Decision Training

and

Skill Development Practices

Decision Training in Ice Hockey

University of Calgary Bookstore
Phone: 1-403-220-5937
Fax 1-403-284-4454
Email: wwatson@acs.ucalgary.ca

Skill Development Practices using Decision Training

Bill Bowker
Wilfrid Laurier University
Phone: 1-519-884-1970 ext: 2182
Email: BBowker@WLU.CA
CROSS ICE PRACTICES

2 on 2 -- 3 on 3

By reducing the space the athlete must work in, it will increase the speed of the decision making process. By simply playing cross ice hockey without specific rules or decision making requirements by the athlete it will only produce "Shinny" Not intelligent capable athletes. We have a responsibility to develop the decision making skills in order to hand the ownership of the game over to the athlete.

As coaches we do not want to remove the creativity of the intelligent game from our athletes. We have to start to develop intelligent, creative and highly skilled players to meet the demands of today's game. Skill is not enough and intelligence is not enough, it must be a mixture of both and we must teach the game withing these confines.

This is not to say we should not use all of the ice.

hockey is played 1 on 1 x 5

EVERYONE MUST THINK!

We have to develop the players thinking with and without the puck. When teaching small children in a full ice flow drill, how often do they really have to think and sometimes how often do they just go through the motions of the drill and not know what they are doing or even why they have skated up and down the ice.
Cross ice  3 on 3

With rules

1. If a player on the team makes a Mental Mistake or their team is scored on: his/her entire team, including those waiting must do a roll-over. It creates responsibility

2. There always has to be one player inside the face off circle. Decision Training.

3. The puck must be carried out of the face off circle and not shot away. Skill and Decision Training.

4. The first pass must be back to a support person: Decision training.

5. Now add SKILL Development and COMPETITION to the CROSS ICE GAME:
List of cross ice game rules:

1. Scoring from a pass only
2. Backhand passes only
3. Score on a rebound only
4. Receive a pass only on your backhand
5. Passing allowed only upwards
6. Passing allowed only downwards
7. Passing off the boards only
8. 1-3 passes before scoring
9. Scoring only from certain area’s
10. Scoring only by a stationary player
11. Every player has to touch the puck before scoring
12. There must be a screening player
13. You can not pass the puck back to the player you receive it from
14. You can never turn your back on the puck
15. Players without the puck must talk
16. Pressure on the puck carrier with two players
17. Pics and screens after you pass
18. Player with the puck can not move until a pic or screen is done
19. Passing only to a player who is moving
20. No passing in the middle zone

Bill Bowker
Wilfrid Laurier University
Preface

The essential message of Decision Training in Ice Hockey is that in a game, athletes are continually making small decisions (and on occasion, big game winning decisions!). To be successful, to perform at their maximum, to make the right decisions the majority of the time, athletes must learn and practice decision making as part of their training.

Decision Training in Ice Hockey is written primarily for coaches and coach educators. It will also be valuable and beneficial for players to be involved in open dialogue with their coaches about coaching methods. It provides practical methods to improve athlete performance through improved athlete decision making. It is not a book on the theory of decision making. It is however, a book that is based on research: by explaining in detail the research foundations behind decision training, it provides the tools for athletes, coaches and coach educators to apply the principles of decision-making to every situation.

Some coaches will feel uncomfortable with the approaches recommended in this book. Some coaches conduct their practices in a very direct manner, controlling all possible aspects of the training session. The leadership role of the coach requires that you provide direction, that you help the athlete develop very high standards of performance. Are you doing this in a way that also develops the ability of the athletes to perform independently in competition, to make the right decisions when they are on their own in a game?

Decision Training in Ice Hockey deals primarily with conducting effective practice sessions that develop the decision making ability of the athlete. It deals with the design of the practice session, the methods of instruction used by the coach, the feedback loop between coaches and players. By using the methods recommended in this book in these aspects of your training, you can help your athletes be better prepared for competition.

