“DESIGNING PERCEPTUAL MOTOR SKILL DEVELOPMENT PROGRAMS FOR SQUASH”

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Introduction

• Better players appear to make better decisions more rapidly than lower standard players.
• They execute their shots at a far higher tempo and can maintain extremely high accuracy and consistency.
• They attempt to be deceptive with every shot - even when under extreme pressure.
• They appear to “read the play” far more effectively than lower standards - research indicates that they can pick the shot much earlier than lower standards.\(^1\)
• These skills are traditionally developed through matchplay at progressively higher levels.

Because these skills can be observed to become enhanced by experience, they must be able to be trained by effectively accelerating the “experience” process using repetitive rehearsal of increasingly complex components of match play.

In all game sports (such as squash, tennis, badminton, table tennis, football, basketball, etc.) there is a demand for effective decision-making by competitors from their earliest beginnings right through to high-performance, international standards. Generally speaking, this decision-making is related to the ability to anticipate, select shots and to deceive.

We can observe that, with experience, players become better decision-makers - suggesting that this skill is enhanced by competition and perhaps incidentally by practice activities, etc.

<table>
<thead>
<tr>
<th>Simple</th>
<th>SPORT</th>
<th>Complex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technique Based</td>
<td>Many and Varied Decision-Making</td>
<td></td>
</tr>
<tr>
<td>Little or no Decision Making</td>
<td>Mental Demands Dominate</td>
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<tr>
<td>Physical Demands Dominate</td>
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Figure 1: Classification of Sport - Simple/Complex Continuum

Figure 1 shows that the more demand on sophisticated decision-making skills, the more “complex” the sport and the greater the dependance on developing “expertise” in that sport.

If decision-making is such a major skill of high performance players in sport, what can we, as coaches, do to accelerate the development of these skills in our players so that they can better utilise their other skills in a competition environment?

The answer, obviously, is to understand the types of decisions being made in our sport (right from beginner levels) and then to recreate situations that provide the player with opportunities to rehearse and practise these decisions under contextually real pressures.

The traditional model of athletic development promoted by Bompa in his text “The Theory and Methodology of Training” (1983), suggests four major categories of development (physiological, psychological, technical and tactical). This model does not satisfactorily address the areas of anticipation/deception and shot-selection decision-making or their respective development.
New Model of Athletic Development

In order to address this inconsistency, a new model of athletic development\(^2\) was suggested (Figure 2) that places technique, tactical and anticipation development under the heading of “Perceptual Motor Skill Development”. In his article, Wollstein (1995) likens the physical capabilities of the player to the engine of a car (the brute strength or power), the psychological capabilities to the engine management system (can be altered these days by computer from a economical “car around town” to a fire-breathing race car) and perceptual motor skill capabilities to the driver of the car - the “steerer”. Each is inter-dependent on the other in the overall performance of the player.

![Figure 2: Model of Athletic Development (Adapted from Wollstein, 1995)](image)

This model places the importance of perceptual motor skill development on an equal footing with psychological and physical development but also suggests that the traditional emphasis by coaches on “technique” development may, in fact, be ignoring whole swathes of more important factors such as the ability to “read the game”, to place the ball effectively, to use the most effective techniques and to deceive their opponents. In other words, there is a whole series of complex decision-making activity that precedes action and it is the combination of the decision-making and the techniques that make up any action that are termed “perceptual motor skills”.

![Figure 3: Information Processing Model of Perceptual Motor Skills](image)
Wollstein also suggests that these perceptual motor skills can be further broken down into their three component processes: 1) perception, 2) decision-making and 3) reaction, which can then be translated into terms that are more relevant to us (see Figure 3). “Technique development”, in fact, is also relegated to a significantly lesser role in the player’s development.

**Observable Stages of Perceptual Motor Skill Development in Squash**

There is a progression from the clumsy, conscious decision-making that is obvious in the beginner to the automated, sub-conscious decision-making of the expert player. The model shown in Figure 3 represents the so-called “Information Processing” version that uses a computer analogy to represent the serial processing of the beginner’s conscious process - Get Information, Process It, Choose a Motor Pattern, Act.

As the player progresses, the process becomes the classical “Stimulus-Reaction” model where most of the decision-making is automated and rapid due to the parallel processing capabilities of the sub-conscious.

Table 1, demonstrates this development of decision-making capabilities as a player progresses from beginner to international standard. The types of decisions alter from “what to do” to “how to” to “where to”. The degree of anticipation increases as does the demand for more deception and variety in the player’s game.

The player eventually learns (or is taught) to adopt different styles of play and to play specific game plans in order to defeat a particular opponent - even though these styles or game plans may not be favoured by the player. This “strategic over-ride” is a conscious pre-game or pre-rally decision which is used to direct the sub-conscious, trained reactions of the player to respond to certain situations in a particular way.

