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The use of video feedback as a performance analysis coaching tool in amateur level ice hockey.

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With the advancement of digital video and computer technology over the past ten years there has been a considerable increase noted in the use of video analysis as a coaching tool in ice hockey. This has been especially noted in the greater Montreal area of Canada, where coaches are often under pressure to develop emerging talented players who aspire to a pro hockey career.
The purpose of this research was to investigate how much performance analysis through video was being used and what it was being used for. The focus area was on amateur teams from midget level through to college and junior pro, such as the QMJHL.

To collect data a questionnire was used to survey the coaches and players views on using video analysis as a tool for coaching. The study was done in Montreal Quebec, Canada with coaches that ranged from midget grade, through junior to college and men's pro.

The survey covered what video analysis is currently being used for, what both the coaches and players expected to gain from its use, its benefits and draw backs with regards to athletes playing abillity and its usefulness as a coaching tool. The findings were compared with existing research which has made use of notational analysis and latterly video analysis.

The study shows that the views towards video analysis of both coaches and players is positive, with it overall being found as useful. Coaches results showed that at the younger levels it is presented more as a player development tool to help the young athlete reach the next level. Coaches in the higher levels use video mainly as an oppostion scouting tool and a systems presentation to the team. Players at a younger age liked to use video to help with their "game sense" whereas older players in higher levels do not rely on video to help "fix" their game but more to just study the other team's systems as well as their own.

Keywords Coaching, , video feedback, performance analysis, notational analysis, ice hockey.

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1 Introduction

The coaching process can be thought of as an ongoing cycle of performance and practice. The role of the coach is to observe and analyse the performance and provide feedback, which can be incorporated into planned practice that should theoretically lead to enhanced performance. Successful coaching depends, among other things, on the accuracy of the observation and how well it is analysed.

It is therefore extremely important that the information collected during athletic performance is objective, unbiased, accurate and as comprehensive as possible. (Hughes & Franks 2008, 4.)

Where a team sport such as ice hockey is involved, the observation and analysis process becomes quite complex. Adding to this is that ice hockey can be described as an invasion team sport, where the success of the team not only depends on the individual skill sets of its players but also on the performance of its special teams and the interactions between players holding specialist positions.

For players, the participation in sport typically involves the intent to improve performance and one of the most important aspects to affect learning and subsequently performance, is feedback. The players and the coach have a common goal and that is to access effective and meaningful feedback on which to base improvement.

Traditional coaching often involves subjective observations and conclusions based on the coach's perceptions, biases and own previous experiences. However, a number of studies have revealed that subjective observations are potentially both unreliable and inaccurate. Examples are given within the research section of this thesis. (Franks & Miller 1986, 39-45).

Human memory systems have limitations and it is almost impossible to remember accurately all the meaningful events that take place during an entire competition, let alone provide any detailed analysis.

At the younger levels there is the added complication where parents and family members also desire to take part in the coaching process and a coach may easily find himself or herself challenged on several fronts to provide objective and meaningful feedback.

Coaches and spectators alike, often easily remember distinctive portions of a competition such as controversial decisions, exceptional performances, actions following stoppages in play, while non-critical events are most likely forgotten. This form of "highlighting" when combined with emotions and personal bias of the observer, may cause a distorted perception of the game in total. (Hughes & Franks 2008, 3.)

Collection of information that is objective, unbiased and as comprehensive as possible can be achieved by using notational analysis based on video.

Combining video and computer technologies has enabled coaches to collect data for post-event analysis using replay and slow-motion, resulting in retrievable, reviewable, unbiased analysis of team and individual performances.

Comparing the patterns of play of two opposing teams enables coaching staff to define the performance indicators that differentiate between the two teams and highlight the tactical strategies that contribute to the team's success. Being able to define quantitatively and objectively where technique fails or excels is of great practical use for a coach, especially one who is looking to analyse performance at different levels for developing and emerging players in the 16 to 25 years age range.

This study focuses on ice hockey in the Montreal, Quebec province of Canada, where coaches are frequently identifying and developing elite young players who aspire to a professional ice hockey career. Therefore rigorous feedback and evaluation is expected of them. The coach is not your regular Mum or Dad, unless he or she has had a distinguished ice hockey career.

Digital video along with advances in computer processing speeds and capacities have transformed both biomechanical and notational analysis almost beyond recognition in the past ten years, allowing for much faster turnaround time and more realistic feedback to coaches and players. (Hughes & Franks 2008, 18.)

Examples of use of video analysis can be found throughout the NHL. Its use was captured in the recent HBO Sports documentary, Capitals and Penguins 24/7, which aired in December 2010, as a build up to the NHL Winter Classic. Both teams are seen viewing previous game-play prior to the big games and the Penguins coach, Dan Bylsma uses individual play analysis with team members. (HBO Sports Documentary 2011.)

There are organizations that advertise software tools for use with video analysis. These utilize modern software capabilities, where interactive programmes can be used to identify player skills, special teams, identify specific episodes and analyse them. Examples are Interplay Sports Analyzer Pro (http://www.interplay-sports.com) and eSpor eAnalyze Pro (www.espor.com), which enable video clipping, capture statistics and allow telestration and use of interactive whiteboards. Steva Sports (www.StevaSports.com) was identified as a software trialled by most of the teams surveyed in this study.

In the past fifteen years the uptake of video analysis within ice hockey organizations has been massive. This study investigates the existing research on use of video feedback and analyses data from a sample of coaches and players about their experiences using video feedback at the junior amateur level in ice hockey.

2 Analysis and feedback in sport

2.1 The use of feedback in coaching

Video use in sport has been a part of our lives for many years. Consumers can watch sports channels, where broadcast material can provide a permanent record of a performance. Now days the performance can be downloaded onto DVD and sections frozen, slowed down and analysed frame by frame, using relatively basic twenty-first century technology.

As early as 1991 sports performance specialists were suggesting that video recording provides a relatively permanent, flexible resource for analysis (Dowrick 1991 in Hughes & Franks 1997, 11) and technology has advanced considerably since then.

Notational analysis is an objective way of recording performance so that critical events in that performance can be identified and quantified in a consistent and reliable manner. This enables qualitative and quantitative feedback, which aims at being accurate and objective. It is a means of collecting performance data on both the coach and the athlete. Advances in both computer and video technology can make this observation process more efficient and provide a coach with audio-visual feedback about their interactions with athletes. (Hughes & Franks 2008: 9,50)

Evidence from studies that have investigated the process of observation indicate how important notational analysis using video can be in augmenting a coach's performance. It is well documented that observational skills of coaches can be variable (Franks & Miller 1986, 39-45). A major problem for coaches, with providing feedback to athletes is that it is hard to try to remember and recollect all their memories of errors that have occurred and therefore the information being given to athletes could be incorrect. Several studies have shown these set backs in providing inaccurate feedback because the coach is unable to remember all the points that need to be made. Among these studies was that made by Franks and Miller (1986, 38-45), which compared coaching observations to an eye witness in a criminal event.

This study looked at comparing observations made of sporting events to eye witness observations in a criminal investigation. They found that the witnesses' testimonies were inaccurate if there was a high arousal level in the victim because of the nature of the crime and again if it was a very violent crime. Also the number of perpetrators led to a less accurate testimony by the eye witness.

Other factors, such as the seriousness of the crime and prior knowledge of the material that was stolen, helped lead to a better or less accurate identification of the thief from the witness.

This information was then compared to a group of novice coaches who were tested on their ability to recall events that happened in a soccer match. There were two groups of coaches, one group was given instructions prior and the other group instructions post match. They then answered a final questionnaire asking them to recall critical moments in the match. Both groups were able to answer about 42% of events in the match correctly. It was also seen that the events that they remembered with greater accuracy were specific stop start plays such as corner kicks, throw-ins and such. (Hughes & Franks 2004, 14-15) This was believed to be due to there being discontinuity in the otherwise continuous play for these events, acting like a memory jogger.

Memory research on international soccer coaches revealed that they too could only remember 42% of corrections that need to be made in a soccer match. (Franks (1993) in Hughes & Franks 2008, 3) It was also pointed out as an additional finding by Franks that the experienced coaches not only made wrong assumptions when events did not exist but they also stood by their false pre-conceived ideas. These studies show that the observations processed by normal human memory become a very unreliable source of information when it comes to feedback of an event or match. (Franks (1993) in Hughes & Franks 2008, 3)

In the earlier days of notational analysis use in sports, such things as pad and pen note taking and tape recorder experiments were tried but became inconclusive when argued that they didn't produce sufficient proof and were subject still to error. There needed to be a visual aid to capture these events so that they could be replayed, shown to and watched by the athlete, as feedback was given to them by the coach on correction. This is where a computer or camcorder became a useful tool to provide feedback, as it provided a relatively permanent record for reference.

2.2 Use of video in performance analysis.

In any sporting situation, especially where team games are involved, it is difficult for coaches to notice and remember all the key events occurring within a training session or in a game. Despite a coach having the knowledge, vision and powers of observation, either remembering all that has happened, then relying on recall or taking one's eye off the game to record the details, means the information collected will not be reliable. Analysis based on accurate observation and recall is a key tool for improving future performance. (Bishop. D, 2008, 39)

Performance analysis is now acknowledged as an aid to performance enhancement at all levels. It is about creating a valid and reliable record of performance by means of systematic observations that can be analysed with a view to facilitating change. Bishop identifies two distinct sports science disciplines:

- match analysis, which uses some means to record aspects of **team** performance
- biomechanics, which revolves around the sporting impact of individual **body** movements.

The two disciplines may use similar methods to collect data for analysis but the main thing they both have in common is measured observation during or after an event to quantify performance in an accurate, reliable and valid way. Without some means, even the most experienced coach cannot achieve this type of measured observation.

In coaching, feedback is the means of eliciting change.

