SUCCESS AND TALENT DEVELOPMENT AS INDICATED BY MOTOR TESTS AND PSYCHOMETRIC VARIABLES OF U18 ICE HOCKEY PLAYERS

PhD dissertation

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I. INTRODUCTION

As the leader of the Coaches Committee of the Hungarian Ice Hockey Federation, and as a former 45 times Hungarian adults national team member, my interest has focused on the systematic development of this spectacular sport. With the leaders of the Ice Hockey Federation we first fully examined the structure and system of Hungarian and international ice hockey and then started to look for areas for development. By this approach we began to re-structure the Hungarian Coach Education Program following the international elite nation's direction in 2003. Today, I am the leader of the ice hockey section in the government sponsored Hungarian Youth Development Program, called "Héraklész". During my work I am in very close contact with the successful players of tomorrow.

Ice hockey is characterized by high intensity intermittent skating, rapid changes in velocity and duration, and also frequent body contact (Montgomery, 1988). This sport is known to be one of the fastest team sports in the world. The success in this sport mainly depends on not only the players' individual efficacy, but a lot more on team efficacy, understanding, communication, cooperation, and team performance (Feltz & Lirgg, 1998). If someone watches a match in the World Championships or in the NHL, he/she can see an unbelievable speed, tempo, tricks and the player's high level of performance (Domer, 2005). Besides these conditional abilities and skills, players are required to have strong mental and psychological skills. Besides others, curiosity, anger, and hostility are found as important determinants in ice hockey, which is presumably a result of sport specific behavior (Sheldon & Aimar, 2001). According to an earlier study of ours (Géczi et al, 2008), the measured lower level of depression

suggests that little frustration was accumulated in this sport. It was also concluded in that particular study that adult successful players are in a more beneficial state from the standpoint of anxiety, pressure, and worry than younger successful players. Also, most young players do not seem to have the necessary skills and/or abilities to use psychological skills in their practice and games (Humara, 2000)

What makes it different from most popular team sports in Hungary, is that it is played with a tool (hockey stick) and players wear protecting equipment. Hence, it makes it more complicated to play with any direct contact with the puck and it is almost impossible to play without direct contact with the opponent players. We also need to emphasize that the weight of a player's equipment is between 12 and 15 kg. However, the goaltenders, as a special post, wear heavier equipment (around 15-17 kg).

To understand the game itself, one also needs to know that the exact gliding surface of the skate's blade is near 1 cm^2 of each, so players must have a very good balance skill. On the gliding surfaces the highest speed of the skating movement achieves 40-50 km/h. The rules of the game allow body contact, also, by this high speed and tempo there are constant pushes and pulls or body checks among the players (Montgomery, 1998). Over those components, high level matches are held in front of 10-20.000 fans.

Altogether these factors in elite ice hockey require adequate gift and talent that should be regularly assessed and systematically developed by well-trained coaches (Géczi & Bognár, 2004). Besides inherited abilities and learned (environmental) skills, good conditional skills (Geitner et al, 2006; Green et al, 2006) coordination skills (Wu, 2002), and tactical preparedness are also meaningful aspects in ice hockey talent development processes (Cernjul, 1999). Successful players demonstrate a high level of

so-called hockey sense (Martell & Vickers 2004) and also strong mental, psychological characteristics (Géczi et al, 2008; Lauer, 2005). Also, ice hockey also demands well-trained aerobic and anaerobic energy systems and also an optimal body composition (Green et al, 2006).

Ice hockey in terms and facts

The International Ice Hockey Federation organizes World Championships (WC) for three different age groups. Due to the complexity of the sport, major international tournaments are not held under the U18 players. The reason for this is that by this age (U18) ice hockey players have achieved most of the necessary skills, technical and tactical competences, and also physical developments that allow playing high level ice hockey. Besides U18 players, the U20 age group and the top level adult players also play for the precious WC title.

It is an important plan for both the Hungarian Ice Hockey Federation (HIHF) and the ice hockey community to bid for the "A" level World Championship in 2014. The leaders of the sport make the strategic planning and aim for the necessary steps in order to reach the long-term goals.

Ice hockey is considered a developing sport in Hungary. All involved parties agree that to be among the best national teams in the world we need good leaders with strategic thinking and planning, well educated coaches, and humble, hard-working players. A good ice hockey player should possess a lot of physiological characteristics (Vescovi et al, 2006), should be very skillful, smart, confident but modest, and intrinsically motivated (Géczi et al, 2008). Young promising players are also expected to be curious, coachable, task oriented with an optimal level of anxiety (Géczi et al,

2007). The youth development program clearly plays a significant role in that planning process of HIHF. Besides, talent identification, selection and development programs seem to be key factors to find adequate players and coaches (Géczi et al, 2005).

Indicated by the official website of the International Ice Hockey Federation (IIHF) the organization has 66 members of national associations. There are three categories of IIHF membership. The first category is IIHF *Full Member*, these are the nations that have their own, independent, ice hockey federations or associations that are clearly separate from a winter sports federation. These members participate annually in the IIHF championship programs. There are 50 full members of the International Ice Hockey Federation. The second category is IIHF *Associate Member*. This group consists of 12 nations that either do not have fully independent national associations or they have independent national associations but they participate to only a limited extent in IIHF championships. Finally, there is IIHF *Affiliate Membership* for those countries that only participate in IIHF InLine championships. Only 4 affiliate members are registered in the IIHF.

According to IIHF, there were 1.475.187 registered players worldwide in 2007 and seeing the tendency, this figure means nearly double of this amount of non-registered players who play ice hockey on a regular basis. The number of ice rinks can be divided into two groups: there are 6.324 covered (in North-America 4.443) and uncovered 935 but the accurate number probably more than this figure.

Ice hockey in North-America is one of the most popular sports, among basketball, baseball, football and the developing soccer and lacrosse. It is considered a very expensive sport, so it is played more in the developed countries worldwide. An interesting fact that according to the literature, the total amount of the combined

operating revenues was 1.996 billion dollars in the 2002-2003 NHL season (Levitt, 2004). Another fact worth mentioning is that in 2004 there were 203 players who during their career earned more than 10.000.000 dollars, and 23 more than 50.000.000 dollars. In today's ice hockey 3 players were over the total of 70.000.000 dollars. The costs of the clubs were so high, that in the NHL the owners and the players had to sign a six year collective bargaining agreement, scheduled to run through September 15, 2011. That agreement put a cap on the salaries and other payments, and also defined the structure of the operation.

In Hungary there are 2.024 registered players, 17 covered and 11 uncovered ice rinks. The adult team plays in the "A" level, both of the youth teams (under 20 and under 18 years of age) play in the Division I level. The women's team is slightly weaker, the team plays in the Division III level.

Problem Statement

There are differences in skills, factors of condition, coordination, and also psychological and mental abilities that determine membership of elite athletes in all sport. Similarly, ice hockey players of different levels and ages have different inborn and learned abilities that ensure a high level of achievement. Ice hockey is a multifactorial sport that requires players to possess a number or different attributes (Vescovi et al, 2001).

Youth sport requires the most dedication, planning, and cooperation from coaches because of the possibility of early burn out, talent identification, selection, and development. Talent development is of key importance of the Hungarian Ice Hockey Federation; hence, there is an increasing attention toward a complex view of youth development, which includes anthropometric, on-ice and off-ice motor performances,

and motivation, perceived motivational climate, coping, curiosity and anxiety measures that might very well affect players performance (Géczi & Bognár, 2004).

When reviewing the literature, it is evident that there are only few studies focusing on multidimensional aspects of youth sports. It is especially true for ice hockey, and also for finding factual, objective, and multidimensional measures for success in youth development programs (Géczi et al, 2008). It is well accepted that progressing success in sports cannot be completed without a complex view of the issue that includes general and specific motor, and also certain psychometric measurements (Trzaskoma-Bicsérdy, Bognár, & Ozsváth, 2007).

Most studies in ice hockey focus on specific physiological aspects of the sports in high intensity exercises (Buffone, 1998; Green et al, 1999) and aggression (Gee & Leith, 2007; Lauer, 2005). Also, a number of research including anthropometry, jumping, aerobic capacity and anaerobic power were performed off-ice, that may very well limit the applicability of the results to on-ice performance or on-ice ability (Cox et al, 1995, Goudreault 2002, Bracko & George 2001, Loh 2003, Petrella et al, 2007). However, examination of sport specific on- and off-ice tests altogether with motivation, coping, and anxiety seem fairly scarce (Géczi, 2008).

Purpose Statement

According to the parameters of HIHF, in this research it was compared and contrasted certain motor and psychological characteristics of Selected and Non-selected U18 players. U18 players were selected for a number of reasons. First, IIHF official championships begin at this age group, so it is an important issue to attend these events for all national associations involved in international ice hockey. Second, a

fundamental basis of future success lies on youth development programs, so it is considered significant to examine different conditional and psychological factors of young athletes.

Both Selected and Non-selected groups participated in the same try out tests in May, 2007. Hence, these players could be considered as the most successful U18 players in Hungary. According to experience, Selected U18 players have more chance to become successful players in the future, although there are players whose individual development is slightly slower. The predicted assumption was that if one knows the specific factors of a successful selection process, the players' career and plan for the most fruitful direction of the players' development system will be directed more successfully

The main purpose of this study was to find out what motor and psychological differences exist between Selected and Non-selected U18 players in ice hockey. To be able to answer this main question, there are six specific questions:

1. Do U18 ice hockey players demonstrate a considerably high level of off- and on-ice motor test measures?
2. Do Selected and Non-selected U18 players differ in their motor results of off-ice motor test?
3. Do Selected and Non-selected U18 players differ in their motor results of on-ice test?
4. Do U18 ice hockey players demonstrate an optimal level of coping, motivational, perceived motivational, and anxiety characteristics?
5. Do Selected and Non-selected U18 players differ in their coping characteristics?

6. Do Selected and Non-selected U18 players differ in their motivational characteristics?
7. Do Selected and Non-selected U18 players differ in their perceived motivational climate characteristics?
8. Do Selected and Non-selected U18 players differ in their anxiety characteristics?

Hypotheses

1. All U18 ice hockey players demonstrate a considerably high level of off- and on-ice motor test measures.
2. The Selected U18 players demonstrate significantly better motor performance in most of the 6 off-ice tests than Non-selected players.
3. The Selected U18 players demonstrate significantly better motor performance in most of the 13 on ice skating tests than Non-selected players.
4. All U18 ice hockey players demonstrate an optimal level of psychological characteristics in coping, motivational, perceived motivational, and anxiety?
5. The Selected U18 players demonstrate significantly better coping characteristics than Non-selected players.
6. The Selected U18 players demonstrate significantly better motivational characteristics than Non-selected players.
7. The Selected U18 players demonstrate better motivational climate than Non-selected players.
8. The Selected U18 players demonstrate significantly less anxiety than Non-selected players.

Terms, Definitions

Acsi-28

Athletic Coping Skills Inventory-28 (Smith, 2006) is a self-evaluation scale of 28 items assigned a numerical assessment from 1 to 4 point for the following psychological traits: coachability; concentration; confidence and achievement motivation; coping with adversity; freedom from worry; goal setting/mental preparation; peaking under pressure (range from 4 to 16 on all of the scales).

Motor Test

The motor test (Géczi et al, 2007) includes off-ice and on ice tests. Motor tests are a useful to measure the players' skills and condition-coordination development. It is very useful information for the coaches; the motor tests mean feedback about the required skills.

Non-Selected Player

Players, who have participated on the try out test, but they were not selected into the U18 national team.

Off-Ice Test

Test without any ice hockey specific equipment, it was held in a track and field stadium (Géczi et al, 2007):

1. 60 m forward sprint **(60fs)**

2. 10 m forward sprint **(10fs)**

3. Standing long jump. For evaluation, the best value of two jumps were taken into account **(slj)**
4. 6*9 m agility run **(6x9ar)**
5. 400 m run around the Track and Field circuit (**400r)**
6. 1500 m run around the Track and Field circuit **(1500r)**

On-Ice Test

Test on the surface of the ice, the players usually wear the whole equipment (Géczi et al, 2007):

1. 36 meter forward skating **(36mfs)**
2. 10 meter forward skating **(10mfs)**
3. 36 meter forward skating with puck **(36mfsp)**
4. 10 meter forward skating with puck **(10mfsp)**
5. 36 meter backward skating **(36mbs)**
6. 10 meter backward skating **(10mbs)**
7. 6*9 meter agility test between the red and the blue lines **(6x9at)**
8. Crossover test with puck **(cotp)**
9. 6*54 meter forward skating **(6x54fs)**
10. Passing skill drill **(psd)**
11. Shooting skill drill **(ssd)**

PMCSQ-2

The Perceived Motivational Climate in Sport Questionnaire-2 (Newton et al, 2000), which was developed to assess perceptions of their team's motivational climate, is

characterized in terms of two higher order dimensions the achievement goal frameworks of task and ego-involving climate. Task-involving climate mostly measures a player's perceptions of coaches' emphasis on players' effort and improvement and ego-involving climate measures players' perceptions of punishment for mistakes, recognition of only the best players, and inter-team competitions among players.

Selected Player

Players who have participated in the try out test and selected into the Hungarian U18 national team and represent the country in international matches and tournaments (Géczi et al, 2007).

SMS

Sport Motivation Survey (Pelletier et al, 1995) was developed particularly to measure motivation in the field of sport and physical education. The purpose of the 28-item survey is to determine components of intrinsic, extrinsic motivation and amotivation.

STPI-Y

State Trait Personality Inventory-revised form (Spielberger, 1995; Sipos et al, 2004) is a self-evaluation scale in order to make known individual differences of anger, curiosity, depression and state/trait anxiety (10-item psychometric scales with 4 grades from 10 to 40 points).

