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Physical profile of Finnish female ice hockey national team between the years 1995-2014

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Abstract

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The understanding of the physical performance characteristics of ice hockey players helps to establish performance data, develop more specialized training programs on and off the ice, improve performance and also identify weaknesses in conditioning. Appropriate training and maintenance of fitness level might help to prevent injuries and maintain performance during games. Additionally, the conditioning of a player may influence the coaches decision on the playing time the player gets, especially during double shifting or penalty killing situations.

Despite the increasing popularity of ice hockey, there are few reasearches examing elite female ice hockey players. The purpose of this study was to create a profile of Finnish women national team ice hockey players' physical profile between the years 1995 to 2014. This work considers players' anthropometrics (height, weight, fat %), anaerobic and aerobic threshold levels (power peak, maximum blood lactate concentration, VO_{2max}) and speed variable (static and countermovement vertical jump).

Finnish national team players are tested several time during each year. In this study it is surveyed the test results from the beginning of the season, from June or August annually from 1995 to 2013.

Peak power and VO_{2max} averages have improved slightly during the last four years. An average player is still the same height and weight as she was in 1995. Only fat percentage has increased from the year 1995. Particularly there would be room for improvement in vertical jump results, which are found to predict skating speed. The overall athleticism of the national team has not altered during the 19 years.

Keywords
Ice hockey, physical profile, women sport, national team, Finland

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1 Introduction

Ice hockey is a high intensity sport, where the game situations change quickly. The sport requires good game sense and well developed skill but also strength, power and high endurance level. Because of the nature of the sport, most of the player's movement is done on anaerobic level, but the importance of aerobic endurance is pronounced during the recovery periods between the shifts. Ice hockey is a popular sport but there are still comparatively few researches from the physiological demands of the sport, especially on women side.

The sport of women's ice hockey is not new; the earliest document of women's hockey competition was in the late 1800s. In Finland women have played ice hockey from 1970s and the success on international level has been good. Women ice hockey became a Olympic sport in the year 1998 in Nagano. At the time Finnish women hockey was leading country in Europe and they were pronze medal favorites after USA and Canada. Nowadays Sweden, Switzerland, Russian and Japan are even challengers, and the level of female ice hockey has improved quite a bit.

The purpose of this work is to create a profile of Finnish women national team ice hockey players' physical profile between the years 1995 to 2014. This work creates a picture of today's ice hockey game's physical demands and surveys a top-level Finnish women ice hockey player's physical capacity. The work considers players' anthropometrics (height, weight, fat %), anaerobic and aerobic threshold levels (power peak, maximum blood lactate concentration, VO_{2max}) and speed variable (static and countermovement vertical jump). The test results from the year 1995 to 2013 are described annually and collected in a table. Figures create pictures of trends of the variables, but the results can be found from the tables in attachments too.

There are only few studies made about female ice hockey players' physiology. As a result it is difficult to evaluate women ice hockey players athleticism or compare to other female athletes in other sports, but it is done that part of what the studies are found.

2 Brief history of women ice hockey

In the year 2010, there were 170 872 female ice hockey players in the world and is on the rise in almost every part of the world. 36 countries applied to enter their national team in the 2011 World Women's Championship program. (International Ice Hockey Federation.)

First records of women's hockey games date back to 1889 in Ottawa and 1892 in Barrie, Canada. The first organized ice hockey game between two women team took place in Ottawa, Canada, on February 11, 1891. (Wallechinsky & Loucky 2009, 41.) Lady Isobel Stanlay, the daugther of Lord Stanley of Preston, was one of the players of the era and one of the first female to be photographed playing ice hockey (International Ice Hockey Federation.) The first international tournament had teams from Canada and the United States in Cleveland in 1916. Those two nations have dominated women's ice hockey ever since. (Wallechinsky & Loucky 2009, 41.)

The first women's world championchips was held in Ottawa in 1990. Since that Canada and United States have battled in every final of every major tournament. (Wallechinsky & Loucky 2009, 41.) The first period of women's ice hockey history in North America peaked in 1930s before it disappeared with World War II. In the post-war era ice hockey was seen as men-only sport and it took a while before a new generation of famale ice hockey players grow up again. (International Ice Hockey Federation.)

In Finland women ice hockey began almost in every big ice hockey center in 1970s. Even though the clubs regarded women ice hockey as a good thing, they were not ready invest in it. The shortage of icetime, coaches and equipment limited practicing at the beginning. The situation got much better after Finnish Ice Hockey Association obligated clubs to share more ice time for women teams in the late 1980s. The first official national league for women took place in 1982 with ten women teams. At the beginnning the biggest women ice hockey cities were Tampere, Oulu, Jyväskylä and the region of Helsinki. (Kantola 2007, 265.)

There are about 4000 registered female ice hockey players in the season 2014 – 2015 in Finland. There are three women leagues in Finland. The highest league SM-sarja has eight teams, the second highest women Mestis league has 6 teams, and the third league Suomi-sarja has 19 teams in the season 2014-2015. There are girls' leagues for A-, B-, C-, D-, E-, F- juniors and some amateur series. (Finnish Ice Hockey Association 2.)

The first European Women's Championship was played in 1989 in Düsseldorf and Ratingen, Germany, with Finland as its first winner. One year later World Women's Championships took place in Ottawa with Canada winning on home ice. (International Ice Hockey Federation) The International Olympic Committee accepted women's ice hockey as an Olympic discipline. The first Olympic women's ice hockey tournament was played in Nagano 1998. Between the 1998 and the 2014 Winter Olympics, the US and Canada continued to dominate women's ice hockey. (Wallechinsky & Loucky 2009, 42.)

European women's Championship Cup is played since 2004, the first World Women's U18 World Championships took place in 2008, and in 2010 was played the first Women's Challenge Cup of Asia (Wallechinsky & Loucky 2009, 42).

Professional leagues were founded in North America in the 1990s and 2000s; the Western Women's Hockey league (WWHL) and the Canadian Women's Hockey League (CWHL). CWHL is considered the major professional league today, while many players form outside North America play in U.S. college system, NCAA Women's ice hockey league. (International Ice Hockey Federation)

Women ice hockey became a Olympic sport in the year 1998 in Nagano. At the time Finnish women hockey was leading country in Europe and they were pronze medal favorites after USA and Canada. That became true, when Finland won China in pronze medal game 4-1. In the year 2002 in Salt Lake City Finland lost to Sweden in pronze medal game. In Torino 2006 Finland met USA, which was unexpectedly lost to Sweden. Finland took the fourth place. In Vancouver 2010 Finland won Sweden in

pronze medal game and got the third place. In Sochi in 2014 Finland lost 4-2 to Sweden in quarter finals and took fifth place. (Finnish Olympic Committee)

The rules for women ice hockey players are the same as those for men. However, in women's game body checking is not allowed and all women are required to wear full-face masks. (Wallechinsky & Loucky 2009, 40.)

3 Charateristics of ice hockey

Ice hockey can be defined as a ball game played on ice surface, and which includes unlimited amount of changing game situations. Game situations are influnced by positions of players, opponent and the puck, their speed and moving direction, and the position of the game. The players on ice try to get the hard rubber puck with the sticks to the opponent's net guarded by a goalie. A team has five players and a goalie on ice at once and usually two to three lines in change. Beacause of the special surface, contact nature of the sport and the hard puck, the players are demanded to wear protections.

3.1 Game- and time-motion analysis

Ice hockey is an interval type of sport where shifts have periods of very high intensity activity of sprint skating, changes in directions, battling for the puck along the boards, and giving and receiving body contacts. All this has to be done on skates, on two thin blades, and on a sliding surface. The game requires quick game reading and excellent technical skills from a player to be able to pass or shoot in fast changing situations. (Bomba & Chambers 1999, 37.) On the other hand goaltenders game is based on concentration, flexibility, and lightning quick reflexes. However the anaerobic demands of the game causes fatigue that leads to a challenge to maintain the level of technical skills. (Bomba 2006, 97.)

Ice hockey is played in three 20-minute periods, so the total duration of the game is 60 minutes. A game extends for 150 to 170 minutes with intermissions and stops of play. An average player performs for 15 to 20 minutes. (Montgomery 2000, 815.)
There are 14 to 21 shifts per player during one game (Green et al. 1976, 160). Compared with NHL statistics, ten most played defenders had approximately 29 shifts, and ten most played forwards 25,5 per game during the season 2011-2012 (The National Hockey League 2012). An average shift includes 39,7 s of uninterrupted play, which is followed by a 27,1 s play stoppage, and that is repeated 2,3 times per shift. An average total playing time is 87,6 s per shift and the recovery time between the shifts is 4,85 minutes. (Green et al. 1976, 160.) Goaltenders usually play all 60 minutes (Bomba 2006, 97.)

Compared with forwards, defenders have a longer playing time. In NHL ten most played defenders had 26s playing time per game, and ten most played forwards 21,6s during the last season 2011-2012 (The National Hockey League 2012). Similar results are found in SM-liiga statistics from the season 2011-2012; ten most played defenders played 24,5s and forwards 20s per game (SM-Liiga 2012). That is explained with larger number of shifts per game, longer playing time per shift, and less recovery time between the shifts. A defender also skates with 61,1% lower average velocity than a forward. (Montgomery 2000, 815-816.)

Finnish highest women league SM-sarja has 8 teams. The regular season begins in September and ends at the end of January. After that playoff games are played. The league has 8 teams, and each team play 28 games during the regular season. See table 1 (Finnish Ice Hockey Association 1 2014).

Table 1 Number of games, teams, and length of seasons in different men's and women's ice hockey leagues in the season 2014-2015

League	**Length of regular season**	**Number of played games**	**Number of teams**	**Reference**
National Hockey League	October - April	82	30	NHL
Liiga (Finland)	September - March	59	14	LIIGA
Svenska Hockeyligan (Sweden)	September - March	55	12	SHL
Canadian Women's Hockey League	November – February	24	5	CWHL
National Collegiate Athletic Association Women	September – February	10 – 22	40	NCAA
SM Sarja (Finland women)	September – February	28	8	FIHA 1
Russian women league	September – January	30	9	RWL
Sweden women league	October – February	15	6	SWH

3.2 Movement of a ice hockey player during a game

Players from Czechoslovakian national team skated average 5160 m (range 4860 to 5620m) during a game (Seliger et al. 1972, 283-291). During 24 minutes of playing time, university level players skated 5553 m with average velocity of 227 m/min. Defensemen (160m/min) skated only averaged 61.6% of the value of forwards. Centers (276 m/min) skated slightly faster than wings (243 m/min). (Green et al. 1976, 160.) Skating velocities between 50 and 400 m/min would be expected during a game (Ferguson et al. 1969, 53-56). On the average, ice hockey players devoted more time skating time to acceleration (49%) than deceleration (41%) with only 10% of the time player search a place by coasting. So the movement of the player on ice is mostly continuous accelerating or deceleration. (Dillman et al. 1984, 190-193.)
Within a shift there are usually five to seven bursts of maximal skating ranging in duration from 2.0 to 3.5 seconds. With the players, who were on ice from 15 to 21 minutes per game, the total burst time average were 4 to 6 minutes during a game. (Garrett & Kirkendall 2000, 816.)

When evaluating ice hockey forwards' skating technique, they spent highest precentage of total on ice time in a two foot glide (39%), and cruise stride (16,2%). There was medium intensity skating only 10% and low intensity skating about 8%. Struggling for the puck or positioning, when body or stick contact was made, takes 10 % of time spend on ice. A player crossover skates about 20% and makes crossover turns about 17% of the time. More turns to left was done with and without the puck. Interesting is that there is very little backward skating (4.9%) and high intensity skating (4.6%). A player changes his skating technique all the time according a game situation. The range of time spent in one skating characteristic was 0,25-2s, when the average was 1,87s. (Bracko et al. 1998, 253-261.)

Green et al. (1976, 159-163) studied players' on-ice time. They found out that during a game an average player skates on maximal speed for 156 s, fights for the puck 52 s, skates 418 s and slides 748 s.

After a player receives the puck he usually works with it a very short time aprroximately 1,2 seconds. Thirty-nine percent of the times a player carries the puck approximately 0-4 meters at the time and passes the puck. 62 % of the times a player passes the puck, 10 % shoots towards the net and 10 % receives a pass and shoots. (Table 2) (Rekilä et al. 1991, 40.)

When studing youth players, a player carried the puck 11-12 times during a game. 5-6 out of them included straight skating. A player passed a puck aproximately 18 times. 11 out of them was from forehand side and 4 from backhand side. 43 % of the passes ended to the opponent team. (Luhtanen 1987, 63 – 72.)

Table 2 A player's skill segmentation after receiving the puck (Rekilä et al. 1991, 41)

A player's actions	**Team average**	**Player average**	**% from all doing**
One timer pass	70	5	14
A pass from skating	189	13	39
A pass from still position	39	3	8
Move	35	2	7
Carry the puck	80	5	17
Battles for the puck	25	2	5
One timer shot	17	1	4
A shot from skating	21	1	4
A shot from still position	7	1	2
All together	483	33	100

4 Physiological profile of ice hockey player

Nowadays professional ice hockey and its schedule have increasingly greater physical and psychological demands on the players. The understanding of the physical performance characteristics of ice hockey players helps to establish performance data, develop more specialized training programs on and off the ice, improve performance and also identify weaknesses in conditioning. Appropriate training and maintenance of fitness level might help to prevent injuries and maintain performance during games. Additionally, the conditioning of a player may influence the coaches decision on the playing time the player gets, especially during double shifting or penalty killing situations.

Other sports physiological variables can be related to individual's performance and certain components of a sport. Because of varied factors and conditions that can affect a team wins or losses, it is hard to link physiological variables to team success. It is still possible that individuals' conditioning can be related to individuals' success during a hockey game.

4.1 Antropometrics

To meet the new demands, the ice hockey players have increased in stature and become progressively faster, stronger, and more aerobically fit.

4.1.1 Length, weight and body fat percentage

Cox et al. (1995, 184-201) found out that approximately 40% of the male players weighed less than 85kg and 71% were shorter than 180cm in height in 1980. By the year 1991, 26% of the players weighted less than 85kg and 85% were taller than 180cm. Also Quinney et al. (2008, 756-758) collected data from National Hockey League players between the years 1979 and 2005. They found out that the mean age of the NHL players fluctuated with an overall mean age of 24,5 years, and body mass, height, and BMI showed an increase over the 26 years period.

Defensemen used to be physically bigger than forwards (Rhodes et al. 1986, 36). The differences between defenders and forwards have leveled up, but still defensemen have generally greater body mass and height compared with other positions, and goaltenders smaller body mass and height in comparison to the other positions. Quinney et al. (2008, 759) Montgomery (1988), Cox et al. (1995, 184-201), Vescovi et al. (2006, 84-94) have reported similar results. It is difficult to discern if self-selection to positions explains these findings. It is also very likely that the differences reflect the training emphasis imposed by the coaches, trainers and players themselves specifically designed to meet the metabolic requirements of the positions. (Cox et al. 1995, 184-201.)

Geithner et al. (2006, 503-504) researched physical differences among positions in elite women hockey players with overall mean age of 21,4 years. They found out that forwards and defensemen did not differ significantly in body mass or height. However, the forwards tended to be lighter and leaner than goalies, on average. The significant differences between male forwards and defensemen weight and height might be explained by the inclusion of body checks and a more physical game overall when compared to women's ice hockey.

Between 20 and 24 years male athlete mean body mass is 70 kg and mean height 174, cm with mean body fat 15 %, and female athlete's mean body mass is 56,7 kg, mean height 164 cm, and mean body fat 27%. (Table 3) (Mero et al. 2012, 53.)

Table 3 Female ice hockey players' average anthropometrics from different researches

A player status	**Age (years)**	**Height (cm)**	**Weight (kg)**	**Fat %**	**Reference**
Elite	27	175,2	66,8		Bracko, M.R. 2001
Non elite	23	164,2	66,6		Bracko, M.R. 2001
Elite	24,7	169,7	70,4	15,8	Randsell & Murray. 2011
Goaltenders	21	166,7	67,1	28,4	Geithner et al. 2006
Defenders	22	169,1	68,5	26,9	Geithner et al. 2006
Forwards	21	167,7	65,3	25,0	Geithner et al. 2006

When studied 10 -11, 12-13, and 14- 15 years old male and female ice hockey players, no significant differences were found in height or weight of the players. The males were consistently lower in fat percentage. (Table 4) (Bracko & Fellingham 2001.)

Table 4 Boy and girl ice hockey players' anthropometrics (Bracko & Fellingham 2001)

Age (years)	Gender	Height (cm)	Weight (kg)	Fat %
10 - 11	Female	143,4	36,4	19,0
10 – 11	Male	140,9	35,7	7,6
12 – 13	Female	158,6	47,0	17,4
12 -13	Male	159,2	48,3	6,8
14 -15	Female	164,9	58,8	19,9
14 - 15	Male	166,7	56,9	13,8

4.2 Endurance

Time motion analysis and the work rest ratio indicate that ice hockey is powered through aerobic and anaerobic pathways. Also the nature of shifts played with high heart rates reflects not only high oxygen consumption, but also high-energy requirements, which indicates that oxidative metabolism is not fully capable of satisfying a player's energy demands during a game or a practice. Seliger et al. (1972, 283-291) and Green et al. (1976, 159-163) concluded that 69 % of the energy demand is provided by anaerobic energy systems and 31 % through aerobic energy systems.

The Adenosine Triphosphate Phosphocreatine (ATP-PC) and the glycolytic energy systems' ATP production peaks after 10 – 45 seconds. That is enough to provide energy for the shift lasting maximally 45 seconds. When the ATP production continues on the glycolytic pathway, lactate and hydrogen ion concentration increase causing fatigue and decreased performance on the ice. (Baechle & Earle 2000, 140-143.) Green et al. (2006, 43-36) found a positive correlation between players' blood lactate concentration and played ice time during games. This can be explained with a fact that coaches play those athletes, who are able to perform longer with higher intensity and more frequently.

Aerobic energy system provides oxidative recovery between the shifts. A player's ability to utilize oxygen is measured by the rate of oxygen consumption (VO_{2max}). The greater the volume is, the more trained the aerobic energy system is. Well-trained aerobic energy system decreases a player's recovery time between the shifts and reduces fatigue during games. This ensures that the player is able to work longer with higher strength levels and maintain his skill levels. Green et al. (2006, 43-46) found also a positive correlation between VO_{2max} and net scoring chances. Aerobic capacity has a direct relationship to playing time and scoring chances.

Aerobic and anaerobic thresholds are the best measurements to describe players' submaximal performance. Anaerobic capacity and aerobic fitness are commonly tested using Wingate cycle ergometer or a peak power cycle ergometer until exhaustion. Test repeatability is good and measurements can be done reliable. Cycling tests are criticized because of the little movement of the arms. Arms do high intensity work while ice hockey player is skating. (Green et al. 2006, 43-46.)

4.2.1 Aerobic threshold

Aerobic threshold or lactate threshold describe a player's ability to produce energy through oxidation of energy resources such as carbohydrates, fats and proteins. Aerobic threshold is measured by blood lactate concentration or through aerobic capacity. When stress of a player is increased, at aerobic threshold blood lactate concentration decreases over rest values (0,5 – 1,5 mmol/l). Aerobic capacity is a maximum rate at which a player can produce energy through oxidative energy system and it is usually expressed as a volume of oxygen consumed per kilogram of bodyweight per minute (ml/kg/min). (Baechle & Earle 2000, 288 – 289.)

4.2.2 Anaerobic threshold

Anaerobic threshold or the maximal lactate steady state is defined as an exercise rate, where maximal lactate production is equal to maximal lactate clearance within the body. When the exercise intensity oversteps anaerobic threshold level, blood lactate concentration increases until exhaustion. When the blood lactate concentration rises

close to a player's maximum level, his ability to produce force and intensity decreases. High anaerobic threshold helps a player to move further the moment, when the lactate starts to build up in the muscles and hinder his performance. (Baechle & Earle 2000, 497.)