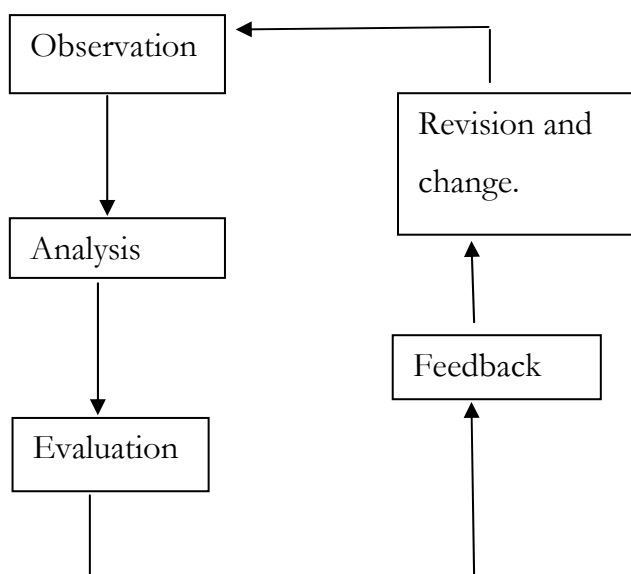The following diagram has been adapted from one suggested by Bishop.

Figure 1. The Coaching Feedback Cycle-an interpretation. (adapted from Sports performance analysis; coaching and training Dan Bishop, Peak Performance-39; www.pponline.co.uk)

This implies that without feedback, there will be no change in performance. The athlete will have no idea that there is an alternative or a better way. However it has been identified that coaches are only able to recall 30—50% of key performance factors they had witnessed, even with special training in observation. (Franks & Miller, 1991; 9 (3), 285—297)

The coaching process is not flawed, but the observation and analysis phases of the process are limited. Many great coaches are able to anticipate events and make appropriate changes to influence performance, but even the best are prone to human error and making wrong decisions. Athletes are often not able to place feedback into context as they cannot visualize what is being fed back to them. Video analysis can provide valid and reliable performance data to monitor and evaluate athletic performance.

2.3 Notational analysis and the role of video analysis in providing accurate feedback.

Notational analysis is based on the premise that no change in performance of any kind will take place without feedback. The role of feedback is central in the performance improvement process, and by inference, so is the need for accuracy and precision of such feedback. The provision of such feedback can only be facilitated if performance and practice involves a vigorous process of analysis. (Hughes & Franks, 2008, 8-9)

Coaches have always assumed their roles as feedback facilitators, but they recognise to a lesser and varied extent their role in the correct administration of feedback (its type, quantity and frequency). It is in their power to decide if and how to integrate feedback based technologies into their training protocols.

Video technology has significantly influenced training methods in the last ten years, because it has become relatively low cost, accessible to all and portable. A video recorder and a laptop can be taken along to games. However, how effective would video information be without a coach's guidance? As a young hockey player, I recall us being most interested in what else was going on around us rather than what was happening on the screen as we watched videos of our recent games.

Studies have found that while we might recognise more specialised and complex movements, such as those magnificent goal moments from our NHL idols on Youtube, whether we understand what we see, and can effectively relate what we see to our bodies and our own performance situation, is questionable. For example an experiment (Hodges et al., 2003, 18-22) where the movement goal was explained using only demonstrations with no augmented feedback showed demonstrations alone were not enough to specify the movement. Participants had difficulty understanding what was required. This was confirmed in error-detection tests provided at the end of practice, where several individuals were unable to differentiate the required movement pattern from incorrect yet similar movements.

Not only was an undesirable strategy adopted, but participants were not aware their movements were wrong. Video feedback about the learner's own movement helped to overcome some of the difficulties in error detection and subsequently led to correction. The performer is helped if they are able to compare and contrast across information sources and pick up subtle differences in the information content of the different displays. (Hodges & Franks 2003)

Individuals watching their performances on video cannot regulate the feedback they receive, and the information available might exceed the athlete's processing ability. Therefore the intervention of a coach is required, especially with inexperienced athletes. Coaches can help in pinpointing the relevant information and the subtle differences captured on video. Then they could use it as feedback that would help the performer to associate errors in performance, their corrections and the expected movement pattern. From video replays, coaches may extract two main kinds of feedback: qualitative aspects and quantitative information.

2.4 Qualitative Feedback

Video is mostly recognized as an appropriate medium for obtaining qualitative information about performance. (Liebermann & Franks, 2004, 166-188) This is further supported by my own findings where all of the coaches surveyed indicated that they used it as part of their training regime.

Video replay and information technology enables enhancement of feedback during the replays, where the comparison between one's performance and that of other athletes is possible.

As a learning strategy, comparison and imitation has both behavioural and neurobiological basis. Humans and other primates imitate movements soon after birth. (Meltzoff & Moore 1977, 75-78) There is evidence that specific neurons in the pre-motor cortex of the brain, the area highly associated with planning motor acts, are responsive to movements of others, acting as mirror neurons, as well as to motor actions carried out by the observer. (Rizzolatti et al 2001, 661-670)

Another advantage of video analysis is the ability, with use of minor technology, to use split screen analysis, where individuals can view and compare their own performance with that of another, expert or opposition. No two performances are likely to be the same however, and one style may not fit all. If used without guidance, the athlete learner may not identify the important subtleties, which may lead to confusion.

2.5 Quantitative Feedback

Information technology via a range of software allows for the collection and use of quantitative information via video and can provide the basis for changes and corrections in performance based on objective and comprehensible data. For example play-by-play analysis of each power play through an ice hockey game may be used to identify relative player positions and effectiveness of team play. Individual player movements can be identified, slowed down and counted to pinpoint subtle differences in player technique and group dynamics.

Displacements as a function of time could therefore be obtained and higher-order time derivations or segmented changes could be calculated (e.g. Ariel Dynamics Inc, www.arielnet.com).

The following is a segment from an article that appeared in the Toronto Star in mid 2010 and later reported by Joshua Schnell on "Macgasm":

What's the one thing that can take you out of the cellar, to the top of the standings? If the Toronto Maple Leafs have their way, it's Apple and their technologies. The Toronto Maple Leafs have adopted iPads and other Apple devices as their primary workstations for analyzing game footage and play-by-play updates, directly on the bench.
Still, the use of technology in professional sports isn't new by any stretch, but it's pretty interesting to see how a team is implementing state of the art equipment to assist their coaches.
  "Each coach has a station to go to. It can be complicated. The video self edits, based on real-time stats from the NHL. That was an issue, to get the league to open their real-time

stats and video so the coaches didn't have to do it. Now we can look at the game shift by shift, any time, any game, any season…

"If there's a question — like should we get Clark McArthur — then we can go on and get every shift, every hit, every time he was hit. . . . It's that detailed, and that's good for the whole organization."
Article Via The Toronto Star. (www.macgasm.net, 2010)

Video analysis programmes that can supply quantitative analysis data have now become more affordable for coaches. From my surveys it was clear that many had tried them at the Midget and Junior levels. They are also a common and almost expected feature of ice hockey summer school programmes world-wide.

2.6 The future of notational analysis

Technological advancements in the new century have seen the simple computer system become way more advanced than it was back in the 1990s. With these relatively rapid changes in technology, there have been improvements in video enhancement and notional analysis has been right behind it. Data produced through notational analysis has now become reliable and error free and it is no longer as time consuming and cumbersome to collect. With notational analysis becoming more popular, more useful and easy to use there are becoming more and more software systems available for specific sports or systems that can be adapted for a wide range of sports. These can now produce film to help provide visual feedback for the athlete in a competitive competition or whole match play in a matter of moments. (Murray and Hughes 2001)

It is only 15 years later that top professional clubs in sports and some National Governing bodies, are implementing these ideas fully, as they have developed. (Pointstreak news 2010)

At junior and midget level ice hockey, the pressure from parents placed on coaches can be huge and unpleasant and the pressure to perform can be quite intense. Outside pressure can impact on a coach's judgement.

Notational analysis of video recordings can be used to enhance a coach's recall of a performance. The availability of augmented information extracted from video can inform the coaching process. (Hughes & Franks 2008, 10) It can also be used to clarify and confirm coaching decisions that are being placed under scrutiny.

In an invasive game such as ice hockey, video technology can record performance of individual players or aspects of unit and team play (power play and penalty kill). Above all, video provides a permanent record of performance for repeated viewing analysis. Analysis of video allows for macro-analysis of performance overall and the micro-analysis of game elements or actions (Hughes & Franks 1997, 23-24). It has the propensity to be a powerful tool.

Early performance analysis systems produced long tables of data and significance tests that were difficult to interpret. Developmentally, what has followed has been a range of data presentations, which have tackled the analysis issue from different perspectives, as researchers in the area of notational analysis have tried to use developing computer technology to control the video image and produce feedback that is easy to assimilate. (Hughes & Franks 2004, 104-105)

Eventually computer-controlled video-interactive systems initiated the idea that the users of analysis systems could utilize the potential of immediate analysis combined with the visual presentation of the feedback of the action, rather than just data. (Franks , Nagelkerke., Goodman, 1989) (Leonard. 1994)

Since this time the edited video image has been the medium of feedback, the story-board of which is created by detailed analysis provided by hand or computerised notation systems. (Murray & Hughes, 2001) (Hughes and Franks 2008, 10,16)

Computerised systems available now enable the analysis, selection, compilation and representation of any game or practice on video to be processed in a matter of seconds. The coach can use this as a visual aid to support more detailed analysis. The main function of video analysis is analysis, diagnosis and feedback. Where there is a good database of information, coaches have been able to produce predictive assertions of winning tactics, based on the use of models formed from the data.

