A Study on the Adoption of the Six-Sigma Methodology for Improving the Competence of Youth Inline Hockey Coaches

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ABSTRACT

With the continuing promotion and marketing of athletic sports, young athletes have more opportunities to demonstrate their talent in front of audiences around the world. Besides personal factors, coaches also play an important role in the athletic life of a young athlete. This study attempts to apply the Six Sigma Methodology to improve the competence of youth inline hockey coaches. The present study uses InWEnt’s (2003) professional training principles along with Hung, Huang and Chen’s (2003) performance analysis matrix for defining problems to construct a measure index. Moreover, the paper also attempts to analyze the reasons for the incompetence of youth inline hockey coaches with a cause-effect diagram and proposes possible solutions for improvement. Finally, the competence of youth inline hockey coaches can be monitored through a control process.

Keywords: Six Sigma Methodology, competence of coaches, inline hockey.

INTRODUCTION

With the continuing promotion and marketing of athletic sports, outstanding young athletes have more opportunities to demonstrate their talent and charm and at the same time challenge human limits with extraordinary willpower and skills. Besides personal factors, a coach also plays an important role in the athletic life of sportsmen. Being a competent coach means acquiring assorted knowledge of physiology, psychology, kinematics, training guidance, leadership management, injury prevention and first aid as well as professional sports techniques, thus making coaching a professional career (Tu, 2000). In other words, in order to build a trustworthy and reliable relationship with youth athletes, a coach must be equipped with a professional disposition and character and be able to take all winning elements into consideration. Over the past decade, studies on professional guidance and perception have been on the rise (McCullick, Cummings, & Schempp, 1999). However, related research on the improvement of professional competence of coaches is still relatively scarce.

Over the past twenty years, when researching the professional competence of coaches, two of the most commonly discussed models were the behavior-oriented model (Smoll & Smith, 1989) and the multidimensional model of leadership (Chelladurai, 1990). These two models have given ground to related studies on the professional competence of coaches. In recent years, the Six Sigma Methodology has been primarily applied to the enhancement of performance (Banuelas, Antony, & Brace, 2005; Mikel & Don, 2007) and improvement of service quality (Behara, Fontenot & Gresham, 1995; Revere & Black, 2003; Antony, 2006). In view of the significance of the role of a coach to youth athletes and sports teams and to further understand the progress in which improvements in professional competence of a coach take place, this paper attempts to utilize the Six Sigma Methodology to probe into the improvements in competence of youth inline hockey coaches through the five methods of Six Sigma: define, measure,
analyze, improve, and control (DMAIC). In such ways, problems regarding improvement in the competence of youth inline hockey coaches can be defined and later pinned down and crucial factors in the development of coaching competence can be measured. Furthermore, this study also aims to analyze related procedures and important factors, so as to correct deviances. It is hoped that this study will serve as a reference for related sports organizations in their efforts to improve the competence of youth inline hockey coaches.

PROFESSIONAL COMPETENCE OF COACHES

Professional competence can be defined as the required knowledge, techniques, and abilities for one to achieve certain tasks at work (Bunk, 1994). InWEnt (2003) further narrows the definition to include factors such as personal abilities, professional abilities, social abilities, and method abilities. And, through the process of career training, these four abilities can be integrated into professional action competency. Such a view echoes the empirical research done by Schempp, McCullick, Busch, Webster and Mason (2006), which emphasized the five most important traits of coaches, namely skills, knowledge, personality traits, command philosophy, and tools. Therefore, professional competence actually consists of specialized skills, value, and attitude. With plentiful resources put into sport development by many countries, the role of a coach is no longer limited to passing on knowledge and skills, but rather being responsible for also organizing, training, and commanding. Thus, far more varied professional competence is needed. The modern definition of physical education would consist of sports, health, leisure activities, and dancing and can be extended to mean a total of twelve distinct professional academic fields in physical education, such as sports philosophy, sports history, sports sociology, sports education, adapted physical education, sports management, biomechanics, sports physiology, sports medicine, movement development, movement learning, and sports psychology (Wuest & Bucher, 2003). Due to the influence of coaches on athletes and sports teams, issues on the professional competence of coaches are getting more and more attention nowadays.