Decision Training in Ice Hockey grew out of the Coaching Effectiveness course at the National Coaching Institute (NCI) - Calgary (University of Calgary, Alberta, Canada). It is a result of teaching the current research in sport pedagogy while observing and assessing coaches conducting practice sessions. During these observations, the underlying questions are: Do the athletes really know what they should be doing? Are they being challenged in a way similar to what they will face in competition? What effects of the training will transfer to competition performance?

The NCI students and master coaches were asked to devise methods that were consistent with the research and that would contribute to athlete decision making and performance. The technical expertise, the ability to interpret the research and apply it to ice hockey was provided by 1996 NCI coaches Jim Curry and Melody Davidson as well as NCI Master Coaches Tom Renney and Mike Johnston.

In addition, 1996 NCI coach, Todd Allison took on the immense task of editing and laying out the manuscript with the guidance of Sharon Bhola.

We hope you find Decision Training in Ice Hockey a thought provoking and valuable aid to your coaching endeavours. It's time to make the first decision -- try decision training -- it's an exciting and rewarding way to coach.

John Bales
Joan Vickers
September, 1996
In every sport, athletes make decisions that determine the success of every effort. Where to place a shot, when to make a move, how to recover body position. These decisions happen continuously throughout a competition and are instrumental in the final competitive result.

What can athletes do in practice to prepare them for making optimal decisions in competition? How can coaches help athletes learn to make effective decisions, so that when it counts the athlete is prepared to perform?

Decision training helps the athlete handle the pressure of competition by incorporating in practice training methods that simulate more accurately what happens in competition. When decision training is used, the athlete is given the opportunity to develop the attention, anticipation, problem solving and other mental skills needed to perform at a high level. Decision training prepares the athlete psychologically — the end goal is a mentally capable and confident athlete.

Decision training has a research foundation largely unknown in the coaching community. This research, some of which we will share with you in this book, shows that traditional or bottom-up coaching methods often lead to quick improvements in practice but athletes trained exclusively under these methods often break down under the stress of competition. If your athletes seem to perform at their best in practice and then falter later during competition then decision training may be for you. If your athlete’s performances are sporadic alternating between very good and poor results then decision training may help. More important, if you know your athletes are prepared physically but constantly break down mentally in competition, then decision training may be the added dimension that will change the outcome for you.

Decision training is not a sporadic event in coaching. It occurs every day, during every practice — and as soon as possible in an athlete’s development. Decision training can be used with the young and old, with elite, intermediate and novice athletes.

Integral to decision training is the belief that athletes need to learn to make good decisions in active partnership with their coaches and others involved in their training. Our target audience is therefore both the coach and the athlete. It is very important that the athlete understand the research foundations of the decision training process and we encourage you to share the material in this book with them. It is also a good idea to share this research with others involved in your sport, especially parents, guardians, sport leaders and administrators. This is because the early effects of using decision training are often less positive than those encountered when using traditional bottom-up methods.

Schmidt (1991) summarizes the puzzling nature of these results as follows “numerous recent experiments have generated very surprising findings that seem to contradict standard views of practice. The challenge is to understand how conditions that degrade (early) practice performance can produce more learning” (p. 201).

It is only by understanding the underlying research foundations of the decision training process that this can be achieved.

In Decision Training in Freestyle Skiing, six research based methods are presented — random practice, variable practice, tactical instruction, video modeling, delayed and reduced feedback and video feedback. Specific freestyle activities are presented for each so they can be implemented immediately in your practices. For each method, easy and more difficult decisions are presented so they can be taught to young beginning athletes, as well as older, more experienced performers.