2.7 Using video analysis.

An understanding of the form and function of the tasks taking place in a sporting event is necessary before analysis can occur. Franks and Goodman (1984, 48-59) outlined three necessary steps in forming any analysis system. (Franks & Hughes 2008)

- Task 1: Describe your sport from a general level to a specific focus.
- Task 2: Prioritise key factors of performance.
- Task 3: Devise a recording method that is efficient and easy to learn.

The more complex the sport, the more care must be taken in deciding exactly what is required of the system, which units of the team or individuals are to be analysed, which actions or events have the most relevance and so on. Then it is necessary to decide the level at which the analysis will take place. Are individuals going to be monitored? Is the whole team to be involved?

Video feedback is important in alerting the athlete to errors but before changes can be observed, some knowledge that change is required is necessary.

Where the skill sets are complex, feedback alerts the athletes to errors, but does not prescriptively alert performers as to how to change their actions to achieve success. Performers need to depend on their own error-detection and correction capacities to improve performance. (Hughes & Franks 2004, 23-24)

The coach's role is to provide feedback on what was done and a guide to what should be done. How much should coaches instruct? Without guidance and examples that reflect performance goals, attempted responses will be undirected. Video feedback can direct attention onto specific components of the action, leading to change, but with no clear reference about what is required, the feedback may be of little value.

The level of conceptual ability needed to determine the task requirements and understand the critical features of a demonstration is important to consider in younger athletes. Not being able to recognise what to do, coupled with under developed cognitive skills, such as attention span, verbal skills and memory capacity, will cause problems with understanding for younger players.

Carroll and Bandura (1990) found through investigation that verbal cues, alerting to sequencing and timing, helped participants reproduce the spatial components of an action more effectively. (Carroll & Bandura (1990) in Hughes & Franks 2004, 26)

The effect of augmented feedback, visual followed by instruction, however, is not always positive in outcome. If the level of feedback is too specific for the level of control that the performer is able to exert over the skill, the feedback could hamper performance and hinder outcome success. (Hughes & Franks 2004, 27-28)

More precise feedback seems overall to be of more benefit; however this does seem to be dependent on the skill level of the athlete. As skill level increases, so must the precision of the feedback. The amount of feedback must also change.

High amounts of feedback may be beneficial early in the learning process, but too much feedback later in learning may actually impair performance. High frequency feedback may result in a dependence on that feedback so that in competition situations the athlete's own error detection ability and self-correction mechanisms are not activated. (Hughes & Franks 2004, 27-28) There is also evidence that over guidance can restrict the creativity of athletes during performance.

Visual feedback provided by video may be too complex for young athletes, who may find the use of video and comparison of performances ineffective. However, as the performance athlete becomes more skilled, so the amount of feedback and the nature of feedback need to change. It also needs to be remembered that video images are only two dimensional representatives of a three dimensional reality and the athlete has to be

able to reconstruct a three dimensional movement sequence in their mind. (Hughes & Franks 2008, 43-45) This, in itself, requires a particular level of ability.

The above has considerable implications for this study where the young amateur athlete is at a turning point in terms of development and these issues must be considered when determining if video analysis is a suitable coaching tool for use with young amateur athletes.

Throughout this research it has been clear that performance analysis using video could be a powerful tool. It incorporates and simplifies the use of notational analysis, which for a team invasion sport such as ice hockey could be of considerable value. At the amateur level, where there are many stakeholders impacting on a coach's performance video analysis could be useful, but it also has the potential to become unmanageable and excessively complex.

3 Empirical part

3.1 Study Design

This study involved amateur hockey from the Montreal area of Canada. This area is known to be competitive in its development of emerging ice hockey players and future NHL aspirants. The Montreal area midget ice hockey teams feed into the Quebec Junior Major Ice Hockey League (QMJHL), Junior AAA and the Canadian Interuniversity Sports or CIS ice hockey, where players are regularly scouted for the NHL draft. This study focused on the following:

– Is video analysis used as an analytical tool at amateur levels of ice hockey in the Montreal area?

– If it is used, how is it used and what is it used for?

– How do the views of coaches and players on the use of video analysis in the sport compare?

A questionnaire was compiled based on research, observation and interviews with coaches and general managers of teams at the midget and junior level within the nominated area.

The questionnaire to coaches consisted of a series of structured "yes" or "no" questions designed to identify aspects of the sport that video feedback was most likely to be used in. There was the opportunity to explain and give reasons for each answer provided with each question.

A second questionnaire, using the same structured questions and design was prepared for players, which would allow for comparison of views between coaches and players.

3.2 Focus group for this study.

The Coaches and players were all form the province of Quebec in Canada and coaching/playing in the city of Montreal. Both players and coaches were informed personally or by e-mail about the questionnaire prior to filling it out.
Coaches that were questioned ranged from midget through to college level involved with teams such as Midget Espoir, Midget AAA, junior and University level.
All coaches had high elite/pro playing backgrounds and have all coached extensively at these levels, with years of experience behind them. Out of 20 surveys delivered to the coaches 18 were returned

The players who took part in the survey were from two teams playing in Montreal, Quebec.
First was the Concordia University men's team. Sixteen players were questioned. This team consisted of junior/men players with a median team age of 22 with the youngest 18 and oldest being 26 years of age.
The second team were players from Lac St Louis Tigers Midget Espoir. Fourteen players were questioned whose ages ranged from 15-16 years.
Both teams have been using video feedback. The first team had players who have used video for more than three years whereas the players from the second team are just starting to understand video as a tool in their hockey career and are mostly using it for the first time this year.

3.3 Questionnaire planning and structure

The questions were modelled from previous studies and arose from the earlier research on video analysis and from general enquiry of coaches and players.
The questions were based on observations from practice sessions and post-game feedback from the two teams mentioned in the previous section. They focused on the key areas raised in these sessions and were then discussed with the team coaches in order to produce a final list of categories on which to base the questions. The categories concerned how and why video-feedback is used.

These categories provided structure to enable analysis and comparison of data, but provided the opportunity within each category for an explanation if desired. Although allowing for explanations and therefore more open feedback, which can be harder to analyse, this was seen as the best type of questioning for the following reasons:

– The reasons given for responses under each category could not be fully second guessed and therefore not structured on a point scale.

– The explanations given under each category had been confined due to the structure of the original question.

Three open style questions for coaches and one for players to provide more general responses on their views regarding the use of video feedback were included at the end of the questionnaire, following the specific question categories.

3.4 Background for all questions used in the questionnaire design.

The following sections outline the background for all questions asked and the categories in the questionnaires for both coaches and players.

3.4.1 Coach/Player information

These initial questions collected basic information and included the age group of the team being coached, level of the league, how many times they practice, if they have used video feedback in the past and if they are using video feedback sessions at the moment.

3.4.2 What have you used video analysis for

This question was expected to provide the information to answer the main question of this study, which was why video feedback is being used and how it is being used by both coaches and players. It included the following categories:

Player Development – Does the coach or player use video feedback to focus or help improve player development as the season goes on

Individual skating – The purpose of this was to see if the coach or player has used video to break down and focus on the athletes' skating technique and or bad habits.

Special teams – This sought to find out if the coach uses video for special units of his team such as power play, penalty kill or special face-off plays in offensive zone or defensive zone. It could also show if the coach likes to look at the opposing teams special units; if they have a certain set play or a special line that the coach or players want to be aware of prior to playing the opposing team. Players would also indicate if they make use of video analysis regarding special teams.

Game situations – Do coaches/players use video to look at certain game situations such as one-on-one, two-on-one, plays in the corner etc, where something went wrong, where there needs to be an improvement, or even just an example of what to do when this situation comes up again in a game.

Defensive play – Do coaches and players prefer to cover things in the defensive zone?

Offensive play – Do coaches and players prefer to cover things in the offensive zone?

Other – This category provided the opportunity to comment if there is something else the coach likes to cover. It also gave players the opportunity to include something that was not covered in the categories asked.

Wouldn't use it – This category was where the coach or player who doesn't believe in video feedback or doesn't see it as a valuable tool for improvement in performance was able to respond.

3.4.3 Open questions

Players question. Was video analysis helpful in training and if so, why? – An open question asking specifically if the athlete finds video feedback sessions a useful tool and why does it help them personally was included in the players' questionnaire. The intention of this was to provide the player with the opportunity to give personal feedback, not covered in the specific game categories above.

Coaches' questions. Have you used video analysis software and how does it enhance what you do –This question requested specific information about video analysis software and if it was of benefit in enhancing coaching.

Benefits and Drawbacks of using video analysis –This provided coaches the opportunity to add in additional comments, which had not been specifically covered in other questions.

If you have never used video analysis, would you consider using it or would you never use it? –This question provided coaches who have never used any form of video analysis the opportunity to reply to this questionnaire and give feedback as to whether they would ever use it or never use it with a reason why.

4 Results and data

4.1 Who uses video analysis? Coaches and player response

Of the replies received from coaches 100% responded that they have used video analysis and 75% responded that they are using video analysis currently.

Table 1 Category Responses from Coaches and Players.

Category	Coach "Yes" %	Player "Yes" %	Coach "No" %	Player "No" %	Coach Nil %	Player Nil %
Player Development	100	96		4		
Individual Skating	75	40	25	60		
Special Teams	100	89		11		
Game Situation	88	52	13	48		
Defensive zone play	100	93		7		
Offensive zone play	100	89		11		
Other	25				75	

4.1.2 Player development

Players and coaches were asked if they found that video analysis feedback helped them with player development.

Coaches:

For the coaches who answered "yes" 25% said that it was a good tool "for certain players who need to see what they are doing to understand what we are telling them".