Gabrys et al. (2012, 37-46) studied Polish male ice hockey national team (n=24). The subjects performed an incremental exercise test on the peak power ergometer. They found an average blood lactate value of 4.02 mmol/l and average VO_{2max} value of 56,9 ml/kg/min at the anaerobic threshold. VO_{2max} was approximately 81,7 % from the player's maximum result. Relative peak power at the anaerobic threshold was 3,41 W/kg on the average. That was 73,9 % on the average from the peak power.

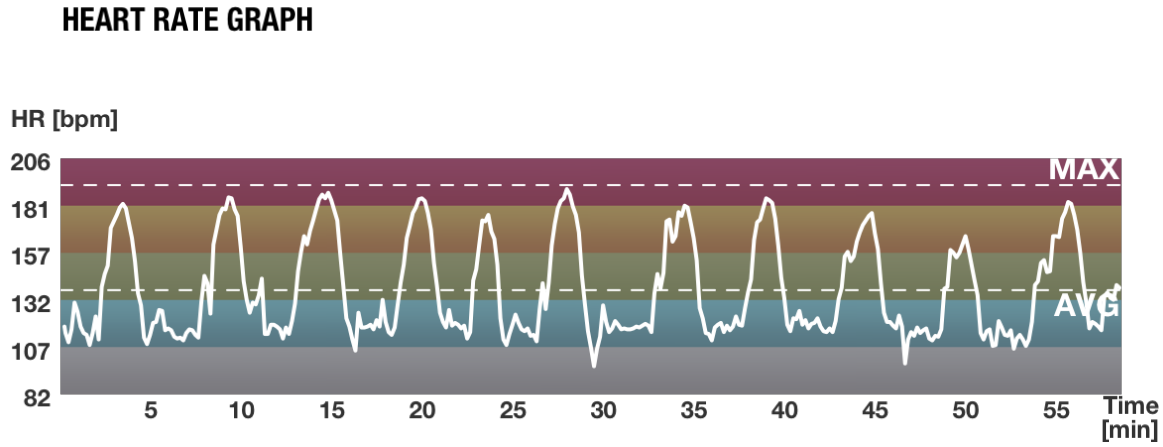
Vescovi et al (2006, 84-94) studied NHL combines players in 2001, 2002, and 2003. Forwards' were able to cycle peak power result of 1008,4 W, defenders' 1028,6 W and goaltenders' 929,2 W. When compared relatively, there was no significant difference; forwards 11,6 W/kg, defenders 11,3 W/kg, goaltenders 10,9 W/kg.

Quinney et al. (2008, 753-760) studied NHL team's physiological profile for 26 years from 1989 to 1993. The subjects performed a 30 s Wingate anaerobic power test. Players performed 4 repeats of 5 s maximal effort sprints with 10 s of active recovery in a 60 s period. Relative anaerobic peak power exhibited an increase over the years. In the early years the average power outputs were 10 - 12 W/kg and in the later years the mean values exceeded 13 W/kg. This is explained with leaner and stronger players, and with the implementation of more sport specific training programs.

4.3 VO_{2max} and heart rate

An athletes' playing time is influenced by positional and physiological differences. Defensemen play close to 50% and forwards play 35% of a game, when work to rest ratio is from 1:3.3 to 1:8. (Twist & Rhodes 1993, 44-46.) Peak on-ice heart rates exceed 90% of maximum and the average heart rates are above 85% of maximum (Montgomery 1988, 107) (Twist & Rhodes 1993, 44-46). During the recovery time on the bench, the heart rate rapidly declines but rarely decreases to below 125 beats/min, which is still

60% of maximum. (Picture 1) There are no differences in the playing heart rate average between defenders and forwards. (Green et al. 1978, 289-293.) The heart rates of goal-tenders have also been monitored and an average heart rate was 143 beats/min (64% of maximum) during adult recreational games (Montgomery 1979, 39-42). Green et al. (2012, 37-46) found heart rate 189 beats/min at VO_{2max} for elite ice hockey players during a game. The high heart rate indicates the high-energy requirements and that oxidative metabolism is not fully capable to satisfy an athlete's energy demands during a shift. (MacLean, 1-3.)



Picture 1 A heart rate graph from a female ice hockey player

The more efficient athletes are in utilizing oxygen, the greater the volume of oxygen they are able to consume over a shorter period of time. VO_{2max} is expressed in ml/kg/min. Heart rate and oxygen uptake has a linear relationship until about 80% of VO_{2max} at the lactate threshold, then the drop back occurs. (Twist & Rhodes 1993, 44.)

There are only few studies, where VO_{2max} is measured while skating on ice, because the contact nature of the sport and the risk that equipment used for measurements might break. More studies can be found from treadmill or cycle ergometer test. Daub et al. (1983, 290-294) reported University male ice hockey team VO_{2max} average value 52.1 ml/kg/min measured while skating. They also reported no change in skating VO_{2max} over a season of ice hockey training. Also Seliger et al. (1972, 283-291) studied Czecho-slovakian national ice hockey team during model game. One shift lasted averaging 1.17 minutes and followed 21 minutes of recovery. They found out that during the shift

oxygen consumption averaged 32 ml/kg/min or 66% of VO_{2max}. Sixty-nine percentage of the oxygen consumption was in the recovery period. They characterized ice hockey as an activity requiring mostly submaximal metabolic rate with great participation of anaerobic metabolism, but with high requirements of aerobic metabolism too. The average total game caloric expenditure was 820 kcal of which 69% would be anaerobic and 31% aerobic expenditure. This would indicate that 70% of the total caloric cost of the game would be expended during the 20% of player's presence on the ice. (Jetté 1980, 278-287.)

There is a trend for VO_{2max} to decrease, when body weight increases. This explains why forwards have significantly higher scores than the defensemen and goalies. (Montgomery & Dallaire 1986, 137-139.) Quinney et al. (2008, 753-760) studied NHL players from 26 years. There was a significant difference between the positions for relative VO_{2max}, with the forwards having the highest score and the goalies the lowest. They also showed relative VO_{2max} increase between the years of 1989 and 1993, although the overall trend showed no increase during the 26-year period. This is likely due to the increase in body mass during the same period of time.

In the study of women ice hockey players from University of Alberta, no significant differences between the positions were found. This might be explained with similar anthropometrics of the players. Forwards and defensemen did not differ from weight. When tested with Leger running test, average VO_{2max} for women ice hockey players was 45 ml/kg/min. (Geithner et al. 2006, 501-505.) Carey et al. tested female college ice hockey players on treadmill. They found average VO_{2max} results of 50 ml/kg/min. Vescovi et al. (2006, 84-94) studied players' results from NHL combines from the years 2001, 2002 and 2003. The players performed Wingate cycle ergometer test. The average VO_{2max} for forwards was 57,8 ml/kg/min, defenders 56,1 ml/kg/min, and for the goaltenders 55,6 ml/kg/min. No positional differences were observed.

4.4 Lactate

During an ice hockey game, there is a large energy contribution from anaerobic glycolysis. Fingerpick and venous samples have been used to measure blood lactate and to

assess the anaerobic energy contribution from glycolysis, which indicates the intensity of the play. (Montgomery 1988, 109-110.) Lactate accumulation depends on the athlete's fitness level, state of training, active muscle mass, muscle-fiber composition, nutritional status, blood flow and fatigue (Garrett & Kirkendall 2000, 817). Green et al. (1976, 159-163) measured average blood lactate values from varsity ice hockey players during a game and found the highest values during the first (8.7 mmol/l) and second period (7.3 mmol/l) then declined during the third period (4.9 mmol/l). Forwards and defensemen had very similar values despite different skating velocities. The goaltender's result (mean 0.93 mmol/l) showed very little changes in blood lactate over the three periods. In subsequence study, Green et al. (1978, 289-293) found lower lactate values average 5.5 mmol/l for forwards and 2.9 mmol/l for the defensemen. The lower values were attributed to shorter shift duration.

4.5 Glycogen

Muscle glycogen depletion is associated with a decrease in physical performance. Muscle-biopsy technique is used to assess the demands that are placed on the muscles' fuel store. Tissue samples have been taken from vastus lateralis, which has indicated a rapid rate of glycogen depletion during intense intermittent skating. (Cox et al. 1995, 196-197.)

During an ice hockey game and skating task, glycogen is used from type 1, 2a and 2b fibers. The pre-game glycogen concentration (mmol/kg wet tissue) values were very similar; 89.3 ± 13.6 to forwards and 85.0 ± 3.74 to defenders. (Green et al. 1978, 298-293.) The greatest depletion is in type 1 fibers for both forwards and defenders. Compared with pregame levels glycogen depletion represented a reduction of 60%. Type 2a and 2b appeared to be much less depleted with a reduction of 15%. Only difference between forwards and defenders appeared in the type 2a fibers where defenders seemed to have a less glycogen left (9% versus 26%). (Green et al. 1978, 298-293.)

Green H.J. (1978, 183-187) studied a group of college ice hockey players. They performed either ten 1-minute work intervals at 120% of VO_{2max} with a recovery period of 5 min following each exercise or a continuous skate of 60 min performed at 55% of

VO_{2max}. During continuous skating, there was 29% reduction in muscle glycogen with the greatest depletion from the type 1 fibers. Intermitted skating reduced 70% depletion of muscle glycogen with a preferential loss from the type 2 fibers, particularly the type 2b fibers. Since a large amount of glycogen is left in the muscles, it does not appear that glycogen depletion is the main cause of fatigue.

Blood glucose concentration was measured before and after each period for each position of varsity ice hockey team by Green et al. (1976, 159-163). They found out large increases (+63.6%) in blood glucose concentration level for both defenders and forwards at the end of the first period with a decline over the two next periods. The goaltender's elevation in glucose concentration was +58% at the end of the second and third period. Blood glucose response is related to the character of the work and the observed increase suggests that the work done on-ice is of sufficient intensity to stimulate glucose output. The decline observed in the third period might be caused by increases in plasma insulin concentration, which facilitate diffusion of glucose across membranes. (Green et al. 1976. 159-162.)

Thou, Simard et al (1988, 144-147) examined the effects of carbohydrate (CHO) intake in blood before and during ice hockey game. The players with CHO- feeding skated 10.2% more at a slightly (4%) faster speed. They also observed a 10.3 % reduction in glycogen utilization. The research demonstrated potential of nutrition for maintaining blood glucose level and a reduction in muscle glycogen utilization.

4.6 Explosive strength

Speed is ability of applying explosive force to a skating movement or technique to achieve high velocity. In ice hockey the ability to change directions, break and accelerate again are usually more important than simply achieving or maintaining high velocity. This agility requires rapid force development and to high power output. Speed endurance is required to maintain skating speed over duration of 6 seconds or to achieve the maximum speed during repetitive sprints. (Baechle & Earle 2000, 472.)

It seems that acceleration (6,1 m) does not differ significantly among female and male young ice hockey players. Researchers found all the groups had similar acceleration, when studying differences between 10-15 years old female and male ice hockey players. (Bracko & Fellingham 2001, 26-34.) Also elite and non-elite female players and non-age-matched high school players were similar in their ability to accelerate (Bracko, M.R. 2001, 42-47; Bracko et al. 1996, 55).

Bracko (2001, 42-47) found that elite players were significantly faster skaters over 15,17 meters than non-elite players. They had also better on-ice anaerobic capacity and scored better on all aspects of the Reed repeat sprint skate test. Bracko (2001, 42-47) hypothesized the better results by the older age of elite players. They might have been physically more mature and been involved in specialized training longer than non-elite players. Bracko & Fellingham (2001, 26-34) found that the 10-15 years old male ice hockey players were 0,76 – 1,06 s faster than the females on the on ice speed (44,80 m) test. The length of the test requires higher level of skating skill in order to have faster time and the superior speed of male players may also be due to their longer playing experience. Length and weight of the player affects to the skating speed, but also skating stride frequency and stride length. (Behm et al. 2005, 326-331.)

40 yard dash time, which is a sprint over 40 yards (36,58 m), was found to predict skating speed in women's ice hockey players. The assumption is that a hockey player, who is able to run fast, will also skate fast and maintain high speed on ice. However, if the player has a poor skating skill, the complex nature of skating can limit players from performing even though she is a fast runner. (Bracko & George 2001, 116-122.)

Vertical jump has been found to be a very consistent predictor for both acceleration and speed in men's hockey players (Diakoumis & Bracko 1998, 272). The assumption is that a player, who is able to generate powerful muscle contraction, will be able to accelerate quickly. Bracko & George (2001, 116-122) found a strong correlation between vertical jump and on-ice anaerobic capacity in female ice hockey players.

When Bracko & Fellingham (2001, 26-34) studied 10-15 years old female and male ice hockey players, they found that male players jumped higher. The players performed countermovement jump and make a mark with their chalked fingers on a wall. At the age of 12 – 13 years, male players jumped 6,93 cm higher than female players at the same age.

Elite female ice hockey players jumped 50,3 cm on the average, when performing a countermovement jump, with a swing of arms to hit the highest possible vane (Ransdell & Murray 2011, 2358 - 2363). Vescovi et al. (2006, 84-92) used the same method to test elite NHL players. There are more results collected in the table 5.

Table 5 Vertical countermovement jump results for male and female ice hockey players

10 – 11 years old male	33,5 cm	Bracko & Fellingham (2001)
10 – 11 years old female	29,7 cm	Bracko & Fellingham (2001)
12 - 13 years old male	37,9 cm	Bracko & Fellingham (2001)
12- 13 years old female	31,0 cm	Bracko & Fellingham (2001)
14 – 15 years old male	44,4 cm	Bracko & Fellingham (2001)
14 – 15 years old female	38,1 cm	Bracko & Fellingham (2001)
Elite female	50,3 cm	Ransdell & Murray (2011)
Competitive college female all	43,1 cm	Geithner et al. (2006)
Competitive college female Defenders	40,9 cm	Geithner et al. (2006)
Competitive college female Forwards	44,0 cm	Geithner et al. (2006)
Competitive college female Goaltenders	44,0 cm	Geithner et al. (2006)
Elite NHL combines Defenders	63,0 cm	Vescovi et al. (2006)
Elite NHL combines Forwards	62,7 cm	Vescovi et al. (2006)
Elite NHL combines Goaltenders	61,0 cm	Vescovi et al. (2006)

5 Methods

5.1 Research design

The purpose of the research is to describe the physical profile of Finnish women national team annually from the year 1995 to 2013. This research searched anthropometrics, endurance and speed variables of the players. Physical profiles have been studied also by the positions.

Research problem:

1. What kind of physical profiles Finnish women national teams have had between the years 1995 and 2013?

5.2 The subjects

The subjects are Finnish women national team players, who were chosen to the team by the Finnish Ice Hockey Federation annually in the years 1995 to 2014. The subjects are tested several times a year. The test results used in this research are from the beginning of June or August. The roster of the national team will vary during the summer and autumn, so the team, which is tested in June and August, is not always the final team playing at World Championships in spring. In the table 6 is shown the exact test dates and the number of players in a team, by the positions, and by the Olympic years.

Table 6 Test dates and the number of tested players each year and Olympic year

Test date	Team	Goaltenders	Defenders	Forwards
26.5.1995	32	4	10	18
14.4.1996	30	5	8	17
23.5.1997	30	3	12	15
1998 Olympiad	92	12	30	50
15.6.1998	23	3	8	12
14.6.1999	26	4	7	15
8.6.2000	33	4	11	18
8.6.2001	41	6	14	21
2002 Olympiad	123	17	40	66
7.6.2002	24	3	6	15
3.6.2003	21	2	8	11

3.6.2004	20	4	4	12
6.6.2005	21	3	6	12
2006 Olympiad	86	12	24	50
11.6.2006	19	3	7	9
8.6.2007	21	5	7	9
5.6.2008	19	2	6	11
5.6.2009	25	6	8	11
2010 Olympiad	84	16	28	40
.8.2010	33	5	10	18
4.8.2011	24	3	8	13
2.8.2012	19	4	7	8
10.8.2013	33	4	10	19
2014 Olympiad	109	16	35	58

5.3 Methods

All the tests have been run at Vierumäki sport center in Finland. The test are performed either at the beginning of June or August annually from 1995 to 2013. (Table 6) The tests vary each year. The tests, which are discussed in this research, are introduced below based on protocols used at the sport center.

5.3.1 Anthropometrics

The tests always start with the anthropometrics measurements, which includes length, weight and body fat percentage measurements. Length of the players is measured using a tape measure. Weight of the players is measured using a bodyweight scale.

Body fat percentage is determined using a skinfold estimation method. A pinch of skin fold is measured by calibers at several standardized points on the body to determine the subcutaneous fat layer thickness. The points used in the tests are biceps, triceps, subscapularis, suprailiaca. The measurements are converted to a body fat percentage by Durning and Womerslay´s equations (Keskinen et al. 2007, 276).

5.3.2 Bicycle peak power ergometer until exhaustion

Bicycle peak power ergometer test is performed at the testing laboratory in Vierumäki test center. By the protocol the resistance is added progressively: each resistance is held for 2 minutes and each resistance raise is 25W. For female ice hockey player the start-

up resistance is the same as their body weight. Heart rate is measured during the test. The subject defines pedaling frequency, but it has to stay over 60 RPM during the whole test. The test will end, when the subject is not able to raise the frequency over 60RPM anymore.

Peak Power is determined from the last resistance before the test end and time (table 7) Relative power is counted from peak power by dividing it with the body weight of the subject.

Table 7 PP ergometer addition watts at the last unfinished resistance

Cessation time during the last resistance (s)	Addition watts (W)
15"	3
30"	6
45"	9
1´00"	13
1´15"	16
1´30"	19
1´45"	22
2´00"	25

VO2max is estimated using a formula

$$VO_{2max}\ (ml*kg^{-1}*min^{-1}) = ((P*12) + (m_{subject} * 3{,}5)) / m_{subject},$$

where P = Peak power (W) and $m_{subject}$ = weight of the subject (kg).

Anaerobic and aerobic work percentages from peak power results are counted with a formula

$$ANT\text{-}\% = AERT\text{-}\% = (\ P\ (W) / P_{peak}\ (W)\ ) * 100,$$

where ANT-% = anaerobic work, AERT-% = aerobic work, P = anaerobic or aerobic work result, P_{peak} = peak power result.

Maximal oxygen uptake can be counted using a formula

$$VO_{2max}\ (l * min^{-1}) = VO_{2max}\ (ml*kg^{-1}*min^{-1}) * m_{subject} / 1000.$$

Blood sample to measure peak blood lactate concentration is taken from a fingertip one minute after the bicycle test end. Recovery phase before blood sample is passive on the saddle. After the sample is taken, the subject can start active recovery.

5.3.3 Vertical jump

Muscle lab and Newtest devices "jump mats" measure subjects jumping height. They count time the subject is in the air and convert it to centimeters. A subject steps on a mat and stands both feet shoulder width apart. The subject has to jump straight up as high as she can without tucking her legs and land with both feet on the mat. Static jump is started from a stationary position, knees bended to 90 degrees, and the hands placed on the hip. Countermovement jump is started from a high standing position, quickly moved down to natural squat position, and immediately jumped. The devices convert the flying time to centimeters.

5.4 Statistical methods

All the tested national team players' test results are collected to a Microsoft Excel file. Annual reviews are done using average. Averages are counted also for annually for all the positions. Annual minimum and maximum values, and median are reported. Averages, minimum and maximum values, and medians are also counted for each Olympiad. Graphs are made with Microsoft Excel.

6 Results

The test results from the year 1995 to 2013 are described in this chapter annually. Figures create pictures of trends of the variables. All the values are averages. The results are collected in the table 8. Each year is presented separately (attachments 1 - 18), and the attachment 19 presents the results by the Olympiads.

From 19 to 41 players were tested each year; about 8 defenders, 14 forwards and 4 goaltenders a year. The average age of the players has varied between 20,6 (2005) and 23,8 (2001) years, but there is not a clear trend. Median age is 22,1 years.