Decision training creates a new coaching environment, one we feel is essential in the successful development of today’s athlete.
The Reversal Effect

One of the most intriguing results emerging from the practice, instruction and feedback literatures in motor skills research today (Christina & Bjork, 1991; Farr, 1987; Lee, Swinnen & Serrien, 1994; Schmidt & Bjork, 1992; Vickers, 1994) is the reversal effect shown in Figure 1.1. Subjects trained under highly structured bottom-up conditions achieve high levels of success early in practice but often falter later when the stress of competition mounts. In contrast, those trained under top-down conditions show an opposite profile — initially they do not perform as well as bottom-up trained athletes but excel later when faced with new, difficult and challenging conditions.

Table 1.1 provides an overview of the characteristics of bottom-up and top-down coaching. Bottom-up methods follow a part to whole, simple to complex progression of drills in which the coach begins the season with basic skills and builds gradually to full competitive situations later as the season progresses. There is extensive use of training involving blocked and repetitive practice of discrete skills. Because technical perfection is stressed, there is low variability and complexity in the skills practiced. These conditions are accompanied by very high levels of coach feedback and virtually no input by the athlete in terms of self analysis and correction. Practices are physically rigorous, but decision training is delayed until later in the season. Or, decision training may never be included in the overt sense we are recommending here. It is also a characteristic of bottom-up coaching that video modeling and video feedback are used sporadically instead of on a regular basis. Overall, there are low levels of athlete cognitive effort defined by Lee et al (1994, p. 328-329) as the “mental work” involved in high levels of “decision making ... anticipation, planning, regulation and interpretation of motor performance”.

Table 1.1 Bottom-Up and Top-Down Methods

<table>
<thead>
<tr>
<th>Bottom-up</th>
<th>Top-down</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technical, physical emphasis</strong></td>
<td><strong>Tactical, cognitive, decision-making emphasis</strong></td>
</tr>
<tr>
<td>- Part to whole training</td>
<td>- Holistic-conceptual training</td>
</tr>
<tr>
<td>- Simple to complex drills</td>
<td>- Competition-like drills</td>
</tr>
<tr>
<td>- Technical emphasis</td>
<td>- Decision-making emphasis</td>
</tr>
<tr>
<td>- Blocked practice</td>
<td>- Random practice</td>
</tr>
<tr>
<td>- Low variability</td>
<td>- High variability</td>
</tr>
<tr>
<td>- Lots of coach feedback</td>
<td>- Reduced, delayed, summary feedback</td>
</tr>
<tr>
<td>- Low levels of questioning</td>
<td>- High levels of questioning</td>
</tr>
<tr>
<td>- Low levels of athlete detection and correction of errors</td>
<td>- High levels of athlete detection and correction of errors</td>
</tr>
<tr>
<td>- Low use of video modeling</td>
<td>- Extensive use of video modeling</td>
</tr>
<tr>
<td>- Low use of video feedback</td>
<td>- Extensive use of video feedback</td>
</tr>
<tr>
<td>- Low levels of athlete cognitive effort</td>
<td>- High levels of athlete cognitive effort</td>
</tr>
</tbody>
</table>
'Bottom-up' and 'Top-down' Coaching

When a coach uses bottom-up methods exclusively, what reasons are given for why athletes succeed in the short term, but are unable to sustain these levels later in competition? No one reason exists, instead many appear to contribute to why the break down occurs later during more difficult and challenging situations.

- Bottom-up methods appear to be limited in helping the athlete understand what really needs to be done. There is too much emphasis on isolated skills and not enough attention to the strategic complexities of the sport.
- The sole use of bottom-up methods may lead to the athlete perfecting certain aspects of their sport at the cost of essential other areas. Critical aspects are simply not trained.
- Because the athlete appears to be successful in practice they develop a type of false confidence that crumbles in the face of tough competition. In fact, these athletes have had limited training in handling what really occurs.
- There may be too much dependence on the coach. When faced with the inherent difficulties of competition, the athlete has not developed the self assurance, mental toughness and confidence that is a characteristic of today's top athletes.

Overall, the exclusive use of bottom-up methods appears to retard the development of the psychological strength and creativity needed to perform at the highest levels.