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25% commented that they use it for "individual video on player development including hitting skating etc". 37% said they use it "mostly for positional development". 13% said yes but did not comment.
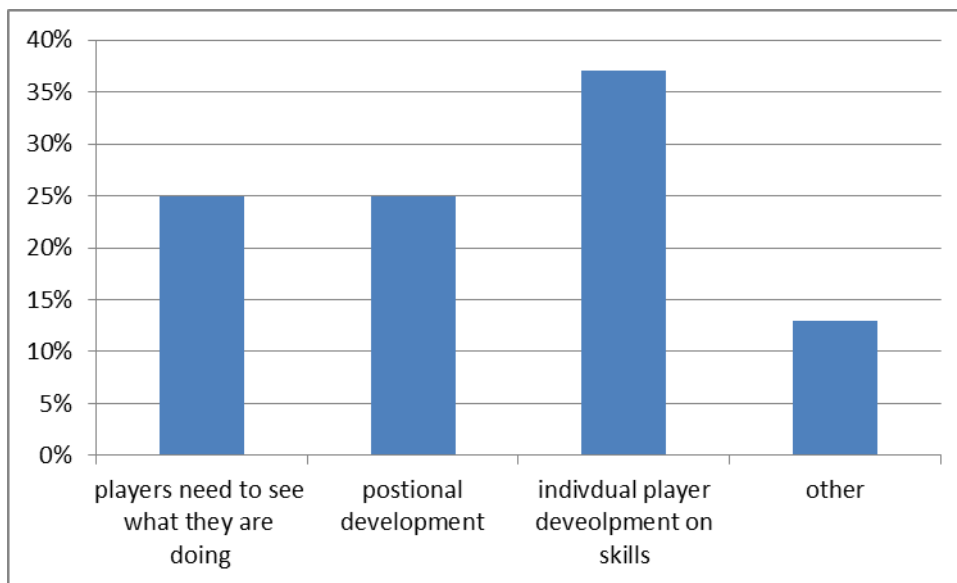

Figure 2. Graph of Coaches responses in regards to using video analysis for player development.

Players:

For the players who responded "yes", 20% of those commented "how I can improve on my strengths and weakness" another 16% said that they would use it "to help with positioning". 10% commented that "like to use it to see how I skate and stickhandle etc". Another 7% commented that they like to use it to "see how they play with one another/ team analysis".
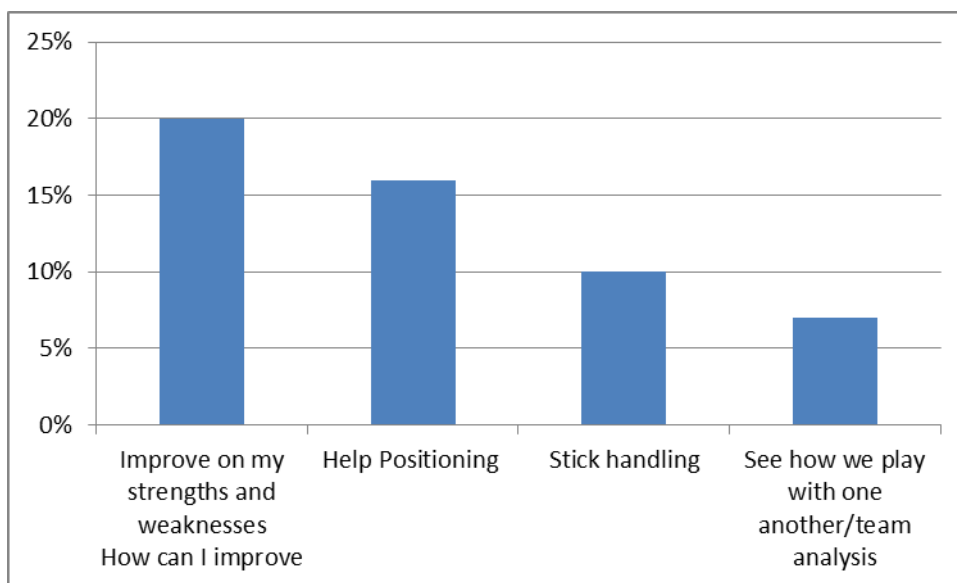

Figure 3. Graph for players quotes in regards to using video for player development.

4.1.3 Individual skating

Notational analysis has been seen as a useful tool to use in not only helping player development but also for biomechanical analysis i.e. it has been a useful tool for coaches/players in the sport of ice hockey to film skating techniques and to help improve "stride length", "tuck in" or even "cornering or crossovers" when it comes to puck protection.(Vierumaki technical &tactical 2010)

Coaches:

When coaches were questioned about using video to analyse and improve athlete skating, not that many seemed to be interested, with the answers coming to about 50/50.
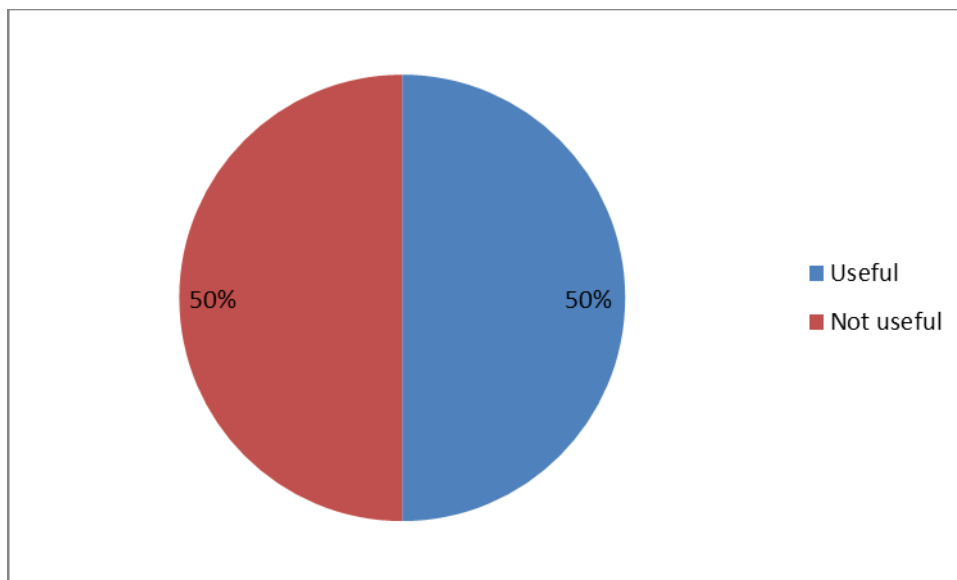

Figure 4. Coaches' responses for if they would like to use video analysis for individual skating.

Most reasons for the coaches who said "no" seemed to be that "we don't focus that much time on this" and "have done this but only on an individual basis with younger athletes."

This raises another point that the majority of the coaches that answered "yes" all seemed to be coaches that taught younger players at around the midget age. This was probably more important to consider here as the athlete at this age is still working on improving technique to become a strong skater rather than at the higher ranks (Jun-

ior/Men's pro) where the athlete is expected to already have a strong skating ability by the time they reach that level.

For the coaches that answered "yes" to the question most responded that "with the film you can slow it down and adjust what needs to be fixed" or "with the film you can put together flicks (short sections of video) where the athlete keeps making the same mistakes"

One coach mentioned that he had a problem during the season with one of his D men always taking too long to move the puck up when re grouping in the N zone, but with the video he was able to show the athlete what he was doing wrong and that he needed to adjust his transitioning from backwards to forwards with a "stop start motion" rather than a "long pivot." After watching the video the athlete was able to now see his problem and adjust accordingly.

Players:

After looking at the results from what the players answered, a majority responded "no" that it wouldn't be something they would want to look at or improve on. About 35% answered "yes" compared with 58% answering "no" and 7% with a nil response.

For those who answered "no" 16% commented that "it's more of a feeling in the moment" 11% said that "it's more of a natural skill" For the players who answered "yes" 27% said they would "use it to watch to see how they skate", 18% said they would "like to watch highlights of their skating" and 9% said they would use it to "see their speed when breaking out of the zone"
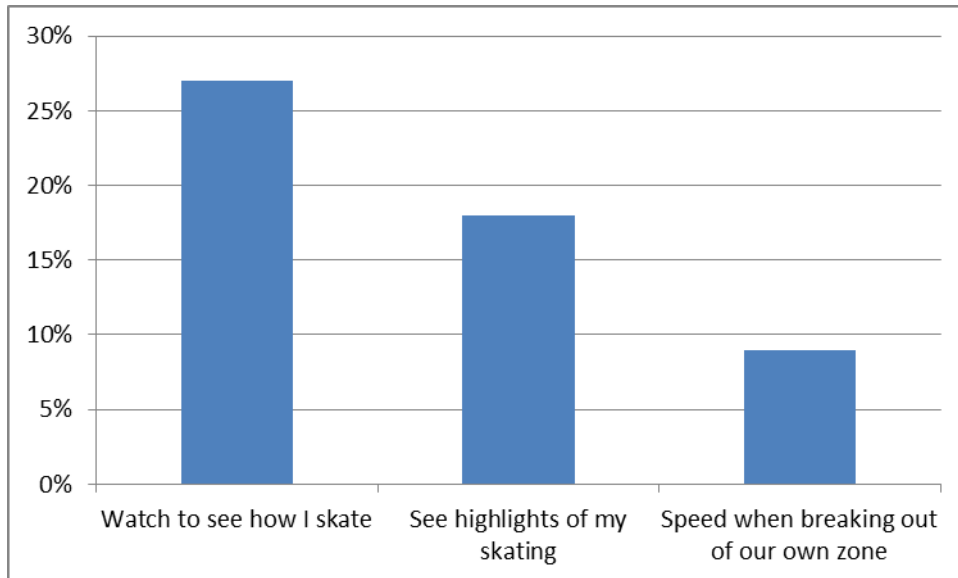
Figure 5 Graph of percentage of players who found video helpful for skating analysis

4.1.4 Special teams

Coaches and players were asked if they would use video analysis to view special team plays i.e. power play, penalty kill etc.