From past studies, it is understood that the professional competence of coaches is determined by the results of performance (Smoll, Smith, Barnett, Everett, 1993; Gould, Guinan, Greenleaf, & Chung, 2002; Knowlesa, Borrieb, & Telferc, 2005) or the professional developments of coaches (Gilbert, Côté, & Mallett, 2006). In addition, studies concerning the levels of competence of coaches and the will to work for coaches between the two genders were carried out in the past (Barber, 1998; Weiss & Stevens, 1993). Thereby, a correlation between the competence of coaches in respect to their career development and the performance of sports teams can be found. Although Situ (2007) emphasized that whether the focus of management education should be placed on generalization of skills or on specialties; it has been one of the toughest issues for management scholars to ponder and dispute. Wen (2010), however, pointed out that the higher the level of competence of a coach, the higher the satisfaction of athletes towards their competence and team relationship. Therefore, improvements in the competence of coaches are really of significance; yet regrettably, related studies as to how to boost and improve coaches' professional competence still lack a complete and scientific methodology. Consequently, this paper intends to use the Six Sigma Methodology as well as improvements over the competence level of coaches of youth inline hockey.
THE SIX SIGMA METHODOLOGY

The Six Sigma Methodology was first introduced by Motorola in 1987 with many corporations and organizations following thereafter. It puts much emphasis on quality control and improvements in an effort to enhance organizational management performance. According to Brue (2002), the Six Sigma Methodology is based on the concept of key quality of an activity and finding the aspects that are of importance to customers. It is also a statistical method for evaluating the process in terms of numbers of failure, ensuring that the number is no more than 3.4 in every one-million products. DMAIC (Define, Measure, Analyze, Improve, Control) is the core of the Six Sigma Methodology.

Although the Six Sigma Methodology is widely used in the industry sector, it lacks a principle-based foundation. Strict Six Sigma Methodology research requires normalized, yet distinctive and usable theories (Linderman, Schroeder, Zaheer & Choo, 2003). Chou (2008) also thinks that the promotion activities of the Six Sigma Methodology still encounter many difficulties. For instance, how to carry out feasible Six Sigma Methodology projects under limited resources while selecting the most important one. In other words, it is necessary to have a substantial theory-based foundation to apply the Six Sigma Methodology in other fields of study.

Based on the Six Sigma (DMAIC) theory, Arthur (2004) established a series of techniques for improving golf skills, utilizing scientific analysis along with the cause-effect analysis chart to study methods for improving golf skills. In fact, if people in charge of sports-related affairs could have a better understanding of the Six Sigma Methodology, it would be very beneficial to enhancing the professional competence of coaches. For example, sports-related authorities could utilize DMAIC to improve the competence of youth inline hockey coaches. First, a self-definition on the competence of youth inline hockey coaches will be carried out in the defining stage. Second, in the evaluation stage, the aim is to determine the difference between coaches' competence and important abilities, so as to analyze whether any improvements in coaches' competence can be attained. Finally, successful experiences will be incessantly controlled. Due to the lack of articles on the application of the Six Sigma Methodology on coaches' competence, this paper attempts to use Six Sigma Methodology – D (Define), A (Analyze), M (Measure), I (Improve), C (Control) to probe the improvements of coaches' competence in youth inline hockey. Furthermore, we will use InWEnt’s (2003) professional training principles along with Hung, Huang and Chen’s (2003) performance analysis matrix to define problems and thus to construct a measure index. Moreover, the paper also attempts to analyze the reasons for incompetence among youth inline hockey coaches through a cause-effect diagram and to propose possible solutions for improvements. The competence of youth inline hockey coaches can be monitored through the control process.

Define

First, a questionnaire was produced based on InWEnt’s (2003) professional training principles along with other relevant literature; there are 10 aspects with regard to the proficiency of youth inline hockey coaches. The questionnaire is composed of 40 questions. The questionnaire is positive in narration and gives slight adjustments to the wording according to varied characteristics of the coaches. The questionnaire adopts the Likert 5-level scale and coaches are asked to fill it out according to equipped ability (1 being not at all competent and 5 being at master level) and important ability (1 being not at all important and 5 being extremely important). The higher the score acquired, the higher the competence level of the coach. The competence scale is shown as follows.
Table 1: Competence Scale of Coaches of Youth Inline Hockey

<table>
<thead>
<tr>
<th>Equipped Ability</th>
<th>Important Ability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Incompetent</td>
<td>2 Not Good</td>
</tr>
<tr>
<td>3 Average</td>
<td>4 Very good</td>
</tr>
<tr>
<td>5 Mastery</td>
<td>1 Unimportant</td>
</tr>
<tr>
<td>2 Not Imp</td>
<td>3 Average</td>
</tr>
<tr>
<td>4 Very Imp</td>
<td>5 Ext. imp</td>
</tr>
</tbody>
</table>