What is top-down coaching?
Tables 1.1 presents the characteristics of top-down coaching. Table 1.2 presents the specific decision training methods featured in this book. Instead of beginning the season with basic skills training in isolated settings, the athlete trains within tactical situations where the decisions needed in the sport are trained from the outset.

**Random and variable practice** drills and activities are used daily that require the athlete combine technical and physical skills within tactical situations similar to those found in competition (see Practice section).

**Tactical instruction** is provided where the coach teaches the strategic knowledge and critical insights needed to achieve excellence. Instead of teaching the skills of the sport in isolated artificial drills, the coach makes extensive use of advanced organizers, video models, simulations, and other methods that teach these higher forms of knowledge throughout the season (see Instruction section).

**Direct feedback** from the coach is intentionally reduced and delayed over the course of a season and/or an athlete's career. Gradually, a questioning style is introduced where the athlete becomes more directly involved in making decisions about their own development. Video feedback is used often with the expectation the athlete learns to identify, analyse and correct those elements that need perfecting in consultation with their coach as well as on their own (see Feedback section). As shown in Figure 1.1, the introduction of top down decision training often causes the athlete to improve at a slower rate than when bottom-up methods are used. This is because the training situation is more challenging and the level of physical and mental skills to be learned are more complex. Over time, however, research shows these athletes excel. Since the positive effects of decision training are delayed, it is critical that both the coach and athlete understand the decision training process in terms of both its short and long term consequences.

**Where to start?**
Many coaches already use aspects of decision training so for them it is a matter of increasing its use. If you have been primarily a bottom-up coach (see the Who Am I? section) then it is recommended that you gradually introduce more and more decision training into your program. The following page show how one evolves to achieve the goals of decision training - from a completely bottom-up approach to one where decision training plays a major role in your program.
The Formula for Success

**Top-Down Decision Training**

- **Goal - High Levels of Cognitive Effort** - The athlete is continually involved in activities that are mentally challenging and relevant to their success.
- **Bottom-Up**
  - **Goal - Low Cognitive Effort** - The athlete is under challenged mentally. They are required to make few decisions or provide input to their training.
  - **Blocked practice** - Drills and activities stress a few skills to a high degree of perfection rather than many skills under all conditions that will be encountered.
  - **Low Variability** - Drills are designed so that a single aspect of a skill is practiced while neglecting other variations of that class of skills.
  - **Technical Practice** - Stress is only on technical, biomechanical, physical aspects of performance isolated from tactical and competitive situations.
  - **Video Modeling** is not used or used sporadically. Athletes are not taught how to use this information on their own.
  - **Video Feedback** is used rarely and is not a part of practice or competitive preparation.
  - **No Bandwidth Feedback** - Feedback is given immediately and often without any standard of athlete self sufficiency expected.
  - **No Questions** - There is limited or no questioning of the athlete or receipt of responses. There is no emphasis on the athlete developing effective communication skills about their own and others performance.

- **Goal - Random Practice** - Drills and activities are designed that combine a number of different skills into effective combinations under all conditions that will be encountered.
  - **High Variability** - For each major class of skills, drills and activities develop many variations under all conditions typically encountered.
  - **Tactical Instruction** - The coach stresses strategic thinking skills. Critical concepts are demonstrated & explained and practiced in modified, simulated and real contexts.
  - **Video modeling** is a regular part of practice. The athlete learns to use video information in consultation with the coach and others and eventually on his or her own.
  - **Video feedback** is a part of regular practice and competition. The athlete learns to analyse and use video information of self and others.
  - **Bandwidth Feedback** - A gradual fading or withdrawal of corrective feedback as skill level increases. Athletes develop confidence they can perform without intervention.
  - **Questions to the athlete** are frequent and sport based. Effective communication is expected about the technical, tactical, mental and physiological aspects of the athlete’s training.
Why Random Variable Practice is Important in Decision Training

Most of us were taught to use a perfect staircase of progressions when teaching a skill or strategy. We were taught to start with simple skills and lead athletes to the more complex skills and strategies gradually over time. Many of us developed perfect progressions that seemed to work magic right before our eyes -- or so it seemed.