Coaches:

When asked if they found video as a useful tool to help with looking at power play (p.p) and penalty kill (p.k). 50% said that they would use it for "all aspects of power play and penalty kill". 25% said that they "would use it to view the other team's p.p and p.k set up". While 13% commented that they use it to look for things such as "5 on 4 and special extra man plays from the other team against us"
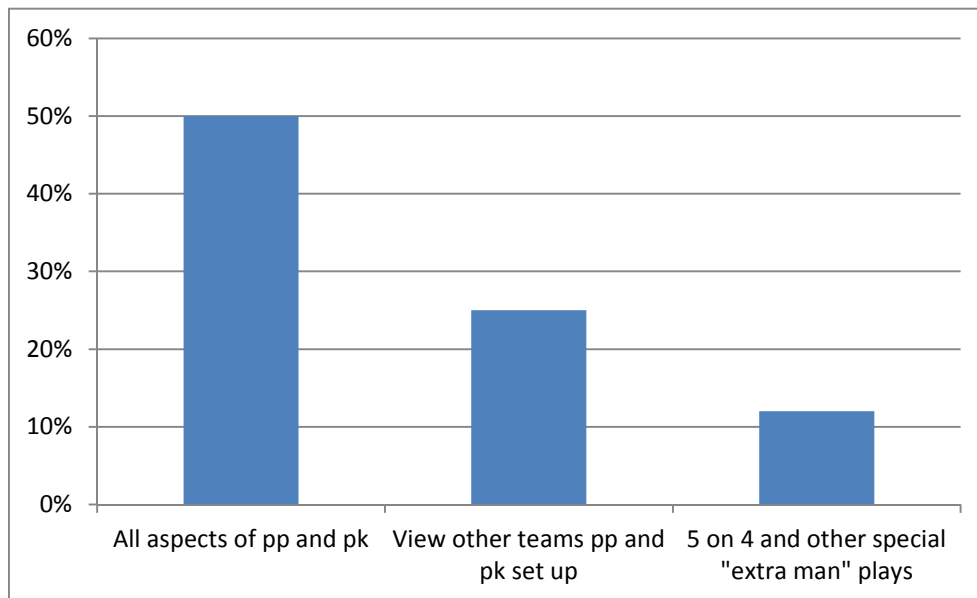
Figure 6. Coaches' responses to using video feedback for special teams.

Players:

Video has served as a useful tool for organizations when it comes to watching such things as team tactics or breakdown in special plays such as P.K (penalty kill) and P.P (power play).

When asked about special teams in the questionnaire the popular answer was power play and penalty kill. Out of the total players 80% answered "yes" on the questionnaire with 20% commenting that they like to use it for the "penalty kill break down" and 36% said that they would use it to "view their power play setup". Results showed not only do the players want to focus on their own strategies with 20% commenting that they would like to use it to "see what can be improved on with P.K and P.P" but they also had almost an equal if not more of an interest to watch the other teams strategies with 24% stating that they use it to "see what the other teams tactics and their strategies are."
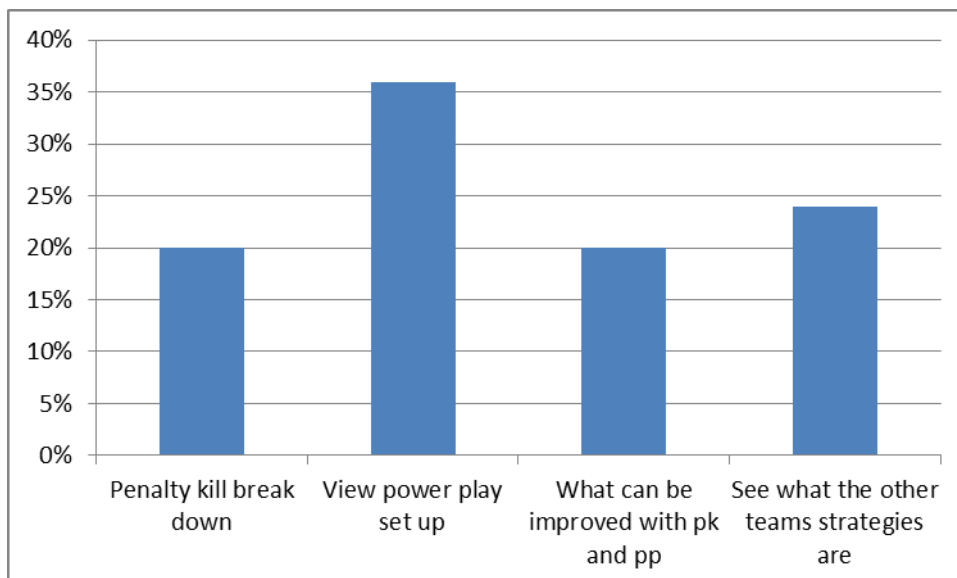
Figure 7. How many times categories were mentioned for special teams.

This was an interesting find as it is often an assumption that unless directed by the coach, players usually want to focus more on their own setups and team strategies and don't really focus on what the other teams may be doing.

It has also been seen that video is in fact a very popular tool for both the coach and the player to use for special teams analysis.

4.1.5 Game situation

When asked about their opinions on using video to look at game situations or certain plays i.e. "one-on-one in the corner or a two-on-one rush".

Coaches:

For the coaches who answered "yes" in regards to using video as a tool for game situations, 14% said that they would use it as "team video for the forwards and defence". 28% said "look at battles in the corner for the forwards in the offensive zone and for the defence in the Defensive Zone". 42% commented that they would "show examples from a game such as odd man rushes on the defence or battles along the boards or in the corner that were won or lost.14% said yes, but did not comment.
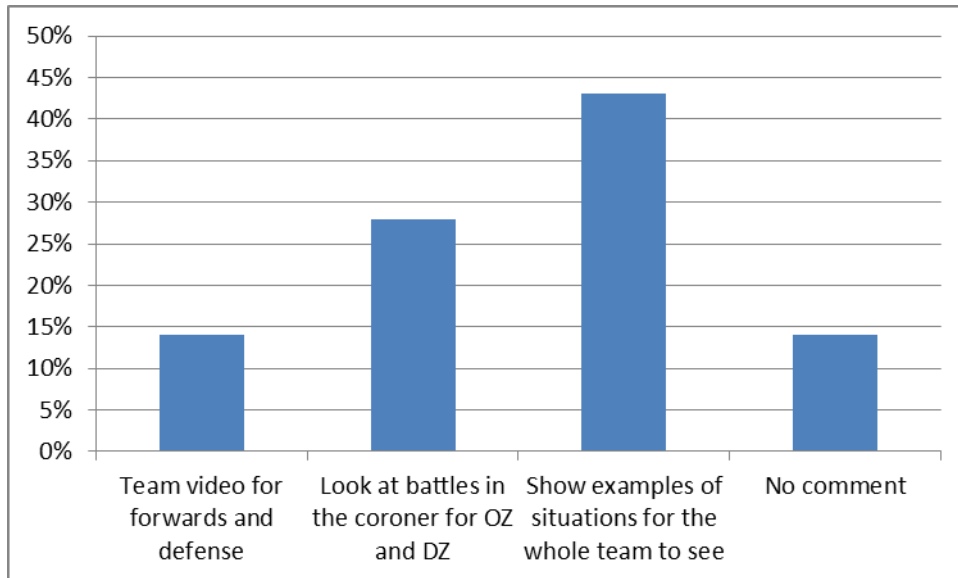
Figure 8. Percentages for coaches' responses to game situation for video feedback.

Players:

Some of the younger players found it useful to help them "read the play" and "positioning" for the future, so in a certain situation on the ice the player will remember viewing the film and think about taking the better option, angling the right way or know where to make that pass. It was also seen as a useful tool under this category to "help correct mistakes" and for the player to "look at how I played it and how I could have played it"

On the other side of things 57% of players who answered, did not find video feedback as a useful tool to help them with game situations. Some saw it as not really something that could be taught or be corrected and that game play was "creativeness" and "more of an instinct thing".
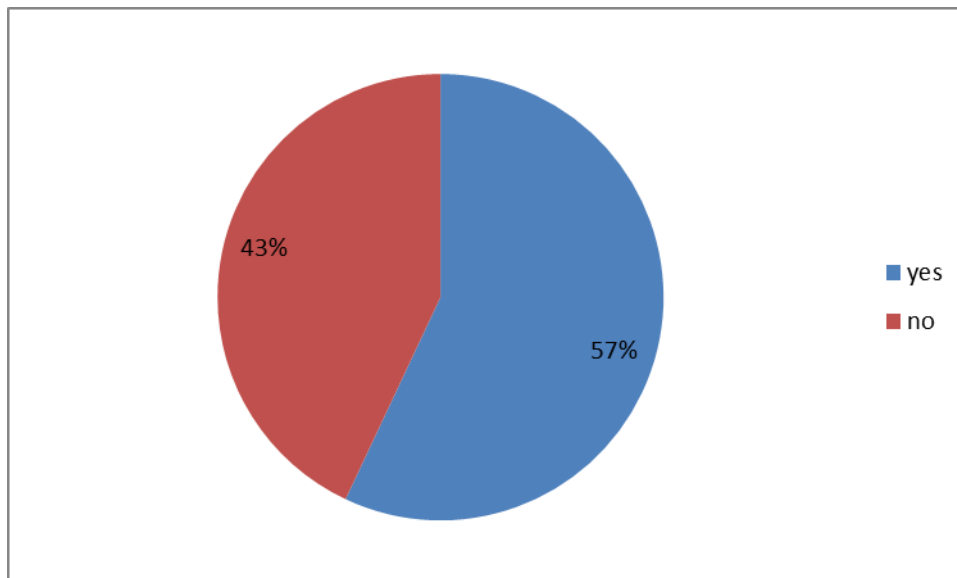
Figure 9. Answers "yes" vs "no" found video feedback for game situation useful.