1. Origin and development of inline hockey
   - Understanding the origin of inline hockey and its development trends
   - Understanding technique evolution and influence on revisions of rules/regulations

2. Principles on inline hockey training
   - Fundamental knowledge of sports science
   - Fundamental knowledge of sports management
   - Fundamental knowledge of sports medicine
   - Knowledge of sports training instructions

3. Proficiency in basic inline hockey training instructions
   - Instructions on ball-hitting
   - Instructions on putting
   - Instructions on ball-picking
   - Instructions on shooting
   - Instructions on defense
   - Instructions on goalkeeper-specific training
   - Instructions on ball-dribbling

4. Physical training and operations
   - Instructions on explosive force
   - Instructions on muscle strength
   - Instructions on speed
   - Instructions on endurance
   - Instructions on weight training
   - Instructions on interval training
   - Instructions on loop training
   - Instructions on repetitive training

5. Applications of tactics and strategies
   - Applications of rules and regulations
   - Applications of attack/defense tactics and strategies for matches

6. Psychological trainings and operation
   - Instructions on image training
   - Instructions on stress management
   - Instructions on pressure-relief training
   - Instructions on focus training
   - Instructions on target setting

7. Prevention of sports injury and handling
   - Understanding sports injury/prevention and handling emergencies
management skills

8. Team management skills

- Abilities to draft training plans and evaluate performance
- Abilities to do financial management and find sponsors to raise funds
- Abilities to command the team on site

9. Training of spirit and operations

- Abilities to pick out elite athletes
- Abilities to cultivate team spirit and a sense of honor among athletes
- Abilities to inspire athletes with the will to fight and obey

10. Professional attitudes

- An aggressive and devoted training spirit
- An modest attitude on review and learning
- An attitude that cares for players’ feelings and ideas

Evaluation of coaches’ abilities

<table>
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<td>5 Ext. imp</td>
</tr>
</tbody>
</table>

Next, referring to the methodology developed by Hung et al (2003), this paper respectively defines the index on equipped ability and important ability in accordance with the 40 items in Table 1.

\[
I_{X_i} = \frac{\mu_{X_i} - 1}{R} \quad \text{（equipped abilities）}
\]

\[
I_{Y_i} = \frac{\mu_{Y_i} - 1}{R} \quad \text{（important abilities）}
\]

In the collected questionnaires, \( \mu_{X_i} \), \( \mu_{Y_i} \) represents the statistical average scores of the corresponding question respectively, where \( i = 1, \ldots, 40 \), \( R = k - 1 \). In this paper, the 5-level scale was utilized and therefore the result \( R = 5 - 1 = 4 \) was obtained.

If \( I_{X_i} = 0 \), then the equipped abilities of all of the coaches are poor, that is, their proficiency qualities are 0%.

If \( I_{X_i} = 1 \), then their equipped abilities are outstanding as their proficiency qualities are 100%.

If \( I_{X_i} = 0.5 \), then their equipped abilities are ordinary, meaning their proficiency qualities are 50%.

The interpretation of the coaches’ important abilities and proficiency qualities are identical; consequently, similar results could be produced.

The performance evaluation matrix (Figure 1) concerning the competence of youth inline hockey coaches is given below. The ordinate refers to important abilities and the abscissa refers to equipped abilities.
The suggestions offered by Hung et al (2003) were also considered in this research. The reasonable set areas, the original 3 plots, were altered by the area formed by two slant lines. In this manner, the problems of I and II could be overcome. The distance between these two slant lines is determined by the professionalism of youth inline hockey coaches. This professionalism can be further divided into individual ability, expertise, social ability, and method ability. In this way, necessary major improvements can be identified and addressed; when factors such as personnel cost and time etc. are taken into consideration, the related authority could also expeditiously improve coaches’ performances. It could be shown in the performance evaluation matrix (Figure 1) that in area A, the coaches’ competence on important abilities is superior to equipped abilities. That is to say, their core skills need to be upgraded. If this circumstance lasts without further alternations, serious impact could be created not only on team management but also on match results. In area B, it is argued that the equipped abilities of the coaches are equivalent to the important abilities, meaning that the coaches’ level of competence and the importance of competence are tantamount. Therefore, this condition could remain current. In area C, it is shown that the equipped abilities of the coaches are higher than the important abilities, which explains why the coaches’ level of competence is superior to the importance of competence. Consequently, it was listed as the subordinate core to be emphasized. After the analysis carried out by superintendents of related sport authorities through the performance evaluation matrix in this paper, it could be discovered that if the result of evaluation items is in area A and C, these evaluated items would be the problems the coaches would need to tackle. Each question would be the basis of a Six Sigma project. Besides, if the superintendents find that the results are mostly in areas A and C, it would be arduous to solve both problems simultaneously. Under this circumstance, through disqualified measurement items and the distance between these two slant lines, it could be demonstrated that the farther the results move to the target area, the more critical the situation and improvement is needed. In light of the concept mentioned above, the superintendents could discover the key to the competence of the inline hockey coaches.