Try Out

On-ice and off-ice tests were developed to evaluate the skills of the participating players who were sent from the clubs (Géczi et. al., 2007; Géczi et al, 2004). It is only after these measurements when the coaches select the national team members.

U18

This is the first age group, in which the International Ice Hockey Federation organizes a World Championship. Those who do not reach their 18th birthday until the end of the season can play in this age group.

II. LITERATURE REVIEW

In this chapter first, the theoretical foundations of this study is demonstrated then the related literature is summarized from general to specific in the following order: ice hockey in general, on-ice and off-ice tests, and psychometric measures.

Theoretical framework

The role of nature and nurture in the achievement expertise in sport are clearly multifaceted and multidimensional. An athlete's environment, as well as an individual's cognitions, perceptions, self-efficacy, and affect can all impact his or her achievement level in sport. It is very well possible that all (or most) of these factors play a prominent role in achieving athletic expertise. Also, the interactions among these factors likely operate in a systemic fashion allowing the promising young athlete to reach athletic expertise.

Coté (1999) identified three stages of development in sport that delineate the transition from one stage to another: sampling (age 6-12), specializing (age 13-15), and investment (age 16+) years. What seem to be important is that the training environment remained relatively consistent within each stage. In sampling years children are given the opportunity to joyfully engage in a wide variety of different sports and develop fundamental motor skills. In the specializing years individuals focus on one or two sport activities in a sport-specific development. The investment years are characterized by commitment to achieving an elite level of performance in a single sport activity.

This study involves players in the investment (age 16+) years. This age is highly important in the development process because these players are eligible to play at

those main international championships and tournaments not available during the sampling and the specializing years.

Research has not been able to answer some of the major questions related to prediction of expertise in sport at a young age (Morris, 2000; Williams & Reilly, 2000). However, Hoare and Warr (2000) demonstrated that it may be possible to select potential elite female soccer players based on anthropometric, physiological, and skill attributes, and also that selection procedures could be enhanced through the systematic development of objective assessment tools. These assessment tools are able to measure tactical and technical competence. Additionally, young elite soccer players are found to be more agile, quicker, ego oriented, leaner, tolerant of fatigue, have better ball skills, and had greater anticipation skills and aerobic power (Reilly et al, 2000).

The current study attempted to find out how young elite ice hockey players differ in motor and psychological variables from non-elite players. The specific on- and off-ice motor tests and perceived motivational climate, motivation, coping, and state personality was compared and contrasted in order to identify the main differences between successful and non-successful ice hockey players. Through such comparison in the investment years (Coté, 1999), we will probably be able to find those motor and psychological variables that play an important role in becoming a successful in iced hockey.

Researchers (Nideffer, Sagal, Lowry, & Bond, 2001) believe that an assessment of an athlete's potential can be evaluated through (a) existing physical skills, (b) cognitive and perceptual skills, (c) intrapersonal characteristics, (d) interpersonal skills, and (e) emotional stability. In a study of elite and sub-elite athletes, Nideffer et al. illustrated that athletes with world championship potential are not just more physically

talented than others, but they are more focused, less impulsive, and less easily distracted. It is our plan to support this statement with ice hockey players.

Research in ice hockey

Montgomery (1988) characterized ice hockey as high intensity intermittent skating, fast changes in velocity and duration, also repeated body contact. The typical player performs for 15 to 20 minutes of a 60-minute match. Each shift lasts from 30 to 80 seconds with 4 to 5 minutes of recovery between shifts.

The intensity and duration of a particular shift determines the extent of the contribution from aerobic and anaerobic energy systems. The high intensity bursts require the hockey player to develop muscle strength, power, and anaerobic endurance (Green et al, 2006). The length of the game and the need to recover quickly from all shifts demands a good aerobic system.

Physical characteristics of elite players show that defensemen are taller and heavier than forwards most likely due to positional demands and the facts supporting the use of anthropometric measurements, superior body strength, and anaerobic capacity to effectively differentiate among positions (Vescovi, Murray & VanHeest, 2006). Geithner, Lee & Bracko's (2006) investigated physical, fitness, and skating performance characteristics of forwards, defensemen, and goalkeepers. There were differences in women's basketball, field hockey, netball, and volleyball, but not in elite women's ice hockey.

According to Dahlstrom's findings (2003) there were no significant differences found among positions for height or weight. They are relatively lean since excess mass is disadvantageous to their skating performance. There seems to be a large inter-

individual variability in VO2 during skating. Both the aerobic and anaerobic energy systems are essential during a hockey game. Peak heart rates during a shift on the ice exceed 90% of with average on-ice values of about 85% of heart rate maximum (Peddie, 1995).

Blood lactate is elevated above resting values confirming the anaerobic nature of the game. The ice hockey affects muscle fiber type, fiber size and metabolic profile but fiber composition are similar to untrained individuals (Green et al, 1999). Physiological profiles of elite hockey teams reveal the importance of aerobic endurance, anaerobic power and endurance, muscular strength and skating speed (Montgomery, 1988; Twist, 2007).

Training studies have attempted to develop specific components of hockey fitness. Using conventional laboratory tests, a season of hockey play shows gains in anaerobic stamina but no change in aerobic endurance (Watson & Seargent, 1986). Compton (1993) examined the effect of the selected warm-up protocols on forward ice-skating performance in elite ice hockey players. There were significant differences only in short distances between warm-up protocols.

Quinney and colleagues (2008) examined physiological profiles of a National Hockey League (NHL) team over a period of 26 years and the results revealed that the fitness profile for a professional NHL ice hockey team exhibited increases in player size and anaerobic and aerobic fitness parameters over a 26 year period. Also, the profiles showed differences by position.

Visual attention orienting in developing hockey players were also recently investigated (Enss & Richards, 1996). Importantly, cue high-skill players had generally smaller orienting effects than low-skill players. For the stimulus cue the high-skill

players showed greater change in the response time function over the cue-target interval. These results support an association between hockey skill and several important aspects of visual attention: sustained alertness, efficient voluntary orienting, and efficient processing of abrupt stimulus events.

The purpose of Buffone's study (1998) was to contrast the blood lactate reply and performance of varsity hockey players to recreational players, and to supply a shift by shift analysis of blood lactate buildup in an imitation ice hockey task, used Repeat Sprint Skate (RSS), Wingate test and nonstop aerobic treadmill test. There was significant relationship between performance indices in the RSS test and resultant variables measured in the 45 s Wingate test.

The idea of Game's study (1999) was to scan changes in pulmonary function and arterial desaturation in hockey players before and after a competitive season. In conclusion, there was a significant decrease in lung function after the end of a varsity hockey season. Dewan (2004) identified in his examination the biomechanics of the foot ankle during the transitional and steady state skating strides using kinematic, kinetic, and myoelectric measures.

Petschnig, Baron and Albrecht (1998) examined the ligaments' work during ice skating. They found that one-legged vertical jump test is capable of detecting functional limitations of the lower limb below the knee ligament.

Wu (2002) investigated the effects of stick construction and player skill during slap and wrist shots. The slap shots had bigger velocity than the wrist shot; the players grasp their stick during slap shots than by wrist shots. There were no significant differences between the attacking angle in both slap and wrist shots.

Physical maturity and birth date effects on the talent of male ice hockey players was also an area of research (Sherar et al, 2007). The birth dates of those players selected for the team were positively skewed, with the majority of those selected being born in the months January to June. In conclusion, scouts appear to preferentially select early maturing male ice hockey players who have birth dates early in the selection year.

Gilenstam, Karp and Henriksson-Larsen (2008) investigated how female ice hockey players describe and explain their situation within as well as outside their sport. They also described gender differences in terms of financial and structural conditions as well as differences in ice hockey history. At the individual level, the players considered themselves different from other women and appeared to share rather traditional views of femininity and masculinity.

Nordström, Högström and Nordström (2007) examined the effects of different types of weight-bearing loading on bone mass and size in young males in badminton and ice hockey. In conclusion, their results suggest that ice hockey is associated with lower gains in bone mass and size compared with badminton after puberty in men. These differences might be associated with the different levels of strains on the bones from the certain activities.

A large number of team sports require athletes to repeatedly produce maximal or near maximal sprint efforts of short duration interspersed with longer recovery periods of submaximal intensity (Sirotic & Coutts, 2007). This type of team sport activity can be characterized as prolonged, high-intensity, intermittent running (PHIIR). The primary purpose of the study was to determine the physiological factors that best relate to a generic PHIIR simulation that reflects team sport running activity. The second purpose of this study was to determine the relationship between common performance

tests and the generic-intensity, intermittent running simulation. The results indicated that an increased lactate was associated with improved PHIIR performance.

Cornish, Chilibeck and Burke (2006) in their study concluded, that creatine was not efficient for improving performance in the examined hockey players. The authors revealed meaningful association of maximal oxygen consumption and metabolic variables between treadmill running and treadmill skating.

Four techniques was used in the study of Dahlstrom (2003) of assessing body composition and percent body fat, hydrodensitometry, bottle buoyancy, ultrasound, and anthropometry. No significant differences were found among positions in view of height or weight of the examined subjects.

Little research has been focused on social support and the geographical region in ice hockey. One such study (Dubé et al, 2007) presented the sources and types of social support employed by major junior hockey players during their assignment in a geographically remote region were considered. The data indicate that the respondents received social support from up to four providers in ways that were unique to their location.

On ice test

On-ice tests are very important in practice, most of the results of the examinations help to build coaches' season program (Géczi et al., 2005). The special circumstances results are the most appropriate opportunities to examine the players' fitness and skill level. Ice hockey players have to perform in a hard and demanding game, so they need good conditional and coordination skills, such as aerobic and anaerobic fitness and power, which are very important during the matches.

Darren (2005) investigated the relationship between maximal aerobic power and both recovery and performance. He concluded there was no relationship between maximal aerobic power and recovery during a simulated game in competitive male ice hockey players. The predictions of that component are very useful in the preparation and in the season as well.

Carey and colleagues (2007) researched the relationship between VO2 max and fatigue during high-intensity intermittent ice skating and their findings were quite controversial in terms of meaningful differences. Hence, little conclusions could be drawn for theory and practice.

Steeves (2005) examined whether there was an association between maximal aerobic power and the revival or performance in male competitive ice hockey players during a simulated ice hockey match and found no relationship between maximal aerobic power and recovery during a replicated match in male ice hockey players.

One can measure the agility and the acceleration on the gliding surface that also these are important factors for good performances in ice hockey. Geithner and colleagues (2006) verified that the player's posts require different skills in the fields of agility, anaerobic and aerobic power on-ice. Other researchers investigated the skating technique and skating efficiency related to the biomechanics and physiology. Williams and Wilkins (1997) found that lower height of the body and increased instantaneous power results in the same range of the possible skating techniques, increased average power raised the top skating speed, and not necessarily extending the full leg optimally to reach a top speed.

Dewan (2004) examined players skating biomechanics on ice, using the first three strides and the maximal speed skating on longer distance. He found more powerfully myoelectric activation patterns at the vastus medialis, tibialis anterior.

McPherson and colleges (2003) compared the skating techniques of developmental and elite ice hockey players from biomechanical aspects. The differences were found in size and strength.

Heart rate monitoring is also a very important marker to check the players' state and it is simple to measure. Peddie (1995) measured the time-motion analysis and heart rate telemetry of ice hockey play.

Green and colleagues (1976) made a panel examination and repeated the former study. The posts of the players determine the time-motion of the players, but they were similar in intensity. The tempo of the game was higher than in practice. The defensemen spent more time on the ice than the forwards.

Wilson, Snyder and Pire (2004) investigated the heart rate of ice hockey players during on-ice practice and matches. They found that the heart rate of the players indicated the same degree of stress during practice and matches. Pire, Snyder and Wilson (2004) examined the ice hockey players' playing intensity changes during matches and suggested that hockey players expend energy similar to triathletes or distance runners. The heart rate shown the stress was similar during games and practices.

Coaches or scientists developed more on-ice tests which are reliable in predicting performance. Leone (2007) designed a new on ice test to predict VO2max in ice hockey players. The Skating Multistage Aerobic Test (SMAT) enabled a highly specific, valid and reliable prediction of the VO2max from the maximal velocity.

Petrella (2006) verified that the Faught Aerobic Skating Test (FAST) is a valid assessment tool for predicting maximum aerobic power in male and female hockey players up to 25 years of age. The most consistent predictors were weight and final stage completed on the FAST.

Comtois, Léger and Leone (2007) suggested that the Skating Multistage Aerobic Test (SMAT) is highly specific, valid and reliable for the prediction of VO2 max of hockey players. The higher energy cost of skating in elite group-age hockey players could be explained mainly by a lower mechanical efficiency.

Faught and colleagues (2003) used the Brock University Skating Test (BUST), which is a precise and easily administered field test requiring minimal equipment and the ability to evaluate several subjects at once. The BUST was found an accurate predictor of maximal oxygen capacity compared to the gold standard, which is a test to determine maximal oxygen uptake, delivery and utilization capacity of oxygen (VO2max) with an open circuit O2 analyzer

Lomas (2004) compared the shoot velocities by female varsity and recreational players and found that there is significant difference between the lighter and normal weight puck by wrist shoot and slap shoot. There was significant relationship between the strength of the upper body and shoot velocity measured the velocities of the shoots. Also there were significant differences between both of the investigated groups.

On-ice tests of hockey fitness have been recommended as a crucial part of the hockey player's physiological profile (Leone et al, 2007). Green and colleagues' (2006) results support the importance of implementing regular physiological testing, which helps strength and conditioning coaches make individualized modifications to a player's condition routines in an attempt to develop specific physiological attributes. Due to the

tests on-ice and off-ice tests (broad jump, vertical jump, aerobic power, curl-ups) the coaches and personal trainers are able to check their players' development in motor skills (Cox et al, 1995; Vescovi, Murray & VanHeest, 2006).

