful integration with performance conditions. Complete integration with the specific training phase will facilitate genuine and effective automization. The entire process must lead to the development of an independent athlete. Achievement dependent on the coach is not an achievement.

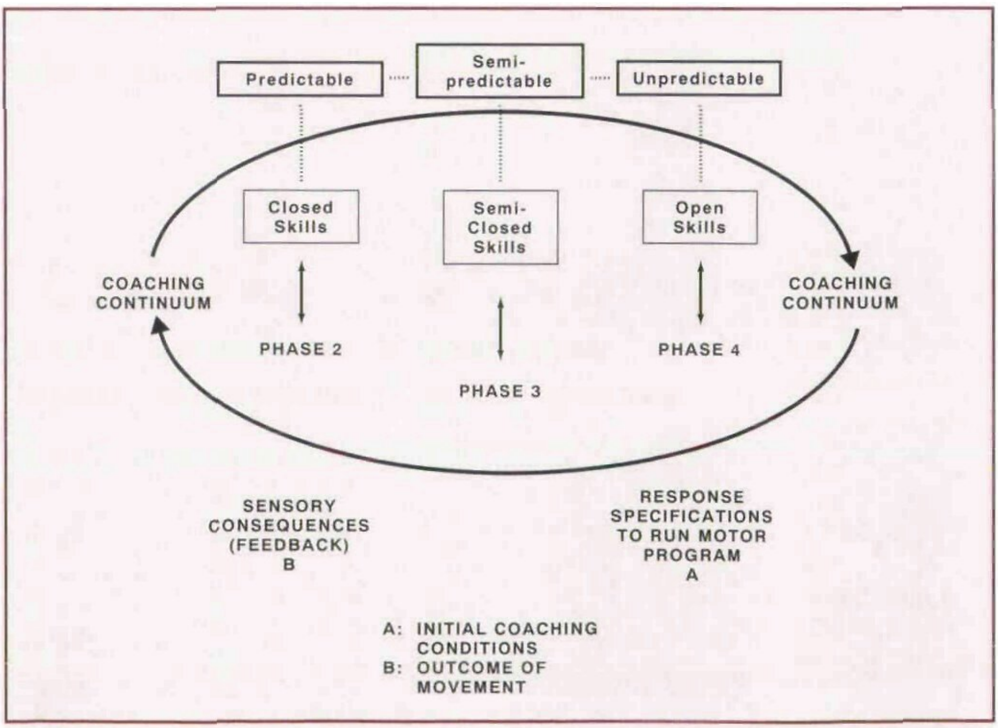

Figure 5: Complete integration