Table 8 Test results from the year 1995 to 2013

						Maximal endurance				Thresholds					
						Anaerobic power				Anaerobic		Aerobic			
	Number of	Age	Length	Weight	Fat %	Peak Power	Rel. Power	VO 2	Max. Lactate	Work		Work		Static	Counterm.
	tested	years	cm	kg	%	W	w/kg	ml/kg	mmol/l	W	Work-%	W	Work-%	cm	cm
Average Defenders	10	23,2	167,1	65,5	20,6	230,4	3,52	45,8	12,8	172,5	74,5	125,5	54,2	33,0	
Average Forwards	18	21,3	168,2	66,7	20,8	231,1	3,48	45,2	11,1	165,5	71,4	125,1	53,9	31,4	
Average Goaltenders	4	23,1	165,8	70,4	24,1	225,0	3,26	42,7	9,5	162,5	72,2	117,5	52,2	30,5	
Average 1995	**32**	**22,1**	**167,5**	**66,8**	**21,1**	**230,1**	**3,46**	**45,1**	**11,5**	**167,4**	**72,5**	**124,3**	**53,8**	**31,8**	
Average Defenders	8	22,8	169,8	64,8	20,8	255,8	3,76	48,6	9,9	199,0	77,7	152,6	59,4	36,7	
Average Forwards	17	21,8	166,9	66,5	21,2	249,6	3,77	48,7	11,0	185,2	74,1	133,9	53,4	35,3	
Average Goaltenders	5	22,6	167,2	66,9	21,8	235,6	3,57	46,3	10,9	162,6	69,1	119,0	50,7	38,3	
Average 1996	**30**	**22,2**	**167,5**	**66,1**	**21,2**	**248,1**	**3,73**	**48,2**	**10,8**	**183,6**	**73,9**	**134,6**	**54,0**	**36,2**	
Average Defenders	12	25,5	167,3	65,0	20,7	236,3	3,64	47,2	11,2	177,3	74,9	127,5	53,5	34,8	
Average Forwards	15	23,0	166,5	67,5	21,6	239,6	3,61	46,8	11,4	170,6	71,1	127,4	52,8	32,3	
Average Goaltenders	3	18,7	167,7	62,8	20,6	240,7	3,87	50,0	10,8	163,3	67,8	120,0	49,9	34,3	
Average 1997	**30**	**23,6**	**166,9**	**66,0**	**21,2**	**238,3**	**3,65**	**47,3**	**11,2**	**172,7**	**72,3**	**126,7**	**52,8**	**33,5**	
Average Defenders	8	21,1	164,4	62,8	20,5	229,9	3,68	47,6	11,0	171,5	74,0	128,0	55,2	33,0	
Average Forwards	12	22,5	167,8	67,6	21,1	246,0	3,65	47,3	12,1	179,2	72,1	131,1	51,9	35,5	
Average Goaltenders	3	20,9	165,0	61,5	19,9	229,0	3,72	48,1	13,8	152,7	66,6	115,0	49,6	37,3	
Average 1998	**23**	**21,8**	**166,2**	**65,1**	**20,7**	**238,2**	**3,67**	**47,5**	**12,0**	**173,0**	**72,1**	**127,9**	**52,8**	**34,9**	
Average Defenders	7	23,3	167,7	65,5	21,8	237,0	3,64	47,1	13,6	167,3	70,4	120,9	50,9	34,1	
Average Forwards	15	21,3	167,5	66,0	22,8	246,2	3,76	48,6	14,5	168,3	68,1	123,1	49,5	33,3	
Average Goaltenders	4	22,3	164,4	63,6	20,9	250,8	3,95	50,9	14,6	159,0	63,4	108,3	42,9	35,5	
Average 1999	**26**	**22,0**	**167,1**	**65,5**	**22,2**	**244,4**	**3,75**	**48,5**	**14,3**	**166,5**	**68,0**	**120,1**	**48,9**	**33,9**	
Average Defenders	11	20,6	165,5	65,5	23,1	233,6	3,58	46,6	11,1	156,5	66,9	113,4	48,3	31,9	29,9
Average Forwards	18	21,6	165,7	64,4	23,2	231,4	3,57	46,4	11,8	166,4	72,0	121,1	52,4	31,8	29,4
Average Goaltenders	4	20,9	162,8	65,8	23,8	232,0	3,55	46,3	11,4	158,5	68,3	121,3	52,0	33,8	32,7
Average 2000	**33**	**21,2**	**165,3**	**64,9**	**23,2**	**232,3**	**3,58**	**46,4**	**11,5**	**162,0**	**69,8**	**118,5**	**51,0**	**32,1**	**29,9**
Average Defenders	14	25,4	168,4	66,5	24,4	242,0	3,68	47,6	11,4	158,7	65,7	113,0	46,5	33,4	31,2
Average Forwards	21	23,3	166,9	65,5	24,8	239,3	3,66	47,4	11,1	167,9	70,1	124,4	52,0	33,4	31,0
Average Goaltenders	6	21,7	167,3	68,1	25,3	233,2	3,46	45,0	11,1	152,0	65,4	114,5	48,9	30,7	28,9
Average 2001	**41**	**23,8**	**167,5**	**66,2**	**24,7**	**239,3**	**3,64**	**47,1**	**11,2**	**162,4**	**67,9**	**119,1**	**49,7**	**33,0**	**30,8**
Average Defenders	6	22,0	168,9	70,2	24,9	255,6	3,74	48,4	8,8	174,2	68,1	125,4	49,0	32,1	34,0
Average Forwards	15	23,1	166,9	64,8	24,3	234,0	3,58	46,5	9,5	160,4	68,7	112,7	48,1	31,5	33,7
Average Goaltenders	3	24,0	166,8	65,3	23,0	233,3	3,58	46,5	9,2	166,3	72,3	125,0	54,5	30,8	31,9
Average 2002	**24**	**22,9**	**167,4**	**66,2**	**24,3**	**239,0**	**3,62**	**46,9**	**9,3**	**164,5**	**69,1**	**117,5**	**49,2**	**31,5**	**33,5**
Average Defenders	8	21,1	168,8	70,0	22,9	248,6	3,52	45,8	10,6	170,6	68,4	124,3	49,5	31,6	34,4
Average Forwards	11	23,6	165,3	66,8	23,9	234,5	3,52	45,7	10,7	158,5	67,4	104,7	44,1	32,9	34,6
Average Goaltenders	2	22,6	169,2	63,1	21,2	205,0	3,28	42,8	9,2	158,0	77,3	124,0	60,6	27,6	29,3
Average 2003	**21**	**22,6**	**167,0**	**67,7**	**23,2**	**236,5**	**3,49**	**45,4**	**10,5**	**162,7**	**68,8**	**113,5**	**47,7**	**31,9**	**34,0**
Average Defenders	4	20,5	168,3	68,4	24,8	247,0	3,64	47,1	11,2	150,0	60,8	104,8	42,3	30,8	34,0
Average Forwards	12	23,0	164,6	66,5	24,4	255,5	3,86	49,8	10,9	178,1	69,9	127,5	50,0	31,8	34,4
Average Goaltenders	4	19,4	169,0	64,7	25,4	214,7	3,23	42,3	10,2	152,3	70,2	96,0	44,3	27,7	30,0
Average 2004	**20**	**21,9**	**166,2**	**66,5**	**24,7**	**246,3**	**3,70**	**48,0**	**10,8**	**167,6**	**67,9**	**117,2**	**47,3**	**30,8**	**33,5**
Average Defenders	6	20,7	169,7	68,1	23,7	253,0	3,74	48,3	12,7	160,4	62,9	106,6	41,3	34,7	37,2
Average Forwards	12	21,6	167,0	64,8	23,9	248,8	3,84	49,6	12,0	177,8	71,5	120,1	48,2	32,5	35,0
Average Goaltenders	3	16,3	162,8	60,0	22,9	224,0	3,76	48,6	10,0	139,7	62,5	88,3	39,9	30,4	33,2
Average 2005	**21**	**20,6**	**167,4**	**65,0**	**23,7**	**246,1**	**3,80**	**49,2**	**11,9**	**167,8**	**68,0**	**112,0**	**45,2**	**32,9**	**35,4**
Average Defenders	7	22,7	167,1	63,7	24,8	248,6	3,91	50,5	11,6	156,0	62,7	96,0	38,5	31,7	32,3
Average Forwards	9	22,7	165,7	65,4	25,4	243,0	3,72	48,1	10,4	162,9	66,7	103,3	42,4	31,6	32,4
Average Goaltenders	3	19,5	164,1	59,2	25,5	213,3	3,59	46,6	10,0	125,0	59,0	77,3	37,1	32,4	32,6
Average 2006	**19**	**22,2**	**166,0**	**63,8**	**25,2**	**240,4**	**3,77**	**48,8**	**10,8**	**154,4**	**64,0**	**96,5**	**40,1**	**31,8**	**32,4**
Average Defenders	6	22,1	166,0	64,0	25,1	231,0	3,61	46,8	11,2	142,5	61,4	95,5	40,9	32,3	33,2
Average Forwards	9	23,7	165,1	65,8	25,3	235,6	3,59	46,6	11,8	156,8	66,3	113,6	47,8	33,2	33,9
Average Goaltenders	5	20,6	166,4	64,0	27,4	221,4	3,47	45,2	10,2	135,8	61,5	85,0	38,3	30,1	30,8
Average 2007	**20**	**22,6**	**165,4**	**64,8**	**25,7**	**232,4**	**3,60**	**46,7**	**11,3**	**148,6**	**63,7**	**103,2**	**44,1**	**32,3**	**33,1**
Average Defenders	6	21,8	165,9	63,8	23,7	243,8	3,84	49,6	10,9	154,2	63,2	97,0	39,6	33,0	34,1
Average Forwards	11	20,4	166,5	66,8	25,7	231,8	3,48	45,3	11,7	165,0	71,2	109,8	47,2	29,2	30,7
Average Goaltenders	2	21,5	164,3	55,4	24,0	196,0	3,54	46,0	10,7	135,5	69,2	99,0	50,5	30,2	31,4
Average 2008	**19**	**20,9**	**166,1**	**64,7**	**24,9**	**231,8**	**3,60**	**46,7**	**11,4**	**158,5**	**68,5**	**104,6**	**45,2**	**30,4**	**31,7**
Average Defenders	8	21,5	170,7	66,3	24,5	252,0	3,82	49,3	14,0	178,6	70,8	117,9	46,5	32,6	33,7
Average Forwards	11	21,2	168,5	67,2	25,6	235,9	3,52	45,7	13,0	166,1	70,1	116,5	49,1	29,8	31,0
Average Goaltenders	6	20,8	167,0	62,5	25,8	203,2	3,25	42,5	10,9	135,8	67,1	81,2	40,4	28,0	28,4
Average 2009	**25**	**21,2**	**168,9**	**65,7**	**25,3**	**233,1**	**3,55**	**46,1**	**12,8**	**162,7**	**69,6**	**108,1**	**46,1**	**30,2**	**31,2**
Average Defenders	10	21,6	170,5	68,4	25,2									30,6	33,0
Average Forwards	18	22,2	166,9	63,5	24,2									31,3	33,2
Avearge Goaltenders	5	22,7	169,7	62,8	24,8									28,4	30,6
Average 2010	**33**	**22,1**	**168,4**	**64,8**	**24,6**									**30,6**	**32,7**
Average Defenders	8	22,8	167,1	65,7	23,7	241,8	3,68	47,7	12,9	165,5	68,4	110,1	45,6	32,0	32,7
Average Forwards	13	22,8	167,6	64,8	24,1	238,2	3,68	47,7	11,6	162,4	67,9	112,6	47,1	31,4	31,7
Average Goaltenders	3	23,2	173,3	62,3	23,8	244,5	3,88	50,1	11,7	168,0	68,9	117,0	48,0	27,4	27,1
Average 2011	**24**	**22,8**	**168,1**	**64,8**	**23,9**	**240,0**	**3,70**	**47,9**	**12,0**	**164,0**	**68,2**	**112,1**	**46,6**	**31,1**	**31,4**
Average Defenders	7	22,1	166,8	67,1	25,6	259,6	3,91	50,4	11,4	184,9	71,0	127,7	49,0	31,7	31,9
Average Forwards	8	20,9	166,5	65,7	24,9	248,8	3,81	49,3	12,4	170,4	68,2	116,0	46,5	32,4	32,9
Average Goaltenders	4	22,3	170,9	62,3	24,5	225,8	3,62	47,0	10,8	170,5	75,5	121,5	53,7	29,7	31,4
Average 2012	**19**	**21,7**	**167,6**	**65,5**	**25,1**	**247,9**	**3,81**	**49,2**	**11,7**	**175,7**	**70,7**	**121,5**	**48,9**	**31,5**	**32,1**
Average Defenders	10	24,6	167,1	65,4	24,4	261,6	4,00	51,5	12,0	179,1	68,5	127,3	48,7		34,3
Average Forwards	19	23,4	168,3	67,9	25,5	254,1	3,75	48,5	11,9	180,8	71,1	125,8	49,5		33,5
Average Goaltenders	4	20,5	169,7	64,1	25,1	246,0	3,84	49,6	12,4	169,8	69,1	118,3	48,2		33,7
Average 2013	**33**	**23,4**	**168,1**	**66,7**	**25,1**	**255,2**	**3,83**	**49,5**	**12,0**	**178,9**	**70,1**	**125,3**	**49,1**		**33,7**

6.1 Anthopometrics

The players were the shortest (165,3 cm) in the year 2000 and the tallest (168,9 cm) in the year 2009. There is not a clear trend between the year 1995 and 2013. The median length is 167,2 cm. There are not differences between the playing positions. (Figure 1)

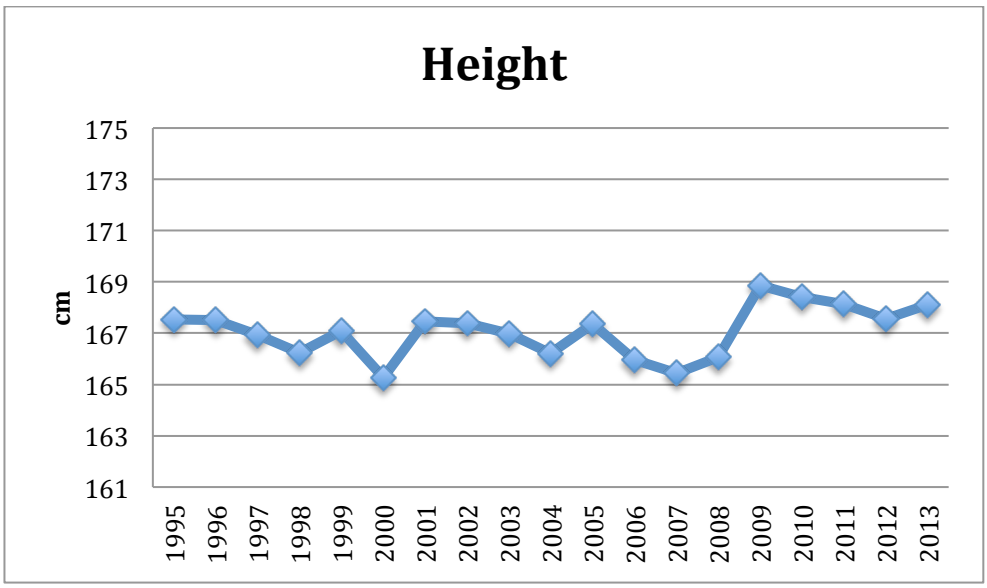


Figure 1 Teams' average height between the year 1995 and 2013

The players were lightest (63,8 kg) in the year 2006 and the heaviest (67,7kg) in the year 2003. There is not a clear trend between the year 1995 and 2013. The median weight is 65,5 kg. Goaltenders seem to be about two kilograms lighter than field players by the median, but there are not clear trend between the positions. (Figure 2)

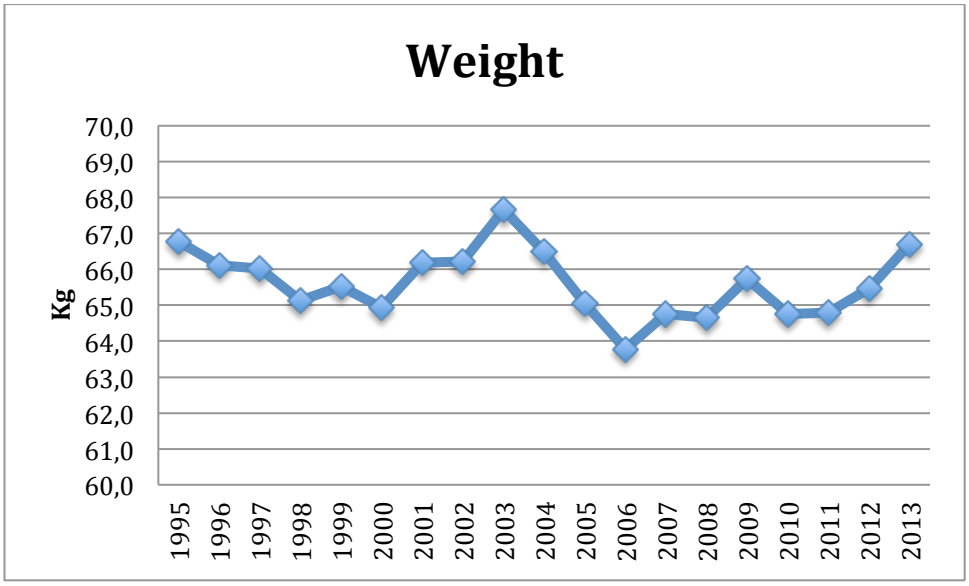


Figure 2 Teams' average weight between the years 1995 and 2013

The average fat percentage value has been the lowest 20,7 % in the year 1998 and the highest 25,7 % in the year 2007. The trend has been growing. Fat percentage is 4 % higher in 2013 (25,1 %) than in 1995 (21,1 %). The median value is 24,1 %. There is not a difference between the playing positions. (Figure 3)

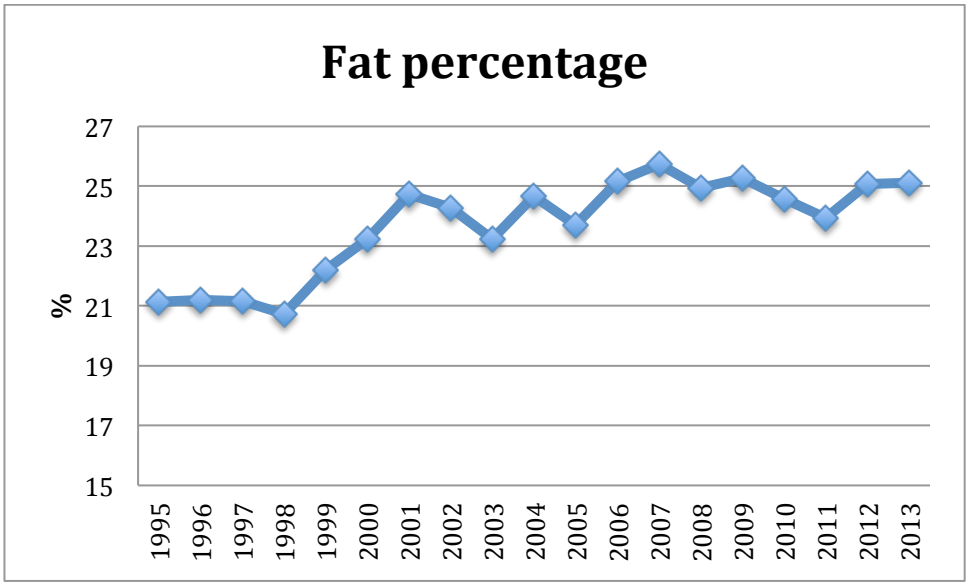


Figure 3 Teams' average fat percentage between the year 1995 and 2013

6.2 Endurance

The lowest VO_{2max} average was in 1995 (45,1 ml/kg/min) and the highest in 2013 (49,5 ml/kg/min). There is 9 % difference between the years, but there is not clear trend. (Figure 5) The median is 47,3 ml/kg/min. There is not a difference between the playing positions.