How many times have you found yourself in this situation? Early in the season you carefully teach the technique of critical skills using your perfect progressions. Your athletes seem to master the techniques, making rapid improvements. Later, after a few days, weeks or months they regress to their old habits, or worse, forget what you taught them all together!

If this is happening to you, then consider the study shown in Figure 2.1 by Shea & Morgan (1979). It was this study that first challenged our extensive use of highly structured simple to complex "perfect progressions" in coaching. Shea and Morgan's study replicated earlier studies by Battig (1972) in reading and by Cuddy & Jacoby (1978) in mathematics. Subjects practiced four levels of a complex arm movement under either blocked or random conditions. Those in the blocked condition practiced the least complex level to a high standard and when proficient moved on to the more complex second, third and fourth levels. Those in the random group practiced each of the four levels in an order dictated by chance. As can be seen in Figure 2.1, over the acquisition period the blocked group was more successful. Indeed, if the experiment had been stopped here the overall results would have recommended blocked training. However, note that when the blocked groups was asked to perform exactly the same skills later at 10 minutes and 10 days (retention) they did not do as well as the randomly trained group. Indeed their performance returned to the same level as their first practice attempts. In contrast, the random group never achieved the levels of the blocked during acquisition but performed at the higher level later. Figure 2.2 shows the results when both groups were asked to perform a novel variation of the skills learned earlier (transfer). After ten days, the blocked group's performance became much worse suggesting that highly structured and rigid training protocols actually harm later performance when new and unexpected conditions are encountered. Transfer results are very important as they resemble the conditions that athletes typically face. During a transfer test the subject has to take what was learned earlier and solve a new and challenging problem -- precisely what athletes face in competition.

Figure 2.1 The beneficial effects of random practice: During random practice of four arm movements, performance was lower initially than under blocked practice. During retention where the same skills were performed later, the random group performed at the higher level.

(adapted from Shea and Morgan, 1979, with permission of the Journal of Experimental Psychology.)
But do these results apply to the real world coaching setting? Results from a study by Hall, Domingues and Cavazos (1994) are shown in Figure 2.3. The subjects were athletes on an NCAA baseball team, divided into three extra hitting groups. The blocked group took extra hits after practice as follows: 15 curves, 15 fast, 15 change-ups. The random group took 45 hits but the three pitches were delivered in random order. The control group took regular practice and no extra hits. As can be seen in Figure 2.3, the blocked group did best at first but was overtaken by the random group after the 8th practice. In the final 12th practice all groups hit under both random and blocked conditions. The superior performance of the random group is clearly evident under both conditions.

Why did this occur? Imagine being in the random group. On every pitch you have no idea what pitch is being delivered. You have to be mentally prepared for all 540 pitches. Now imagine being in the blocked training group. You have to mentally prepared for the first couple of pitches per set as the same pitch is delivered 15 times. Over all practices, the random group had much more mental and physical training than the blocked group.

A weight of evidence currently supports training under random and variable conditions. For more information on this intriguing and counterintuitive phenomenon, we recommend Goode & Magill, 1986; Lee, Serrien, 1994; Liu & Wrisberg, 1991; Magill & Hall, 1990; Schmidt, 1991; Wrisberg, 1991.
Random Practice Applied to Ice Hockey

Random Practice in ice hockey is achieved by creating game-like situations where an athlete is required to select from a number of tactical choices the one that is most appropriate for the situation. The design of the practice should be such that neither offensive nor defensive players are prepared for what their opponent will be doing. Options that can be randomized are skills such as driving, passing, shooting or delaying on the attack. Because all of these options are distinct possibilities in a game, their inclusion in practice is essential. Ice hockey players must use many different skills in each game. Successful players, both defensive and offensive, must be able to decide immediately which tactics are needed and the optimal skill needed by interpreting cues from their opponent’s actions.