Neary, Wenger and Botterill (2003) investigated the potential integration of physical and psychological development programs on the acquisition of power in elite ice hockey players. The data illustrate the importance of the interaction between physiological and psychological programs to ensure a pay off from off-ice training to on-ice improvement.

Off-ice tests

Because of the financial costs of the time on ice, off-ice preparation and the checking of the off-ice work is very important in ice hockey. As one can read in the previous chapter, certain tests and measurements are crucial to know the development of the players. The practice on dry land or off-ice significantly influences the on-ice performance. Greer and colleagues (1992) studied the effects of off-ice training on performance measures related to ice hockey. Results suggested that performance on tests related to ice hockey can be improved by training specifically for field hockey but that performance is not affected by summer league play alone.

Domer (2005) examined the off-ice speed and quickness for ice hockey because they believe that these kinds of skills provide dimension to overall athleticism. In addition to enhancing performance, off-ice training could also provide a much-needed break from the ice after a long season. Manners (2004) suggested that strength and conditioning are crucial in the training programs by implementing specific exercises to address the movements and essential components of the game, which balance, skating

strength, power, and agility in ice hockey players. Goudreault's study (2002) showed that an increase in velocity results in more muscle activation, but the muscle coordination patterns stayed the same.

Koepp (2005) presented that the running treadmill elicited a higher VO_2 ($ml \cdot kg^{-1} \cdot min^{-1}$) than the skating treadmill. Also there was no significant difference between the discontinuous and continuous skating treadmill protocols. Therefore, a continuous procedure is possible on the skating treadmill without compromising accurate skating position and physiological responses.

Comparison of on ice and off-ice tests

It is accepted by experts in the field that all tests in ice hockey are important for assessing and evaluating players' physical, motor, and anthropometric development, however, the associations and relationships among these measurements and the comparisons are even more interesting in practice.

Socha T, Skowronek, and Socha S. (2006) indicated that Polish U16, U18, U20 and adult team members' body mass and its components were of greater importance than body height and length variables of extremities in ice hockey. Body mass in seniors shows a strong relationship with many fitness variables, among them the most important seems to be closely associated with anaerobic capacity. The results also indicate that basic somatic features in ice hockey players, playing in different positions (forwards and defenders) differed significantly. As expected, defenders have greater body mass and were slightly taller than forward players. The relationship between functional indexes and somatic variables determined in the senior group may be regarded as typical for high-class hockey players. The results of the Wingate test and

shuttle skate 5×54 m, in which senior national team athletes reached best results may be regarded as specific for evaluation of performance in ice hockey.

Farlinger, Kruisselbrink, and Fowles (2007) examined the relationships to skating performance in competitive hockey players. According to results, coaches should include horizontal power tests of off-ice sprint and 3 hop jumps to adequately assess sport-specific performance and power.

Results showed that the first acceleration in ice hockey skating from steady start was best related to drop jumps from 25 cm (Strojnik, Hribar, & Dolenec, 2007). When the velocity increased in the second 5 meters section, skating was still related to drop jump although the relationship seemed somewhat lower than in the first section. It was concluded that the start of the skating corresponded to hopping type of stretch-shortening cycle while skating at maximal velocity was more alike to slow stretch-shortening cycle. For that reason, plyometric training seems to be important for ice hockey players and stressing specific type of stretch-shortening cycle action during conditioning may contribute to better performance in specific skating tasks.

Fowles, Murphy and Kruisselbrink (2003) made a 5-year long analysis in a varsity ice hockey team. Anthropometrical data, weight, height, body fat and Wingate peak power test was measured in their study. Their results indicate only minor changes over five years of pre-season testing with some changes evident over a single season.

Based upon Watson and Seargent's (1986) examination, where the particular protocol was used, and the laboratory Wingate Anaerobic Test 4 did not show a high association with on-ice measures of Anaerobic Capacity (AnCap) and Anaerobic Power (AnPow) in the examined ice hockey players. They compared the Wingate Anaerobic Test (WAT40) and the earlier investigated Repeat Sprint Skate (RSS) and the Sargeant

Anaerobic Skate (SAS). The laboratory test WAT40 does not demonstrate a high relationship with on-ice measures of AnCap and AnPow in this group of ice hockey players.

Loh (2003) examined the plantar forces during forward skating: comparison between ice and treadmill conditions. The comparison showed higher loading using the skating treadmill and adequate to simulate the on ice skating. Brocherie and colleges (2005) examined the effects of electro stimulation on the physical performance of ice hockey players. It was demonstrated that a short term elelctromyostimulation program of the knee extensors significantly improved isokinetic strength (eccentric and for two concentric velocities) and short skating performance of a group of ice hockey players. This result could be very usefully to raise the youth players' isokinetic strength in the development program.

Psychometric measures

Martell and Vickers (2004) show us the importance of game reading, fixation of a tracking time and recognition time of the situation in ice hockey. It was found to be in close connection with decision-making, which is important in the open skills team sport. They suggest that an expert's decision-making ability is reflected in a tighter coupling between perception and action.

The relationship between assertive and non-assertive forechecking strategies scoring opportunities in ice hockey was also examined (Cernjul, 1999). The assertive forechecking is not depending on the status of the team (home or visitor), but the motor and psychological skills of the players. It was measured more scoring opportunities by the assertive forechecking than the non-assertive forechecking.

Widmeyer and Birch (1984) investigated the correlation between aggression and success, and reason for the aggression. Significant positive relationship was found between aggression committed in the first period and overall performance. The coping and the anxiety existed in this kind of situations, and they found that aggression is an effective strategy for success in ice hockey, but is employed by hockey teams as a reaction to failure.

MacDougall and colleagues' (2003) results indicate that elite hockey players are characterized by, desire, passion for the game, ability to overcome adversity, work ethic, hockey sense, character, and a good background. Sheldon and Aimar (2001) examined the aggressive and non-aggressive behaviors of ice hockey players and their role in success. A significant relationship was found between fight and unsuccessful performance. The negative aggression depends on the mental development and the judgments of the referees. Gee and Leith (2007) examined aggressive behavior in ice hockey, in relation to birthplace. They found, that the European players had significant fewer penalties than the North-American players for aggressive behavior. The differences exist due to the rink-size and different rules.

Hamre (2007) investigated the relationships between psychological attribute information and prediction of ice hockey player performance. The author found predictors for the future performance of the athletes in this complex study. The first of two most important findings of that examination is that the players self perceptions were highly and significantly correlated with playing performance. Secondly the player's depression indicators are the potential impact of athlete's responsibilities and the conduct of the coaches in relation to the mental health of athletes. Attila wrote This

type of past research listing, without a conceptual assimilation and synthesis is not informative in relation to the research.

Results demonstrated that mental skills training was effective in producing improvements in the save percentage of the goaltenders (Rogerson & Hrycaiko, 2002). The social validation results indicated that the participants enjoyed using the mental skills and were satisfied with the results obtained. Furthermore, the coaches were very satisfied with the results and felt that mental skills' training was an important ingredient in improving performance, in particular performance consistency.

Brown, Szabó and Seraganian (1988) showed us the heart rate reactivity to mental arithmetic examining the physical versus psychological determinants. Both tasks attained that heart rate achieved the peak levels at about 50s into the tasks and then declined. Level of reactivity to the two tasks was correlated with each other.

Elferik-Gemser, Visscher and Lemmink (2005) investigated the psychological characteristic of talented youth athletes in field hockey, basketball, volleyball, speed skating and swimming. The examined fields were motivation, confidence, anxiety control, mental preparation, team emphasis and concentration. Motivation and mental preparation were useful indicators that are independent of gender and type of sport.

Hagy (2001) studied specifically the phenomena experienced by players retired from the National Hockey League (NHL) that helped them reach the NHL. The summary of that study show four station of the trip to the top: (a) Beginning the Dream; (b) Fostering the Dream; (c) Preparation for the Dream; and (d) Passing on the Dream. Working years with the youth national teams; one can see the same stations of the players' life.

Soberlak (2001) examined the effects which can modify the development of the players' carrier. Deliberate practice, motivation, self-determination, influence of the parents and practice in other sports during the three main development phases following Cote's idea.

Motivation

Weiss, Bredemeier and Shewchuk (1985) created a scale to measure intrinsic and extrinsic motivation in youth sport. They modified and validated a general psychological scale from a sport psychological viewpoint. According to Papagergiou and colleagues (2008) results, individuals who participated in the gym program had statistically higher levels in intrinsic motivation to knowledge, to stimulation, to accomplishment and Extrinsic Motivation to interjected regulation. In contrast, the control group had statistically higher levels of extrinsic motivation to external regulation and motivation.

Kingston, Horrocks and Hanton (2006) examined the level of multidimensional intrinsic, multidimensional extrinsic motivation and amotivation in US collegiate athletes. Their result indicated that scholarship can undermine intrinsic motivation.

Martens and Webber (2002) examined the validity and reliability of the Sport Motivation Scale in the United States. They found that the scale should further be refined. Reed and Cox (2001) used the Sport Motivation Scale and Motivation for Physical Activities Measure to search for significant correlations.

Beaudoin (2006) interests focused on the competitive orientations and sport motivation of professional women football players via an Internet survey. Her result showed that the examined group was highly competitive and intrinsically motivated.

The Sport Motivation Scale was used by Armstrong (2002) although he modified it to black consumers. The results revealed that cultural affiliation was a viable motive for Black's sport consumption.

The perceived constraints on recreational sport participation were investigated by Alexandris, Tsorbatzoudis and Grouios (2002). They suggested that intrapersonal constraints act as de-motivating forces for persons. They support fundamentals of the hierarchical model of leisure constraints and supplementary explain the role of motivation.

Rayani (2004) monitored elite competitive swimmers' psychological variables across a season. The participants filled 10 different self-report measures and these contained among others SMS. The result indicated that in the examined group required moderate to high levels of confidence, high levels of concentration and motivation.

Coping, anxiety, and stress

Spieler et al (2007) examined the factors of athletic success by football players. Their research showed that age, high school size, and coping with adversity may be predictors of starting status in collegiate football. The concept of coping with adversity as an overarching psychological skill is also plausible.

ACSI-28 was found relatively free of the more traditional Impression Management response bias, however, all ACSI-28 sub scales were strongly affected by Self-Deception bias by the subjects (Bourgeois et al, 2001).

Laws (2003) suggested that goalkeepers have better Personal Coping Resource and confidence when comparing players. These factors had a strong influence on performance by both groups.

Smith (2006) investigated the US National Team and Team USA for the triathlon. Only one subscale, concentration predicted competitive success in the subjects. Filaire and colleagues (2001) examined the martial arts (judo) and found that anxiety components may provide a better sensitive index of physiological stress than testosterone concentrations. The effects of performance and process goals on anxiety and performance of a racquetball task was examined by Clark (2004), but he could not find any significant differences.

One can see that there were psychological examinations in other sports that are of importance in this research. For instance, Mayer (2001) made an investigation of cognitive-affective stress management training with golf players. His results of before and after team average revealed no significant changes in trait or state anxiety or self-confidence, but individually the subjects have shown decrease in somatic component. In the field of intensity and interpretation of pre-competitive anxiety Hubbard (2006) recognized that highly self-confident baseball players interpreted somatic anxiety symptoms more facilitative to performance than the mid and low self-confidence groups in a high school.

Kais and Raudsepp (2005) examined the intensity and direction of competitive state anxiety, self-confidence and athletic performance. Their findings revealed a moderate level of state anxiety and very high self-confidence of the players before the matches, but it is not in correlation with their athletic performance.

There were a few studies using the State-Trait Personality Inventory (STPI) as a method (Rochford, 2004; Woolrich, 2005). Pedersen (2001) revealed the interaction of high state and trait anxiety over time may increase the likelihood that threat-related words used on implicit measures could reach the level of awareness populations.

Beland (2005) investigated the effect of spirituality and social factors on depression and anxiety in an elderly group and the results showed that depression and anxiety were negatively correlated with activity level and spiritual well-being. Generally speaking, there are few research studies in the area of sport on anxiety and depression in ice hockey (Géczi et al, 2008).

As far as we know, only Géczi and colleges (2008) examined ice hockey players' personality measures using STPI. Their findings revealed that the experienced players were generally in a more beneficial state from the standpoint of anxiety, pressure, and worry than the younger players and they could better manage unexpected events (stress situations), than the younger players.

Perceived motivational climate measures in sport

Naylor (1996) experienced in the field of goal orientation, perceived motivational climate and cohesion in sports teams using PMCSQ. Gender and sport differences were revealed in achievement goal orientation and perceptions of motivational climate.

Kuczka and Treasure (2005) used PMCSQ-2 test to examine golf players in both genders during a tournament and revealed perceptions of a task-involving motivational climate, self-efficacy, and perceived event importance to be negatively related to claim self-handicaps. They propose that in addition to enhancing self-efficacy, trainers should increase the salience of task-involving cues in the athletic context to attenuate the situational claimed self-handicaps of elite collegiate athletes.

Effects of climate, autonomy, relatedness and competency on self determination were investigated by Duncan (2006). The results indicated that task mastery as a measure of climate was positively and significantly related to other psychological

variables including self-determination. Performance ego was negative related to autonomy and it appears that hard working coaches liked the self-determined athletes. Athletes' feeling and positive experiences related to participation and improved relationships with coaches and teammates. Also in sport and society the results could be promote productive behaviors and positive communications.