**Major Decisions in Squash**

These decisions can generally be summarised as follows:

1. **Anticipation**
   - Getting into suitable position from which to see the available cues
   - Observing the available cues
   - Deciding which shot the opponent will play
   - Moving into the best position from which to strike the next shot

2. **Shot Selection**
   - Choosing where to hit the ball to
   - Choosing which shot to play from the range available
   - Choosing the effect required - eg. how to hit the ball (hard, soft, spin, etc.)
   - Choosing when to play the ball

3. **Deception**
   - Choosing the type of deception (positioning and striking technique)
   - Choosing the timing of the deception.
Table 1: Progression of Decision Making Stages in Squash

<table>
<thead>
<tr>
<th>Player Standard</th>
<th>Conscious Decisions Necessary</th>
<th>Automatic Decisions Made</th>
</tr>
</thead>
</table>
| Beginner (ie. just tries to keep the ball in play) | • Anticipation of Ball Bounce  
• Anticipation of Opponent’s Shot  
• Position to run to  
• Which side of the body to play the ball from  
• How to hit the ball to the front wall  
• When to make contact with the ball | • None                                                                                     |
| Better Beginner (ie. starting to try to play the ball away from opponent) | • Anticipation of opponent’s shot  
• Where to hit the ball to  
• How to hit the ball  
• When to hit the ball  
• Anticipation of ball bounce  
• Position to run to  
• Which side of the body to play the ball on |  
| Competition Player (ie. low standard pennant competition) | • Anticipation of opponent’s shot  
• Where to hit the ball to (Player tends to play a simple game plan - eg. just driving to the back of the court, which reduces the number of decisions required before execution)  
• When to hit the ball  
• Anticipation of ball bounce  
• Position to run to  
• Which side of the body to play the ball from  
• How to hit the ball |  
| Higher Standard Competition Player (ie. Domestic “State Grade” Competition) | • Amount and type of deception  
• What effect is required on the ball  
• Type of Serve - tends to stick to one or two  
• Style of play (tends to play a more complete game using a greater range of shots and begins to play game plans depending on opponent’s style of play) | • Anticipation of opponent’s shot  
• Position to run to  
• Which side of the body to play the ball from  
• Where to hit the ball to  
• How to hit the ball  
• When to hit the ball |
| International Competition Player | • Style of play - ie. various game plans specifically designed to beat opponents  
• Type of Serve - plays a greater range of serves depending on opponent | • Position to run to  
• Which side of the body to play the ball from  
• How to hit the ball  
• Anticipation of opponent’s shot  
• Amount and type of deception  
• What effect is required on the ball  
• When to hit the ball  
• Where to hit the ball to (tends to play a more complete game using a greater range of shots and playing them to all parts of the court even when retrieving difficult shots) |
Steps to Developing These Skills in Squash Training

Shot Selection

Shot Selection is the process of choosing the appropriate stroke, the method of execution and timing to produce some effect on the opponent - ideally winning the rally.

The decisions involved range from comparatively easy (where plenty of time is available - eg. the service), to split-second decisions during a high-tempo rally - eg. when volleying.

In order to play shots more consistently and at increasingly higher tempo, the developing player typically reduces the number/type of strokes that he uses so that he has fewer options from which to choose. This can be a very effective strategy for some players to adopt especially when the player is emotionally disturbed and perception skills are interfered with due to a loss of concentration.

At the high end of the sport, however, the ability to quickly and effectively play and place the ball into the most difficult positions for the opponent is vital.

<table>
<thead>
<tr>
<th>Beginner</th>
<th>Intermediate</th>
<th>Advanced</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Player may play one of two options during drill practice</td>
<td>• Pattern Play: Players play set shots depending on relative position of opponent - eg. If opponent is behind, player must boast. If opponent is in front, player must drive straight.</td>
<td>• Random Pattern Play: Players choose from two or more tactically sound alternatives in back court positions depending on opponent’s relative position. (Deception is introduced to eliminate over anticipation by opponent)</td>
</tr>
<tr>
<td>• Player must play a particular shot from set positions on court</td>
<td></td>
<td>• Random Pattern Play with Front Court Options: Players can play repeated short shots when chasing a short shot</td>
</tr>
<tr>
<td>• Player A plays set shots from centre court position in response to set shots from partners (players B and C) - eg. 3 Person Volley Boast &amp; Drive exercise.</td>
<td></td>
<td>• Phasing Pattern Play: Players choose from tactically sound alternatives in various positions depending on opponent’s relative position, balance, recovery from previous shot, etc.</td>
</tr>
<tr>
<td>• Player A plays shots to all parts of court for Player B to return to set position.</td>
<td></td>
<td>• Extended Phasing Play: Players play long until sure of opponents poor recovery to “T” and then play short. Can be combined with Random and Options.</td>
</tr>
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</table>

Anticipation

There are two main forms of anticipation required in squash - anticipation of the bounce of the ball (and the intended point of impact with the ball) and anticipation of the opponent’s intentions.