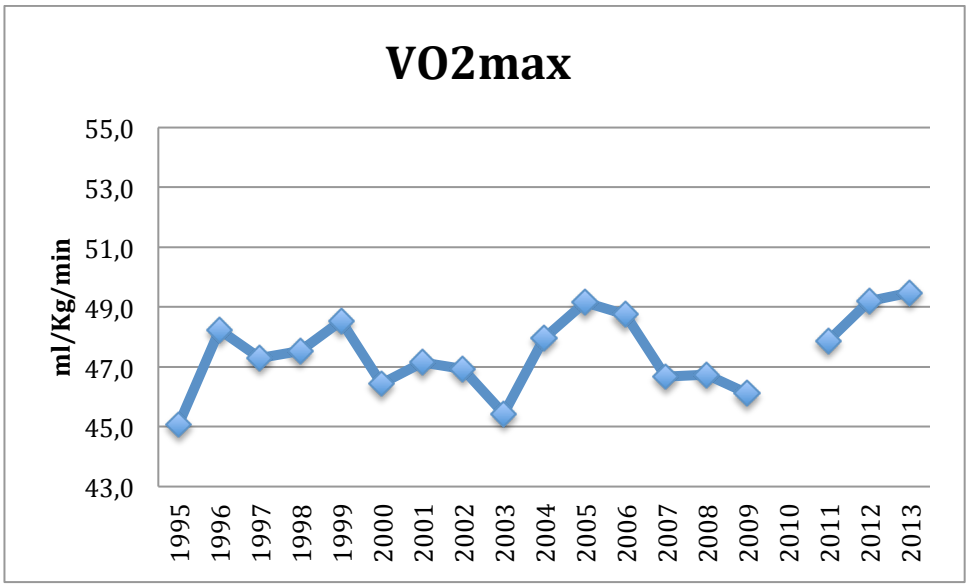


Figure 4 Teams' VO2max averages between the years 1995 and 2013

An average player was able to produce the less force 230 W in 1995 and the most 255 W in 2013. The median is 239 W. Relatively the lowest value was 3,46 W/Kg in 1995 and the highest 3,83 W/Kg in 2013. The median is 3,65 W/Kg (Figure 4). The average in the year 2013 are 10% higher than in 1995. Field players were able to produce slightly higher peak power results, but when compared relatively there is no difference between the positions.

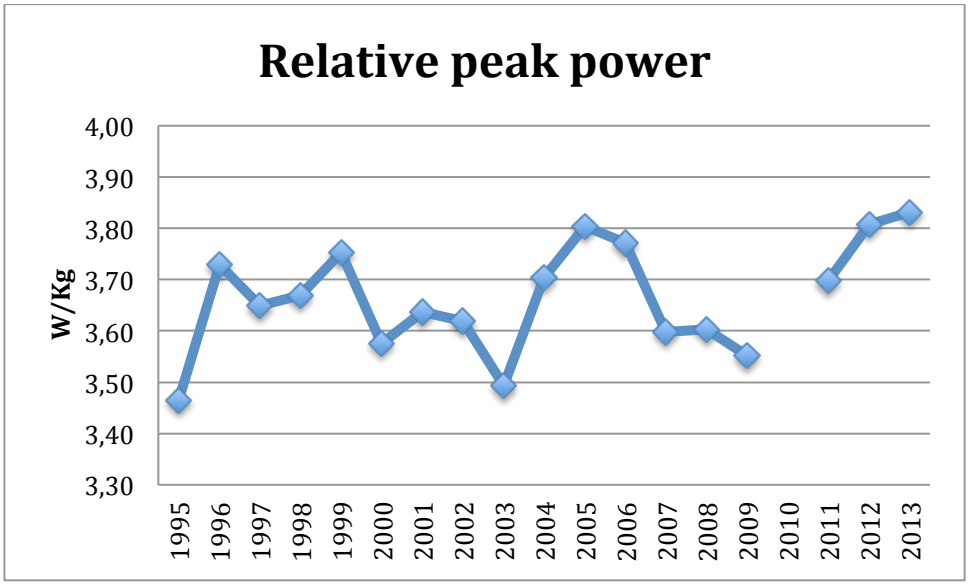


Figure 5 Teams' average relative peak power results between the years 1995 and 2013

Anaerobic threshold power results were lowest 149 W in 2007 and highest 184 W in the year 1996. The median is 165 W. Aerobic threshold power results were lowest 97 W in 2006 and the highest 135 W also in 1996. The median is 118 W. There are not clear trends. Field players were able to produce slightly higher values than goaltenders by the median, but when compared by the percentage of the peak power values, there are not differences between the playing positions.

Peak blood lactate concentration was measured from a fingertip after passive one-minute recovery from the finish of the PP-ergometer test. The lowest peak blood lactate concentration average 9,3 mmol/l was in the year 2002 and the highest 14,3 mmol/l in 1999. The median is 11,4 mmol/l. The trend shows that the average has stayed close to 11,5 mmol/l. (Figure 6) There is not a difference between the playing positions.

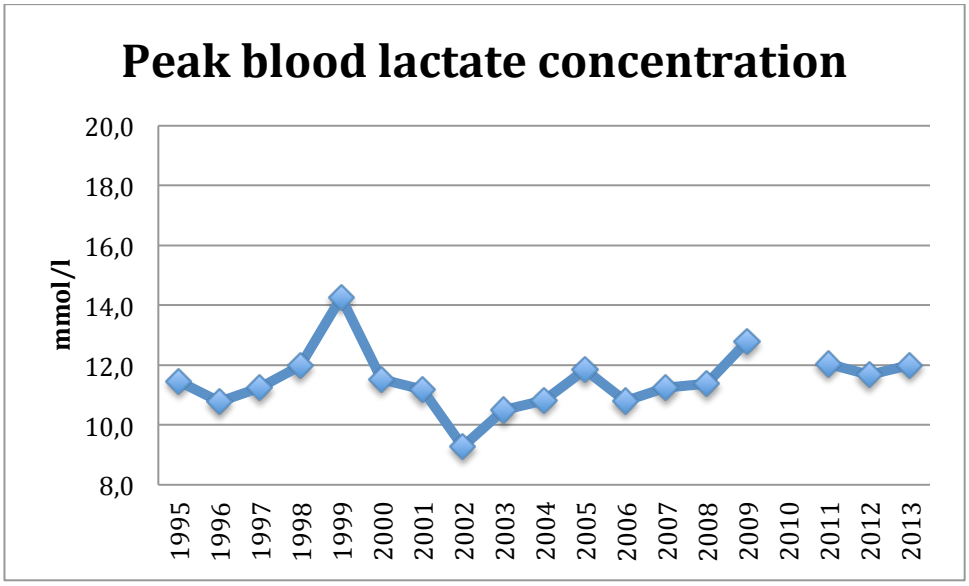


Figure 6 Teams' peak blood lactate concentration averages between the years 1995 and 2013

6.3 Explosive strength

An average player jumped the highest 33,0 cm static vertical jump in the year 2001 and the lowest 30,2 cm in 2009. The median is 31,8 cm. There is not a clear trend. There is not a difference between the playing positions.

Countermovement vertical jumps are higher. Countermovement jump is only tested from the year 2000. The lowest average was 29,9 cm in the year 2000 and the highest 35,4 cm in 2005. The median is 32,4 cm. There is not a trend between the years. (Figure 7) There is no difference between the playing positions.

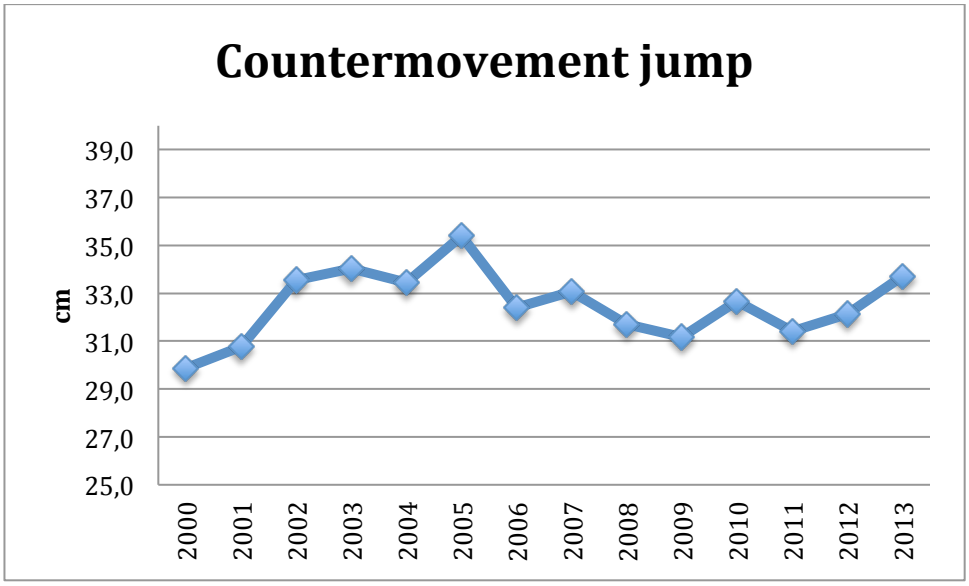


Figure 7 Teams' average countermovement vertical jump results between the years 1995 and 2013

7 Discussion

The purpose of the work was to create a physical profile from annual off ice tests for women national team in Finland between the years 1995 to 2014. All the results are presented annually in attachments 1 – 18, and by the Olympiads in the attachment 19. There was not any significant difference between the playing positions found. Previous studies of women ice hockey players found the same results (Geithner et al. 2006, 500-505; Ransdell & Murray 2011, 2358-2363).

The average age of the team has stayed about 22 years. An average player has been about 167 cm tall and weighed about 66 kg through all the years. Average fat percent has risen from 21,1% in the year 1998 to 25,3 % in the 2009. In 2014 the average dropped slightly down to 25,1 %. Ransdell & Murray (2011, 2358-2363) studied 23 elite USA female ice hockey players. The players were approximately three years older than Finnish national team players. The average height was 169,7 cm, the average weight 70,4 kg, body fat percentage 15,8 %. Geithner et al (2006, 500-505) studied 112 competitive Canadian female ice hockey players, who were 21,4 years old on average. Their average height was 167,9 cm, body mass 66,4 kg and fat percentage 20,9%.

There tented to be no differences between the positions in anthropometrics. This differs from the studies done for male ice hockey players. That might be because the game is not as physical as the male sport due the fact women players are not allowed to body check. Body fat percentage of USA female players was respectively lower than Finnish national team players. This might be caused by the possibility to participate more advanced periodization techniques and nutritional practices in athletes' everyday life. Higher fat percentage predicts lower anaerobic power results and lower relative VO_{2max} values. (Webster et al. 1998, 25-40). During skating a player's extra weight resulting from fat is not that big drawback while moving horizontally but powerful starts and stops made during a game require more energy from a heavier player and they are usually slower.

The peak power average results improved 25 W from 230 W in the year 1998 to 255 W in 2014. Also average relative result has risen from 3,46 W/kg to 3,83 W/kg. Relative results could have raised more, if the fat percentage stayed stable.

The average VO_{2max} was 45,1 ml/kg/min in the year 1998 and 49,5 ml/kg/min in 2014. Canadian women ice hockey players' average VO_{2max} was 44,6 ml/kg/min, but they were tested using Lager running test. (Geithner et al. 2006, 500-505) A player having lower relative VO_{2max} will get tired faster and recovers slower between the shifts, periods, and games. Slower recovery between the games affects a player's tournament durability.

Peak blood lactate concentration average has changed from 9,3 mmol/l (2002) to 12,8 mmol/l (2009), but there is not a clear tendency of improvement. In the year 2014, the average was 12,0 mmol/l. Canadian women ice hockey players' average result was 13,4 mmol/l, but that was measured after skating tests instead of cycling (Geithner et al. 2006, 500-505).

Anaerobic threshold power averages varied from 149 W (2007) to 184 W (1996) and were from 64 % to 73 % from the peak power average. In the year 2014, the average anaerobic threshold power was 179 W and 70 % on the average of the peak power. Aerobic threshold power averages have varied between 97 W (2006) and 135 W (1996) and were from 40% to 54 % from the peak power average. In the year 2014, the average aerobic threshold power was 125 W and 49 % of the peak power. It seems that anaerobic and aerobic threshold levels has improved during the years. Many advances have been made in strength and conditioning planning to create more sport specific training sessions also on clubs level during the years.

An average player jumped 31,8 cm on static vertical jump in 1998 and 31,5 cm in the year 2012. Countermovement jump was measured first time in the year 2000, when the average was 29,9 cm. In the year 2014, it was 33,7 cm. USA elite female ice hockey players jumped at countermovement vertical jump 50,3 cm, which is 16,6 cm higher than Finnish players, but they are allowed to swing arms during the jump (Ransdell &

Murray 2011, 2358-2363). Canadian female ice hockey players' average countermovement result was 43,1 cm. They are measured by using reaching technique, which allow arm movement and might bring some extra height to jumps (Geithner et al. 2006, 500-505). The difference between lowest and highest result was clear in both static (24,3 cm – 43,3 cm) and countermovement (23,0 cm – 45,8 cm) jump tests. When vertical jump is found to predict skating speed, the 16,6 cm difference to USA players seems to be pretty clear in ability to accelerate and keep the tempo. Also a high fat percentage affects negatively a player's ability produce power strength. When compared to USA and Canadian female ice hockey players' ability to produce power strength, that would be one clear development area for Finnish women national team players.

The state of conditioning of the players is not necessarily directly related to the success of the team at World Championships. There have been players tested, who have not been playing at World Championships in the spring. Also some of the players, who have played at World Championships, might not have taken part in the testing camp. Even though, it would also be interesting to compare test results to the team success at World Championships. Some of the players might have been very familiar with all the tests and some of them might have performed them the first time. The older the player is, the longer she has usually taken part in sport specialized training programs. That might affect the average values, especially the goaltenders' average, because there have only been 2-4 goaltenders tested each year.

There are very few studies about women ice hockey players' conditioning, which makes the comparison towards other countries difficult. It is also difficult to find studies about athletes in other sports. That part of what the studies are found the conditioning of the players could still be better. Peak power and VO_{2max} averages have improved slightly during the last four years. An average player is still the same height and weight as she was in 1995. Only fat percentage has increased from the year 1995. Particularly there would be room for improvement in vertical jump results, which are found to predict skating speed. The overall athleticism of the national team has not altered during the 19 years.

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9 Attachments

Attachment 1. Women national team test results and averages in the year 1995.

26.5.1995	Position	Age years	Length cm	Weight kg	Fat % %	Maximal endurance Anaerobic power Peak Power W	Rel. Power w/kg	VO 2 ml/kg	Max. Lactate mmol/l	Thresholds Anaerobic Work W	Työ-%	Aerobic Work W	Työ-%	Explosive cm
	D	19	174	73,9	24,3	265	3,59	46,5	13,7	210	79,2	165	62,3	34,2
	D	28	162	64,4	23,1	205	3,18	41,7	13,4	160	78,0	130	63,4	25,3
	D	24	169	62,0	22,0	215	3,47	45,1	10,7	140	65,1	95	44,2	24,8
	D	23	160	59,7	17,3	210	3,52	45,7	12,3	150	71,4	100	47,6	34,8
	D	30	169	73,6	21,6	250	3,40	44,3	14,3	205	82,0	155	62,0	
	D	21	165	58,5	18,8	225	3,85	49,7	13,2	160	71,1	115	51,1	32,9
	D	24	162	66,4	18,1	230	3,46	45,1	13,2	175	76,1	120	52,2	36,0
	D	25	168	61,4	19,0	215	3,50	45,5	15,0	135	62,8	100	46,5	35,5
	D	19	166	71,0	21,5	255	3,59	46,6	12,9	215	84,3	145	56,9	31,2
	D	19	176	64,0	19,9	234	3,66	47,4	9,6	175	74,8	130	55,6	42,5
Average Defenders	**10**	**23**	**167**	**65,5**	**20,6**	**230**	**3,52**	**45,8**	**12,8**	**173**	**74,5**	**126**	**54,2**	**33,0**
	F	17	163	58,8	21,4	205	3,49	45,3	12,0	140	68,3	95	46,3	31,5
	F	23	163	66,2	19,0	245	3,70	47,9	12,0	175	71,4	125	51,0	29,7
	F	28	165	70,3	20,5	265	3,77	48,7	13,1	200	75,5	170	64,2	34,0
	F	21	172	80,0	24,0	255	3,19	41,8	14,0	200	78,4	165	64,7	38,0
	F	21	167	61,5	24,0	215	3,50	45,5	13,6	165	76,7	140	65,1	34,8
	F	17	162	62,1	21,2	215	3,46	45,0	11,0	140	65,1	110	51,2	25,9
	F	30	171	67,3	20,0	230	3,42	44,5	7,7	160	69,6	100	43,5	33,2
	F	20	164	68,1	22,4	205	3,01	39,6	8,9	140	68,3	95	46,3	27,1
	F	17	171	63,8	24,8	215	3,37	43,9	11,0	165	76,7	135	62,8	22,9
	F	29	171	77,9	19,7	265	3,40	44,3	13,5	200	75,5	155	58,5	32,9
	F	20	158	63,8	24,3	215	3,37	43,9	12,4	125	58,1	90	41,9	37,9
	F	24	176	70,8	18,7	245	3,46	45,0	10,8	175	71,4	120	49,0	38,6
	F	17	177	61,5	19,8	230	3,74	48,4	9,0	140	60,9	110	47,8	28,7
	F	16	170	59,5	18,7	205	3,45	44,8	9,1	155	75,6	105	51,2	27,0
	F	20	172	67,3	16,4	265	3,94	50,8	8,6	190	71,7	145	54,7	27,7
	F	23	167	69,5	16,2									27,7
	F	20	165	63,0	23,6	213	3,38	44,1	10,1	163	76,5	135	63,4	32,3
	F	19	173	69,0	20,0	241	3,49	45,4	12,5	180	74,7	132	54,8	35,3
Average Forwards	**18**	**21**	**168**	**66,7**	**20,8**	**231**	**3,48**	**45,2**	**11,1**	**165**	**71,4**	**125**	**53,9**	**31,4**
	G	29	175	71,9	24,6	225	3,13	41,1	8,4	175	77,8	150	66,7	30,3
	G	18	162	59,6	23,1	220	3,69	47,8	9,2	150	68,2	100	45,5	29,8
	G	27	166	85,3	30,4	215	2,52	33,7	9,4	150	69,8	100	46,5	31,3
	G	20	160	64,7	18,2	240	3,71	48,0	10,9	175	72,9	120	50,0	30,5
Average Goaltenders	**4**	**23**	**166**	**70,4**	**24,1**	**225**	**3,26**	**42,7**	**9,5**	**163**	**72,2**	**118**	**52,2**	**30,5**
Average 1995	**32**	**22**	**168**	**66,8**	**21,1**	**230**	**3,46**	**45,1**	**11,5**	**167**	**72,5**	**124**	**53,8**	**31,8**
Minimum	16	158	58,5	16,2	205	2,52	33,7	7,7	125	58,1	90	41,9	22,9
Maximum	30	177	85,3	30,4	265	3,94	50,8	15,0	215	84,3	170	66,7	42,5
Median	21	167	65,5	20,9	225	3,47	45,1	12,0	165	72,9	120	51,2	31,5