Murcia, Gimeno, and Coll (2007) classified young athletes' motivational profiles in three groups:a "selfdetermined profile" characterized by higher scores on the taskinvolving climate perception and on the task orientation; a "nonself-determined profile", characterized by higher scores on egoinvolving climate perception and ego orientation; and a "low self-determined and low non-self-determined profile" which had lowest dispositional flow. The profile self-determined was more commonly associated with females and athletes practicing individual sport. The non-self-determined profile was more customary of males and team sports. The results provided information necessary to work on the least desirable profiles through the transmission of task-involving motivational climates.

Chi-der and colleagues (2003) used the PMCSQ-2 to examine male and female basketball players' goal orientation and their perceived motivational climates. The results of their study indicated that more confidence could be generated from a task-oriented environment. Players who were task-oriented also had higher confidence levels. So, sports coaches should work harder to create a task-oriented practice environment (climate) to enhance players' confidence.

Reinboth and Duda (2006) executed a five-month longitudinal examination in team sports players during a season. Their results suggest that an increase in perceptions of a task-involving climate positively predicted an increased satisfaction of

the needs of autonomy, competence and relatedness. The previous literatures used the same psychological test to examine phenomena in sport.

III. METHODS

The following methodology was followed in order to conduct the research. According to the problem statement, especially sport specific motor and psychological attributes and measurement inventories were focused upon in this study. It was assumed that Selected U18 ice hockey players are further advanced in motor tests, coping, motivational, perceived climate, and anxiety measures than those of Non-selected players. However, as mentioned earlier, this study does not focus on physiological determinants and measurements.

This study primarily focuses on those motor and psychological attributes that differentiate Selected and Non-selected U18 players. As defined earlier, Selected players are members of the U18 national team and have represented the country at numerous international events and matches. This study included only national team members at the U18 level of ice hockey.

Participants

A series of motor and physical tests, and also psychometric measures were administered among those U18 (under 18 years of age) Hungarian ice hockey players who attended at the official final selection stage recruiting for the U18 National Team in May, 2007. Based upon regular physical tests, technical and tactical performances at practices and games, all players were recommended by their club coaches and national team leaders to take part in this final selection try out process. All players that attended this try out were preselect and sent by club coaches to participate in the study, so altogether 40 U18 players did all the on-ice and off -ice motor tests and filled out all psychometric

measures. This comprised 88% of all the U18 players aiming for the membership of the U18 national team.

It is important that all participants were those young talented U18 hockey players (M_{age}=16,52, SD= ,506) that had the potential to play for the National Team at international events. From the players that participated in this particular study, 20 were U18 National team Selected members (M_{age}=16,45, SD= ,512) and another 20 Non-selected players (M_{age}=16,62, SD= ,50). In this study it was planed to compare in a series of motor tests and measurements between Selected and Non-selected players.

Each participant has been offered the opportunity to receive his results; otherwise all data were kept anonymous. Consideration was given to the protection of the human subject throughout the study and confidentiality was maintained all through the research. Informed consent was obtained from every player, and parents' approval was also requested.

Instruments

In order to answer the research questions, a number of motor and psychological tests were administered. First, 19 on ice and off-ice motor tests were processed. Also, Athletic Coping Skills Inventory (ACSI-28), Perceived Motivational Climate in Sport Questionnaire-2 (PMCSQ-2), Sport Motivation Scale (SMS), State-Trait Personality Inventory (STPI-Y).

Motor tests and physical measurements

To determine the physical and motor performance characteristics of Selected and Non-selected U18 ice hockey players, a full range of on-ice and off-ice physical tests were

administered. Altogether, 13 on-ice, body height and weight were measured for calculation of BMI and 6 off-ice tests and shooting/passing accuracy were assessed. The specific tests and measurements were selected by the experts of the National Ice Hockey Federation in order to provide coaches and players with useful information on these young ice hockey players at this stage of talent development.

On-ice tests

On ice tests included skating performance measuring speed with a puck (5, 6, 8, 9, 10) and without puck (1, 2, 3, 4, 7), stamina (9) and passing/shooting accuracy (11, 12). All players were required to skate as fast as they could for the specific distance in a specific manner. In each case digital gates were used for accurate and reliable timing. Participants did the following tests on an individual basis.

1. 36 m forward skating **(36mfs)**

2. 10 m forward skating **(10mfs)**

3. 36 m backward skating **(36mbs)**

4. 10 m backward skating **(10mbs)**

5. 36 m forward skating with puck **(36fsp)**

6. 10 m forward skating with puck **(10fsp)**

7. 6*9 m agility test between the red and the blue lines **(6x9at)**

8. Crossover test with puck: using the 2 circles in figure 8. From the base line, the players have to carry the puck on the face off circles starting towards the board; first forwards a full circle the direction depends on the players, afterwards they have to change to backwards skating. After completing both circles they should skate

forward and go around a pylon which stands on the middle of the nearly blue line. Then with full speed the subjects have to shoot the puck into the net **(cotwp)**

9. 6*54 m forward skating. For evaluation of specific anaerobic and aerobic endurance a 6 x 54 m shuttle skate test was used. Between the base lines, the players should skate forward, over the lines they have to fully stop with both legs. The rate of charging similar to a shift during the game **(6x54fs)**

10. Passing drill. There are 5 pucks on the blue line, between the board and a pylon (pylon distance 5m from the board). Starting from the base line forward, the players have to pick up a puck during which they turn backwards by the pylon and carry the puck to the base line. By the base-line pylon they have to turn forward, afterwards pass until they reach the top of the face-off circle to a net on the central circle. The time and the successful passes are measured **(psd)**

11. Shooting drill1. There are 10 pucks on the copulative line between the tops of the face-off circles. A pylon stands on the blue line centering to the net. Starting from the blue line, the players should shoot the pucks in a four hollow canvas hung on the goal. The exercise ended when the player skated over the near blue line after the last shot. The time are measured **(sd1)**

12. Shooting drill2. The same drill, but scores are measured **(sd2)**

The Body Mass Index (BMI)

13. SI (*Système international d'unités)* units, the calculation: BMI= Weight (kg) / Height^2 (m^2). It was measured before the tests.

Off-ice test

Testing off-ice is very important to evaluate the player's physical state. The selected items were chosen from the Slovakian and Finnish tests, with the available facilities. From the viewpoint of ice hockey we were interested in measuring acceleration, full speed, dynamic power, agility, anaerobic stamina and aerobic stamina of the players:

14. 60 m forward sprint **(60fs)**

15. 10 m forward sprint **(10fs)**

16. 6*9 m agility run **(6x9ar)**

17. Standing long jump. For evaluation, the best value of two jumps were taken into account **(slj)**

18. 400 m run around the Track and Field circle (**400r)**

19. 1500 m run around the Track and Field circle **(1500r)**

Psychometric tests

All four assessment instruments (ACSI-28-H, PMCSQ-2, SMS, STPI-Y-H) methods are used widely in applied sport psychology, however, not so much in ice hockey. They are applicable as diagnostic tools for both coaching and competition situations (Kyprianou & Sipos, 2005a; Kyprianou & Sipos, 2005b; Majoross, Tóth, & Lénárt, 2004; Tóth et al, 2006).

Athletic Coping Skills Inventory-28 (ACSI-28)

Smith and colleges' (1995) self-evaluation scale of 28 items assigned a numerical assessment from 1 to 4 point for the following psychological traits: coping with adversity; peaking under pressure; goal setting/mental preparation; concentration;

freedom from worry; confidence and achievement motivation; and coachability (range from 4 to 16 on all of the scales). The Hungarian version of the scale (ACSI-28-H) was defined by Jelinek and Oláh (2000) and its Cronbach alpha coefficients ranged between .59 (Confidence and Achievement Motivation) and .84 (Peaking under Pressure).

Perceived Motivational Climate in Sport Questionnnaire-2 (PMCSQ-2)

To measure players' perceptions of the motivational climate, the Perceived Motivational Climate in Sport Questionnnaire-2 (PMCSQ-2) was used (Newton, Duda &Yin, 2000). This test was developed to assess perceptions of their team's motivational climate is characterized in terms of two higher order dimensions the achievement goal frameworks of task and ego-involving climate (Ames & Archer, 1988; Nicholls, 1989). The PMCSQ-2 instrument assigns a numerical assessment scale of 1 to 5. It has adequate internal reliability (Newton, Duda &Yin, 2000). The Hungarian version of PMCSQ-2 was developed by Révész et al (2008) and reported an internal consistency between ,65-,92.

Sport Motivation Survey (SMS)

SMS was developed particularly to measure motivation in the area of sport and physical education. The purpose of this 28-item (scale of 1 to 7) survey is to assess components of intrinsic, extrinsic motivation and amotivation (Pelletier et al, 1995). The internal consistency values range between .69 and .85. The Hungarian version of SMS also had an acceptable level of internal consistency (,63-,80) (Tsang, Szabo, Soos & Bute, 2005).

State Trait Personality Inventory-revised form (STPI-Y)

STPI-Y (STPI-Y) self-evaluation scale was developed by Spielberger (1995) in order to demonstrate individual differences of state/trait anxiety, curiosity, anger and depression (10-item psychometric scales with 4 grades from 10 to 40 points). The Hungarian version of STPI-Y (STPI-Y-H) scale has an internal consistency range of .64 (State Curiosity) to .91 (State Anger) by Sipos et al, (2004). In this research we focused only the Trait Personality Inventory aspects of the instrument (Trait Anxiety, Trait Curiosity, Trait Anger, and Trait Depression)

Procedures

All U18 players and their coaches were contacted before the try out and were informed about the purpose of the study. Upon receiving their support, all participants signed an informed consent and all parents supported their child in taking part in the testing process. Height and weight were taken by technicians. At the beginning of the tests, every player was given clear instructions about the purpose and methods of the tests. The motor tests were administered at an ice rink and the off-ice tests were administered at the Track and Field stadium. Both series were conducted by the officials and coaches of the Hungarian Ice Hockey Federation. The author of this study was present during data collection for explanation purposes. Participation was voluntary and corresponded to all procedures of human protection. Participation required approximately 5 hours that included motor testing procedure and completion of all psychometric questionnaires.

Data analysis

Descriptive data for all variables are described by mean (M) and standard deviation (SD). In order to answer the results questions, data of Selected and Non-selected ice hockey players were statistically compared. For the comparison Independent T-test was conducted, also Effect sizes were computed. The eta-squared statistic describes the proportion of total variability attributable to a factor.

Additionally, after checking for normality and homogeneity of variance assumptions, discriminant analysis was calculated to build a predictive model of group membership. Stepwise discriminant analysis was used for differentiating motor and psychometric differences between Selected and Non-selected U18 players. SPSS 15.0 for Windows statistical program was utilized for data processing and the p level was set at the .05 level.

IV RESULTS

It was the researcher's goal to measure U18 ice hockey players' anthropometric, motor, and certain psychometric values that affect their athletic performance the most. The results of those measured anthropometric, motor and psychometric variables are shown in tables with descriptive statistics for the whole sample (N=40) and also for Selected (n=20) and Non-selected ice hockey players (n=20).

The results of the statistical analysis were used to describe the sample of Selected and Non-selected U18 ice hockey players and address the main questions. The first section provides a description of on- and off-ice motor tests. The second section presents a description of psychometric variables and the third section provides the discriminant analysis with all the variables in this study.

Motor tests

Descriptive statistics for the whole sample (N=40) of those 13 test that were conducted are shown in Table 1. U18 ice hockey players' results generally can be evaluated as high-level. According to the statistical measurements, Means in most tests seem to be fairly similar, Standard Deviation and Range values tend to be quite low. The minimum and maximum measures in most cases appear to be in low range.

The eta-squared statistic is quite low in most cases, only Passing drill (sec) and Crossover test with puck have a larger effect size.

	Mean	Std. Deviation	Min	Max	Partial eta-squared
36mfs (sec)	5,0282	,35198	4,24	5,60	0,012
10mfs (sec)	1,8373	,16937	1,55	2,27	0,012
36mbs (sec)	6,2313	,49356	5,44	7,21	0,039
10mbs (sec)	2,3160	,18654	2,03	2,71	0,047
36mfsp (sec)	5,1938	,35968	4,60	5,95	0,023
10mfsp (sec)	1,8510	,13739	1,62	2,18	0,018
6X9ice (sec)	12,6785	1,02638	11,83	17,70	0,057
Crossoverwp (sec)	16,8965	1,25488	14,70	20,36	0,169
6X54m (sec)	52,7270	2,56202	47,90	60,30	0,014
Passing drill (sec)	55,9533	3,90509	46,82	66,02	0,271
Shooting drill (sec)	57,0348	3,16721	50,32	64,92	0,003
Shooting drill (goal)	4,5500	1,63221	2,00	10,00	0,009

Table 1: Descriptive Statistics and Effect size for the On-ice motor variables (N=40)

As seen in Table 2, on-ice measures of the sample of Selected and Non-selected ice hockey players seem fairly similar in most cases. However, Selected U18 ice hockey players demonstrated better results in Crossover test with puck (t=-2,781 (38) p=,008) and passing drill (t=-3,762 (38) p=,001) than Non-selected players.