The beginner initially has poor understanding of the way in which the ball reacts when it bounces around the court - not only from the floor but also from the walls. The tactical requirements of the beginner are based on the need to just keep the ball in play.
As he/she progresses (and the “will to win” emerges) the need to anticipate the opponent’s next shot becomes increasingly important due to the increasing tempo of play and the speed and retrieving ability of the opponents.

Research has shown that the most important cues, required for accurate anticipation by the expert player of his opponent’s intentions, to be the ball, the arm and the racquet (Abernethy, 1991).

Table 3: Progression/Type of Training Activities for “Anticipation”

<table>
<thead>
<tr>
<th>Beginner</th>
<th>Intermediate</th>
<th>Advanced</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Coach throws the ball into set positions for player to play set stroke</td>
<td>• Coach feeds ball to variable positions for player to practice set stroke</td>
<td>• Allow partner (player B) to play a choice of two shots from one position using deceptive techniques with player A to play just one response</td>
</tr>
<tr>
<td>• Player feeds the ball into set positions for self</td>
<td>• Coach feeds ball in variety of ways to variable positions for player to play set stroke</td>
<td>• Allow player B to play a choice of shots using deceptive techniques from more positions with player A to play just one response</td>
</tr>
<tr>
<td>• Coach feeds the ball onto front wall to rebound to set positions for player to play set stroke</td>
<td>• Introduce partner drills incorporating shots to be practised being played from various positions</td>
<td>• Allow player B more variables.</td>
</tr>
<tr>
<td>• Player feeds the ball onto front wall to rebound to set positions and executes set stroke.</td>
<td>• Introduce a new stroke/shot</td>
<td>• As the player becomes more expert, the coach (or partner) can hit the ball to all parts of the court and the player can be required to either return the ball to the coach or to play a shot nominated by the coach.</td>
</tr>
</tbody>
</table>

Deception

The ability to deceive the opponent becomes increasingly important as the retrieving ability of the opponent increases.

Deception in squash can be defined as:

1. The ability to eliminate the opponent’s capacity to anticipate the next shot.
2. The ability to confuse the opponent into anticipating a different shot to the one that is actually played.
3. The ability to disturb the opponent’s anticipation of the timing sequence of the player’s stroke - including the pace of the stroke, so that the opponent is less able to react effectively.

The use of deception starts to occur quite early in the player’s development but the most effective techniques are not usually integrated into the player’s training until quite late. The decision during the rally to use one or more of these techniques relies on the understanding and interpretation of a wide number of cues and having identified, by appropriate research (Abernethy, 1991), the most important cues for effective anticipation, fundamental components of technique development may
have to be altered in order to increase effective deception - eg. position of ball relative to body at impact, grips and swings.

**Table 4: Progression/Type of Training Activities for “Deception”**

<table>
<thead>
<tr>
<th>Beginner</th>
<th>Intermediate</th>
<th>Advanced</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Develop techniques that allow the ball to be played from various positions relative to the body</td>
<td>• Develop variation in timing sequences of strokes - ie. Delay</td>
<td>• Develop ability to play soft shots with large swings and vice-versa</td>
</tr>
<tr>
<td></td>
<td>• Use wrist and grip to facilitate unusual angles and effects</td>
<td>• Introduce drills that allow player A to play a choice of shots using deceptive techniques from more positions with player B to play set responses</td>
</tr>
<tr>
<td></td>
<td>• Create need and ability to cover ball-contact with body</td>
<td>• Integrate deception training with partner’s anticipation training</td>
</tr>
<tr>
<td></td>
<td>• Introduce drills that allow player to play a choice of two shots from a position using deceptive techniques with partner to return the ball with volley response</td>
<td>• Integrate deception training with shot selection training</td>
</tr>
</tbody>
</table>

**Steps to Designing a Perceptual Motor Skill Development Program**

1. Perform a task analysis of the **tactical/strategic decisions** required by the sport - e.g. shot selection, preparation for shot performance, etc;
2. Perform a task analysis of the **anticipation** requirements of the sport;
3. Through appropriate research (such as Abernethy, 1991), identify the key components of the opponent’s activity that provide **essential information** for effective anticipation - ie. cues;
4. Analyse the various activities, drills or routines that are used in training to identify those that may have a beneficial or negative effect on these three areas;
5. To complement and/or enhance these, design new drills, activities or routines that effectively stimulate the player’s perceptual skills in these areas - ie. Accurately simulate match context in a drill environment;
6. Initially reduce the number of decisions and skills required to a minimum and repetitively rehearse the situation - at first to assist in “grooving” the **correct response** and then to enhance the **skill performance** in that situation;
7. Repeat for all identified situations with possible or alternative responses;
8. **Overload** the decision-making, anticipation processes by reducing the time available for decisions and subsequent skill executions;
9. Combine drills/activities to increase decision-making opportunities and overload;
10. **Add options** to one decision-making situation of the drill/activity;
11. **Increase options** for decisions based on advanced or more subtle cues. This does not necessarily mean that the player must be aware of the cue - rather the option itself provides a stimulus for increased attention to the particular cue;
12. Attempt the above under match conditions.

**References**