For the convenience of the superintendents, \( d_i \) is defined as the distance from the coordinated point \((I_{X,i}, I_{Y,i})\) to its diagonal line. Since the diagonal plotted point of \((I_{X,i}, I_{Y,i})\) is
\[
\left( \frac{I_{X_i} + I_{Y_i}}{2}, \frac{I_{X_i} + I_{Y_i}}{2} \right), \ d_i, \text{ the distance between two points, could be calculated as follows:} \\
\]
\[
d_i = \frac{|I_{X_i} - I_{Y_i}|}{\sqrt{2}} \\
Consequently, after the numerical value of \( d_i \) is calculated and each item is sorted, superintendents could immediately and competently determine improvements the coaches need to make by adopting Six Sigma Methodology.

**Measure**

The second step of the Six Sigma Methodology is Measure. According to the result of the items of competence, points are plotted in the matrix. It is found that the coaches’ competence could be high in equipped abilities but low in important abilities; or inferior in equipped abilities but superior in important abilities. Following this process, the main points of improvement could be specified and the first step of the Six Sigma Methodology, Define, is completed. The competence of coaches could be either high in the equipped abilities or in important abilities; therefore, in (2(a), 2(b)), it is discovered that the overlapping parts of equipped and important abilities are rarely found. There are various means of designing questionnaires; nevertheless, the method of Measure stated in this study could be applied to most of the scales. The inference of Measure in this paper would be set examples by using the Likert 5-level scale. For other kinds of scales, familiar results could also be estimated.

![Histogram: Variation in the Proficiency Levels of the Youth Inline Hockey Coaches’ Equipped Abilities and Important Abilities](image)

**Figure 2:** Histogram: Variation in the Proficiency Levels of the Youth Inline Hockey Coaches’ Equipped Abilities and Important Abilities

Figure 2(a) (blue bar indicates equipped abilities and red indicates important abilities) clearly shows that the blue bar has a higher proportion in items 3, 4 or 5, while the red bar prefers 1, 2 or 3. This result implies that the significance of the differences between the awareness of the equipped abilities and the important abilities for the youth inline hockey coach, and that the equipped abilities are more substantial than the important ones. However, in figure 2(b) the equipped abilities of the coaches’ proficiency are less substantial than the important ones, and both of them require improvement. According to performance evaluation matrix theory, if the equipped abilities and the important abilities fall in reasonable areas, the histogram of the proficiency, i.e. the blue bar for the equipped and the red for the important abilities, should nearly overlap (shown as figure 3), which means that the equipped and the important abilities are equivalent.
According to the above concept, indicator $S$ was defined to measure the differences between the individual equipped abilities and important abilities. Indicator $S$ represented the difference between the frequencies of the equipped abilities and the important abilities in different $k$ scales. The definition of $S$ is as below:

$$S = \sum_{i=1}^{k} |A_i - B_i|$$

$A_i$ and $B_i$ represents the frequencies in different scales. When the $S$ value is relatively small, the result means that the coaches’ proficiencies are good. If $S=0$, it shows that the coaches’ proficiencies are excellent, and the entire control system at that moment is flawless. According to the concept of the acceptable areas of the performance evaluation matrix theory, some differences between the equipped abilities and the important abilities of the competence for youth inline hockey coaches are allowed, and they are not necessarily identical. If the allowed attributable risk is $\Delta$, the differences between the equipped abilities and the important abilities of the coaches’ competence could be assessed whether they are smaller than the allowed differences. However, the coaches’ competence is relatively difficult to be equivalent. We hypothesized that $\Delta \geq 0$ to assess if the result shows $S \leq \Delta$. The hypothesis is as below:

$$H_0 : S \leq \Delta$$

$$H_A : S > \Delta$$

(1)