	MEAN±SD	Selected	Mean	Std. Deviation	Std. Error Mean
36mfs (sec)	5,02±,351	Yes	4,9900	,31782	,07107
		No	5,0665	,38756	,08666
10mfs (sec)	1,83±,169	Yes	1,8190	,14101	,03153
		No	1,8555	,19570	,04376
36mbs (sec)	6,23±,493	Yes	6,1345	,45155	,10097
		No	6,3280	,52576	,11756
10mbs (sec)	2,31±,186	Yes	2,2760	,17394	,03890
		No	2,3560	,19443	,04348
36mfsp (sec)	5,19±,359	Yes	5,1395	,32880	,07352
		No	5,2480	,38891	,08696
10mfsp (sec)	1,85±,137	Yes	1,8330	,12790	,02860
		No	1,8690	,14732	,03294
6X9m (sec)	12,67±1,026	Yes	12,4375	,59563	,13319
		No	12,9195	1,29820	,29029
Crossoverwp (sec) *	16,89±1,254	Yes	16,3870	1,10058	,24610
		No	17,4060	1,21430	,27153
6X54m (sec)	52,72±2,562	Yes	52,4270	2,69347	,60228
		No	53,0270	2,45542	,54905
Passing drill (sec) *	55,95±3,905	Yes	53,9445	2,96635	,66330
		No	57,9620	3,74272	,83690
Shooting drill (sec)	57,03±3,167	Yes	57,2070	3,30134	,73820
		No	56,8625	3,10308	,69387
Shooting drill (goals)	4,55±1,632	Yes	4,4000	1,53554	,34336
		No	4,7000	1,75019	,39135

Table 2: Selected and Non-selected players' On-ice motor test variables (N=40) (* means p<,05)

There were also Body Mass Index and six Off-ice tests that were compared and contrasted Selected and Non-selected U18 ice hockey players (Table 3, 4). There were no significant differences between the two groups when comparing their BMI (Table 4). According to statistics, there seem to be a lot of similarities of Means, Standard Deviations, and Minimum-Maximum measures. There are more similarities in values within the sample than it appeared in On-ice tests. Effect size values seem also rather low, 1500m track has a more meaningful eta-squared value.

Other than the 1500m track, there seem to have no statistical difference between Selected and Non-selected U18 players in this area of research. As was expected, Selected U18 players have faster 1500m times than those of Non-selected players (t=-2,184 (38) p=,035)

	Mean	**Std. Deviation**	**Min**	**Max**	**Partial eta-squared**
BMI	22,335	2,1721	17,1	27,8	0,058
60mtrack (sec)	8,0812	,42977	7,36	9,13	0,002
10mtrack (sec)	1,7968	,09141	1,64	2,03	0,001
6X9mtrack (sec)	13,9533	,54212	12,91	15,15	0,042
Standing long-jump (cm)	232,63	15,483	192	260	0,013
400mtrack (sec)	67,3705	4,43564	58,13	78,89	0,041
1500mtrack (sec)	364,703	23,3283	319,7	417,5	0,112

Table 3: Descriptive Statistics and Effect size for BMI and Off-ice motor variables (N=40) (* means p<,05)

	MEAN±SD	Selected or Not	Mean	Std. Deviation	Std. Error Mean
BMI groups	22,33±2,17	Yes	21,820	2,3309	,5212
		No	22,850	1,9218	,4297
60mtrack (sec)	8,08±,429	Yes	8,0630	,51089	,11424
		No	8,0995	,34264	,07662
10mtrack (sec)	1,79±,091	Yes	1,7995	,09730	,02176
		No	1,7940	,08756	,01958
6X9mtrack (sec)	13,95±,542	Yes	13,8435	,56495	,12633
		No	14,0630	,50864	,11374
Standing long jump (cm)	232,63±15,483	Yes	230,88	15,471	3,459
		No	234,39	15,690	3,508
400mtrack (sec)	67,37±4,435	Yes	66,4810	4,96730	1,11072
		No	68,2600	3,74775	,83802
1500mtrack (sec) *	364,703±23,328	Yes	357,010	22,9977	5,1424
		No	372,395	21,5311	4,8145

Table 4: Selected and Non-selected players' BMI and Off-ice motor test variables (N=40) (* represents p<,05)

Psychometric variables

As seen in Table 5, most subscales of ACSI-28 have medium values. When examining Means, Standard Deviations, Range and Minimum-Maximum levels, there seems to be very similar range of data**.** Regarding the subscales of ACSI-28, Peaking under pressure, Concentration, and Confidence and achievement motivation seem to be a bit higher than the other subscales. On the other hand, Freedom from worry and Coachability seem very low. Effect size values also very low, except for Freedom from worry.

	Mean	Std. Deviation	Min	Max	Partial eta-squared
Coping with adversity	3,0375	,47888	1,75	4,00	0,006
Peaking under pressure	3,2125	,53872	2,00	4,00	0,000
Goal setting/mental preparation	2,6346	,59007	1,25	3,75	0,002
Concentration	3,2750	,39141	2,25	4,00	0,032
Freedom from worry	1,9313	,45639	1,00	2,75	0,186
Confidence and achievement motivation	3,1875	,31900	2,50	3,75	0,004
Coachability	1,8625	,54582	,50	2,50	0,053

Table 5: Descriptive Statistics and Effect size for ACSI-28 variables (N=40) (* means p<,05)

The only statistical difference between Selected and Non-selected ice hockey players exists in Freedom from worry (t=2,935, df=38, p=,006) (Table 6). It can be seen in the table that Selected athletes have higher level of Freedom from worry than Non-selected ones.

	MEAN±SD	Selected or Not	Mean	Std. Deviation	Std. Error Mean
Coping with adversity	3,03±,477	Yes	2,9875	,40127	,08973
		No	3,0875	,55176	,12338
Peaking under pressure	3,21±,538	Yes	3,2250	,57868	,12940
		No	3,2000	,51042	,11413
Goal setting/mental preparation	2,63±,590	Yes	2,6579	,64124	,14711
		No	2,6125	,55295	,12364
Concentration	3,27±,391	Yes	3,2125	,37412	,08366
		No	3,3375	,40778	,09118
Freedom from worry *	1,93±,456	Yes	2,1250	,35818	,08009
		No	1,7375	,46929	,10494
Confidence and achievement motivation	3,187±,319	Yes	3,1625	,27236	,06090
		No	3,2125	,36522	,08167
Coachability	1,86±,545	Yes	1,9750	,45088	,10082
		No	1,7500	,61772	,13813

Table 6: ACSI-28 in the sample of Selected and Non-selected players (N=40) (* means p<,05)

Table 7 illustrates the Means, Standard Deviations, Range, Minimum and Maximum values of PMCSQ-2 of the whole sample (N=40). Effort/improvement seems to be the highest values and Punishment for mistakes has the lowest values of all. Also, Task orientation is a lot higher than Ego orientation. Effect sizes are also low in all cases except for Unequal recognition.

	Mean	Std. Deviation	Min	Max	Partial eta-squared
Cooperative learning	3,9313	,78648	1,50	5,00	0,017
Important role	4,0050	,45851	2,80	5,00	0,072
Effort/improvement	4,2531	,44532	3,25	4,88	0,008
Punishment for mistakes	2,7375	,60257	1,50	3,83	0,042
Unequal recognition	2,9000	,78992	1,57	4,86	0,125
Intra-team member rivalry	3,3250	,74912	1,33	4,67	0,033
Task	69,7750	7,52257	52,00	83,00	0,019
Ego	46,7000	9,40594	27,00	65,00	0,090

Table 7: Descriptive Statistics and Effect size for PMCSQ-2 variables (N=40)

There is only one significant difference between Selected and Non-selected ice hockey players in perceived motivation. Non-selected ice hockey players demonstrate significantly higher Unequal recognition values than that those of Selected ice hockey players (t=-2,288, (38) p=,028).

	MEAN±SD	Selected or not	Mean	Std. Deviation	Std. Error Mean
Cooperative learning	3,93±,786	Yes	4,1250	,54712	,12234
		No	3,7375	,94408	,21110
Important role	4,00±,458	Yes	4,0700	,32622	,07295
		No	3,9400	,56233	,12574
Effort/improvement	4,25±,445	Yes	4,2375	,40332	,09018
		No	4,2688	,49384	,11042
Punishment for	2,73±,602	Yes	2,6750	,58107	,12993
		No	2,8000	,63199	,14132
Unequal recognition *	2,90±,789	Yes	2,6286	,61033	,13647
		No	3,1714	,86785	,19406
Intra-team member	3,32±,749	Yes	3,1833	,83403	,18650
		No	3,4667	,64346	,14388
Task	69,77±7,522	Yes	70,7500	5,30020	1,18516
		No	68,8000	9,27702	2,07441
Ego	46,70±9,405	Yes	44,0000	9,06700	2,02744
		No	49,4000	9,16745	2,04990

Table 8: PMCSQ-2 in the sample of Selected and Non-selected players (N=40) (* means p<,05)

Based upon descriptive statistics, one can see a relatively low Amotivation (M=1,58), a medium level of Extrinsic motivation (M=4,97), and a relatively high level of Intrinsic motivation (M=5,77). Standard deviation and Range values in most cases seem to be fairly high. All effect size values are very low.

	Mean	Std. Deviation	Min	Max	Partial eta-squared
Amotivation	1,5875	,80573	1,00	5,00	0,085
Extrinsic motivation	4,9786	,96194	2,75	6,42	0,020
Intrinsic motivation	5,7729	,96040	2,92	6,92	0,024

Table 9: Descriptive Statistics and Effect size for SMS variables (N=40)

Table 10 demonstrates that there are no statistical differences between Selected and Non-selected ice hockey players in sport motivation.

	MEAN±SD	Selected	Mean	Std. Deviation	Std. Error Mean
Amotivation	1,58±,805	Yes	1,3500	,49604	,11092
		No	1,8250	,98375	,21997
Extrinsic motivation	4,97±,961	Yes	5,2417	,90479	,20232
		No	4,7018	,96518	,22143
Intrinsic motivation	5,77±,960	Yes	5,8000	,98208	,21960
		No	5,7458	,96294	,21532

Table 10: SMS in the sample of Selected and Non-selected players (N=40) (* means p<,05)

As indicated in table 11, Trait Depression seems to be the lowest and Trait Curiosity and Trait Anger the highest of the subscales of STPI-Y. Effect sizes tend to be low.

	Mean	Std. Deviation	Min	Max	Partial eta-squared
Trait anxiety	2,1278	,22629	1,70	3,00	0,063
Trait curiosity	2,5974	,26106	2,00	3,10	0,067
Trait anger	2,4132	,28680	1,60	2,90	0,023
Trait depressions	1,9897	,26536	1,40	2,50	0,077

Table 11: Descriptive Statistics and effect size for STPI-Y variables (N=40)

There are no significant differences between Selected and Non-selected ice hockey players in STPI-Y.

	MEAN±SD	Selected or not	Mean	Std. Deviation	Std. Error Mean
Trait anxiety	2,12±,226	Yes	2,0684	,20562	,04717
		No	2,1941	,23577	,05718
Trait curiosity	2,59±,261	Yes	2,5800	,21909	,04899
		No	2,6158	,30416	,06978
Trait anger	2,41±,286	Yes	2,4050	,28557	,06386
		No	2,4222	,29616	,06981
Trait depression	1,98±,265	Yes	1,9450	,21392	,04783
		No	2,0368	,30950	,07100

Table 12: STPI-Y in the sample of Selected and Non-selected players (N=40) (* means p<,05)

Discriminant analysis

The relatively small degrees of significant differences between Selected and Non-selected U18 players raises the question as to what those relevant factors are which play an important role in differentiating the groups. The researcher expected more larger meaningful differences between Selected and Non-selected U18 ice hockey players than the researcher found.

Discriminant analysis is used to determine which variables discriminate between Selected and Non-selected U18 ice hockey players. After checking for the various assumption of discriminant analysis, a stepwise discriminant analysis was used to build a predictive model of group membership with being Selected or Non-selected player as a grouping factor.

Since Box's M is not significant, it does not violate the accuracy of Discriminant analysis.

Box's M		50,832
F	Approx.	1,204
	Df1	28
	Df2	1814,972
	Sig.	,213

Table 13: Tests null hypothesis of equal population covariance matrices.

The results of discriminant analysis showed that Unequal recognition, Concentration, Peaking under pressure, BMI, 36m back skating, Freedom from worry, Trait depression, and Intra-team member rivalry are those variables that differentiate the groups (Table 14). Interestingly, ACSI-28 sub scales were found in three, PMCSQ-2

sub scales in two, STPI-Y, On-ice motor test one time, and also the BMI to make a difference.

Step	Entered	Removed	Wilks' Lambda							
	Statistic	df1	df2	Df3		Exact F			Stat.	df1
	Statistic	df1	df2	Sig.	Stat	Df1	df2	Sig	Stat.	df1
1	Unequal recognition		,730	1	1	23,0	8,52	1	23,000	,008
2	Concentration		,550	2	1	23,0	8,99	2	22,000	,001
3	Peaking under pressure		,347	3	1	23,0	13,1	3	21,000	,000
4	BMI		,218	4	1	23,0	17,9	4	20,000	,000
5	36mbs		,143	5	1	23,0	22,8	5	19,000	,000
6	Freedom from worry		,104	6	1	23,0	25,9	6	18,000	,000
7	Trait depression		,083	7	1	23,0	26,6	7	17,000	,000
8	Intra-team member rivalry		,061	8	1	23,0	30,8	8	16,000	,000
9		36mbs	,070	7	1	23,0	32,3	7	17,000	,000

Table 14: Variables Entered/Removed(a,b,c,d)

At each step, the variable that minimizes the overall Wilks' Lambda is entered.
a Maximum number of steps is 90.
b Minimum partial F to enter is 3.84.
c Maximum partial F to remove is 2.71.
d F level, tolerance, or VIN insufficient for further computation.

For a 2-group analysis, only one function is needed to discriminate thus 1 eigenvalue is given. The Canonical correlation measures the association between the Discriminant scores and the groups. A high value (close to 1) shown in table 15 illustrates that the function discriminates well

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	13,302(a)	100,0	100,0	,964

Table 15: Eigenvalues

First 1 canonical discriminant functions were used in the analysis.