14.4.1996						Maximal endurance Anaerobic power				Thresholds Anaerobic		Aerobic		
	Position	Age years	Length cm	Weight kg	Fat % %	Peak Power W	Rel. Power w/kg	VO 2 ml/kg	Max. Lactate mmol/l	Work W	Työ-%	Work W	Työ-%	Explosive cm
	D	20	174	73,5	21,8	275	3,74	48,4	7,7	240	87,3	210	76,4	37,3
	D	32	158	57,8	20,5	228	3,94	50,8	10,7	185	81,1	135	59,2	30,2
	D	20	176	64,4	19,1	250	3,88	50,1	9,4	175	70,0	138	55,2	46,0
	D	15	172	74,0	23,6	263	3,55	46,1	9,0	190	72,2	135	51,3	35,2
	D	31	169	71,3	19,9	263	3,69	47,8	12,6	205	77,9	145	55,1	36,2
	D	24		58,0										36,5
	D	22		56,2	17,5									36,5
	D	19		63,0	23,2									35,5
Average Defenders	**8**	**23**	**170**	**64,8**	**20,8**	**256**	**3,76**	**48,6**	**9,9**	**199**	**77,7**	**153**	**59,4**	**36,7**
	F	18	164	60,5	24,0	225	3,72	48,1	10,5	160	71,1	115	51,1	35,0
	F	24	163	65,9	17,4	256	3,88	50,1	11,4	190	74,2	125	48,8	35,5
	F	29	166	68,5	22,0	278	4,06	52,2	9,6	210	75,5	163	58,6	36,8
	F	22	172	80,0	23,9	291	3,64	47,2	8,1	230	79,0	190	65,3	39,3
	F	21	172	67,0	18,1	278	4,15	53,3	10,1	195	70,1	125	45,0	37,5
	F	18	163	64,0	21,3	250	3,91	50,4	12,6	170	68,0	115	46,0	30,5
	F	21	165	71,3	23,5	225	3,16	41,4	10,7	170	75,6	120	53,3	31,5
	F	17	172	66,4	25,3	250	3,77	48,7	11,5	190	76,0	135	54,0	30,5
	F	30	171	79,2	21,6	275	3,47	45,2	13,1	225	81,8	175	63,6	35,5
	F	24	168	72,3	18,0	275	3,80	49,1	12,2	225	81,8	175	63,6	36,3
	F	28	172	66,4	23,7	228	3,43	44,7	12,1	175	76,8	125	54,8	36,4
	F	18	162	72,3	31,7	263	3,64	47,2	11,8	205	77,9	150	57,0	33,7
	F	23	158	51,9	14,4	200	3,85	49,7	10,4	130	65,0	90	45,0	38,0
	F	20	158	62,4	20,8	238	3,81	49,3	10,3	150	63,0	100	42,0	44,5
	F	19	162	52,6	18,3	225	4,28	54,8	11,7	160	71,1	110	48,9	35,0
	F	21	172	67,2	16,2	294	4,38	56,0	12,1	200	68,0	150	51,0	32,0
	F	18	178	62,5	20,0	192	3,07	40,4	8,7	163	84,9	113	58,9	32,0
Average Forwards	**17**	**22**	**167**	**66,5**	**21,2**	**250**	**3,77**	**48,7**	**11,0**	**185**	**74,1**	**134**	**53,4**	**35,3**
	G	29	174	66,5	19,4	225	3,38	44,1	8,2	180	80,0	150	66,7	34,3
	G	18	167	56,4	20,5	231	4,10	52,6	13,2	138	59,7	100	43,3	47,0
	G	20	167	70,0	20,5	250	3,57	46,4	10,7	175	70,0	125	50,0	38,2
	G	18	162	61,4	23,6	241	3,93	50,6	10,2	155	64,3	100	41,5	33,5
	G	27	166	80,4	25,1	231	2,87	38,0	12,4	165	71,4	120	51,9	38,5
Average Goaltenders	**5**	**23**	**167**	**66,9**	**21,8**	**236**	**3,57**	**46,3**	**10,9**	**163**	**69,1**	**119**	**50,7**	**38,3**
Average 1996	**30**	**22**	**168**	**66,1**	**21,2**	**248**	**3,73**	**48,2**	**10,8**	**184**	**73,9**	**135**	**54,0**	**36,2**
Minimum		15	158	51,9	14,4	192	2,87	38,0	7,7	130	59,7	90	41,5	30,2
Maximum		32	178	80,4	31,7	294	4,38	56,0	13,2	240	87,3	210	76,4	47,0
Median		21	167	66,4	20,8	250	3,77	48,7	10,7	180	74,2	125	53,3	35,9

23.5.1997						Maximal endurance Anaerobic power				Thresholds Anaerobic		Aerobic		
	Position	Age years	Length cm	Weight kg	Fat % %	Peak Power W	Rel. Power w/kg	VO 2 ml/kg	Max. Lactate mmol/l	Work W	Työ-%	Work W	Työ-%	Explosive cm
	D	38	173	74,0	22,4	253	3,42	44,5	10,3	190	75,1	140	55,3	33
	D	21	175	69,1	20,5	238	3,44	44,8	9,0	180	75,6	125	52,5	46
	D	28	165	61,2	21,0	209	3,42	44,5	8,9	150	71,8	95	45,5	37
	D	16	172	74,6	22,4	306	4,10	52,7	14,1	225	73,5	185	60,5	34
	D	15	158	51,9	20,0	219	4,22	54,1	12,4	150	68,5	105	47,9	30
	D	25	160	57,8	18,4	197	3,41	44,4	10,7	125	63,5	90	45,7	41
	D	32	168	73,0	23,2	275	3,77	48,7	15,2	220	80,0	150	54,5	34
	D	27	176	68,8	20,1	219	3,18	41,7	8,6	175	79,9	125	57,1	33
	D	23	165	58,9	18,2	247	4,19	53,8	11,4	185	74,9	140	56,7	36
	D	27	168	63,6	20,2	213	3,35	43,7	14,3	165	77,5	90	42,3	33
	D	30	162	63,7	19,9	234	3,67	47,6	11,3	188	80,3	155	66,2	30
	D	22	165	63,7	22,1	225	3,53	45,9	8,1	175	77,8	130	57,8	30
Average Defenders	**12**	**25**	**167**	**65,0**	**20,7**	**236**	**3,64**	**47,2**	**11,2**	**177**	**74,9**	**128**	**53,5**	**34,8**
	F	19	163	55,7	19,0	200	3,59	46,6	10,1	130	65,0	85	42,5	33
	F	25	163	65,6	17,1	263	4,01	51,6	14,0	188	71,5	150	57,0	32
	F	24	171	64,8	20,7	244	3,77	48,7	10,6	188	77,0	133	54,5	35
	F	19	162	62,2	20,3	250	4,02	51,7	12,2	155	62,0	115	46,0	31
	F	22	164	70,4	23,2	225	3,20	41,9	10,9	150	66,7	110	48,9	28
	F	29	171	68,8	21,9	263	3,82	49,4	12,2	195	74,1	160	60,8	34
	F	19	162	75,0	34,0	256	3,41	44,5	13,3	188	73,4	133	52,0	30
	F	22	158	66,2	23,1	206	3,11	40,8	8,1	150	72,8	110	53,4	42
	F	19	168	67,2	20,7	278	4,14	53,1	14,2	200	71,9	150	54,0	34
	F	20	162	52,6	19,4	181	3,44	44,8	9,6	135	74,6	90	49,7	30
	F	19	179	67,4	21,2	228	3,38	44,1	10,9	150	65,8	100	43,9	29
	F	22	172	70,5	17,2	269	3,82	49,3	13,3	170	63,2	138	51,3	28
	F	31	171	81,7	24,3									34
	F	30	165	70,0	21,8	228	3,26	42,6	9,5	165	72,4	135	59,2	33
	F	25	167	74,0	20,5	263	3,55	46,1	10,0	225	85,6	175	66,5	32
Average Forwards	**15**	**23**	**167**	**67,5**	**21,6**	**240**	**3,61**	**46,8**	**11,4**	**171**	**71,1**	**127**	**52,8**	**32,3**
	G	20	162	60,2	20,7	244	4,05	52,1	10´7	160	65,6	100	41,0	32
	G	19	167	56,1	18,1	234	4,17	53,6	12,8	145	62,0	120	51,3	40
	G	17	174	72,0	23,1	244	3,39	44,2	8,8	185	75,8	140	57,4	31
Average Goaltenders	**3**	**19**	**168**	**62,8**	**20,6**	**241**	**3,87**	**50,0**	**10,8**	**163**	**67,8**	**120**	**49,9**	**34,3**
Average 1997	**30**	**24**	**167**	**66,0**	**21,2**	**238**	**3,65**	**47,3**	**11,2**	**173**	**72,3**	**127**	**52,8**	**33,5**
Minimum		15	158	51,9	17,1	181	3,11	40,8	8,1	125	62,0	85	41,0	28,0
Maximum		38	179	81,7	34,0	306	4,22	54,1	15,2	225	85,6	185	66,5	46,0
Median		22	166	66,7	20,7	238	3,55	46,1	10,9	175	73,4	130	53,4	33,0

Attachment 4. Women national team test results and averages in the year 1998.

15.6.1998	Position	Age years	Length cm	Weight kg	Fat % %	Maximal endurance Anaerobic power Peak Power W	Rel. Power w/kg	VO 2 ml/kg	Max. Lactate mmol/l	Thresholds Anaerobic Work W	Työ-%	Aerobic Work W	Työ-%	Explosive cm
	D	27,6	173	64,0	14,0	278	4,34	55,6	10,1	235	84,5	180	64,7	34
	D	17,5	174	74,0	20,7	288	3,89	50,2	12,6	218	75,7	170	59,0	34
	D	16,5	158	52,4	21,0	200	3,82	49,3	12,8	130	65,0	95	47,5	32
	D	25,8	160	59,0	18,6	200	3,39	44,2	11,9	150	75,0	116	58,0	38
	D	23,4	165	70,0	28,8	188	2,69	35,7	8,6	138	73,4	110	58,5	28
	D	19,3	168	60,7	19,7	216	3,56	46,2	11,9	138	63,9	90	41,7	29
	D	17,3	156	63,7	20,3	225	3,53	45,9	10,7	175	77,8	125	55,6	34
	D	21,2	162	58,2	20,8	244	4,19	53,8	9,7	188	77,0	138	56,6	35
Average Defenders	**8**	**21,1**	**164**	**62,8**	**20,5**	**230**	**3,68**	**47,6**	**11,0**	**172**	**74,0**	**128**	**55,2**	**33**
	F	20,5	164	54,8	16,0	175	3,19	41,8	10,3	113	64,6	70	40,0	35
	F	22,0	167	55,4	20,7	200	3,61	46,8	12,9	132	66,0	75	37,5	33
	F	24,0	173	75,0	20,4	275	3,67	47,5	12,5	205	74,5	168	61,1	43
	F	17,4	172	64,1	20,0	263	4,10	52,7	15,2	200	76,0	120	45,6	32
	F	19,8	163	65,1	23,4	266	4,09	52,5	12,4	168	63,2	113	42,5	31
	F	22,6	158	65,6	20,5	222	3,38	44,1	10,7	163	73,4	100	45,0	47
	F	20,8	162	53,6	17,3	225	4,20	53,9	12,5	160	71,1	115	51,1	35
	F	31,8	172	87,2	24,4	291	3,34	43,5	12,3	231	79,4	173	59,5	33
	F	25,9	168	77,5	24,6	300	3,87	50,0	14,9	265	88,3	248	82,7	35
	F	20,2	168	69,0	23,0	269	3,90	50,3	13,1	200	74,3	153	56,9	34
	F	24,2	168	77,0	24,1	250	3,25	42,5	9,1	168	67,2	138	55,2	37
	F	20,2	180	67,0	18,9	216	3,22	42,2	9,7	145	67,1	100	46,3	31
Average Forwards	**12**	**22,5**	**168**	**67,6**	**21,1**	**246**	**3,65**	**47,3**	**12,1**	**179**	**72,1**	**131**	**51,9**	**36**
	G	22,0	166	64,4	16,5	256	3,98	51,2	15,5	175	68,4	150	58,6	39
	G	20,1	167	58,4	21,0	225	3,85	49,7	16,1	145	64,4	105	46,7	41
	G	20,6	162	61,8	22,1	206	3,33	43,5	9,7	138	67,0	90	43,7	32
Average Goaltenders	**3**	**20,9**	**165**	**61,5**	**19,9**	**229**	**3,72**	**48,1**	**13,8**	**153**	**66,6**	**115**	**49,6**	**37**
Average 1998	**23**	**21,8**	**166**	**65,1**	**20,7**	**238**	**3,67**	**47,5**	**12,0**	**173**	**72,1**	**128**	**52,8**	**35**
Minimum		16,5	156	52,4	14,0	175	2,69	35,7	8,6	113	63,2	70	37,5	28
Maximum		31,8	180	87,2	28,8	300	4,34	55,6	16,1	265	88,3	248	82,7	47
Median		20,8	167	64,1	20,7	225	3,67	47,5	12,3	168	73,4	116	55,2	34

14.6.1999						Maximal endurance Anaerobic power				Thresholds Anaerobic		Aerobic		
	Position	Age	Length	Weight	Fat %	Peak Power	Rel. Power	VO 2	Max. Lactate	Work		Work		Explosive
		years	cm	kg	%	W	w/kg	ml/kg	mmol/l	W	Työ-%	W	Työ-%	cm
	D	18,5	174	67,9	20,0	269	3,96	51,0	14,1	180	66,9	115	42,8	32
	D	24,4	166	61,4	23,1	200	3,26	42,6	8,2	145	72,5	110	55,0	32
	D	17,5	158	56,7	24,6	200	3,53	45,8	15,0	113	56,5	70	35,0	32
	D	34,2	169	73,0	20,3	241	3,30	43,1	15,4	188	78,0	150	62,2	32
	D	22,2	162	58,0	18,7	265	4,57	58,3	13,7	198	74,7	163	61,5	37
	D	22,7	167	66,0	21,2	228	3,45	45,0	14,7	177	77,6	138	60,5	37
	D	23,8	179	75,6	24,6	256	3,39	44,1	13,8	170	66,4	100	39,1	37
Average Defenders	**7**	**23,3**	**168**	**65,5**	**21,8**	**237**	**3,64**	**47,1**	**13,6**	**167**	**70,4**	**121**	**50,9**	**34**
	F	21,5	163	62,0	21,5	238	3,84	49,6	14,3	175	73,5	111	46,6	34
	F	21,2	165	67,1	25,0	234	3,49	45,3	14,8	180	76,9	115	49,1	29
	F	25,0	173	74,4	21,3	303	4,07	52,4	14,6	227	74,9	187	61,7	44
	F	22,1	178	68,1	21,5	216	3,17	41,6	15,2	124	57,4	91	42,1	22
	F	20,8	163	63,0	22,4	269	4,27	54,7	14,0	165	61,3	117	43,5	31
	F	20,7	172	62,7	21,6	263	4,19	53,8	13,3	198	75,3	138	52,5	30
	F	23,4	172	66,0	19,0	253	3,83	49,5	15,8	159	62,8	125	49,4	35
	F	18,4	172	67,7	21,6	238	3,52	45,7	15,5	148	62,2	110	46,2	31
	F	21,3	162	75,3	30,7	250	3,32	43,3	16,0	175	70,0	133	53,2	34
	F	23,6	158	64,3	18,0	259	4,03	51,8	12,4	198	76,4	163	62,9	45
	F	19,2	158	55,4	25,3	209	3,77	48,8	18,0	132	63,2	85	40,7	35
	F	21,2	168	70,1	23,5	256	3,65	47,3	14,0	190	74,2	138	53,9	32
	F	21,8	163	55,8	20,0	203	3,64	47,2	12,8	135	66,5	95	46,8	32
	F	21,2	180	67,5	22,0	256	3,79	49,0	12,9	150	58,6	115	44,9	31
	F	18,2	168	71,2	27,9									35
Average Forwards	**15**	**21,3**	**168**	**66,0**	**22,8**	**246**	**3,76**	**48,6**	**14,5**	**168**	**68,1**	**123**	**49,5**	**33**
	G	23,7	161	67,3	20,3	269	4,00	51,5	16,3	165	61,3	123	45,7	33
	G	23,0	168	65,4	17,8	266	4,07	52,3	16,2	173	65,0	125	47,0	38
	G	21,1	167	58,0	19,7	234	4,03	51,9	14,0	138	59,0	95	40,6	40
	G	21,6	162	63,5	25,6	234	3,69	47,7	11,8	160	68,4	90	38,5	31
Average Goaltenders	**4**	**22,3**	**164**	**63,6**	**20,9**	**251**	**3,95**	**50,9**	**14,6**	**159**	**63,4**	**108**	**42,9**	**36**
Average 1999	**26**	**22,0**	**167**	**65,5**	**22,2**	**244**	**3,75**	**48,5**	**14,3**	**167**	**68,0**	**120**	**48,9**	**34**
Minimum		17,5	158	55,4	17,8	200	3,17	41,6	8,2	113	56,5	70	35,0	22
Maximum		34,2	180	75,6	30,7	303	4,57	58,3	18,0	227	78,0	187	62,9	45
Median		21,5	167	66,0	21,6	250	3,77	48,8	14,3	170	66,9	115	46,8	33

Attachment 6. Women national team test results and averages in the year 2000.

8.6.2000	Position	Age years	Length cm	Weight kg	Fat % %	Maximal endurance Anaerobic power Peak Power W	Rel. Power w/kg	VO 2 ml/kg	Max. Lactate mmol/l	Thresholds Anaerobic Work W	Työ-%	Aerobic Work W	Työ-%	Static cm	Counterm. cm
	D	19	171	63,0	24,1	219	3,48	45,0	11,5	135	61,6	98	44,7		
	D	18	169	69,9	21,5	263	3,76	49,0	12,0	175	66,5	120	45,6	31,1	29,7
	D	25	179	77,2	25,0	250	3,24	42,0	9,7	168	67,2	135	54,0	29,6	29,3
	D	24	168	67,0	20,9	247	3,69	48,0	10,6	163	66,0	120	48,6	33,9	31,9
	D	19	159	57,1	25,3	200	3,50	46,0	12,2	152	76,0	113	56,5	32,6	31,1
	D	20	157	61,0	24,3	231	3,79	49,0	11,4	175	75,8	118	51,1	32,6	30,7
	D	19	156	71,6	23,0	188	2,63	35,0	9,0	100	53,2	60	31,9	31,1	28,8
	D	19	164	62,0	23,3	244	3,94	51,0	10,0	150	61,5	110	45,1	29,8	28,3
	D	23	162	59,7	21,2	231	3,87	50,0	12,4	180	77,9	130	56,3	33,7	32,0
	D	17	169	64,7	24,9	250	3,86	50,0	13,1	160	64,0	123	49,2	30,8	25,3
	D	24	168	67,0	20,9	247	3,69	48,0	10,6	163	66,0	120	48,6	33,9	31,9
Average Defenders	**11**	**21**	**166**	**65,5**	**23,1**	**234**	**3,58**	**46,6**	**11**	**156**	**66,9**	**113**	**48,3**	**31,9**	**29,9**
	F	22	164	57,1	21,0										
	F	24	162	59,0	20,7	216	3,66	47,0	10,1	175	81,0	133	61,6	41,5	38,9
	F	28	164	65,5	19,0	228	3,48	45,0	10,9	163	71,5	108	47,4	30,2	27,8
	F	20	157	62,6	29,0	178	2,84	38,0	8,4	115	64,6	70	39,3	28,5	24,8
	F	22	163	64,5	22,0	266	4,12	53,0	13,3	168	63,2	118	44,4	30,0	29,7
	F	22	172	60,9	21,8	263	4,32	55,0	12,7	192	73,0	130	49,4	28,3	26,4
	F	18	166	58,1	22,0	225	3,87	50,0	11,0	155	68,9	113	50,2	29,4	25,7
	F	19	172	67,1	23,5	216	3,22	42,0	10,1	175	81,0	118	54,6	31,6	27,8
	F	25	159	63,1	18,4	219	3,47	45,0	9,9	145	66,2	110	50,2	40,3	35,2
	F	19	171	64,1	24,5	188	2,93	39,0	9,9	142	75,5	110	58,5	28,4	24,8
	F	22	168	69,0	22,8	263	3,81	49,0	15,0	198	75,3	150	57,0	34,1	31,0
	F	23	162	59,0	24,5	203	3,44	45,0	12,1	140	69,0	115	56,7	28,3	27,6
	F	22	179	69,5	23,8	269	3,87	50,0	15,2	170	63,2	115	42,8	31,3	29,4
	F	22	164	69,0	28,5	244	3,54	46,0	11,3	170	69,7	125	51,2	30,5	28,5
	F	19	159	69,0	24,5	197	2,86	38,0	13,1	148	75,1	115	58,4	30,7	30,7
	F	25	173	72,8	21,7	284	3,90	50,0	13,8	210	73,9	154	54,2	32,8	28,1
	F	19	168	68,8	25,0	234	3,40	44,0	12,1	177	75,6	130	55,6	35,0	35,1
	F	17	163	60,1	24,4	241	4,01	52,0	11,8	185	76,8	145	60,2	30,5	27,6
Average Forwards	**18**	**22**	**166**	**64,4**	**23,2**	**231**	**3,57**	**46,4**	**12**	**166**	**72,0**	**121**	**52,4**	**31,8**	**29,4**
	G	25	161	65,7	21,0	256	3,90	50,0	11,3	178	69,5	150	58,6	34,7	32,1
	G	15	167	75,0	27,4	225	3,00	40,0	7,4	150	66,7	115	51,1	34,6	33,5
	G	23	162	64,8	24,4	225	3,47	45,0	12,6	138	61,3	102	45,3	32,0	32,4
	G	21	162	57,7	22,4	222	3,85	50,0	14,1	168	75,7	118	53,2		
Average Goaltenders	**4**	**21**	**163**	**65,8**	**23,8**	**232**	**3,55**	**46,3**	**11**	**159**	**68,3**	**121**	**52,0**	**33,8**	**32,7**
Average 2000	**33**	**21**	**165**	**64,9**	**23,2**	**232**	**3,58**	**46,4**	**12**	**162**	**69,8**	**118**	**51,0**	**32,1**	**29,9**
Minimum		15	156	57,1	18,4	178	2,63	35,0	7	100	53,2	60	31,9	28,3	24,8
Maximum		28	179	77,2	29,0	284	4,32	55,0	15	210	81,0	154	61,6	41,5	38,9
Median		22	164	64,7	23,3	231	3,67	47,5	11	166	69,2	118	51,1	31,2	29,6