$\Delta$ is the sum of a number ($k$) of the differences between $A_i$ and $B_i$. If $w_i$ represents the ratio of the differences between the equipped abilities and the important abilities of a certain item ($i$), then $\sum_{i=1}^{k} w_i = 1$ and $|A_i - B_i| = w_i \Delta$, while $i = 1, ..., k$. As a result,

$$S = \sum_{i=1}^{k} |A_i - B_i| \leq \sum_{i=1}^{k} w_i \Delta = \Delta.$$
From the above in accordance with the weighted formula \((w_i)\) we re-wrote the hypothesis test (1) as below:

\[
H_0 : |A_i - B| \leq w_i \Delta, \text{ while all } i = 1, \ldots, k.
\]
\[
H_A : |A_i - B| > w_i \Delta, \text{ while partly } i = 1, \ldots, k.
\] (2)

While \(\Delta = 0\), hypothesis test (2) was equivalent to the following:

\[
H_0 : |A_i - B| \leq 0, \text{ while all } i = 1, \ldots, k.
\]
\[
H_A : \text{ reject } H_0
\] (3)

In terms of hypothesis testing (3), the test statistic can be referred to Pearson’s goodness of fit test (cf. Desu (2003)). In hypothesis test (3), when the test statistic is close to the \(k - 1\) degrees of freedom in a Chi-square distribution and could reject \(H_0\) under the level \(\alpha\) test, the result is \(P(X^2_{(k-1)} > T(obs)) < \alpha\).

In this formula,

\[T = \sum_{i=1}^{k} \left( \frac{(A_i - B_i)^2}{C_i} \right) \text{ and } T(\text{obs}) \text{ are the values of the sample test statistic.} \]

Next, we will discuss the attributable risk \(\Delta \neq 0\). According to hypothesis tests (1) and (2),

\[S \leq \Delta \Leftrightarrow |A_i - B_i| \leq w_i \Delta \Leftrightarrow (A_i - B_i)^2 \leq (w_i \Delta)^2 \Leftrightarrow \left( \frac{(A_i - B_i)^2}{C_i} \right) \leq \left( \frac{(w_i \Delta)^2}{C_i} \right)\]

However,

\[\sum_{i=1}^{k} \left( \frac{(A_i - B_i)^2}{C_i} \right) \leq \Delta^2 \sum_{i=1}^{k} \frac{w_i^2}{C_i}\]

Thus, rejecting \(H_0\), \(T - \Delta^2 W > X^2_{(k-1)}(1-\alpha)\). In this case, \(W = \sum_{i=1}^{k} \frac{w_i^2}{C_i}\) is the function of \((w_1, w_2, \ldots, w_k)\). Next, mathematics programming was applied to discover the extreme value \(W\). The program is:

Maximize: \(W = \sum_{i=1}^{k} \frac{w_i^2}{C_i}\)

Subject to: \(\sum_{i=1}^{k} w_i = 1\)

\(\hat{W}\) represents the extreme value found by the mathematical program, and the correspondent \(P\)-value is \(P(X^2_{(k-1)} > T(\text{obs}) - \Delta_0^2 \hat{W})\). The \(\Delta_0\) is the initial value. If \(P(X^2_{(k-1)} > T(\text{obs}) - \Delta_0^2 \hat{W}) < \alpha\), then we did not have adequate evidence to accept the null hypothesis.

**Analyze**

The outstanding achievements of worldwide youth athletes came not just from their long-term diligent practice and will power. Coaches also play an extremely important role. They provide psychological and physical help to youth athletes in order to enhance their sports skills. Along with globalization and improvements in science technology, more sports training and coaching skills have professionalized the coaching field. As indicated by Hong (2001), it can be learned from coach training courses and methods provided by different institutions around the globe that the essential qualities of coaches focus on knowledge of professional theories, professional sports skills, techniques and strategies. In other words, the competence of coaches is trained systematically and respectively through various sports categories to achieve optimal athletic training results. Relevant references (Peak & Brown, 1980; Cheng, 2000; Xue and Hsieh, 2001;
Jiang and Huang, 2004) also show many factors influencing coaching competence. These factors can be generally put into three categories: professional knowledge, professional skills and professional attitude. To further explain the relationship between these three categories and coaches’ competence, a cause-effect diagram was applied to show the improvement of coaches’ competence. In figure 4, inline hockey specialist knowledge and sports science knowledge were classified into ‘Professional Knowledge’. Professional Skills include inline hockey basic skills training, specialist physical fitness training, competition tactics and strategy applications, psychological training and performance, sports injury prevention and handling abilities, and sports team management. Professional attitude consists of coaches’ attitude towards athletes, excellent work attitude, and willingness to make sacrifices.