Wilks' Lambda (Table 16) shows the proportion of total variance (,70) in the Discriminant scores not explained by differences among groups. A small Lambda value in this case indicates that the group's mean Discriminant scores differ. The Sig (p=,000) is for the Chi square test, which indicates that there is a significant difference between the groups' centroids.

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1	,070	51,878	7	,000

Table 16: Wilks' Lambda measures

Table 17 shows the Leave-one-out classification, which gives us a 90,0% accuracy.

		Selected or Non-selected	Predicted Group Membership		Total
			Yes	No	Yes
Original	Count	Yes	16	4	20
		No	6	14	20
	%	Yes	80,0	20,0	100,0
		No	30,0	70,0	100,0
Cross-validated(a)	Count	Yes	19	1	20
		No	3	17	20
	%	Yes	95,0	5,0	100,0
		No	15,0	85,0	100,0

Table 17: Classification Results(b,c)

a Cross validation is done only for those cases in the analysis. In cross validation, each case is classified by the functions derived from all cases other than that case.

b 75,0% of original grouped cases correctly classified.

c 90,0% of cross-validated grouped cases correctly classified.

V. DISCUSSION

The primary purpose of this study was to find those measurements and tests that differentiate Selected and Non-selected U18 ice hockey players. To answer to the main questions, it was used a series of motor tests (12 On-ice, BMI, and 6 Off-ice), and four psychometric measurements (ACSI-28, PMCSQ-2, SMS, STPI-Y). The results of this study indicate that Selected and Non-selected U18 ice hockey players do not differ much in most measurements.

It means that most tests and measurements in this research project do not make a lot of difference between Selected and Non-selected players. Surprisingly there were only two On-ice tests and one Off-ice test with significant differences. The author found one sub scale with significant difference both in ACSI-28 and PMCSQ-2 tests. SMS and STPI-Y did not produce any significant differences between the groups.

When searching for more meaningful differences; Discriminant analysis showed 8 variables that differentiate between the two groups of players: Unequal recognition, Concentration, Peaking under pressure, BMI, 36m back skating, Freedom from worry, Trait depression, and Intra-team member rivalry.

The evaluation of physical tests, performance is often used to identify talent, develop training regimens, and also to quantify training adaptations (Vescovi et al, 2006). A wide range of anthropometric and motor variables are used, for instance, to distinguish between levels of players (Bracko, 2001).

U18 players can be considered high level in their skating ability. Given the little time they spend on ice (at least when compared to successful ice hockey nations), it is a competitive result from all the players in this study. Contrary to the expectations, there

was only one difference between Selected and Non-selected U18 players' skating abilities. The only differences appeared when players had to use complex skating technique with a puck. Hence, conditional skills may be improved to a certain level but complex skills might need a more sophisticated level of talent (Bracko & Fellingham, 2001).

Only two tests were seemed successful for the Non-selected players in On-ice test, the Shooting 1 and the Shooting 2 drills. Presumably, the difference lies in that these kinds of tests were totally new for the participants, thus could not prepare for them and the precision of the shoots was not so frustrating for the players with less chance. As we saw previously there were two tests with significant differences, the Crossover with Puck and the Passing Skill drills.

The body mass index (BMI) showed us that there were no significant differences between the Selected and Non-selected groups. The measured indexes of the body mass were not far from each other, but the Selected players were more suited to modern ice hockey. In the elite level of this age group there are not overweight players, and by the selections in the clubs big differences in this field were avoided.

The off-ice examination showed there were significant differences only in the 1500 m running. The measurements reveal better results for the Selected players, although the Standing Long Jump and the 10 m acceleration showed a controversial outcome. The date of the national TRY OUT test was in the first weekend of May, the players practiced mostly off-ice in the clubs. The answer for this phenomenon probably lies in the same practice procedure and also the same volume of training. Also a lot of the rested players were not sent from the clubs to the National TRY-OUT test.

The results of the motor tests altogether verify the “Coaches eyes”, but in this field there were no really big differences between the investigated groups.

There were only small differences in ACSI-28 as well. In the sub scales of ACSI-28, Peaking under pressure, Concentration, and Confidence and achievement motivation seem to be a bit higher than the other sub scales. Controversial, Freedom from worry and Coachability seem very low. All of the results gained show us that these sub scales are not developed sport specifically by the examined groups. The answer lies in the education of the coaches; they should be sufficiently open-minded to understand the importance of that issue.

The two major goal orientations tend to be referred to as mastery and performance goals in research on academic achievement (Pintrich & Schunk, 2002), and as task and ego orientations in research in sports settings (Duda, 1995; Duda & Nicholls, 1992; Duda, Olson, & Templin, 1991; Duda & Whitehead, 1998). Task and ego orientations refer to general dispositions, and task and ego involvement refer to goal states in specific situations (Nicholls, 1989). Effort/improvement had the highest values and Punishment for mistakes had the lowest values of all in PMCSQ-2. Also, Task orientation was a lot higher than Ego orientation by the examined groups. People with a task orientation tend to use standards for success that are personal, long term, and flexible (Ames, 1992; Dweck & Elliott, 1983; Grant & Dweck, 2003). Also, players with a task orientation tend to focus on what they can do to improve their skills; they focus on practice, persistence, effort, and hard work (Bergin & Habusta, (2004). They do not focus on innate talent as the determinant of success.

Non-selected ice hockey players demonstrate significantly higher Unequal recognition values than that those of Selected ice hockey players. It depends on the

coaches' behavior, and the feeling of the players about themselves. Also the perceived motivational climate transmits signals, which appeal to the players.

Based upon the statistics of SMS, the low Amotivation, the medium level of Extrinsic motivation, and a relatively high level of Intrinsic motivation warn us, that both of the examined groups were committed to ice hockey. This is very important in ice hockey, so combined with humility and hard work; the players are motivationally able to achieve great careers in sport.

Freedom from worry was the only significant difference between the two groups in STPI-Y, which means that Selected athletes have higher level of Freedom from worry that Non-selected ones. Probably the Selected players have fewer problems in their sporting life, so in this field they have more self-confidence and they can play with more pleasure, and their coaches support them in this belief.

Conclusions, recommendations

Practice needs the results of sports science, and controversially sports science needs directions assigned by the practice. The practice and the science in the field of sport work for the same aim, to achieve better results, but neither can exist without the other.

Summarizing the findings it is recommended to do similar investigations with a broader sample, in more age groups or in more players. The results which were found in this examination are very useful for the Hungarian coaches because they can search for and recognize these kinds of components by the selection at a younger age. Coaches in ice hockey practice should know the exact method of measurements and have an appreciation of the results (Géczi et al, 2007).

It is also crucial in all sports to know the procedure of the scientific measurement, and to know the feedback from the players to the planned development program. The author hopes that this dissertation contributes some value to ice hockey in Hungary and also more widely.

Ice hockey is one of the fastest team sports, requiring multiple skills and talent. A lot of years, humility, tolerance and work lie in a successful career in this sport. These kinds of players are developed in the youth programs in every country (IIHF, 2008).

The philosophy of the direction of the development depends on the knowledge and humility of those who are working in this spectacular sport. The motivation, which is required by ice hockey players, should come from inside the subjects. The happiness of the practice, the games and the training camps is the pedagogical tool for the coaches to develop their players, and the way for the players' successful career. The coaches should be well educated and competent people, who the parents believe in. Life-long learning is a basic criterion to be a very good and successful coach, and it is also a criterion for a good ice hockey player.

Ice hockey players should play in all the positions, because situations are always changing during a match, it is very important in ice hockey that the transitions of the game roles should flow continuously without any break to transform. Seeing an ice hockey match the left wing should defend on the right side, and the right defender should try to sore goal depending on the situation. For this reason, the modern development of the players contains game role transitions, and the early period of the development means trying the possible roles in practice and matches.

At this stage results of the games are not important, but the performance is important. The U18 players have different individual periods in their maturation that is

why a lot of accelerated players are very depressed in the time when the less developed team mate is getting better. The well educated and good coach knows the signs of this, and he/she is interested in all of players' development, not in the achievement of good results in the early phase (Géczi et al, 2007).

In sports there are a lot of athletes, who are disappointed after 6-8 years of practice who retire from elite sport, but they will be the next generations' parents or they will support the sport financially in the future if the retirement was not experienced with negative feelings. In Hungarian ice hockey the philosophical values involved are transmitted to individuals, who are playing ice hockey, not only ice hockey players. A lot of parents emphasize result but are not aware that this is secondary to players' development. If someone is very frustrated because of the result they cannot master the skills which are required at an older age and on the higher level of development. The learning of ice hockey should based on multiple and strong fundamentals, meaning that firstly the skills should develop and after that the motor skills to reach the adequate level. If the players own all the required skills and motor ability, the coaches can teach tactics and strategy for the players.

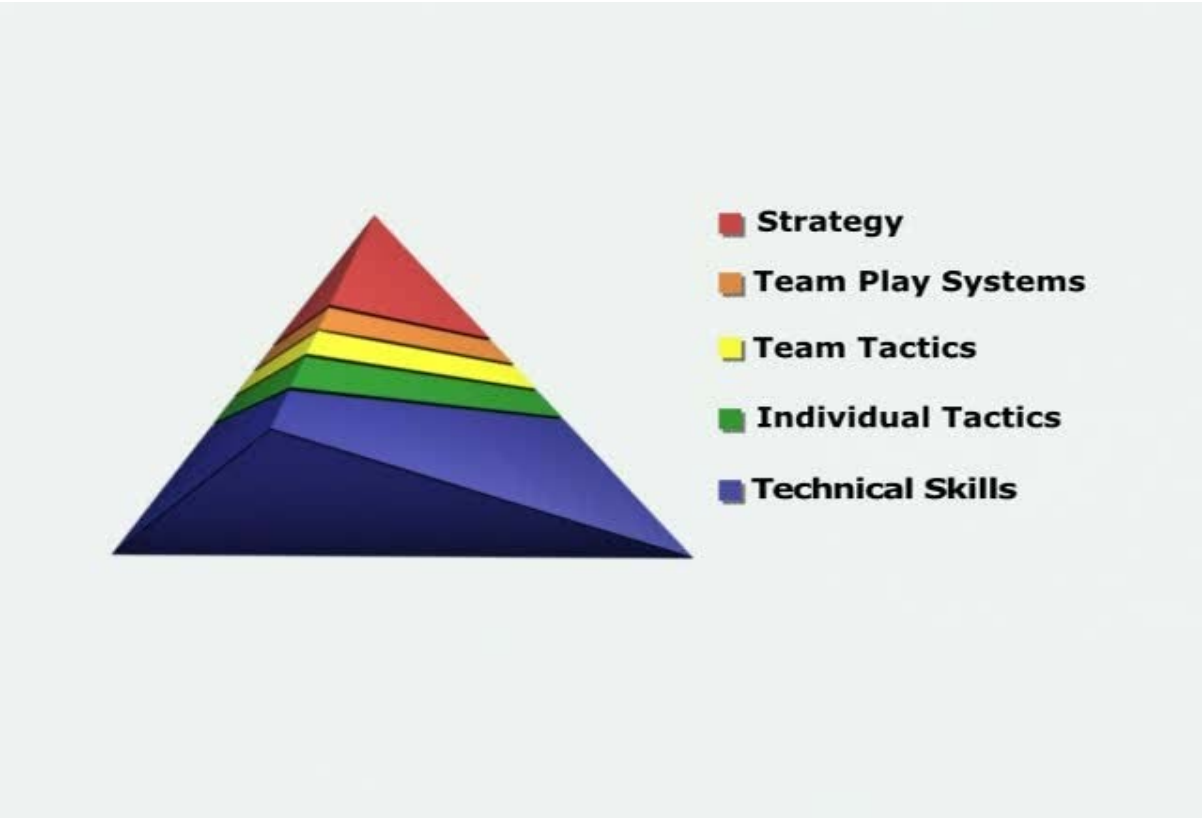

Figure 1. Ice hockey skills pyramid

The players should compete against each other for the reason of being a member of the team, continuous competition results in better performance and more humble players. The matches are very important in the development program; these are the tests of the players' ice hockey knowledge, the examination how they can perform under stress. The results are going to be more and more important in the development procedure, the first age group, where the result is important is the U16. The International Ice Hockey Federation organizes official events firstly for the age group U18 because the impact of the results means not enough time to prepare for the requirements of the elite level ice hockey. "What little Johnny did not practice, the older Johnny will not use."

The natural progression starting at the base of the triangle emphasizes the development of fundamental skills. These skills are the foundation of each player's success. As the pyramid is climbed, a greater emphasis is placed on individual tactics; adding the dimension of „hockey sense" to skill development. Once a player has developed the skills of skating and puck handling then the individual tactic of puck control can be learned. The player now understands the "why" of each tactic, for example the read and react skills are being developed.

Moving up the pyramid, players perform drills that will develop team tactics and systems. The U18 level of ice hockey emphasizes team performance practices. But even at this level, time spent on team tactics and team play should not exceed 60 % of the practice. The coach, through practice must continue to develop the fundamental skills and individual tactics of each player which lead into team tactics and systems of team play.

Strategy is the peak of the pyramid. It sets the style of play that will combat the opposition. The coach determines the strategy based upon their own philosophy, the age of the players, and the skills level of the team. As a player age and competitive level increase, game strategies become more complex.