8.6.2001						Maximal endurance				Thresholds					
						Anaerobic power				Anaerobic		Aerobic			
	Position	Age	Length	Weight	Fat %	Peak Power	Rel. Power	VO 2	Max. Lactate	Work		Work		Static	Counterm.
		years	cm	kg	%	W	w/kg	ml/kg	mmol/l	W	Työ-%	W	Työ-%	cm	cm
	D	30,6	173	61,8	18,1	244	3,95	50,9	11,6	173	70,9	131	53,7	33,0	31,8
	D	23,9	165	69,0	27,6	238	3,45	*44,9*	8,7	133	55,9	82	34,5	31,6	30,0
	D	36,8	160	61,0	25,6	203	3,33	*43,4*	11,1	146	71,9	104	51,2	28,3	27,0
	D	24,7	176	68,0	20,4	244	3,59	46,6		177	72,5	123	50,4	50,1	45,8
	D	20,5	174	78,0	26,1	275	3,53	45,8	11,1	193	70,2	166	60,4	32,5	31,1
	D	25,7	179	78,0	26,0	272	3,49	45,3	9,1	171	62,9	133	48,9	31,1	28,7
	D	22,1	168	76,3	29,9	213	2,79	***37,0***	11,5	150	70,4	113	53,1	23,8	21,7
	D	19,5	159	59,2	28,0	225	3,80	49,1	13,9	135	60,0	70	31,1	35,6	30,0
	D	20,2	164	66,1	28,1	272	4,11	52,9	11..4	163	59,9	123	45,2	32,5	29,3
	D	24,2	162	60,9	23,5	246	4,04	52,0	11,9	173	70,3	123	50,0	34,6	34,2
	D	31,3	176	70,9	25,2	225	3,17	*41,6*	10,3	167	74,2	120	53,3	30,3	28,6
	D	27,4	166	56,3	19,6	259	4,60	58,7	12,8	167	64,5	129	49,8	36,7	36,8
	D	30,4	165	68,0	23,6	238	3,50	45,5	11,6	140	58,8	90	37,8	34,2	30,7
	D	18,4	172	56,8	19,7	234	4,12	52,9	12,9	134	57,3	75	32,1		
Average Defenders	**14**	**25,4**	**168**	**66,5**	**24,4**	**242**	**3,68**	**47,6**	**11,4**	**159**	**65,7**	**113**	**46,5**	**33,4**	**31,2**
	F	25,3	163	64,0	25,2	209	3,27	*42,7*	9,7	150	71,8	120	57,4	38,6	37,5
	F	23,6	166	60,0	18,5	228	3,80	49,1	12,4	175	76,8	137	60,1	47,0	42,5
	F	29,5	164	65,4	22,3	244	3,73	48,3	13,1	175	71,7	145	59,4	29,1	27,4
	F	14,4	169	65,5	27,0	219	3,34	*43,6*	11	160	73,1	121	55,3	27,7	25,4
	F	21,4	166	64,9	23,0	231	3,56	46,2	12,1	160	69,3	100	43,3	33,8	32,4
	F	19,0	170	67,0	28,0	203	3,03	39,9	7,5	136	67,0	104	51,2	27,8	27,8
	F	22,8	163	63,5	25,0	244	3,84	49,6	10,9	175	71,7	127	52,0	26,1	23,4
	F	22,6	173	65,0	23,4	256	3,94	50,8	12,6	213	83,2	168	65,6	30,3	28,0
	F	28,0	164	59,0	20,5	238	4,03	51,9	12,5	152	63,9	110	46,2		
	F	23,8	170	67,0	26,5	253	3,78	48,8	12,3	165	65,2	115	45,5	30,8	28,7
	F	20,4	172	71,5	27,5	253	3,54	46,0	11,4	169	66,8	125	49,4	28,8	27,0
	F	23,3	163	73,4	28,5	253	3,45	*44,9*	11,0	169	66,8	115	45,5	32,5	29,0
	F	28,3	159	52,5	20,0	181	3,45	*44,9*	11,4	127	70,2	83	45,9	36,8	33,5
	F	25,6	159	65,5	24,2	241	3,68	47,7	11,0	167	69,3	135	56,0	44,7	37,9
	F	23,2	168	65,0	24,0	266	4,09	52,6	10,6	184	69,2	131	49,2	36,2	34,3
	F	23,7	163	56,0	25,8	228	4,07	52,4	12,0	156	68,4	115	50,4	27,9	26,7
	F	22,0	171	70,3	27,0	281	4,00	51,5	10,3	195	69,4	140	49,8	35,5	32,6
	F	23,2	179	70,8	25,4	263	3,71	48,1	10,7	170	64,6	135	51,3	33,0	31,5
	F	23,2	164	67,0	28,0	259	3,87	49,9	10,8	171	66,0	119	45,9	32,9	30,4
	F	26,0	173	73,0	23,4	256	3,51	45,6	9,8	215	84,0	166	64,8	32,9	31,4
	F	20,2	169	68,5	27,5	219	3,20	*41,9*	10,0	142	64,8	102	46,6	35,2	33,0
Average Forwards	**21**	**23,3**	**167**	**65,5**	**24,8**	**239**	**3,66**	**47,4**	**11,1**	**168**	**70,1**	**124**	**52,0**	**33,4**	**31,0**
	G	25,7		65,0	20,2	247	3,80	49,1	11,2	118	47,8	118	47,8	33,2	32,1
	G	21,4	168	74,4	28,4	228	3,06	*40,3*	12,0	166	72,8	125	54,8	29,3	27,9
	G	16,5	168	78,3	28,2	253	3,23	*42,3*	9,4	167	66,0	130	51,4	32,8	28,5
	G	23,6	162	60,4	23,4	234	3,87	50,0	10,5	148	63,2	90	38,5	30,9	29,1
	G	21,8	162	58,8	25,7	228	3,88	50,0	12,1	184	80,7	149	65,4	27,8	27,2
	G	21,4	177	71,4	25,6	209	2,93	***38,6***	11,3	129	61,7	75	35,9	30,3	28,4
Average Goaltenders	**6**	**21,7**	**167**	**68,1**	**25,3**	**233**	**3,46**	**45,0**	**11,1**	**152**	**65,4**	**115**	**48,9**	**30,7**	**28,9**

Attachment 8. Women national team test results and averages in the year 2002.

7.6.2002						Maximal endurance Anaerobic power				Thresholds Anaerobic		Aerobic			
	Position	Age years	Length cm	Weight kg	Fat % %	Peak Power W	Rel. Power w/kg	VO 2 ml/kg	Max. Lactate mmol/l	Work W	Työ-%	Work W	Työ-%	Static cm	Counterm. cm
	D	21,5	173	83,0	29,4	279	3,36	43,8	9,7	200	71,7	150	53,8	32,1	33,9
	D	26,7	179	77,3	24,9	263	3,40	44,3	7,9	188	71,5	135	51,3	31,3	36,6
	D	21,6	157	63,0	25,9	240	3,81	49,2	9,5	175	72,9	133	55,4	29,0	30,9
	D	19,4	171	58,1	19,9	246	4,23	54,3	8,9	154	62,6	113	45,9	39,4	37,2
	D	21,6	170	75,3	24,5									29,6	33,5
	D	21,2	164	64,4	24,9	250	3,88	50,1	8,0	154	61,6	96	38,4	31,1	31,8
Average Defenders	**6**	**22,0**	**169**	**70,2**	**24,9**	**256**	**3,74**	**48,4**	**8,8**	**174**	**68,1**	**125**	**49,0**	**32,1**	**34,0**
	F	24,4	164	56,7	22,3									28,3	29,7
	F	19,7	173	63,7	22,0	225	3,53	45,9	6,9	160	71,1	98	43,6	29,7	29,9
	F	24,6	167	59,3	15,3	233	3,93	50,7	9,7	175	75,1	125	53,6	40,8	43,6
	F	22,4	165	59,6	19,2	225	3,78	48,8	9,1	177	78,7	120	53,3	33,9	34,8
	F	21,6	158	64,7	30,4									23,1	25,5
	F	23,6	172	68,1	28,8	252	3,70	47,9	9,4	190	75,4	150	59,5	26,4	25,6
	F	24,8	171	69,9	25,6	266	3,81	49,2	11,2	163	61,3	127	47,7	30,5	33,7
	F	24,3	163	71,4	30,5	250	3,50	45,5	9,8	156	62,4	106	42,4	33,5	36,2
	F	26,6	159	64,9	26,1	244	3,76	48,6	11,0	144	59,0	100	41,0	36,3	41,4
	F	20,9	172	60,8	21,6	208	3,42	44,6	9,4	160	76,9	115	55,3	26,9	28,0
	F	24,2	168	63,5	21,4	264	4,16	53,4	11,2	185	70,1	135	51,1	32,8	35,6
	F	24,2	180	70,3	23,6	238	3,39	44,1	8,9	133	55,9	75	31,5	31,6	32,1
	F	21,3	158	69,0	26,8	213	3,09	40,5	9,8	160	75,1	115	54,0		
	F	22,9	169	59,3	22,1	198	3,34	43,6	7,5	121	61,1	70	35,4	34,7	40,1
	F	21,2	168	71,0	28,7	226	3,18	41,7	9,2	161	71,2	129	57,1	32,3	35,8
Average Forwards	**15**	**23,1**	**167**	**64,8**	**24,3**	**234**	**3,58**	**46,5**	**9,5**	**160**	**68,7**	**113**	**48,1**	**31,5**	**33,7**
	G	26,7	161	66,2	21,0	263	3,97	51,2	9,9	163	62,0	115	43,7	33,8	33,0
	G	22,8	163	57,5	21,8	203	3,53	45,9	9,0	173	85,2	131	64,5	29,7	30,0
	G	22,4	177	72,3	26,2	234	3,24	42,3	8,8	163	69,7	129	55,1	28,8	32,5
Average Goaltenders	**3**	**24,0**	**167**	**65,3**	**23,0**	**233**	**3,58**	**46,5**	**9,2**	**166**	**72,3**	**125**	**54,5**	**30,8**	**31,9**
Average 2002	**24**	**22,9**	**167**	**66,2**	**24,3**	**239**	**3,62**	**46,9**	**9,3**	**165**	**69,1**	**117**	**49,2**	**31,5**	**33,5**
Minimum		19,4	157	56,7	15,3	198	3,09	40,5	6,9	121	55,9	70	31,5	23,1	25,5
Maximum		26,7	180	83,0	30,5	279	4,23	54,3	11,2	200	85,2	150	64,5	40,8	43,6
Median		22,6	168	64,8	24,7	240	3,53	45,9	9,4	163	71,1	120	51,3	31,3	33,5

Attachment 9. Women national team test results and averages in the year 2003.

3.6.2003	Position	Age years	Length cm	Weight kg	Fat % %	Maximal endurance Anaerobic power Peak Power W	Rel. Power w/kg	VO 2 ml/kg	Max. Lactate mmol/l	Thresholds Anaerobic Work W	Työ-%	Aerobic Work W	Työ-%	Static cm	Counterm. cm
	D	21,5	173	77,8	23,3	291	3,74	48,4	10,2	203	69,8	169	58,1	34,1	35,1
	D	26,7	179	77,5	22,8	269	3,47	45,2	9,9	200	74,3	158	58,7	33,9	38,2
	D	21,2	164	62,1	22,5	256	4,12	53,0	9,7	161	62,9	111	43,4	31,3	35,8
	D	19,1	169	74,0	27,6	263	3,55	46,1	11,7	189	71,9	135	51,3	28,0	31,5
	D	19,2	169	66,2	23,1	228	3,44	44,8	10,2	138	60,5	74	32,5	33,7	35,5
	D	20,6	170	71,7	20,0	227	3,17	41,5	12,8	165	72,7	124	54,6	35,9	36,7
	D	19,6	172	65,3	19,4	206	3,15	41,4	9,5	138	67,0	99	48,1	29,7	33,0
	D	21,3	156	65,0	24,1									26,6	29,2
Average Defenders	**8**	**21,1**	**169**	**70,0**	**22,9**	**249**	**3,52**	**45,8**	**10,6**	**171**	**68,4**	**124**	**49,5**	**31,6**	**34,4**
	F	24,3	162	74,0	32,5	275	3,72	48,1	13,7	188	68,4	138	50,2	30,8	33,4
	F	21,2	168	67,7	24,3	227	3,35	43,7	9,1	154	67,8	106	46,7	31,0	32,8
	F	26,6	158	71,6	28,3	227	3,17	41,5	9,6	134	59,0	85	37,4	33,2	38,6
	F	21,3	157	67,3	23,8	194	2,88	38,1	11,1	131	67,5	70	36,1	35,5	34,4
	F	23,6	172	64,5	23,8	219	3,40	44,2	11,1	157	71,7	123	56,2	27,7	27,6
	F	22,4	165	61,4	19,9	237	3,86	49,8	11,5	153	64,6	88	37,1	36,8	37,9
	F	24,2	168	65,1	19,1	259	3,98	51,2	11,1	185	71,4	133	51,4	31,9	34,1
	F	24,6	166	60,5	15,5	244	4,03	51,9	11,2	182	74,6	138	56,6	39,6	43,6
	F	24,8	170	71,0	24,0	253	3,56	46,3	11,6	169	66,8	123	48,6	31,6	32,8
	F	24,2	164	71,0	30,5	244	3,44	44,7	9,1	163	66,8	98	40,2	31,1	32,9
	F	22,9	170	61,2	21,2	201	3,28	42,9	8,7	127	63,2	50	24,9	33,0	33,0
Average Forwards	**11**	**23,6**	**165**	**66,8**	**23,9**	**235**	**3,52**	**45,7**	**10,7**	**158**	**67,4**	**105**	**44,1**	**32,9**	**34,6**
	G	22,4	176	69,8	23,5	213	3,05	40,1	9,8	154	72,3	121	56,8	28,6	29,6
	G	22,8	162	56,3	18,8	197	3,50	45,5	8,5	162	82,2	127	64,5	26,6	29,1
Average Goaltenders	**2**	**22,6**	**169**	**63,1**	**21,2**	**205**	**3,28**	**42,8**	**9,2**	**158**	**77,3**	**124**	**60,6**	**27,6**	**29,3**
Average 2003	**21**	**22,6**	**167**	**67,7**	**23,2**	**237**	**3,49**	**45,4**	**10,5**	**163**	**68,8**	**114**	**47,7**	**31,9**	**34,0**
Minimum		19,1	156	56,3	15,5	194	2,88	38,1	8,5	127	59,0	50	24,9	26,6	27,6
Maximum		26,7	179	77,8	32,5	291	4,12	53,0	13,7	203	82,2	169	64,5	39,6	43,6
Median		22,4	168	67,3	23,3	233	3,46	45,0	10,2	162	68,1	122	49,4	31,6	33,4

Attachment 10. Women national team test results and averages in the year 2004.

3.6.2004	Position	Age years	Length cm	Weight kg	Fat % %	Maximal endurance Anaerobic power Peak Power W	Rel. Power w/kg	VO 2 ml/kg	Max. Lactate mmol/l	Thresholds Anaerobic Work W	Työ-%	Aerobic Work W	Työ-%	Static cm	Counterm. cm
	D	15,2	160	61,0	24,8	225	3,69	47,8	10,6	119	52,9	81	36,0	31,3	32,8
	D	26,7	180	75,3	23,1	231	3,07	40,3	11,2	162	70,1	106	45,9	32,8	36,3
	D	21,2	165	63,9	20,6	269	4,21	54,0	11,8	142	52,8	105	39,0	32,5	35,4
	D	19,1	169	73,4	30,5	263	3,58	46,5	11,0	177	67,3	127	48,3	26,7	31,4
Average Defenders	**4**	**20,5**	**168**	**68,4**	**24,8**	**247**	**3,64**	**47,1**	**11,2**	**150**	**60,8**	**105**	**42,3**	**30,8**	**34,0**
	F	30,5	164	67,2	22,1	241	3,59	46,5	11,5	157	65,1	119	49,4	27,3	29,7
	F	22,4	166	63,3	20	247	3,90	50,3	9,0	183	74,1	115	46,6	34,3	37,1
	F	24,8	170	63,4	21,9		3,94	50,8	11,3	167	66,8	115	46,0	29,8	31,5
	F	24,3	163	73,3	29,9	266	3,63	47,0	11,8	177	66,5	113	42,5	30,2	33,2
	F	26,6	159	65,9	25,8	241	3,66	47,4	11,2	166	68,9	110	45,6	37,0	41,1
	F	24,2	169	65,4	21,5	266	4,07	52,3	10,1	200	75,2	144	54,1	31,6	33,3
	F	23,6	162	67,4	22,6	284	4,21	54,1	11,9	185	65,1	145	51,1	31,9	35,2
	F	24,2	165	70,0	29,4	278	3,97	51,2	10,9	200	71,9	150	54,0	32,0	33,7
	F	21,3	159	69,0	28,6									30,0	31,3
	F	16,4	169	65,8	23,5	241	3,66	47,5	10,4	175	72,6	135	56,0	29,4	32,9
	F	16,5	163	58,8	20,4	247	4,20	53,9	11,9	175	70,9	121	49,0	36,7	40,4
	F	21,2	168	67,9	27,1	244	3,59	46,6	9,6	174	71,3	135	55,3	31,1	33,8
Average Forwards	**12**	**23,0**	**165**	**66,5**	**24,4**	**256**	**3,86**	**49,8**	**10,9**	**178**	**69,9**	**127**	**50,0**	**31,8**	**34,4**
	G	18,4	161	50,5	18,5	175	3,47	45,1	10,7	111	63,4	72	41,1	31,6	33,4
	G		169	58,0	22,8									24,2	25,9
	G	17,5	169	76,3	34,4	244	3,20	41,9	9,6	194	79,5	122	50,0	28,7	31,4
	G	22,4	177	74,0	25,9	225	3,04	40,0	10,2	152	67,6	94	41,8	26,1	29,4
Average Goaltenders	**4**	**19,4**	**169**	**64,7**	**25,4**	**215**	**3,23**	**42,3**	**10,2**	**152**	**70,2**	**96**	**44,3**	**27,7**	**30,0**
Average 2004	**20**	**21,9**	**166**	**66,5**	**24,7**	**246**	**3,70**	**48,0**	**10,8**	**168**	**67,9**	**117**	**47,3**	**30,8**	**33,5**
Minimum		15,2	159	50,5	18,5	175	3,04	40,0	9,0	111	52,8	72	36,0	24,2	25,9
Maximum		30,5	180	76,3	34,4	284	4,21	54,1	11,9	200	79,5	150	56,0	37,0	41,1
Median		22,4	165	66,6	23,3	244	3,66	47,4	11,0	175	68,2	117	47,4	31,2	33,2

Attachment 10. Women national team test results and averages in the year 2005.