![Cause-Effect Diagram for Youth Inline Hockey Coaches’ Competence.](image_url)

**Figure 4: Cause-Effect Diagram for Youth Inline Hockey Coaches’ Competence.**

Through the analysis of the cause-effect diagram, this study further examines the implicit meaning of each dimension:

1. Professional Knowledge

   Youth inline hockey coaches are required to have complete relevant knowledge to be competent in selecting players, planning, training and managing competitions. In general, coaches’ professional knowledge should include:

   (1) Specialist knowledge of inline hockey, including the development and skills progression of inline hockey, and organizing relevant information from real competition experiences.

   (2) Sports science knowledge: coaches must be equipped with general science knowledge such as physiology, psychology, pedagogy and sociology. It is necessary to be familiar with applied sciences such as sports sociology, sports psychology and sports medicine.

2. Professional Skills

   Youth inline hockey coaches usually gain their professional skills from formal training, practical
experience as well as direct observation. The aim is to improve team members’ performances. In other words, professional skills mean that the level of understanding of inline hockey, including training methods and relevant specialist abilities allows them to enhance team performance. Hoegl (2007) points out the direct influence on the performance effects of domain-relevant skills. It is worth noticing that the natures of professional knowledge and professional skills are different. Tamir (1990) separates ‘knowledge’ from ‘a skill’, i.e. knowledge as ‘knowing what,’ while a skill as ‘knowing how to apply.’ The literature review shows that professional skills for inline hockey include the following:

1. Basic skills training: batting, stick handling, wrist shot, slap shot, defense, passing and goaltender training.
2. Specific physical fitness training: establishing a complete training session focusing on explosive force, speed, speed endurance, muscle endurance, weight training, interval training, circular training and repetitive training.
3. Competition tactics and strategy application: establishing the awareness of tactics to train players dealing with various complicated conditions; flexibly employing tactics and practicing drills to avoid rigid tactics application in different competition situations.
4. Psychological training and handling ability: psychological training usually has a close connection to skills and tactics, and plays a key role in modern sports training. It includes image training, stress management, relaxation training, attention training and goal setting.
5. Sports injury prevention and treatment: not every sports team can afford a sports injury specialist, and thus coaches should be familiar with sports injury types and their causes as well as emergent handling procedures; they should also have knowledge of soft and hard tissues, so as to make prompt judgment on emergencies as well as be equipped with psychological consultation skills.
6. Sports training and team management: a team consists of different members, and therefore it is important for coaches to learn how to manage a team, for example, making training plans and assessing training effects, financial management, seeking sponsorship, and on the spot guidance.

3. Professional Attitude

Apart from professional knowledge and skills, professional attitude is also another influential factor for coaches of youth inline hockey. After all, professional attitude is the critical element to establishing coaches’ professional status. It is shaped by a highly responsible attitude as well as enthusiasm and devotion to the team. It can be understood from the relevant literature that a professional attitude consists of the following three facets:

1. Attitude towards athletes: coaches should establish a harmonious team atmosphere and should attempt to develop a sense of security for players by listening to them and respecting their opinions apart from training in their specialist skills.
2. Excellent work attitude: A team cannot always be the winner; therefore, coaches should review every training session and competition, and discuss them with the players to form a learning environment.
3. Attitude of devotion: coaches should not just teach skills and pursue good competition results, but should also spend extra time taking care of team members’ various problems such as employment, family issues and psychological distress, and offer help when possible.