This was interesting to find as this has been noticed as one of the emerging arguments right now regarding use of video as a source of feedback.

Some critics see this technology getting out of hand, restricting the athletes' freedom to be creative or make their own decisions with respect to their play. This will be continued further in the discussion part of the thesis.

4.1.6 Defensive play

Coaches:

Coaches were asked if they use video feedback as a tool for looking at play improvement in the defensive zone.

100% of coaches answered "yes" with 50% saying that they use it "to go over coverage and positioning in the defensive zone". 38% like to use video to see the "D zone face off wins and losses and breakouts from the D zone". 12% did not comment.
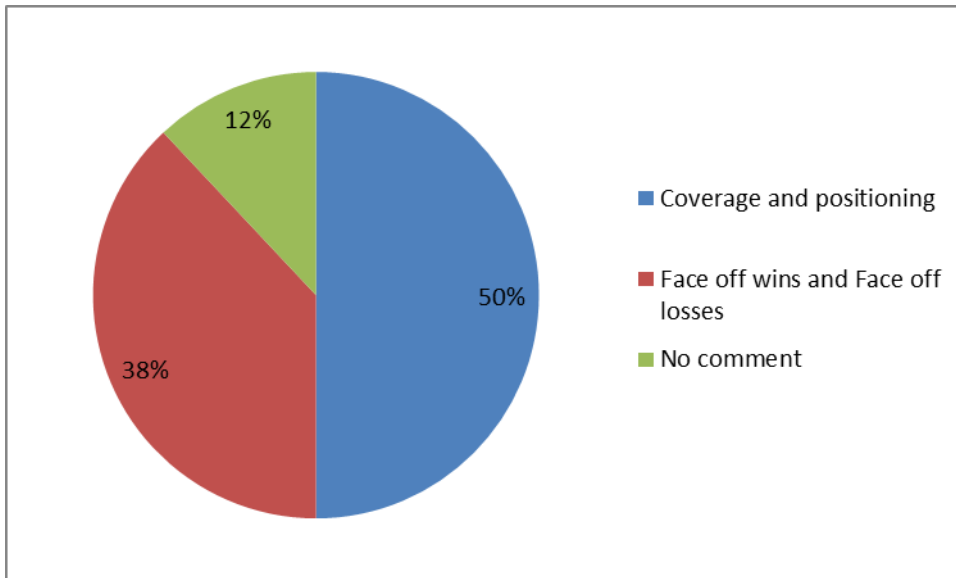
Figure 10. Pie Graph of coaches' percentages that took up the "yes" answers for D zone play.

Players:

Players were asked if video analysis would be a useful tool to help them look over their D zone coverage. For the players who answered "yes", 36% commented that they would use it "to look at coverage in our own zone" and 21% said that it is helpful "to see your mistakes in the D zone and how to improve on them"

Another interesting find was that only 7% would use it "to see holes in the other teams D zone system and how to use it"

Figure 11. Players responses to video feedback with offensive feedback

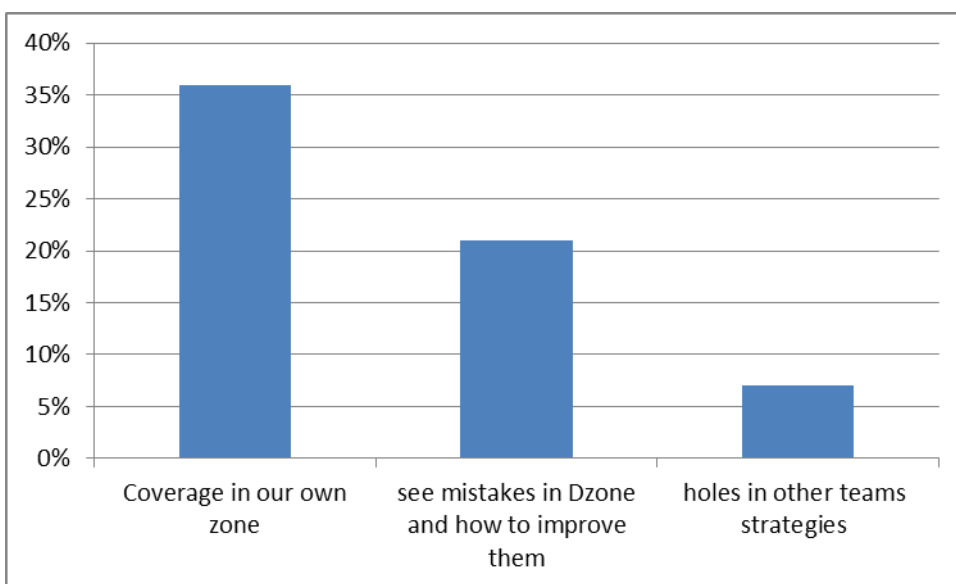Coaches and players seemed to have agreed on the same aspects of the D zone coverage with both players and coaches agreeing mostly on focusing on coverage in "own" zone and fixing mistakes in the D zone.

The percentage of coaches who wanted to observe the other team's D zone set up was a lot lower than expected Even though it was not mentioned in the graph, a few coaches did comment on this, but the percentage commenting was very low.
So it is seen that although the opponent's D zone is something that coaches and the players may look at, it is not rated so important as focusing on their own D zone coverage.

4.1.7 Offensive play

Coaches:
When asked if they would use video feedback to help with offensive zone play 100% of coaches answered "yes" with 37% commenting that they use it to "work on cycling out of the corner and shots on net". 38% said that they use it to "look at net pressure and net drive into the offensive zone and also look at face off wins/losses and possession time while in the offensive zone"
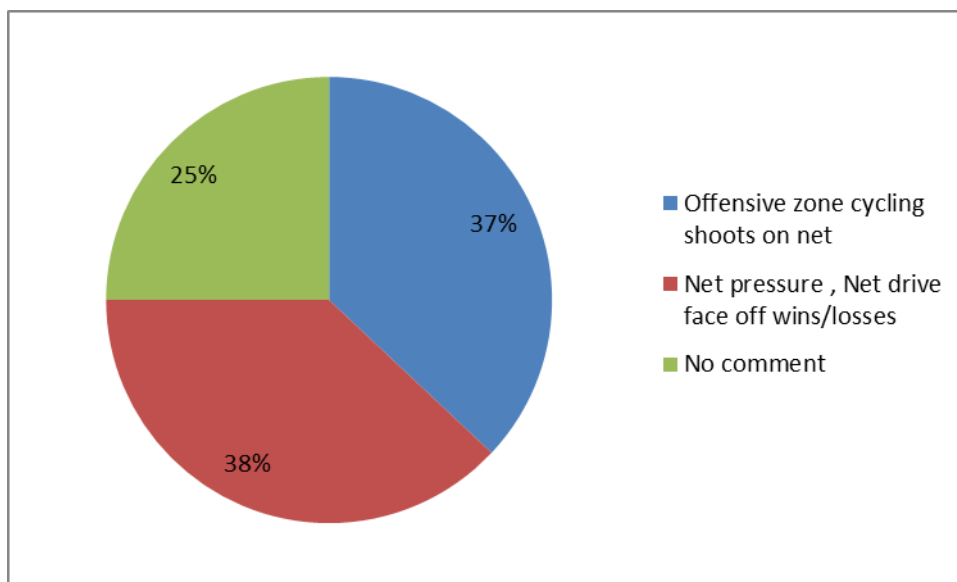

Figure 12. Coaches' responses to use of video feedback in offensive zone.
With coaches that teach the younger midget age players it was seen that they only liked to focus on the simple components or the "easy things" to remember such as "cycling, "putting shots on net" and "moving the puck". This was seen as an appropriate ap-

proach to the younger players as they are still developing their skills and the goal usually in these stages is to keep the creativeness in their minds.

With the coaches of the older teams it was seen that much more structure goes into the offensive zone play, with "face off" plays and "special set ups" for certain lines.

Players:

Out of the 80% who answered "yes" to the question if they would use video analysis as a tool to help their offensive play game, 20% said it would be useful for "in zone entry, set up" and "cycling out of the corner, shooting on net". 12% who were defence players commented "like to see their positioning in offensive zone and when they are able to jump in to the play". Only 8% of the players were interested in looking at "the strengths and weakness of the other team" when in the offensive zone.

4% were interested in looking at "fore checking on the other team". 8% commented on looking at things such as "who has their head up in the offensive zone or puck control in the offensive zone" and 12% use video to "see their mistakes" in the offensive zone.
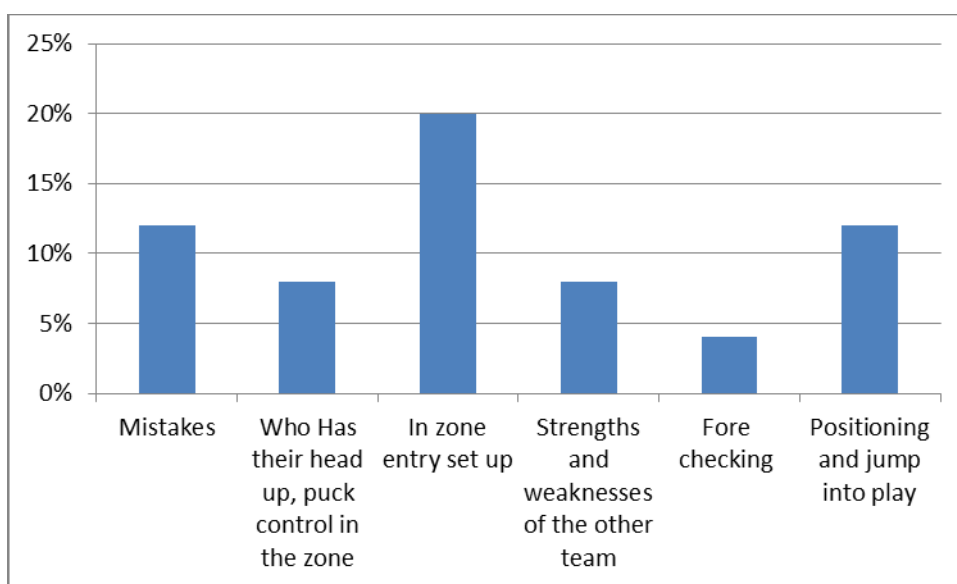

Figure 13. Graph of players' replies to offensive zone play.