6.6.2005						Maximal endurance				Thresholds					
						Anaerobic power				Anaerobic		Aerobic			
	Position	Age	Length	Weight	Fat %	Peak Power	Rel. Power	VO 2	Max. Lactate	Work		Work		Static	Counterm.
		years	cm	kg	%	W	w/kg	ml/kg	mmol/l	W	Työ-%	W	Työ-%	cm	cm
	D	19,2	169	66,7	22,4	234	3,51	45,6	13,7	135	57,7	80	34,2	35,9	40,3
	D	21,5	173	75,4	23,3	300	3,98	51,2	14,3	210	70,0	167	55,7	34,3	35,9
	D	26,7	179	80,4	27,2	253	3,15	41,3	10,2	169	66,8	106	41,9	29,9	33,0
	D	20,5	159	60,9	26,5	231	3,79	49,0	13,0	117	50,6	63	27,3	34,1	36,3
	D	16,8	166	67,1	23,1										
	D	19,4	172	58,0	19,4	247	4,26	54,6	12,5	171	69,2	117	47,4	39,4	40,4
Average Defenders	**6**	**20,7**	**170**	**68,1**	**23,7**	**253**	**3,74**	**48,3**	**12,7**	**160**	**62,9**	**107**	**41,3**	**34,7**	**37,2**
	F	22,4	165	63,2	20	244	3,86	49,8	11,3	179	73,4	115	47,1	34,4	36,3
	F	23,2	160	58,9	23,7	231	3,92	50,6	11,7	169	73,2	115	49,8	31,0	31,8
	F	23,6	173	68,3	27,1	256	3,75	48,5	12,5	188	73,4	142	55,5	25,9	29,6
	F	24,8	170	65,0	22,4	244	3,75	48,5	11,0	156	63,9	102	41,8	33,7	35,2
	F	17,3	170	65,9	21,3	225	3,41	44,5	11,1	163	72,4	108	48,0	30,7	35,1
	F	24,3	163	72,2	28,6	275	3,81	49,2	11,4	221	80,4	156	56,7	32,6	35,0
	F	20,9	172	62,5	22,7	225	3,60	46,7	12,0	175	77,8	129	57,3	31,6	34,8
	F	24,2	168	63,3	18,5	259	4,09	52,6	11,9	181	69,9	131	50,6	34,7	36,6
	F	24,2	165	68,0	29,8	269	3,96	51,0	11,8	188	69,9	119	44,2	35,6	38,6
	F	16,4	169	63,5	23,7	266	4,19	53,8	12,7	185	69,5	135	50,8	35,6	38,0
	F	16,5	162	59,3	21,5	238	4,01	51,7	15,5	156	65,5	70	29,4	34,8	36,8
	F	21,2	168	67,2	27,3	253	3,76	48,7	10,6	173	68,4	119	47,0	29,7	32,4
Average Forwards	**12**	**21,6**	**167**	**64,8**	**23,9**	**249**	**3,84**	**49,6**	**12,0**	**178**	**71,5**	**120**	**48,2**	**32,5**	**35,0**
	G	18,4	161	52,5	21,7	203	3,87	49,9	10,7	140	69,0	102	50,2	29,0	31,1
	G	17,5		72,1		250	3,47	45,1	9,7	154	61,6	88	35,2		
	G	13,0	165	55,5	24,1	219	3,95	50,9	9,5	125	57,1	75	34,2	31,8	35,2
Average Goaltenders	**3**	**16,3**	**163**	**60,0**	**22,9**	**224**	**3,76**	**48,6**	**10,0**	**140**	**62,5**	**88**	**39,9**	**30,4**	**33,2**
Average 2005	**21**	**20,58**	**167**	**65,04**	**23,72**	**246**	**3,80**	**49,15**	**11,9**	**168**	**68,0**	**112**	**45,2**	**32,89**	**35,39**
Minimum		13,0	159	52,5	18,5	203	3,15	41,3	9,5	117	50,6	63	27,3	25,9	29,6
Maximum		26,7	179	80,4	29,8	300	4,26	54,6	15,5	221	80,4	167	57,3	39,4	40,4
Median		20,9	168	65,0	23,2	246	3,83	49,5	11,8	170	69,4	115	47,2	33,7	35,2

Attachment 11. Women national team test results and averages in the year 2006.

11.6.2006	Position	Age years	Length cm	Weight kg	Fat % %	Maximal endurance Anaerobic power Peak Power W	Rel. Power w/kg	VO 2 ml/kg	Max. Lactate mmol/l	Thresholds Anaerobic Work W	Työ-%	Aerobic Work W	Työ-%	Static cm	Counterm. cm
	D	25	174	74,6	23,8	281	3,77	48,7	12,0	192	68,3	120	42,7	32,8	32,6
	D	24	159	59,4	26,2	225	3,79	49,0	13,7	106	47,1	50	22,2	31,3	34,7
	D	25	164	63,8	24,5	278	4,36	55,8	10,1	158	56,8	100	36,0	34,1	33,2
	D	18	164	53,9	23,2	200	3,71	48,0	12,2	131	65,5	86	43,0	28,8	28,0
	D	23	171	59,2	19,9	253	4,27	54,8	12,0	165	65,2	105	41,5	38,9	39,7
	D	19	170	60,0	23,7	237	3,95	50,9	8,4	180	75,9	111	46,8	27,1	28,4
	D	23	168	75,0	32,2	266	3,55	46,1	12,8	160	60,2	100	37,6	29,0	29,7
Average Defenders	**7**	**23**	**167**	**63,7**	**24,8**	**249**	**3,91**	**50,5**	**11,6**	**156**	**62,7**	**96**	**38,5**	**31,7**	**32,3**
	F	19	169	70,2	28,7	225	3,21	42,0	11,2	143	63,6	100	44,4	27,2	26,6
	F	26	165	63,1	20	256	4,06	52,2	10,9	155	60,5	90	35,2	37,2	35,8
	F	16	164	71,1	29,8	256	3,60	46,7	11,6	175	68,4	120	46,9	30,7	30,8
	F	26	157	61,7	30,1	184	2,98	39,3	8,9	115	62,5	75	40,8	29,9	31,1
	F	21	166	67,4	27,2	266	3,95	50,9	11,0	195	73,3	115	43,2	27,4	28,7
	F	29	170	65,0	24,2	250	3,85	49,7	9,4	191	76,4	130	52,0	32,9	33,0
	F	26	170	64,7	21,1	250	3,86	49,9	9,5	185	74,0	100	40,0	31,9	35,0
	F	20	169	65,3	24	275	4,21	54,0	10,1	178	64,7	125	45,5	33,2	34,2
	F	21	163	59,8	23,1	225	3,76	48,7	11,1	129	57,3	75	33,3	34,4	36,4
Average Forwards	**9**	**23**	**166**	**65,4**	**25,4**	**243**	**3,72**	**48,1**	**10,4**	**163**	**66,7**	**103**	**42,4**	**31,6**	**32,4**
	G	22	161	53,4	24,6	181	3,39	44,2	10,8	112	61,9	82	45,3	30,0	29,4
	G	19	168	61,8	24,5	253	4,09	52,6	10,2	138	54,5	75	29,6	32,8	33,0
	G	17	164	62,4	27,4	206	3,30	43,1	9,1	125	60,7	75	36,4	34,4	35,2
Average Goaltenders	**3**	**20**	**164**	**59,2**	**25,5**	**213**	**3,59**	**46,6**	**10,0**	**125**	**59,0**	**77**	**37,1**	**32,4**	**32,6**
Average 2006	**19**	**22**	**166**	**63,8**	**25,2**	**240**	**3,77**	**48,8**	**10,8**	**154**	**64,0**	**97**	**40,1**	**31,8**	**32,4**
Minimum		16	157	53,4	19,9	181	2,98	39,3	8,4	106	47,1	50	22,2	27,1	26,6
Maximum		29	174	75,0	32,2	281	4,36	55,8	13,7	195	76,4	130	52,0	38,9	39,7
Median		22	166	63,1	24,5	250	3,79	49,0	10,9	158	63,6	100	41,5	31,9	33,0

Attachment 12. Women national team test results and averages in the year 2007.

8.6.2007	Position	Age years	Length cm	Weight kg	Fat % %	Maximal endurance Anaerobic power Peak Power W	Rel. Power w/kg	VO 2 ml/kg	Max. Lactate mmol/l	Thresholds Anaerobic Work W	Työ-%	Aerobic Work W	Työ-%	Static cm	Counterm. cm
	D	20	162	63,2	25,8	238	3,77	48,7	11,0	164	68,9	118	49,6	31,5	33,9
	D	18	185	78,0	24	288	3,69	47,8	10,8	185	64,2	133	46,2	35,4	35,4
	D	25	159	60,0	28,0	216	3,60	46,7		121	56,0	70	32,4		
	D	19	164	52,8	22,9	191	3,62	46,9	12,6	109	57,1	73	38,2	26,7	27,2
	D	21	157	67,4	26,5	225	3,34	43,6	11,7	147	65,3	113	50,2	35,6	36,6
	D	28	170	62,8	23,6	228	3,63	47,1	9,8	129	56,6	66	28,9	32,0	33,2
Average Defenders	**6**	**22**	**166**	**64,0**	**25,1**	**231**	**3,61**	46,8	**11,2**	**143**	**61,4**	**96**	**40,9**	**32,3**	**33,2**
	F	22	170	64,0	26,9	213	3,33	43,4	10,8	113	53,1	50	23,5	39,1	40,3
	F	28	160	59,1	22,5	231	3,91	50,4	12,3	161	69,7	118	51,1		
	F	18	169	69,9	26,1	238	3,40	44,4	11,9	154	64,7	110	46,2	31,1	32,8
	F	29	163	70,2	29,2	266	3,79	49,0	12,2	178	66,9	131	49,2	31,1	31,5
	F	26													
	F	26	158	65,5	22,1	228	3,48	45,3	12,0	147	64,5	120	52,6	33,8	34,1
	F	20	169	71,3	28,1	225	3,16	41,4	11,2	155	68,9	118	52,4	31,5	31,3
	F	21	169	66,3	24,1	253	3,82	49,3	11,8	196	77,5	160	63,2	31,6	32,9
	F	22	164	59,7	23,4	231	3,87	49,9	11,9	150	64,9	102	44,2	33,9	34,4
Average Forwards	**9**	**24**	**165**	**65,8**	**25,3**	**236**	**3,59**	46,6	**11,8**	**157**	**66,3**	**114**	**47,8**	**33,2**	**33,9**
	G	23	161	52,9	24	194	3,67	47,5	10,6	123	63,4	89	45,9	30,3	30,2
	G	20	168	63,7	25,3	247	3,88	50,0	10,6	140	56,7	92	37,2	33,5	32,6
	G	22	167	74,8	35,2	250	3,34	43,6	9,8	148	59,2	92	36,8	27,1	28,4
	G	18	166	63,9	25,6	222	3,47	45,2	10,4	155	69,8	102	45,9	32,6	34,4
	G	19	171	64,5	26,8	194	3,01	39,6	9,7	113	58,2	50	25,8	26,7	28,5
Average Goaltenders	**5**	**21**	**166**	**64,0**	**27,4**	**221**	**3,47**	45,2	**10,2**	**136**	**61,5**	**85**	**38,3**	**30,1**	**30,8**
Average 2007	**20**	**23**	**165**	**64,8**	**25,7**	**232**	**3,60**	46,7	**11,3**	**149**	**63,7**	**103**	**44,1**	**32,3**	**33,1**
Minimum		18	157	52,8	22,1	191	3,01	39,6	9,7	109	53,1	50	23,5	26,7	27,2
Maximum		29	185	78,0	35,2	288	3,91	50,4	12,6	196	77,5	160	63,2	39,1	40,3
Median		21	166	64,0	25,6	228	3,62	46,9	11,1	148	64,5	102	45,9	31,6	32,9

Attachment 13. Women national team test results and averages in the year 2008.

5.6.2008	Position	Age years	Length cm	Weight kg	Fat % %	Maximal endurance Anaerobic power Peak Power W	Rel. Power w/kg	VO 2 ml/kg	Max. Lactate mmol/l	Thresholds Anaerobic Work W	Työ-%	Aerobic Work W	Työ-%	Static cm	Counterm. cm
	D	21	162	59,7	20,8	254	4,25	54,6	11,9	179	70,5	110	43,3	34,9	36,5
	D	19	183	82,0	26,1	305	3,72	48,1	11,2	200	65,6	142	46,6	36,8	38,4
	D	26	159	58,8		233	3,96	51,1		100	42,9	40	17,2		
	D	20	165	55,7	23,2	206	3,70	47,9	10,2	152	73,8	104	50,5	28,6	29,2
	D	21	170	59,2	22,3	250	4,22	54,2	11,0	156	62,4	96	38,4	29,2	29,1
	D	22	157	67,5	25,9	215	3,19	41,7	10,1	138	64,2	90	41,9	35,6	37,4
Average Defenders	**6**	**22**	**166**	**63,8**	**23,7**	**244**	**3,84**	49,6	**10,9**	**154**	**63,2**	**97**	**39,6**	**33,0**	**34,1**
	F	18	166	72,4	31,2	250	3,45	44,9	13,9	156	62,4	100	40,0	28,9	30,2
	F	23	166	70,0	27,8	266	3,80	49,1	10,6	192	72,2	135	50,8	25,4	26,1
	F	19	170	70,2	25,0	220	3,13	41,1	10,2	146	66,4	104	47,3	30,4	33,7
	F	23	172	67,5	22,1	250	3,70	47,9	13,1	193	77,2	128	51,2	27,1	27,5
	F	20	164	53,1	20,8	203	3,82	49,4	10,4	147	72,4	93	45,8	29,9	31,8
	F	19	165	63,1	26,7	193	3,06	40,2	8,9	144	74,6	78	40,4	32,2	34,1
	F	21	170	75,8	28,9	222	2,93	38,6	8,7	163	73,4	125	56,3	30,3	30,9
	F	21	165	66,8	26,8	231	3,46	45,0	10,7	170	73,6	127	55,0	26,7	28,4
	F	18	166	67,2	24,6	259	3,85	49,8	16,0	186	71,8	127	49,0	30,7	33,5
	F	23	164	60,2	22,6	227	3,77	48,7	12,5	150	66,1	98	43,2	34,4	34,8
	F	18	166	68,5	26,2	229	3,34	43,6	13,8	168	73,4	93	40,6	25,4	26,4
Average Forwards	**11**	**20**	**166**	**66,8**	**25,7**	**232**	**3,48**	45,3	**11,7**	**165**	**71,2**	**110**	**47,2**	**29,2**	**30,7**
	G	24	162	53,3	24,1	198	3,71	48,1	9,3	129	65,2	93	47,0	29,8	31,1
	G	19	167	57,5	23,9	194	3,37	44,0	12,1	142	73,2	105	54,1	30,5	31,6
Average Goaltenders	**2**	**21**	**164**	**55,4**	**24,0**	**196**	**3,54**	46,0	**10,7**	**136**	**69,2**	**99**	**50,5**	**30,2**	**31,4**
Average 2008	**19**	**21**	**166**	**64,7**	**24,9**	**232**	**3,60**	46,7	**11,4**	**158**	**68,5**	**105**	**45,2**	**30,4**	**31,7**
Minimum	18	157	53,1	20,8		193	2,93	38,6	8,7	100	42,9	40	17,2	25,4	26,1
Maximum	26	183	82,0	31,2		305	4,25	54,6	16,0	200	77,2	142	56,3	36,8	38,4
Median	21	166	66,8	24,8		229	3,70	47,9	10,9	156	71,8	104	46,6	30,1	31,4

Attachment 14. Women national team test results and averages in the year 2009.

5.6.2009	Position	Age years	Length cm	Weight kg	Fat % %	Maximal endurance Anaerobic power Peak Power W	Rel. Power w/kg	VO 2 ml/kg	Thresholds Anaerobic Max. Lactate mmol/l	Work W	Työ-%	Aerobic Work W	Työ-%	Static cm	Counterm. cm
	D	22	162	60,5	22,5	253	4,18	53,7	14,0	204	80,6	131	51,8	36,1	37,9
	D	18	162	55,9	22,3	197	3,52	45,8	11,1	132	67,0	86	43,7	35,1	36,0
	D	20	185	83,0	26,2	303	3,65	47,3	13,9	208	68,6	162	53,5	32,8	34,6
	D	21	187	80,0	25,2	278	3,48	45,2	12,7	211	75,9	144	51,8	34,2	34,7
	D	26	172	61,5	22,1	259	4,21	54,0	14,6	162	62,5	75	29,0		
	D	18	172	63,0	26,7	230	3,65	47,3	11,1	175	76,1	113	49,1	31,3	31,0
	D	27	159	58,8	24,1	247	4,20	53,9	18,4	143	57,9	75	30,4	32,9	35,3
	D	18	168	67,9	27,0	249	3,67	47,5	15,8	194	77,9	157	63,1	26,0	26,5
Average Defenders	**8**	**21**	**171**	**66,3**	**24,5**	**252**	**3,82**	**49,3**	**14,0**	**179**	**70,8**	**118**	**46,5**	**32,6**	**33,7**
	F	19	166	70,5	27,1	250	3,55	46,1	12,1	186	74,4	132	52,8	29,4	31,8
	F	18	170	59,3	20,7	225	3,79	49,0	13,6	119	52,9	64	28,4	29,0	29,9
	F	20	170	72,4	24,9	225	3,11	40,8	12,8	175	77,8	127	56,4	28,8	31,5
	F	17	175	66,8	26,9	229	3,43	44,6	9,7	142	62,0	103	45,0	26,7	25,8
	F	21	165	56,4	23,0	197	3,49	45,4	11,6	136	69,0	94	47,7	27,5	29,2
	F	20												30,6	33,0
	F	28	171	66,6	27,0	227	3,41	44,4	13,4	147	64,8	98	43,2	30,8	32,2
	F	19	165	69,2	24,4	266	3,84	49,6	19,0	200	75,2	135	50,8	32,2	33,0
	F	23	169	67,3	24,5	250	3,71	48,1	10,9	183	73,2	143	57,2	33,9	33,4
	F	28	168	71,3	28,6	256	3,59	46,6	12,4	200	78,1	152	59,4	28,6	30,4
	F	19	166	72,3	28,7	234	3,24	42,3	14,5	173	73,9	117	50,0		
Average Forwards	**11**	**21**	**169**	**67,2**	**25,6**	**236**	**3,52**	**45,7**	**13,0**	**166**	**70,1**	**117**	**49,1**	**29,8**	**31,0**
	G	17	176	60,5	24,7	219	3,62	46,9	12,4	129	58,9	78	35,6	24,3	25,6
	G	25	161	53,4	22,8	183	3,43	44,6	11,5	118	64,5	73	39,9	28,9	29,5
	G	22	169	65,5	25,9	244	3,73	48,2	12,6	167	68,4	100	41,0	33,2	33,3
	G	21	168	63,0	28,1	169	2,68	35,7	9,8	115	68,0	82	48,5	26,5	24,6
	G	20	166	69,3	26,9	229	3,30	43,2	12,4	153	66,8	79	34,5	30,2	31,1
	G	19	163	63,5	26,2	175	2,76	36,6	6,8	133	76,0	75	42,9	24,6	26,4
Average Goaltenders	**6**	**21**	**167**	**62,5**	**25,8**	**203**	**3,25**	**42,5**	**10,9**	**136**	**67,1**	**81**	**40,4**	**28,0**	**28,4**
Average 2009	**25**	**21**	**169**	**65,7**	**25**	**233**	**3,55**	**46,1**	**12,8**	**163**	**69,6**	**108**	**46,1**	**30,2**	**31,2**
Minimum		17	159	53,4	21	169	2,68	35,7	6,8	115	52,9	64	28,4	24,3	24,6
Maximum		28	187	83,0	29	303	4,21	54,0	19,0	211	80,6	162	63,1	36,1	37,9
Median		20	168	66,1	26	232	3,57	46,4	12,5	165	68,8	102	48,1	30,2	31,5

Attachment 15. Women national team test results and averages in the year 2010.