Improve

The factors that affect a coach’s competence were discussed in the previous section; relative strategies in accordance with the aforementioned factors will be proposed to improve coaches’ competence in this section:
1. Professional Knowledge

The cause-effect diagram (figure 4) shows that the professional knowledge of inline hockey and sports knowledge affects coaches’ professional knowledge. Thus, in terms of specialist knowledge of inline hockey, sports authorities should hold conferences and seminars about youth inline hockey and encourage coaches’ active participation. Community discussion and sharing also provide a chance to absorb current and future development trends of youth inline hockey. Nowadays, society pursues multi-dimensional development, and many factors such as different policies technologies may affect the development of youth inline hockey. For example, inline hockey was held in the 2009 World Games in Kaohsiung, which increased this sport’s visibility and gave a deeper meaning to the development of inline hockey in Taiwan. In addition, by actively participating in various sports events, youth inline hockey coaches were likely to contact top teams. Apart from accumulating competition experiences, they are also able to observe competitions to record other teams’ attack and defense skills for future training purposes. Furthermore, regarding the knowledge of sports science, the coaching training for youth inline hockey requires self-advancement; for example, reading domestic and international sports-related academic journals, participating in relevant specialist forums and acquiring qualifications. These can all contribute to coaches’ professional knowledge. Lin (1999) points out that coaches should specialize in domains such as education, psychology, physiology, sociology, sports and science to formulate effective sports training programs. Successful coaches should also continuously explore new theories and techniques and should implement strategies suitable for the athlete’s individual needs to fully demonstrate their talents for the best results. Therefore, sports authorities or sports-related departments at the university level should also launch courses or qualifications specializing in sports science. This would provide an orderly and progressive coaching training procedure as well as offer more resources to those youth inline hockey coaches who are willing to enhance their sports science knowledge.

2. Professional Skills

The cause-effect diagram (figure 4) shows the aspects concerning the professional skills of a youth inline hockey coach, of which the implications will be further analyzed here. Generally, professional skills have a lot to do with a person’s job. In this case, a coach’s professional skills refer to the skills needed in order to be well-rounded, which are different from the above-mentioned professional knowledge – professional skills emphasize the practical techniques. In other words, possessing professional skills is the utmost core value to a coach who has to earn both the players’ and the outside world’s respect. As a result, regarding basic technique training, coaches in youth inline hockey have to recognize that the sport itself is comprised of multiple open skills. During the matches, the speed of attack-defense tactics from each side becomes faster and could vary significantly. Thus, during regular training, apart from passing on the basic techniques based on the coach’s own attainment, relevant auxiliary activities, such as straight-ahead dribble, slalom dribble and dribble passing should be included in the basic technique training programs. Meanwhile, the coach also needs to constantly keep updated – either through observing games or attending workshops – to develop professional skills.

“Specific Physical Fitness” involves whether the coach is able to improve players’ physical conditioning so that it is appropriate for playing the game, which means that the coach could match new sport science technologies with players’ physical fitness so that the players can apply what has been learned in training to games. Therefore, a youth inline hockey coach must be able to provide a systematic program for the methodology and purposes of physical training and read extensively both national and international literature or watch teaching videos and obtain relevant information from the Internet; for example, the SAQ
(Speed, Agility, Quickness) or SPARQ (Speed, Power, Agility, Reaction, Quickness) training concepts which are popular internationally. With thorough understanding of such training concepts, a coach would be able to further adjust and improve his/her training program based on the players’ feedback.

“Competition Tactics and Strategy Application” refers to the tactics used in response to different competitors arranged by the coach as a team leader. Applying the right tactics is the key to victory. Hence, a youth Inline hockey coach should be able to master both defensive and offensive tactics. According to Cheng, Lee and Huang (2007), the basic quality of tactics thinking includes depth and breadth, agility and accuracy, logicality and criticality, predictability and creativity. They also suggested that quality tactics thinking is critical to win a game. It is a long term process that develops tactical thinking in players; therefore, the coach has to enhance his/her own observation and learning abilities, upgrading the creativity in tactics through the absorption of extensive information and then put into effect both during training and contests.

“Psychological Training and Handling Ability” illustrates the ability of a coach to handle the psychological factors of motivation, emotion, attention, will power and awareness of the youth players’ anticipation to a game. Thus, psychological factors are also vital to the team’s performance. In addition to improving the psychological training and handling ability based on the coach’s own attainment, s/he needs to further develop the ability to make the correct judgment upon the type of games, competitors and arenas to predict psychological variations and possible mental status of youth players, and then provides counseling in accordance to the player’s needs. In other words, the coach represents the soul of the team. To enhance the psychological training and handling ability, the coach will have to establish a deliberate procedure to grasp the cognitive, external and physiological factors of youth players so as to refine his/her professional skills with counseling based on direct observation.