The Atlantic 1 on 1 Drill

simulates the foundation of the game -- the 1 on 1. Both offensive and defensive players must read and react continually as each tries to gain an advantage over the other. As the defender is trying to eliminate as many attacker options as they can by manipulating their gap and body position, the attacker is trying to read what the defender is giving up in order to exploit that seam. This will enable the athlete to potentially gain an advantage in a game.

Atlantic 1 on 1 Drill Set Up

- F1 & D1 pass the puck as D1 skates backwards.
- Once F1 reaches centre or D1 is at the far blue line, F1 takes the puck back to the blue line
- F1 attacks 1 vs 1
- D1 must touch centre before retreating backwards
**Easier Decisions**

- (Defense) leave ice in front, behind or to the outside.
- (Forwards) give specific tactical direction such as wide drive and shoot from the circle.
- If the number of decisions that the player will need to perform is reduced, the drill will be easier.

**Harder Decisions**

- Allow the attacker to use any tactic they wish.
- Add a second attacker at different points and/or at different times.
- Encourage the defense to pressure before their blue line.

**Coaching Cues ...**

- gap control
- deflect outside
- read -- drive, cross or delay
- speed
- puck protection
- finish

---

**Cognitive Skills Trained**

Decision making becomes more difficult when an attacker must perform any number of tactics on the rush. It is the difference between a traditional practice and a game. If a player is out of position they are forced to be reactive rather than proactive. Random Practice principles offer the players the chance to improve their decision making. Effects of the Atlantic 1 on 1 drill are visible in:

- **Anticipation**: By presenting a variety of individual offensive/defensive tactics, the defensive/defensive player begins to react naturally to all cues.
- **Attention**: The forwards learn to read the ice given by the defense while the defense learn forwards actions based on their positioning and individual skill.
- **Concentration**: Game like situations in practice allow the athlete to focus on their tactical execution rather than drill patterns.
- **Memory Retrieval**: As each play is unique, the athletes make decisions based on the cues presented and draw the best alternative from their inventory of skills. The Atlantic 1 on 1 provides exposure to a variety of attack patterns.
- **Problem Solving**: Each action by an opponent requires that the player perform a counter move. In this drill, the athlete learns to react appropriately to their opponents tactics. They will recognize opportunities to exploit mistakes.
- **Confidence**: The success of a reaction, or the lesson learned from an error, give players confidence that they can make decisions at full speed, in the heat of a game situation.
- **Automaticity**: Players learn to react automatically to the actions of their opponents by experiencing the success and failure of their moves in the drill.

**Attention + Anticipation + Concentration + Memory Retrieval + Problem Solving + Automaticity + Creativity = Decision Training**
Variable Practice Applied to Ice Hockey

In every play of every game, an ice hockey player needs to perform many variations of each skill that is in their repertoire. For example, offensive and defensive players need to take backhand, wrist, snap and slap shots from different locations on the ice for different reasons. Learning to shoot is important but more important is gaining exposure to the different types of shots, and making the best decision on which shot to use in each situation. A practice incorporating these variations offers a great learning opportunity for both the attacker and the goalie. Each player’s experience is unique and both are exposed to a variety of events.

**Triple Threat**

allows the shooter the opportunity to shoot a variety of shots from different locations. The goalie is forced to be ready and stay square, always prepared for a shot, yet not knowing when it will come. Situations such as this closely simulate a game, for both the shooter and goalie.