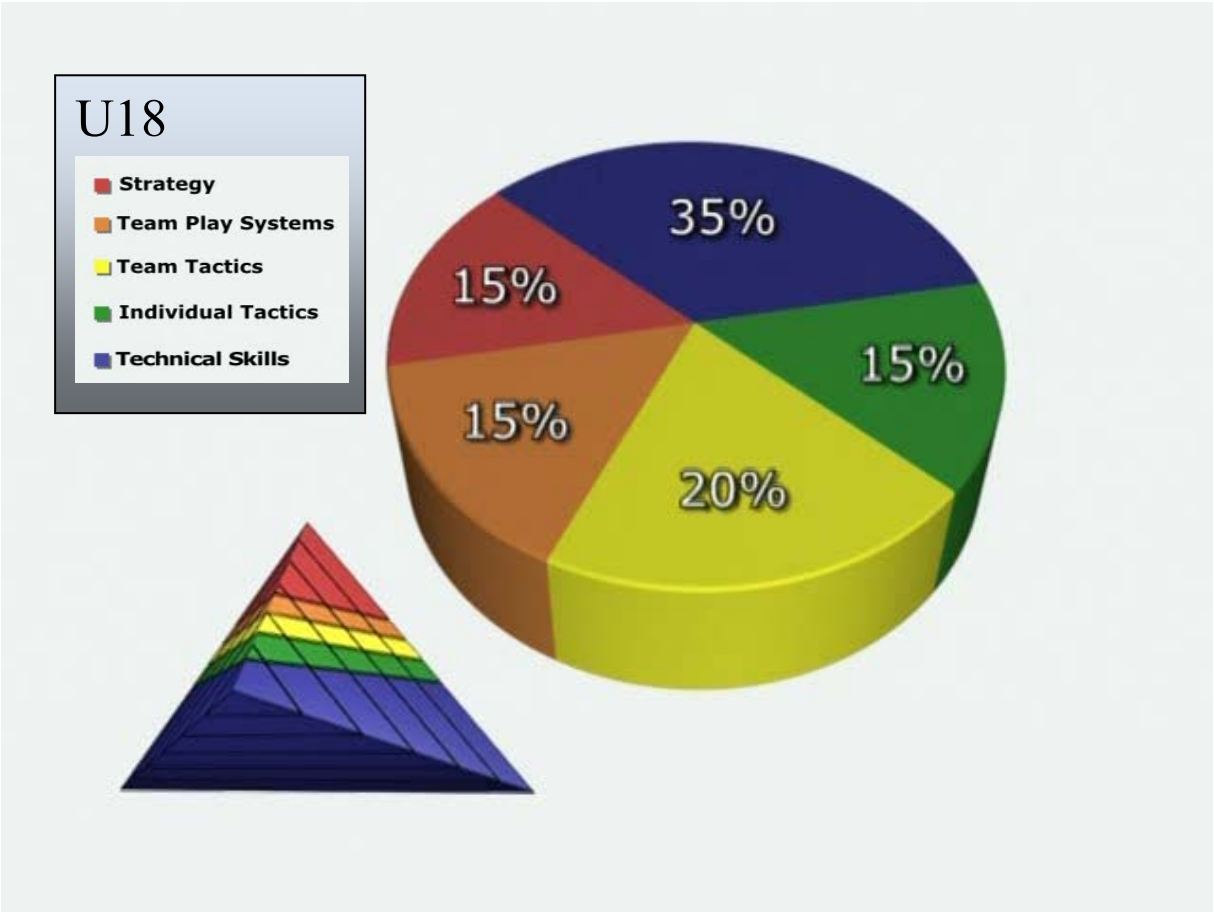

Figure 2. The recommended practice component of the U 18 ice hockey players

The examined age group is next to the adult level, so the workout what the players should execute is very similar to the professional adult players' practice. The International Ice Hockey Federation organizes firstly in this age group the official World Championship, so the players should acquire skills, tactics and mental factors too.

The youth program is the key to the rise of Hungarian ice hockey (Géczi et al, 2005). The coaches should compare the players to each other and to their own development, so the tests during the practices are relevant to get information, feed-back about the planned development. The coaches are only the tools to promote the players' talent; the biggest mistake is if someone's talent does not appear in the society.

95% of the players cannot achieve the elite level, but it is crucial that these people have positive and good feelings about ice hockey. The correct, adequate development of the players allows the choice to be made in the age group 18-20, to be a professional player or to be amateur players with a civil job.

As we can recognize, hypothesizes were not supported by the results of the investigation, so probably the really significant differences lies in the "hockey sense". The "hockey sense" is a very complicated skill; its components are the understanding the game; the game reading and the decision-making by the players. "Understanding the game" means to understand the team's goals and the principles of cooperation in different situations.

"Game reading" means observing own team's, opponent team's and puck's location and movement direction and speed, the continuous following and interpreting of the situations. With the help of visual tips the player can predict what will happen in the game. This is a skill which is determined by the thinking of the players, the combination skill and also the time they passed on the gliding surface.

"Decision making" means selecting the right skill for the game situation; which playing skills the player chooses to carry out the decision. Essential is the speed and creativity of the decision making. It is not only the decision-making that is important in the game; the player has to be able to carry his decisions in practice where playing skills are needed.

Future research should include an attempt to determine the major differences between Selected and Non-selected players other than players' motor skills, motivation, perceived motivational climate, coping, and trait personality measures values. Probably

the utilization of a test to measure game reading as a skill could be a major indicator of being successful in this sport.

It seems especially important at the youth sport level because it is at that time when talent should be recognized, differentiated and further developed for success. Complex and multifaceted examinations should be carried so coaches can have a more in depth understanding of this age group. This understanding can facilitate future and optimal development of motor and psychometric areas.

VI. TESTS OF HYPOTHESES

1. The first hypothesis stated that the Selected U18 players demonstrate significantly better motor performance in most of the 12 on ice skating + BMI tests than Non-selected players. The BMI results show us, that the all players had adequate body composition for ice hockey. Through statistical measurements, there were only two tests showing significant differences: the Crossover test with puck and in the Shooting drill. Hence we can partly approve the first hypothesis.

2. In the second hypothesis I expected that the Selected U18 players demonstrate significantly better motor performance in most of the 6 off-ice tests than Non-selected players. The only significant different lies in 1500m track, Selected U18 ice hockey players are significantly better than Non-selected players. So the second of my hypotheses cannot be fully supported.

3. The third hypothesis stated that Selected U18 players demonstrate significantly better coping characteristics than Non-selected players. According to the results, Selected players demonstrate higher Freedom from worry than Non-selected players. Although there were no significant differences. Hence, we can only partly approve this hypothesis.

4. The fourth hypothesis stated that Selected U18 players demonstrate significantly better motivational characteristics than Non-selected players. The result demonstrated that Amotivation is quite low and extrinsic motivation was quite high in the sample, but there were no statistical differences between Selected and Non-

selected ice hockey players in sport motivation. So the fourth of my hypotheses was not supported.

5. The fifth hypothesis stated that Selected U18 players demonstrate significantly better perceived motivational climate characteristics than Non-selected players. As indicated by the result that Effort/improvement seems to be the highest values and Punishment for mistakes has the lowest values. Also, Task orientation is a lot higher than Ego orientation. Unequal recognition is the only one significant difference between Selected ice hockey players and Non-selected ones. Those ice hockey players without being selected have higher values of Unequal recognition than the Selected ones. So the fifth of my hypotheses was not supported by my investigation.

6. The sixth hypothesis stated that Selected U18 players demonstrate significantly better anxiety characteristics than Non-selected players. Depression seems to be the lowest and Curiosity and Anger the highest of the sub scales of Trait Personality Inventory-Y. There were no significant differences between Selected and Non-selected ice hockey players, so the sixth of my hypotheses was not proven.

SUMMARY

Ice hockey is known as one of the fastest and multifactorial team sport, which required condition, coordination, and also psychological and mental abilities by the players. Also, ice hockey is characterized by high intensity intermittent skating, rapid changes in velocity and duration, and also frequent body contact (Montgomery, 1988). The success in this spectacular sport mainly depends on not only the player efficacy, but more on team efficacy, understanding, communication, cooperation, and team performance and humble (Feltz & Lirgg, 1998). The purpose of this dissertation was to analyze and determine motor and psychometric factors which are the most deciding factors to the successful selection of the U 18 National team. Further to analyze the differences between the Selected and Non-selected players comparing the results of both groups. And to direct the coaches in the practice, that they should force the adequate skills improvement during the youth development program. All players that attended this try out were preselect and sent by club coaches to participate in the study, so altogether 40 U18 players did all the on-ice and off -ice motor tests and filled out all psychometric measures. From the players that participated in this particular study, 20 were U18 National team Selected members (M_{age}=16,45, SD= ,512) and another 20 Non-selected players (M_{age}=16,62, SD= ,50). In order to answer the research questions, a number of motor and psychological tests were administered. 19 on ice and off-ice motor tests were processed. Also, Athletic Coping Skills Inventory (ACSI-28), Perceived Motivational Climate in Sport Questionnaire-2 (PMCSQ-2), Sport Motivation Scale (SMS), State-Trait Personality Inventory (STPI-Y). Descriptive data for all variables are described by mean (M) and standard deviation (SD). In order to answer the results questions, data of Selected and Non-selected ice hockey players were statistically compared. For the comparison Independent T-test was conducted. Additionally, after checking for normality and homogeneity of variance assumptions, discriminant analysis was calculated to build a predictive model of group membership. Stepwise discriminant analysis was used for differentiating motor and psychometric differences between Selected and Non-selected U18 players. The main findings of my study were to determine the deciding factors to be successfully selected to the U18 National ice hockey team on the examined participants. According to T-test, there were significant differences between Selected and Non-selected U18 players in these tests: Crossover test with puck, Passing skill drill (sec), 1500 m track, Freedom from worry and Unequal recognition. Discriminant analysis showed that the discriminating factors were in the sample: Unequal recognition, Concentration, Peaking under pressure, BMI, 36 m backward skating, Freedom from worry, Trait depression and Intra-team member rivalry. Further studies needed to understand motor and psychometric characteristics of elite young players. Hence, it is worth examining how age is a factor in motor and psychometric variables (U16, U18, U20, adult team). Furthermore longitudinal studies might be useful for understanding the processes and development stages of the young player can help the planning process. As well as comparisons with players from other sports than ice hockey may be useful for talent development purposes.

ÖSSZEFOGLALÓ

A jégkorong az egyik leggyorsabb és legösszetettebb csapatsport a világon, amely differenciált tulajdonságokat követel meg a játékosoktól (Vescovi et al, 2001). A jégkorongra egyébként jellemző még a nagy intenzitású, rövid korcsolyázás, a gyors sebesség és irányváltás, valamint az állandó test-test elleni harc (Montgomery, 1988). Ebben a kiváló sportban a siker nemcsak az egyéni hatékonyságon, hanem sokkal inkább a csapathatékonyságon, egymás megértésén, a kommunikáción, az együttműködésen és az alázaton múlik (Feltz & Lirgg, 1998). A disszertáció elsődleges célja volt, hogy analizálja és meghatározza azokat a jellemzőket, amelyek a motorikus és pszichológiai faktorok közül a döntő volt a magyar U18 jégkorong válogatottba kerülés szempontjából. Másodlagos cél volt, hogy bemutassa a különbségeket a Válogatott és a Nem-válogatott játékosok között. A kutatás eredményeit hozzáférhetővé téve a hazai edzők számára, megfelelő irányba lehet befolyásolni az általuk elvégzendő edzésmunkát. Minden vizsgálati személy a saját egyesületében átesett egy előválogatáson, ezért mindösszesen 40 fő, U18 életkorú játékos végezte el a jeges és szárazföldi gyakorlatokat és töltötte ki a pszichológia teszteket. A játékosok közötti megoszlás 20 Válogatott (M_{age}=16,45, SD= ,512) és 20 Nem-válogatott (M_{age}=16,62, SD= ,50) játékos volt. A kutatáshoz felhasználásra került a válogató tesztelés 19 motoros gyakorlata, jeges és szárazföldi feladatok. A pszichológiai tesztelésben az Athletic Coping Skills Inventory (ACSI-28), a Perceived Motivational Climate in Sport Questionnaire-2 (PMCSQ-2), a Sport Motivation Scale (SMS) és a State-Trait Personality Inventory (STPI-Y) kérdőívek voltak felhasználva. Minden mért adat Átlag (M) és Szórás (SD) értékei voltak kiszámítva először. A Válogatott és Nem-válogatott játékosok eredményei össze lettek összehasonlítva egymással, amely az Egymintás T-próba segítségével lett elvégezve. A Normalitás és Homogenitás ellenőrzése után, Diszkriminancia analízis lett végrehajtva a csoporttagság prediktív modelljének felállítása érdekében. Diszkriminancia analízist felhasználva a Válogatott és Nem-válogatott csoportok közötti különbségek lettek kimutatva. A legfőbb eredménye a tanulmánynak, hogy megmutatta azokat a faktorokat, amelyek megkülönböztették a résztvevő 40 főt, azaz a Válogatott játékosokat a Nem-válogatott játékosoktól. Az egymintás T-próba alapján statisztikailag szignifikáns különbség volt a két csoport között a következő tesztekben: Koszorúzás koronggal, Passzolási gyakorlat, 1500 méteres síkfutás, Aggódásmentesség és az Egyenlőtlen elismerés esetében. A Diszkriminancia analízis alapján a megkülönböztető faktorok voltak a vizsgált mintán: az Egyenlőtlen elismerés, a Koncentráció, a Teljesítés nyomás alatt, a Testtömeg index (BMI), a 36 méter hátrakorcsolyázás, az Aggódásmentesség, a Pillanatnyi depresszió és a Csapaton belüli rivalizálás. A kutatás kevés szignifikáns különbséget mutatott a csoportok között, a klubokban történt előzetes kiválasztás megfelelő volt. Az „Edző szeme" jelenség bebizonyosodott a vizsgált mintán, azaz a Magyar Jégkorong Szövetség edzői garnitúrája által előre megnevezett játékosok érték el a jó eredményeket. További tanulmányok szükségesek a motoros és pszichikai képességek jobb megértéséhez az utánpótláskorú, elit jégkorongozóknál. Az életkor változásának szempontjából több korosztálynál (U16, U18, U20 és Felnőtt) is el kellene végezni az összehasonlítást. Longitudinális vizsgálatok jól jellemeznék a fejlődés állomásait, ami megfelelő segítséget tudna adni a fejlesztési folyamat tervezéséhez. További sportágak hasonló korú versenyzőivel is hasznos lehet az összehasonlítás a jövőbeni vizsgálatoknál, a sportági tehetség-összetevők leírásakor.