“Sports Injury Prevention and Treatment” is indispensable to a sport as physically fierce as inline hockey. Many sports teams in Taiwan cannot afford athletic trainers due to limited budgets. As a result, the coach’s ability to prevent and treat sports injury has a close relationship to the players' safety. Coaches need to possess basic techniques such as PRICE (protection, rest, icing, compression, elevation) sports injury treatment principle and CPR. Furthermore, sports related organizations should organize workshops regarding sports injury on a regular basis, providing opportunities for the coaches to exchange thoughts and opinions with athletic trainers and paramedics who have long term experiences in treating sports injury. In the meantime, a database should be created in accordance with motion analysis, injury symptoms and steps for treatment to determine the injuries which occur most among youth players in order to enhance the coach’s ability to prevent and treat sports injuries.

Just as every corporation needs an excellent manager, a sports team also relies on the coach’s “Training and Management Ability” to operate well. The coach is not only responsible for the results of games, but also needs to demonstrate his/her leadership and organizing ability – that is, planning and developing actions concerning the team’s expected goal through the coach’s leadership and achieve the outcome with sponsorship. Hence, sports related organizations may encourage coaches to attend sports leadership workshops to further understand leading skills for sports teams. A coach also needs to develop his/her own leading style, utilizing leadership and management skills flexibly based on the players’ personal characteristics to achieve effective training and management.

3. Professional Attitude

Professional attitude presents three important facets in the cause-effect diagram, Diagram 1. The contents of these three facets will be discussed in this section.

“Attitude toward athletes” faithfully presents how a coach views the players and how the players grow together as a team. Particularly, coaches nowadays no longer work by simply giving orders and
carrying out their duties arbitrarily. The process for building a powerful team with devotion has become an important lesson for a coach. Therefore, if the coach hopes to refine the attitude of youth players, s/he has to set a goal which can be attained by the whole team so as to build trust and consensus through communicating with and listening to the players. In addition, the coach has to value individual differences and offer assistance, exerting his/her influence through leading by personal example.

“Working Attitude” not only demonstrates the coach’s professionalism, but also provides an indirect influence on the team’s performance. As long as the coach picks excellent players, quality training and supervision should be offered, sharing the gain and loss of each game together with the players. Among which, the coach will have to present extraordinary patience and persistence, bringing his/her instructing, training, commanding and managing abilities to full play and sacrificing himself/herself. Only by doing so can the coach refines his/her dedication to work.

“Attitude of Devotion” is a lifetime ambition for coaches. To refine the attitude of devotion, the coach has to unceasingly take care of and teach players, sparing more private time to enhance professional expertise to elevate the team’s technical level, tactics application and psychological condition to establish the team’s devotion. Such process requires long term development and efforts to achieve the team’s expected goal.

Control

The last step of Six Sigma Methodology is Control. This study sets up the gap regulation mode for equipped abilities and important abilities to effectively monitor the coach’s professional skills. The statistics T of gap indication S for measuring the equipped abilities and important abilities conform to the k-1 freedom of Chi-Square; therefore, the control limit is as follows:

\[
UCL = \chi^2_{(k-1)}(1-\alpha/2) + \Delta_0^2 \hat{W}
\]

\[
CL = \chi^2_{(k-1)} 0.5 + \Delta_0^2 \hat{W}
\]

\[
LCL = \chi^2_{(k-1)} \alpha/2 + \Delta_0^2 \hat{W}
\]

When \( \Delta_0 = 0 \), the control limit is as follows:

\[
UCL = \chi^2_{(k-1)}(1-\alpha/2)
\]

\[
CL = \chi^2_{(k-1)} 0.5
\]

\[
LCL = \chi^2_{(k-1)} \alpha/2
\]

CONCLUSION

Without an excellent coach, it is impossible to train brilliant players. An excellent youth inline hockey coach not only has to possess a solid foundation for training the players in both physical and psychological levels, but also has to constantly acquire better techniques and tactics. Based on the professional ability training of InWEnt (2003) and aided with a questionnaire designed from relevant literature, this study investigates the equipped abilities and important abilities of youth inline hockey coaches. Followed by the performance evaluation matrix, items of insufficient proficiency were discovered. The reasons for insufficient proficiency were then analyzed by using the cause-effect diagram to find specific measures for improvement and adjusting the coach’s professional abilities continuously through monitoring. Moreover, this study has built a process with the Six Sigma Methodology suitable for improving the youth inline hockey coaches’ competence. In the sports fields where competitions are
getting fiercer than ever, enhancing the coaches’ professional abilities to upgrade training results is critical to sports related organizations and can also serve as an example for elevating professional abilities for coaches in other sports.

REFERENCES