4.1.8 Was video feedback helpful? Player responses.

The last question on the sheet was for the player to give a quick answer about if and how they found video feedback helpful. 100% answered "yes" that they found video feedback helpful.

9% said that they "can refer back to what the coach has taught in practice". 42% commented that it "shows what to improve and learn from your mistakes". 9% said "it gives you a chance to look at your positioning and intensity". Only 16% said "good to see from another point of view". This number was slightly lower than expected as it was thought that most of the players would mention the importance of another point of view amongst their other comments.

6% said that "it helps with looking at game situations, reading the play, tendencies with offensive play and defensive play". 9% commented "it's a good tool to see who is cheating and not going 100% on plays". 9% said that it "helps with decision making."
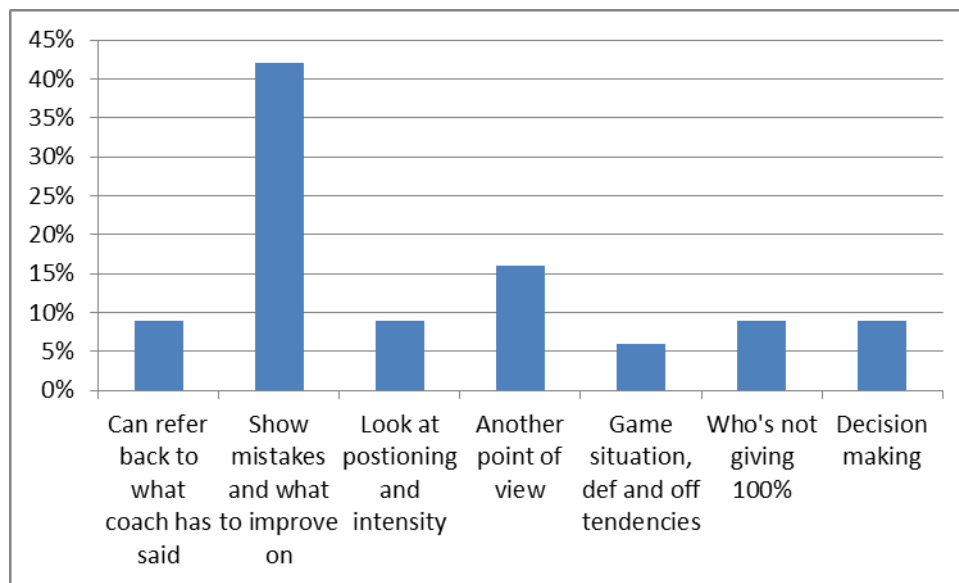

Figure 14. Players responses to how they found video feedback helpful.

4.1.9 How does video analysis software enhance what you do? Coaches response

Coaches were asked if they have used or are using video analysis software.

All of the coaches mentioned that they have used a few in the past but 100% answered that Steva or Steva sports seemed to be their favourite or "go to" software when it came to breaking down film and presenting it. As Steva is based in Quebec and has made junior sport one of its focus areas, this was not surprising.

Coaches saw it as a very useful tool to have and they found that with the new software that is out, its easier to correct mistakes, cut and break film down and make compilations. It is also possible to file film for easy reference and was seen as a great tool for pre scouting the opposition.

Coaches found that using film for feedback is a very useful analysis tool and can be a great benefit to the coach and the team as a whole.

4.1.10 Benefits and Draw backs of using video analysis.

When asked to make extra comments about using video analysis, the responses indicated that it is a very useful tool to have but there can be challenges at times when using it.

Coaches brought up the concern about how much is too much? This was seen as a major concern by coaches in the midget levels. Also another problem was that younger coaches who had less experience in giving feedback or pin pointing problems found it hard to know what to put in their sessions and give the best examples, because there isn't really a "how to do video sessions" manual. These coaches need to rely on an older mentor coach to provide this help for them.

It was also mentioned that video can be difficult to use because it has the potential to upset some players who may observe a bad example of their performance and only relate to bad things they are doing on the ice.

A further concern was how much time should be devoted to video feedback. Coaches tried not to use long video sessions, which potentially leave the players frustrated and

bored. It was mentioned by one coach that all you need to do with video is to only bring up a few points in your presentation, keep it short and to the point. If there needs to be a further expansion of an example shown on the video then it was best to do it with smaller groups or one-on-one. This way you will have more alertness from the players and it will be easy to explain the point you want to go over.

4.1.11 If you have never used video analysis, would you consider using it or would you never use it?

None of the coaches surveyed answered this question because all of them had mentioned earlier in the other questions that they have used video analysis and that they use it regularly as part of their coaching programme.

5 Discussion

5.1 Summary and recommendations.

The investigation shows that the coaches within the Montreal area do see video analysis as a useful tool to help them deliver correct feedback to the athlete.

Coaches seemed to agree on most aspects of video analysis when looking at using it for player development, offensive and defensive zone coverage.

With the coaches all using video at different levels it was interesting to see the difference between how a midget team coach would use video compared to a college or men's pro team coach.

With the younger levels there was a greater focus on player development and game situation examples and less on learning the systems. It seems that coaches at the younger levels will show one or two examples of game situations to the whole team, while including some system plays and then have one-on-one or small group video sessions to work on individual player skills and development. This aligned well with the research, where it was found that younger, less developed players required a greater amount of instructional feedback to go with the video, to help them identify what needed to change and how it might be changed. Small group videos and one-on-one would enable the coach to augment the video feedback to suit the needs and levels of the players.

Higher level coaches (junior/men's pro) use video for mainly D zone coverage, opposition team scouting and system plays, such as power play, penalty kill and face offs. Coaches at this level keep everything "short and simple", where the coach will only want to go over a few points with the players.

"When making video presentations don't draw it out. One or two examples of opposition, p.k or fore check is enough, so make your points and keep it simple",- Ross Yates Syracuse Crunch AHL. Again, this aligns with the research, where less verbal instruction was required as

the players have the experience and maturity to see what they need to do from the video feedback.

5.2 Players views towards video

Player's results showed that their views towards using video analysis were surprisingly positive. Players seemed to be quite responsive to using video analysis for player development, and its use with special teams, the same as the coaches.

The younger players seemed to want to use video analysis for all aspects of the game, which is a positive sign but cannot always be a wise thing. As indicated again in the research, there is a risk that young players especially, could get in the habit of watching too much video and use it as a substitute for their coaching instruction. With insufficient guidance they may not be learning the right things or could be restricting themselves from discovering their potential.

With the older players it is seen that the use of video is not a major focus in the individual game preparation, but serves as a team viewing resource. The higher the level, the less the athlete needs to see when it comes to the basic things such as player development skills, skating and "1 on 1" and "2 on 1". The video time is set to go over systems, power play, penalty kill, special teams and faceoff plays. It is very rare that a player or a coach would want to focus on any individual effort. This reflected in the answers to the questionnaire. Older, more experienced players were more than capable of identifying particular aspects of the team's game or the special teams they are a part of, without the coach needing to unpack it for them. This would have accounted for the similarities in both coach and player responses for this section.

When it came to using video for special teams, this was something that coaches and players used video to rely on. Both coaches and players liked the fact that they could "be able to go over all aspects of pp and pk" and "to go through the full break down of the p.k and pp set up"

Both the coach and the player had around the same percentage when it came to viewing the other team's p.p/p.k. (fig 6. 25% and fig 7. 24%), a correlation which was interesting to note.

Results for the coaches were as expected because all of them commented later in the open questions that they would use video analysis to see the other team's special plays. The players' results were higher than expected and surprisingly, a decent percentage of players seemed to be interested in viewing the other team's plays when it came to special teams.

Players don't seem to be that interested in the other team's pp or pk set up unless under guidance from the coach, so this was an interesting find and could easily be overlooked, to the cost of an opposing team.

5.3 Analysing the game and issues with technology

When asked about game situation the coaches found it helpful to look at situations in the corner or such things as "2 on 1 rush" or "1 on 1" plays down the boards. Players on the other hand had not all found it useful. Younger midget aged players found it helpful mentioning things like "helps me ready the play" and "see how I played it and look at how I should have played it" whereas the older players didn't find it as appealing, saying that "it's more of a natural thing" or "it's more of an instinct thing". This argument has been a growing factor with video. For a long time there has been concern that as video technology advances the role for the athletes creativeness will become less and less. This is not just in hockey but possibly in all sports.

As mentioned earlier in the theory section, as technology expands and becomes more advanced the use of video feedback will be right there behind it and soon there will be software out there that will have the technology and data to not only carry out diagnostics but to also predict plays in certain game situations and run the game itself. The use of Ipad technology referred to in the research appears to be getting dangerously close to this situation .

This is the part that coaches fear because even though this could be seen as a useful thing it limits the athlete and only allows them to do really what is put in front of them instead of thinking "outside of the box" and developing their own creativity. It is after all, the creativity in a game that enthrals the spectator and the reason why so many younger players are involved in the sport.

Coach's comments "It's hard because you don't want the player to not be thinking for themselves. If I say to do it this way, it doesn't mean it's necessarily the right way or the only way" and "sometimes players rely on watching too much video to fix their play."

Coaches need to remind the athlete that even though the video is there to help, it shouldn't stop the athlete from trying new things because that is how the game advances, from athletes breaking boundaries and trying what nobody else does.