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APPENDICES

The Athletic Coping Skill Inventory (ACSI-28) (Smith and colleges' 1995)

Directions: Answer the following questions as honestly as possible, according the scale, 0 to 3.

0 = ALMOST NEVER, 1 = SOMETIMES, 2 = OFTEN, 3 = ALMOST ALWAYS

1) On a daily or weekly basis, I set very specific goals for myself that guide what I do.	0 1 2 3
2) I get the most out of my talent and skills.	0 1 2 3
3) When a coach or manager tells me how to correct a mistake I've made, I tend to take it personally and feel upset.	0 1 2 3
4) When I am playing sports, I can focus my attention and block out distractions.	0 1 2 3
5) I remain positive and enthusiastic during competition, no matter how badly things are going.	0 1 2 3
6) I tend to play better under pressure because I think more clearly.	0 1 2 3
7) I worry quite a bit about what others think about my performance.	0 1 2 3
8) I tend to do lots of planning about how to reach my goals.	0 1 2 3
9) I feel confident that I will play well.	0 1 2 3
10) When a coach or manager criticizes me, I become upset rather than helped.	0 1 2 3
11) It is easy for me to keep distracting thoughts from interfering with something I am watching or listening to.	0 1 2 3
12) I put a lot of pressure on myself by worrying how I will perform.	0 1 2 3
13) I set my own performance goals for each practice.	0 1 2 3

14) I don't have to be pushed to practice or play hard; I give 100%.	0 1 2 3
15) If a coach criticizes or yells at me, I correct the mistake without getting upset about it.	0 1 2 3
16) I handle unexpected situations in my sport very well.	0 1 2 3
17) When things are going badly, I tell myself to keep calm, and this works for me.	0 1 2 3
18) The more pressure there is during a game, the more I enjoy it.	0 1 2 3
19) While competing, I worry about making mistakes or failing to come through. 0	0 1 2 3
20) I have my own game plan worked out in my head long before the game begins.	0 1 2 3
21) When I feel myself getting too tense, I can quickly relax my body and calm myself.	0 1 2 3
22) To me, pressure situations are challenges that I welcome.	0 1 2 3
23) I think about and imagine what will happen if I fail or screw up.	0 1 2 3
24) I maintain emotional control no matter how things are going for me.	0 1 2 3
25) It is easy for me to direct my attention and focus on a single object or person.	0 1 2 3
26) When I fail to reach my goals, it makes me try even harder.	0 1 2 3
27) I improve my skills by listening carefully to advice and instruction from coaches and managers.	0 1 2 3
28) I make fewer mistakes when the pressure's on because I concentrate better.	0 1 2 3

THE PERCEIVED MOTIVATIONAL CLIMATE

IN SPORT QUESTIONNAIRE – 2

(M. L. Newton & J. L. Duda)

Directions: Please read each of the following statements carefully and respond to each in terms of how you view your team. Place a check mark (x) in the column that best represents how you feel.

Use the following scale:

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

On this team….

1. the coach wants us to try new skills.
2. the coach gets mad when a player makes a mistake.
3. the coach gives most of his or her attention to the stars.
4. each player contributes in some important way.
5. the coach believes that all of us are crucial to the success of the team.
6. the coach praises players only when they outplay team-mates.
7. the coach thinks only the starters contribute to the success of the team.
8. players feel good when they try their best.
9. players are taken out of a game for mistakes.
10. players at all skill levels have an important role on the team.
11. players help each other learn.

12. players are encouraged to outplay the other players.

13. the coach has his or her own favorites.

14. the coach makes sure players improve on skills they're not good at.

15. the coach yells at players for messing up.

16. players feel successful when they improve.

17. only the players with the best `stats' get praise.

18. players are punished when they make a mistake.

19. each player has an important role.

20. trying hard is rewarded.

21. the coach encourages players to help each other.

22. the coach makes it clear who he or she thinks are the best players.

23. players are `psyched' when they do better than their team-mates in a game.

24. if you want to play in a game you must be one of the best players.

25. the coach emphasizes always trying your best.

26. only the top players `get noticed' by the coach.

27. players are afraid to make mistakes.

28. players are encouraged to work on their weaknesses.

29. the coach favors some players more than others.

30. the focus is to improve each game/practice.

31. the players really `work together' as a team.

32. each player feels as if they are an important team member.

33. the players help each other to get better and excel.

Sport Motivation Survey

(Pelletier et al, 1995)

Why Do You Practice Your Sport?

Using the scale below, please indicate to what extent each of the following items corresponds to one of the reasons for which you are presently practicing your sport.

1	4	7
Does not correspond at all,	Corresponds moderately	Corresponds exactly

1. For the pleasure I feel in living exciting experiences.
2. For the pleasure it gives me to know more about the sport that I practice.
3. I used to have good reasons for doing sports, but now I am asking myself if I should continue doing it.
4. For the pleasure of discovering new training techniques.
5. I don't know anymore; I have the impression that I am incapable of succeeding in this sport.
6. Because it allows me to be well regarded by people that I know.
7. Because, in my opinion, it is one of the best ways to meet people.
8. Because I feel a lot of personal satisfaction while mastering certain difficult training techniques.
9. Because it is absolutely necessary to do sports if one wants to be in shape.
10. For the prestige of being an athlete.
11. Because it is one of the best ways I have chosen to develop other aspects of myself.
12. For the pleasure I feel while improving some of my weak points.
13. For the excitement I feel when I am really involved in the activity.

14. Because I must do sports to feel good about myself.

15. For the satisfaction I experience while I am perfecting my abilities.

16. Because people around me think it is important to be in shape.

17. Because it is a good way to learn lots of things which could be useful to me in other areas of my life.

18. For the intense emotions that I feel while I am doing a sport that I like.

19. It is not clear to me anymore; I don't really think my place is in sport.

20. For the pleasure that I feel while executing certain difficult movements.

21. Because I would feel bad if I was not taking time to do it.

22. To show others how good I am at my sport.

23. For the pleasure that I feel while learning training techniques that I have never tried before.

24. Because it is one of the best ways to maintain good relationships with my friends.

25. Because I like the feeling of being totally immersed in the activity.

26. Because I must do sports regularly.

27. For the pleasure of discovering new performance strategies.

28. I often ask myself; I can't seem to achieve the goals that I set for myself.

SELF-ANALYSIS QUESTIONNAIRE
STPI FORM Y-1

MIND GARDEN
P.O. BOX 60669
Palo Alto, CA 94306

IDENTIFICATION NUMBER	AGE	TODAY'S DATE	Gender	HIGHEST GRADE	MARITAL STATUS
A B C D E F G H I		MO DAY YR			
		Jan. Feb. Mar. Apr. May Jun. Jul. Aug. Sep. Oct. Nov. Dec.	Female / Male	8TH OR LESS; 9; 10; 11; 12; H.S. DIPLOMA; H.S. G.E.D.; Some College; A.A OR A.S; B.A. OR B.S.; M.A. OR M.S.; Ph.D., Ed.D., L.L.B. M.D.	SINGLE; MARRIED; WIDOWED; SEPARATED; DIVORCED

ETHNIC CODE: AFRICAN AMERICAN; ASIAN; CAUCASIAN (WHITE); HISPANIC; NATIVE AMERICAN; OTHER

DIRECTIONS FOR MARKING ANSWER SHEET

- Use a No. 2 black lead pencil. Do NOT use ink or ball point pen.
- Make each mark heavy and black. Mark should fill circle completely.
- Erase clearly any answers you wish to change. Make no stray marks.

IMPROPER ✓ ✗ ●

PROPER ● ● ●

Part 1 Directions: A number of statements that people have used to describe themselves are given below. Read each statement and then darken the appropriate value to the right of the statement to indicate how you feel *right* now, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to **best** describe your **present feelings**.

	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
1. I feel calm	1	2	3	4
2. I am in a questioning mood	1	2	3	4
3. I am furious	1	2	3	4
4. I feel strong	1	2	3	4
5. I am tense	1	2	3	4
6. I feel curious	1	2	3	4
7. I feel like banging on the table	1	2	3	4
8. I feel blue	1	2	3	4
9. I feel at ease	1	2	3	4
10. I feel interested	1	2	3	4
11. I feel angry	1	2	3	4
12. I feel miserable	1	2	3	4
13. I am presently worrying over possible misfortunes	1	2	3	4
14. I feel inquisitive	1	2	3	4
15. I feel like kicking somebody	1	2	3	4
16. I feel downhearted	1	2	3	4
17. I feel nervous	1	2	3	4
18. I feel like exploring my environment	1	2	3	4
19. I feel like breaking things	1	2	3	4
20. I feel alive	1	2	3	4
21. I am jittery	1	2	3	4
22. I feel stimulated	1	2	3	4
23. I am mad	1	2	3	4
24. I feel sad	1	2	3	4
25. I am relaxed	1	2	3	4
26. I feel mentally active	1	2	3	4
27. I feel irritated	1	2	3	4
28. I feel safe	1	2	3	4
29. I am worried	1	2	3	4
30. I feel bored	1	2	3	4
31. I feel like hitting someone	1	2	3	4
32. I feel gloomy	1	2	3	4
33. I feel steady	1	2	3	4
34. I feel eager	1	2	3	4
35. I feel annoyed	1	2	3	4
36. I feel healthy	1	2	3	4
37. I feel frightened	1	2	3	4
38. I feel disinterested	1	2	3	4
39. I feel like swearing	1	2	3	4
40. I feel hopeful about the future	1	2	3	4

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SELF-ANALYSIS QUESTIONNAIRE
STPI FORM Y-2

MIND GARDEN
P.O. BOX 60669
Palo Alto, CA 94306

Part 2 Directions: A number of statements that people have used to describe themselves are given below. Read each statement and then darken the appropriate value to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you *generally* feel.

	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
41. I am a steady person	1	2	3	4
42. I feel like exploring my environment	1	2	3	4
43. I am quick-tempered	1	2	3	4
44. I feel gloomy	1	2	3	4
45. I feel satisfied with myself	1	2	3	4
46. I am curious	1	2	3	4
47. I have a fiery temper	1	2	3	4
48. I feel happy	1	2	3	4
49. I get in a state of tension or turmoil as I think over my recent concerns and interests	1	2	3	4
50. I feel interested	1	2	3	4
51. I am a hot-headed person	1	2	3	4
52. I feel depressed	1	2	3	4
53. I wish I could be as happy as others seem to be	1	2	3	4
54. I feel inquisitive	1	2	3	4
55. I get angry when I'm slowed down by others mistakes	1	2	3	4
56. I feel sad	1	2	3	4
57. I feel like a failure	1	2	3	4
58. I feel eager	1	2	3	4
59. I feel annoyed when I am not given recognition for doing good work	1	2	3	4
60. I feel hopeless	1	2	3	4

	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
61. I feel nervous and restless	1	2	3	4
62. I am in a questioning mood	1	2	3	4
63. I fly off the handle	1	2	3	4
64. I feel low	1	2	3	4
65. I feel secure	1	2	3	4
66. I feel stimulated	1	2	3	4
67. When I get mad, I say nasty things	1	2	3	4
68. I feel whole	1	2	3	4
69. I lack self-confidence	1	2	3	4
70. I feel disinterested	1	2	3	4
71. It makes me furious when I am criticized in front of others	1	2	3	4
72. I feel safe	1	2	3	4
73. I feel inadequate	1	2	3	4
74. I feel mentally active	1	2	3	4
75. When I get frustrated, I feel like hitting someone	1	2	3	4
76. I feel peaceful	1	2	3	4
77. I worry too much over something that really does not matter	1	2	3	4
78. I feel bored	1	2	3	4
79. I feel infuriated when I do a good job and get a poor evaluation	1	2	3	4
80. I enjoy life	1	2	3	4

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INFORMED-CONSENT FORM MINORS

1. Gábor Géczi, who is a Leader of the Youth program known as Héraklész has requested my child participation in a research study. The title of the research is "**SUCCESS AND TALENT DEVELOPMENT AS INDICATED BY MOTOR TESTS AND PSYCHOMETRIC VARIABLES OF U18 ICE HOCKEY PLAYERS**"

2. I have been informed that the purpose of the research is to find out what motor and psychological differences exist between Selected and Non-selected U18 players in ice hockey.

3. My child's participation will involve a series of on- and off-ice motor, pedagogical and psychological tests. The expected duration of the measurements will be approximately 5 hours.

4. I understand that there are very few foreseeable risks and discomforts to my child if I agree my child's participation in this study. Possible discomforts include fatigue and exhaustion.

5. I understand that the results of the research study may be published but my child's name or identity will not be revealed and confidentiality will be maintained throughout the research study.

6. I have been advised that the research in which my child will be participating does not involve more than minimal risks.

7. I have been informed that I will not be compensated for my child's participation.

8. I have been informed that any questions I have concerning the research study or my child's participation in it, before or after my consent, will be answered by Gábor Géczi (06-20-444-33-70).

9. I understand that in case of injury, if I have questions about my rights as a parent of my participant child in this research, or if I feel I have been placed at risk, I can contact the Chair of the Human Subject Research Review Committee of Semmelweis University Doctoral School.

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PARENT SIGNATURE DATE