.8.2010						Maximal endurance Anaerobic power				Thresholds Anaerobic		Aerobic			
	Position	Age years	Length cm	Weight kg	Fat % %	Peak Power W	Rel. Power w/kg	VO 2 ml/kg	Max. Lactate mmol/l	Work W	Työ-%	Work W	Työ-%	Static cm	Counterm. cm
	D	19	174											26,2	27,9
	D	27	169	68,3	26,5									29,0	32,3
	D	23	162	60,4	19,8									39,6	43,6
	D	23	164	72,5	31,6									29,8	31,3
	D	19	163	55,4	22,6									31,3	35,2
	D	22	184	87,0	28,6									33,4	34,8
	D	23	186	79,8	22,4									35,1	37,3
	D	22	165	57,5	23,4										
	D	19	172	67,0	27,2									25,0	26,9
	D	19	167	67,5	24,9									26,4	27,4
Average Defenders	**10**	**22**	**170**	**68,4**	**25,2**									**30,6**	**33,0**
	F	22	162	57,4	23,0									28,3	30,7
	F	27	169	70,0	26,0									29,8	32,9
	F	22	162	58,7	22,9									30,9	33,1
	F	21	170	72,3	25,2									30,3	33,7
	F	30	158	65,1	32,2									30,4	31,2
	F	20	165	60,2	22,3									29,7	31,1
	F	18	170	58,3	22,5									32,8	33,2
	F	18	176	66,8	24,1									29,0	28,4
	F	22	163	54,9	22,2										
	F	21	164	64,3	24,5									35,0	38,4
	F	32	163	66,9	25,8									32,5	34,4
	F	18	172	64,3	24,5									34,2	35,9
	F	21	170	63,9	27,3									33,3	35,6
	F	19	166	57,7	22,4									28,2	30,1
	F	17	177	64,1	22,4									32,2	33,7
	F	23	165	62,0	18,7									30,0	32,6
	F	20	165	69,5	24,7										
	F	25	169	66,8	24,7									34,0	35,9
Average Forwards	**18**	**22**	**167**	**63,5**	**24,2**									**31,3**	**33,2**
	G	18	174	60,8	24,6									25,3	26,6
	G	27	161	56,0	24,0									26,5	28,1
	G	21	170	63,5	25,8									27,1	30,8
	G	21	165	66,6	25,0									35,9	38,9
	G	26	179	67,0	24,8									27,0	28,5
Avearge Goaltenders	**5**	**23**	**170**	**62,8**	**24,8**									**28,4**	**30,6**
Average 2010	**33**	**22**	**168**	**64,8**	**24,6**									**30,6**	**32,7**
Minimum		17	158	54,9	18,7									25,0	26,6
Maximum		32	186	87,0	32,2									39,6	43,6
Median		21	167	64,3	24,6									30,2	32,8

Attachment 16. Women national team test results and averages in the year 2011.

4.8.2011	Position	Age years	Length cm	Weight kg	Fat % %	Maximal endurance Anaerobic power Peak Power W	Rel. Power w/kg	VO 2 ml/kg	Max. Lactate mmol/l	Thresholds Anaerobic Work W	Työ-%	Aerobic Work W	Työ-%	Static cm	Counterm. cm
	D	28	169	67,7	24,2	250	3,7	47,8	14,4	136	54,4	50	20,0	30,7	32,5
	D	24	162	66,8	21,5	271	4,1	52,2	13,5	188	69,4	120	44,3	43,2	43,5
	D	24	163	69,0	24,8	213	3,1	40,5		150	70,4	103	48,4		
	D	20	162	57,5	22,8	217	3,8	48,8	13,4	144	66,4	92	42,4	32,3	33,5
	D	24	187	80,2	24,3	310	3,9	49,9	14,9	221	71,3	156	50,3	33,4	33,4
	D	23	165	56,0	22,6	211	3,8	48,7	11,3	133	63,0	84	39,8	27,4	27,6
	D	18	164	65,0	25,8	227	3,5	45,4	11,3	165	72,7	125	55,1	28,5	29,5
	D	20	167	63,5	23,3	235	3,7	47,9	11,7	187	79,6	151	64,3	28,6	29,2
Average Defenders	**8**	**23**	**167**	**65,7**	**23,7**	**242**	**3,7**	**47,7**	**12,9**	**166**	**68,4**	**110**	**45,6**	**32,0**	**32,7**
	F	24	169	63,7	25,7	236	3,7	48,0	13,0	132	55,9	77	32,6	40,1	41,5
	F	21	165	72,2	28,1	240	3,3	43,4	11,0	173	72,1	105	43,8	28,6	29,9
	F	23	164	58,0	21,8	191	3,3	43,0	12,3	109	57,1	75	39,3	28,6	28,1
	F	21	166	61,0	22,1	234	3,8	49,5	11,2	151	64,5	102	43,6	31,7	31,6
	F	19	170	58,5	21,6	226	3,9	49,9	10,2	152	67,3	109	48,2	31,5	30,7
	F	19	175	69,0	25,7	251	3,6	47,2	8,0	172	68,5	113	45,0	27,0	26,2
	F	23	163	56,8	23,8	209	3,7	47,7	12,1	146	69,9	100	47,8	26,5	27,2
	F	22	164	72,3	27,2	247	3,4	44,5	14,1	204	82,6	151	61,1	33,7	32,9
	F	33	163	68,0	22,8	273	4,0	51,7	12,6	196	71,8	137	50,2	33,5	34,5
	F	22	170	66,0	25,6	251	3,8	49,1	11,4	177	70,5	118	47,0	35,4	36,6
	F	18	177	66,5	23,8	264	4,0	51,1	10,2	179	67,8	128	48,5	32,1	30,5
	F	24	170	68,5	24,2	228	3,3	43,3	12,6	166	72,8	125	54,8	30,5	32,2
	F	24	165	62,0	21,2	247	4,0	51,3	12,2	154	62,3	124	50,2	28,7	30,2
Average Forwards	**13**	**23**	**168**	**64,8**	**24,1**	**238**	**3,7**	**47,7**	**11,6**	**162**	**67,9**	**113**	**47,1**	**31,4**	**31,7**
	G	19	175	62,2	23,7	256	4,1	52,9	12,2	167	65,2	113	44,1	24,3	23,0
	G	23	167	60,7	24,2									29,5	30,2
	G	27	178	64,0	23,6	233	3,6	47,2	11,1	169	72,5	121	51,9	28,5	28,2
Average Goaltenders	**3**	**23**	**173**	**62,3**	**23,8**	**245**	**3,9**	**50,1**	**11,7**	**168**	**68,9**	**117**	**48,0**	**27,4**	**27,1**
Average 2011	**24**	**23**	**168**	**64,8**	**23,9**	**240**	**3,7**	**47,9**	**12,0**	**164**	**68,2**	**112**	**46,6**	**31,1**	**31,4**
Minimum		18	162	56,0	21,2	191	3,1	40,5	8,0	109	54,4	50	20,0	24,3	23,0
Maximum		33	187	80,2	28,1	310	4,1	52,9	14,9	221	82,6	156	64,3	43,2	43,5
Median		23	166	64,5	23,8	236	3,7	48,0	12,2	166	69,4	113	47,8	30,5	30,5

Attachment 17. Women national team test results and averages in the year 2012.

2.8.2012	Position	Age years	Length cm	Weight kg	Fat % %	Maximal endurance Anaerobic power Peak Power W	Rel. Power w/kg	VO 2 ml/kg	Max. Lactate mmol/l	Thresholds Anaerobic Work W	Työ-%	Aerobic Work W	Työ-%	Static cm	Counterm. cm
	D	29	168	69,1	27,0	235	3,4	44,3	11,4	143	60,9	83	35,3	28,5	30,0
	D	25	161	59,8	21,8	291	4,9	61,9	13,4	220	75,6	138	47,4	43,3	43,4
	D	17	169	74,3	28,2	281	3,8	48,9	11,3	197	70,1	138	49,1	30,8	30,4
	D	18	153	51,1	18,8	219	4,3	54,9	10,6	147	67,1	100	45,7	31,6	32,8
	D	25	186	82,4	27,2	308	3,7	48,4	12,0	220	71,4	163	52,9	33,2	33,2
	D	19	164	67,1	28,0	234	3,5	45,3	10,9	170	72,6	117	50,0	27,3	28,1
	D	21	168	65,7	28,1	249	3,8	49,0	10,0	197	79,1	155	62,2	27,3	25,5
Average Defenders	**7**	**22**	**167**	**67,1**	**25,6**	**260**	**3,9**	**50,4**	**11,4**	**185**	**71,0**	**128**	**49,0**	**31,7**	**31,9**
	F	18	160	61,8	27,2	244	3,9	50,9	11,5	140	57,4	80	32,8	32,0	33,2
	F	25	170	65,1	26,3	215	3,3	43,1	11,6	125	58,1	95	44,2	37,0	38,3
	F	18	166	77,0	32,1	263	3,4	44,5	12,2	200	76,0	127	48,3		
	F	22	166	59,3	25,1	239	4,0	51,9	11,0	170	71,1	119	49,8	28,8	28,0
	F	19	177	63,2	19,9	270	4,3	54,8	12,9	187	69,3	140	51,9	33,6	33,2
	F	25	164	62,5	18,2	255	4,1	52,5	12,3	194	76,1	140	54,9	29,2	31,2
	F	18	166	64,8	24,5	275	4,2	54,4	14,4	195	70,9	125	45,5	34,0	33,6
	F	22	165	71,6	26,1	229	3,2	41,9	13,1	152	66,4	102	44,5		
Average Forwards	**8**	**21**	**167**	**65,7**	**24,9**	**249**	**3,8**	**49,3**	**12,4**	**170**	**68,2**	**116**	**46,5**	**32,4**	**32,9**
	G	18	165	61,0	23,7	220	3,6	46,8	12,8	170	77,3	120	54,5	29,2	32,0
	G	24	170	60,0	25,0	215	3,6	46,5	8,3	152	70,7	103	47,9	30,4	32,0
	G	19	171	64,9	25,5	230	3,5	46,0	8,8	180	78,3	125	54,3	32,4	32,4
	G	28	178	63,2	23,6	238	3,8	48,7	13,2	180	75,6	138	58,0	26,6	29,2
Average Goaltenders	**4**	**22**	**171**	**62,3**	**24,5**	**226**	**3,6**	**47,0**	**10,8**	**171**	**75,5**	**122**	**53,7**	**29,7**	**31,4**
Average 2012	**19**	**22**	**168**	**65,5**	**25,1**	**248**	**3,8**	**49,2**	**11,7**	**176**	**70,7**	**121**	**48,9**	**31,5**	**32,1**
Minimum		17	153	51,1	18,2	215	3,2	41,9	8,3	125	57,4	80	32,8	26,6	25,5
Maximum		29	186	82,4	32,1	308	4,9	61,9	14,4	220	79,1	163	62,2	43,3	43,4
Median		21	166	64,8	25,5	239	3,8	48,7	11,6	180	71,1	125	49,1	30,8	32,0

Attachment 18. Women national team test results and averages in the year 2013.

10.8.2013						Maximal endurance Anaerobic power			Thresholds Anaerobic			Aerobic		Static	Counterm.
	Position	Age years	Length cm	Weight kg	Fat % %	Peak Power W	Rel. Power w/kg	VO 2 ml/kg	Max. Lactate mmol/l	Work W	Työ-%	Work W	Työ-%	cm	cm
	D	30	169	70,4	25,8	256	3,6	47,1	11,7	175	68,4	125	48,8		31,2
	D	26	162	59,9	18,7	303	5,1	64,2	13,3	202	66,7	138	45,5		45,8
	D	18	169	73,7	28,9	282	3,8	49,4	13,0	194	68,8	138	48,9		31,2
	D	19	152	52,6	21,5	207	3,9	50,7	10,0	140	67,6	95	45,9		34,9
	D	26	186	80,9	23,2	307	3,8	49,0	13,2	213	69,4	160	52,1		37,0
	D	20	164	65,7	26,8	224	3,4	44,4	10,3	155	69,2	125	55,8		32,4
	D	22	172	69,2	29,0	276	4,0	51,4	11,2	190	68,8	135	48,9		28,9
	D	31	172	61,0	21,4	255	4,2	53,7	10,0	180	70,6	125	49,0		
	D	32	159	58,4	23,3	244	4,2	53,6	15,0	163	66,8	105	43,0		37,0
	D	22	167	62,0	25,5										29,9
Average Defenders	**10**	**25**	**167**	**65,4**	**24,4**	**262**	**4,0**	**51,5**	**12,0**	**179**	**68,5**	**127**	**48,7**		**34,3**
	F	26	169	68,3	28,8	225	3,3	43,0	11,1	150	66,7	95	42,2		39,6
	F	23	166	71,0	26,7	202	2,8	37,6	7,8	155	76,7	113	55,9		29,6
	F	19	167	69,8	29,6	251	3,6	46,7	12,2	200	79,7	140	55,8		24,8
	F	21	169	60,0	22,5	250	4,2	53,5	11,9	180	72,0	130	52,0		34,9
	F	21	176	67,3	23,0	247	3,7	47,5	11,1	170	68,8	125	50,6		29,7
	F	17	176	73,0	25,4	286	3,9	50,5	14,3	200	69,9	138	48,3		27,3
	F	24	164	71,2	29,4	252	3,5	46,0	12,8	180	71,4	127	50,4		
	F	35	163	67,4	25,9	277	4,1	52,8	7,9	200	72,2	140	50,5		36,0
	F	18	164	71,0	28,9	233	3,3	42,9	12,4	145	62,2	100	42,9		32,8
	F	24	170	64,5	27,3	253	3,9	50,6	11,0	180	71,1	125	49,4		37,9
	F	18	174	67,0	22,4	275	4,1	52,8	10,5	200	72,7	150	54,5		40,6
	F	20	177	65,0	22,4	274	4,2	54,1	12,2	175	63,9	132	48,2		36,6
	F	27	170	67,7	23,2	251	3,7	48,0	10,6	185	73,7	130	51,8		37,5
	F	26	166	62,8	21,5	260	4,1	53,2	14,5	170	65,4	115	44,2		33,6
	F	23	165	69,7	24,2	273	3,9	50,5	14,0	200	73,3	136	49,8		34,5
	F	28	164	60,2	23,0	222	3,7	47,8	14,0	150	67,6	95	42,8		40,1
	F	19	168	67,3	24,1	275	4,1	52,5	11,5	200	72,7	125	45,5		32,4
	F	32	168	74,3	31,2	231	3,1	40,8	14,0	175	75,8	125	54,1		28,4
	F	23	166	73,5	24,6	290	3,9	50,8	12,8	220	75,9	150	51,7		26,2
Average Forwards	**19**	**23**	**168**	**67,9**	**25,5**	**254**	**3,8**	**48,5**	**11,9**	**181**	**71,1**	**126**	**49,5**		**33,5**
	G	19	164	63,3	23,7	260	4,1	52,8	15,9	182	70,0	125	48,1		34,5
	G	25	170	63,0	26,4	252	4,0	51,5	9,8	160	63,5	105	41,7		37,0
	G	18	173	63,5	23,8	226	3,6	46,2	10,4	162	71,7	118	52,2		32,4
	G	20	172	66,6	26,5	246	3,7	47,8	13,4	175	71,1	125	50,8		30,8
Average Goaltenders	**4**	**21**	**170**	**64,1**	**25,1**	**246**	**3,8**	**49,6**	**12,4**	**170**	**69,1**	**118**	**48,2**		**33,7**

Attachment 19. Women national team averages, medians, minimum and maximum values by the Olympiads.

	Position	Age years	Length cm	Weight kg	Fat % %	Maximal endurance Anaerobic power Peak Power W	Rel. Power w/kg	VO 2 ml/kg	Thresholds Anaerobic Max. Lactate mmol/l	Work W	Työ-%	Aerobic Work W	Työ-%	Static cm	Counterm. cm
Average Olympiad 1998	**92**	**23**	**167**	**66,3**	**21,2**	**238**	**3,61**	**46,8**	**11,2**	**174**	**72,9**	**128**	**53,5**	**33,8**	
Defenders	30	24	168	65,1	20,7	238	3,62	46,9	11,6	180	75,3	131	54,8	34,7	
Forwards	50	22	167	66,9	21,2	240	3,62	46,9	11,1	174	72,3	129	53,4	33,0	
Goalies	12	22	167	67,0	22,3	233	3,54	46,0	10,4	163	69,8	119	51,0	34,7	
Minimum		15	158	51,9	14,4	181	2,52	33,7	7,7	125	58,1	85	41,0	22,9	
Maximum		38	179	85,3	34,0	306	4,38	56,0	15,2	240	87,3	210	76,4	47,0	
Median		21	167	66,3	20,7	234	3,57	46,4	11,0	175	73,4	125	52,5	33,7	
Average Olympiad 2002	**123**	**22**	**167**	**65,5**	**23,0**	**238**	**3,65**	**47,3**	**12,1**	**165**	**69,2**	**121**	**50,4**	**33,3**	**30,4**
Defenders	40	23	167	65,3	22,8	236	3,64	47,3	11,6	162	68,5	117	49,5	33,1	30,6
Forwards	66	22	167	65,7	23,2	240	3,66	47,4	12,2	170	70,6	125	51,6	33,4	30,3
Goalies	17	22	165	65,3	22,9	236	3,64	47,2	12,4	155	65,8	115	48,4	33,7	30,1
Minimum		14	156	52,4	14,0	175	2,63	35,0	7,4	100	47,8	60	31,1	22,0	21,7
Maximum		37	180	87,2	30,7	303	4,60	58,7	18,0	265	88,3	248	82,7	50,1	45,8
Median		22	166	65,4	23,1	238	3,69	47,7	12,0	167	69,2	118	50,2	32,6	29,7
Average Olympiad 2006	**86**	**22**	**167**	**66,3**	**24,0**	**242**	**3,65**	**47,3**	**10,6**	**166**	**68,5**	**115**	**47,4**	**31,8**	**34,1**
Defenders	24	21	169	69,3	23,9	251	3,65	47,3	10,8	165	65,6	117	46,1	32,3	34,8
Forwards	50	23	166	65,6	24,1	243	3,70	47,9	10,7	169	69,4	116	47,6	32,1	34,4
Goalies	12	20	167	63,4	23,5	221	3,48	45,3	9,7	154	70,0	107	48,8	29,0	31,0
Minimum		13	156	50,5	15,3	175	2,88	38,1	6,9	111	50,6	50	24,9	23,1	25,5
Maximum		30	180	83,0	34,4	300	4,26	54,6	15,5	221	85,2	169	64,5	40,8	43,6
Median		22	168	65,9	23,5	244	3,66	47,5	10,6	165	69,5	117	48,3	31,6	33,7
Average Olympiad 2010	**83**	**22**	**167**	**64,8**	**25,3**	**234**	**3,62**	46,9	**11,6**	**156**	**66,6**	**103**	**43,8**	**31,0**	**32,0**
Defenders	27	22	168	64,6	24,6	245	3,80	49,1	12,1	159	64,9	103	41,7	32,4	33,3
Forwards	40	22	167	66,3	25,5	236	3,57	46,4	11,8	163	68,8	111	46,7	30,7	31,8
Goalies	16	21	166	61,5	26,0	210	3,42	44,6	10,5	134	64,1	84	40,4	29,7	30,3
Minimum		16	157	52,8	19,9	169	2,68	35,7	6,8	100	42,9	40	17,2	24,3	24,6
Maximum		29	187	83,0	35,2	305	4,36	55,8	19,0	211	80,6	162	63,2	39,1	40,3
Median		21	166	64,0	25,0	231	3,65	47,3	11,2	155	66,4	100	45,0	30,8	32,2
Average Olympiad 2014	**109**	**23**	**168**	**65,5**	**24,7**	**249**	**3,78**	**48,9**	**11,9**	**173**	**69,7**	**120**	**48,3**	**31,0**	**32,6**
Defenders	35	23	168	66,6	24,7	254	3,87	49,9	12,1	176	69,2	122	47,7	31,4	33,1
Forwards	58	23	167	65,6	24,7	248	3,74	48,4	11,9	173	69,5	120	48,1	31,5	32,9
Goalies	16	22	171	62,9	24,6	238	3,76	48,6	11,6	170	71,6	119	50,4	28,6	30,9
Minimum		17	152	51,1	18,2	191	2,85	37,6	7,8	109	54,4	50	20,0	24,3	23,0
Maximum		35	187	87,0	32,2	310	5,06	64,2	15,9	221	82,6	163	64,3	43,3	45,8
Median		22	167	65,1	24,5	248	3,78	48,9	12,0	175	70,3	125	48,9	30,4	32,4