In ice hockey, however, there will always be room for creativeness, there will always be "a loose puck" or "50/50 races" in the game, which will always leave room for something new to happen. Also there are a lot of turnovers in the game which will always be hard for a computer to make accurate predictions about.

5.4 Video analysis used in the offensive zone and defensive zone

The use of video analysis in the defensive zone was seen by both the coaches and the players as a main chance to work on positioning and coverage in their own zone. This was expected because that is what the main purpose of video in the defensive zone would be., to look at defensive coverage and "who is to take on who" when in different situations around the defensive net.

Video analysis used in the offensive zone was similar. The coaches and players had similar ideas about what they would want to use it for. With the coaches response, the main reasons for using video analysis in the offensive zone was to view team plays and set ups such as cycling in the zone and face off wins and losses, also pressure around the opposition net. Players also wanted to focus on in-zone set-ups, and wanted to see the mistakes in the other team's zone. This was coming from both age groups, which in my opinion was a great thing to see because the coach can spend less time forcing the players to see this and focus more on how the team's system can defeat the other team's defensive coverage.

5.5 Video coaching presentation

Another problem that arose in the comments and also some of the later open questions was how to handle video with the players in a way as not to come across as to appear negative. This is likely to be a greater problem with the younger players rather than the older ones.

Coaches commented that **"video is a tricky thing to master. I found that it is too easy to show the negatives as opposed to the positives"**
The players could feel as if they were being picked on or humiliated in front of their peers for their mistakes when it is not what the coach's intentions are. This situation can arise because the video is an additional resource and, as found through the research, it requires additional feedback to fully unpack it for the younger player, who may feel unnecessarily burdened by it all.

The goal for the coach when in a video session or prior to one is to find ways to make the athlete feel that he/she is in a positive environment and not something that he/she will dread going to the coach's office for.

A good suggestion from a coach who is currently coaching at a Jr AAA level is what he calls the "candy coat" approach, where the video feedback is just like if you were to correct the play in a practice. Start off with a positive look at the problem, then go into

the negative, then end with another positive note. This will leave the athlete feeling positive rather than feeling like they can't get anything right.

5.6 Draw Backs when using video analysis

There are some drawbacks with using video analysis, because there isn't really a "how to use video manual." It is hard for novice coaches that are new to using the software, to know what they're looking for in the data or what they want to add to the presentation. This has led to coaches sometimes not looking at the right things or pulling up wrong examples that will leave the players confused and leading to wrong feedback on subjects.

A good idea for a novice coach that is new to video would be to try and go over certain bits of films with someone who has used it before and can give them guidance on what to look for and how to make and present it to a player or team.
Also coaches reported that without using the new software, it is quite hard to cut up film and can be time consuming. Even with the new software it can still use up time and can be a cost against team funds. The coach must weigh up just how much resourcing is worth putting into it, especially at the younger levels.

The software itself can be quite costly. The top software for video analysis now days such as Steva or Steva Sports and Coach studio etc range from hundreds to thousands of dollars and that is just for one year of use. You have to keep renewing the licence to run them each year. So affordability through the team budget must be a major consideration depending on what level you are coaching and how much money your club has.

This shouldn't put coaches off trying to use video and the analysis software after a few trial and errors. Used in the right way it can become a valuable performance analysis tool for the coach and his team. It does provide the only real means of objective and totally reliable feedback. Certainly the responses to this survey have shown that it already seems to have become a fully integrated coaching feedback tool within a range of leagues in the greater Montreal area of Canada. It remains to be seen if this is reflected in other places.

Bibliography

Ariel Dynamics Inc. Biomechanical analysis. URL: www.arielnet.com accessed 6-2-11.

Bartlett, R & Hughes, M 2008 What is Performance Analysis? In Hughes, M & Franks, I (editors) The Essentials of Performance Analysis, pages 1-4. Routlege. New York.

Bishop, D. 2008. Sports Performance Analysis: Coaching and Training, Peak Performance Online. URL: http://www.pponline.co.uk/encyc/sports-performance-analysis-coaching-and-training-39 accessed 6-2-11.

Carroll, W. R., & Bandura, A. (1990). Representation guidance of action production in observational learning: A causal analysis. Journal of Motor Behavior, 22, 85-97. In Hughes, M & Franks, I. 2004 Notational Analysis of Sport: systems for better coaching and performance in sport. (2nd Edition). Routlege. London.

Dowrick, P. 1991 Practical guide to using video in the behavioural sciences, Wiley. New York. In Hughes, M. & Franks, I. (Editors) 1997 Notational Analysis of Sport. Chapman and Hall. London, page 18.

eSpor Inc., Game Changing Technology for Sports, Denver, Colorado
URL: http://www.espor.com accessed 3-01-11

Franks, I & Goodman, D 1986 A systematic approach to analysing sports performance. Journal of Sports Sciences 4, 49-59.

Franks, I. Goodman, D. & Paterson, G. 1986, The Real Time Analysis of Sport: An Overview. Canadian Journal of Applied Sport Sciences 11 [1] pages 55-57.

Franks, I. & Miller, G. 1986 Eyewitness Testimony in Sport, Journal of Sport Behaviour, volume 9, issue 1, pages 38-45.

Franks, I & Miller, G. 1991 Training Coaches to Observe and Remember, Journal of Sports Sciences Volume 9, No 3, Autumn 1991, pages 285-297.

Franks, I. Nagelkerke, P. Goodman, D. 1989. Computer controlled video: An inexpensive IBM based system. Computers and Education, volume 13, No 1, pages 33-44.

HBO Sports Documentary 24-7 Penguins Capitals Road to the NHL Winter Classic (2011) URL: http://www.hbo.com/sports-24-7-penguins-capitals-orad-to-the-NHL-winter-classic/index.html   accessed 3.01.11

Hodges, N. Hayes, S. Breslin, G. William, A. 2003 An Evaluation of the minimal constraining information during movement, observation and reproduction. Practice Instruction and Skill Acquisition.pdf.
URL: www.thefa.com/.../Practice%20instruction%20and%20skill%20acquistion.pdf. Accessed 4-2-11.

Hodges, N. & Franks, I. 2003. The nature of feedback. In Hughes, M & Franks, I (Editors) Notational Analysis of Sport (2nd Edition). Routlege. London.

Hughes, M & Franks, I. (Editors) 2008 The Essentials of Performance Analysis. An Introduction. Routlege. Canada.

Hughes, M & Franks, I. 2004 Notational Analysis of Sport: systems for better coaching and performance in sport. (2nd Edition). Routlege. London.

Interplay Information Systems AS, Oslo, Norway GM Jan Tunli
URL: http://interplay-sports.com accessed 3-01-11

Leonard, K. J. 1994 The development of a data base management system for a National Hockey League team. Journal of Sport Behaviour, Volume 17, No 4, pages 246-257

Liebermann, D.G. & Franks, I.M. 2004. The use of feedback-based technologies. In Hughes, M & Franks, I (Editors) Notational Analysis of Sport: systems for better coaching and performance in sport. (2nd Edition) Routlege. New York., pages 166-188

Maslovat, D. & Franks, I. 2008. The Need for Feedback. In Hughes, M & Franks, I (Editors). The Essentials of Performance Analysis An Introduction. Routlege. Canada. pages 1-4

Meltzoff, A.N & Moore, M.K. 1977. Imitation of Facial and Manual Gestures by Human Neonates. Science. 7 October 1977: Vol 198 No 4312 pages 75-78.

Murray, S. & Hughes, M. Tactical Performance Profiling in Elite Level Senior Squash. Presented at World Conference of Performance Analysis and Computers in Sport. Cardiff, 2001.
URL: http://quinticsquash.com/chapter7/performanceprofiling.asp., accessed 6-02-11

Pointstrek news 2010. Website news article. Pointstreak.com website.
URL: http://www.pointstreak.com/aboutus/news-story.html?newsid=95
Accessed 4-4-11

Rizzolatti, G. Fogassi, L. Galles, V. 2001. Neurophysiological mechanisms underlying the understanding and imitation of action. Nature Reviews Neuroscience 2: pages 661-670.

Schnell, J. Toronto Maple Leafs go high-tech with iPads. (Article via the Toronto Star) from Macgasm.net. Tue, Oct 5, 2010. URL:
http://www.macgasm.net/2010/10/05/toronto-maple-leafs-hightech-ipads/ accessed 21-11-2010.

Steva Sports Software Inc. Ottawa, Canada URL: www.stevasports.com. accessed 04-02-11.

Vierumaki Technical and Tactical Degree Lectures, 2010. Degree Programme in Sports and Leisure Management Haaga-Helia UAS.

Yates, R. 28-11-2010. Coach. Syracuse Crunch. AHL. Interview. Montreal, Canada.

Video Analysis Questionnaire for Coaching and Management perspective.

Team Description:

Region: League:

Player age group: Level:

Your position:

How often does your team practice?

What is your regular game schedule? (i.e. 2 games per week/40 games per season)

Do you use video analysis?

When do/have you used it?

What have you used video analysis for?   (tick all relevant options and comment if you wish)

Player development	Y	
	N	
Individual skating	Y	
	N	
Special teams	Y	
	N	
Game situation, 1-on-1, 2-on-2 etc.	Y	
	N	
Defensive play	Y	
	N	

Offensive play	Y	
	N	
Other	Y	
	N	
None—we don't use it	Y	
	N	

Do you use video analysis software or have you tried it?

How does it enhance what you do?

If you have indicated above that you have used video analysis in your coaching programmes please briefly comment on the **benefits** and the **drawbacks**

If you have never used video analysis as part of your coaching programme

Would you consider using it in the future?

What would you use it for?

If you would **not** consider using it, please give reasons why.

Other comments.

Thankyou.

Please return the questionnaire to Martin Lee, c/o 110 Elgin Crescent, Unit 523, Beaconsfield, Quebec. Phone: 5144356102.