**The Triple Threat Drill**

- O1 shoots on a breakaway
- O1 quickly goes to the left corner and walks out for a shot or a pass to X1 who shoots
- O1 gets a puck from the right corner and passes to X2 or shoots.
- A variety of shots are used
Easier Decisions

- eliminate the checker -- isolate the skating pattern and attack
- have the man without the puck act as a rebounder instead of a defender

Harder Decisions

- have F1 join the attack making it a 2 on 1
- have the players play the puck until there is a goal or the puck is frozen by the goaltender.

Coaching Cues ...

- puck protection
- quick feet
- build a wall
- gain funnel
- goalie positioning
- quick release
- neutralize stick
- seals on rebound

Cognitive Skills Trained

Complex tactics and skills are often difficult to understand without seeing. Watching an expert model, either live or on video, allows the athlete to see how they can improve in the play.

Complex drills such as the Olympic Drive Drill are more understandable if Video Modeling principles are applied. Video Modeling of the Olympic Drive Drill affects the players in the following ways:

- **Anticipation:** Players see how to make better and quicker decisions. The players learn where they need to go depending on where the pass goes and how the play unfolds.
- **Attention:** Each athlete will not know their role in the drill until the pass is made. Each athlete needs to focus on where the pass is going and how that affects their role in the drill.
- **Concentration:** The athlete will be able to know what the important tactical elements of the drill are. Over time, they will keep the end result, the drive for the net, in mind during the execution of the drill.
- **Memory Retrieval:** The video model provides each athlete with a mental image of the drill. This mental image assists the athlete in knowing what to do to reproduce the actions.
- **Problem Solving:** Seeing where the expert models had difficulty when executing the drill can help the players anticipate potential problems and be able to preprogram solutions.
- **Confidence:** The Olympic Drive Drill is very game-like, players will gain confidence in their abilities to react and execute in game conditions.

- **Automaticity:** Knowing ahead of trial how the drill unfolds will allow the athletes to focus their attention on the strategic elements of the drill and let the physical elements occur naturally.
Why Reduced Delayed Feedback is Important in Decision Training

One of the oldest beliefs in coaching is that athletes need a lot of continuous feedback that is instantaneous and specific. The widespread belief that high levels of feedback are critical in achieving high levels of performance is also supported by the design of existing evaluation tools, observation instruments and instructional models. Abundant feedback is encouraged, regardless of the age of the athlete, the type of sport or the level of competition.

It therefore comes as quite a surprise that the new research on feedback advocates providing less and less to the athletes as the season progresses. To achieve high levels of long term performance, feedback should be gradually reduced thereby asking the athlete to function more and more on their own, independent of corrective information from the coach (Lavery, 1962; Schmidt, 1991).

Research showing this was first published over 30 years ago (1962) by Lavery, whose results are shown in Figure 4.1. Subjects practiced a complex skill over a three month period. The “Summary” group was given feedback only after completing 20 trials. The “Immediate” group was provided feedback after every trial while the “High Feedback” group receive feedback after every trial as well as a summary after 20 trials. First, note the quick and dramatic improvement of the Immediate and High Feedback groups. The rapid improvement in performance of these two groups shows why high levels of feedback have been advocated in the past — positive effects are seen immediately giving both the athlete and coach encouraging signals regarding performance. In contrast, those in the Summary group, where feedback was withheld, lagged well behind throughout the six day training period. With results like these it is no wonder this approach was initially rejected. However, look what happened when the subjects were followed for an extended period of time, under the conditions of withdrawn feedback. Note the reversal in results as the Summary group continued to improve while the Immediate and High Feedback group’s performance declined. Note also that the Summary group was able to retain the higher performance level to the 30th day without any feedback while the performance of the feedback groups continued to decline. Finally, the results show that all the groups fell back in their performance after three months showing that a complete withdrawal of feedback is not a good idea.

In the following sections we describe how much feedback
should be given and why too much impairs long term performance. Research by Winstead & Schmidt (1990), Swinnen, Schmidt, Nicholson & Shapiro, (1990) and Butler, Reeve & Fischman (1996) now argues not only for a reduction in the frequency of feedback but also for a delay in when feedback is provided. A 'bandwidth' of feedback is recommended (Sherwood, 1988) in which levels are reduced as skill is achieved.

When feedback is provided following a bandwidth strategy, the athlete is required to be more self sufficient; they are given more opportunities to analyse their own errors and provide self-correction. They are more cognitively involved in the decision making and the problem solving associated with improving their own performance.

Similar findings have been reported in many school subjects as well. Shroth and Lund (1993) found that students were better at using analytic strategies in identifying rules and prototypes when feedback was delayed than when a constant feedback schedule was followed. Day & Gordon (1993) found that students as young as grade three did better when a 'scaffolded learning' technique was used where the amount of feedback was decreased as their skill levels increased.

Finally, Reeves and Butler (1996) have shown that when you use a bandwidth it is important that your athletes know why you are not supplying feedback. You should tell them that your intention is for them to have an opportunity to analyse and offer suggestions for the correction of their own performance.

Implementing a New Feedback Strategy

It is important to fully understand the situation shown in Figure 4.1. Would you be able to watch your athletes struggle over six days of practice without giving any individual or group correction? Think of how much easier it is to be a high frequency feedback coach. Athletes improve immediately and rapidly as a consequence of the information you are giving them, thus providing both the athletes and the coach with a great deal of satisfaction. Think also of the consequences of following a reduced and delayed feedback strategy while being observed by another coach, a supervisor or a parent.

We therefore recommend the following strategies be followed when implementing this new feedback research —

1) educate your athletes (and parents, supervisors, ...) about the new feedback literature,

2) adopt a "bandwidth" feedback strategy that gradually introduces your athletes to reduced and delayed amounts of feedback

3) manage the feedback delay by incorporating a questioning style into your coaching.
Three Feedback Strategies

1) Educate Athletes About the New Feedback Research

Communicate to your athletes the following feedback concepts:

1. High levels of coaching feedback normally lead to high levels of immediate performance but the athlete is unable to sustain these levels later on.
2. The inability to sustain performance appears to be due to two factors: First, the athlete is too reliant on the coach. Second, because of that dependency the athlete has not developed the mental skills needed to perform at a high level on their own.
3. During every practice, athletes need the opportunity to learn how to analyse their performance.
4. Verbal communication with the coach is at the heart of this process. For some coaches and athletes this may be a new skill that must be learned like all others.
5. Athletes need to be told that the coach is withdrawing feedback in order to give them a chance to analyse their own performance. It must be stressed that they are not being ignored.
6. Athletes should be encouraged to use video feedback and other means to gain a better understanding of their performance.
7. The coach must exhibit complete confidence that the athletes can succeed in this important dimension of decision training.

2) Use Bandwidth Feedback

Figure 4.2 presents a bandwidth applied to any skill or strategy that you want your athletes to perfect. The centre line reflects ideal performance. Located here in the “minds eye” of the coach are the many qualitative and quantitative aspects underlying perfect performance.

The two bandwidth lines reflect when feedback is given. When performance falls outside of these expectations then corrective feedback is given. In these instances, the athlete is having problems with critical aspects that must be corrected regardless of skill level.

When performance falls within the bandwidth lines, the coach has made a judgement that the athlete is able to correct these errors on his or her own. Over time and as skill level develops the amount of feedback given is faded as more and more of the athletes attempts fall within the bandwidth lines. Where the bandwidth lines are placed depends on the skill level of the athlete, the expectations of the coach, the time in the season, the date of the next competition and so on.

Placing the bandwidth lines nearer the centre increases the feedback zone and the amount of feedback you feel the athlete needs. This occurs with novices or with individual athletes at any skill level when more feedback is called for.

Moving the bandwidth lines out away from centre increases the zone where no feedback is given. This should be the coaches goal. The athlete should learn to effectively analyse more and more of their own performance in practice, during competition and on videotape.