Swedish National Team selections in ice hockey

- A retrospective study

Oscar Eriksson

GYMNASTIK- OCH IDROTTSHÖGSKOLAN
Master's thesis 29:2023
Master of sport science 2021-2023
Supervisor: Alexandra Pérez Ferreirós
Examiner: Magnus Lindwall

Abstract

Countries invest a large amount of money in talent development and talent identification. The Swedish ice hockey federation is reorganizing and evaluating the national team selection system. Relative age effect (RAE) refers to a selection bias when relatively older athletes get selected because maturity can be mistaken for talent. This study aimed to examine the selection patterns in the Swedish ice hockey national team and see if there is a relationship between selected players and their birth month. Studies on selections have been conducted in Canadian ice hockey and different leagues, but no one has investigated selections in national team ice hockey.

A Quantitative approach was used, to analyze the sample from this retrospective study. The sample contained 384 players that has been selected for the Swedish youth and junior national team once or more from five different cohorts from 1997-2001. The statistical analyses were conducted through X^2test of association, X^2 goodness of fit and factorial ANOVA. The significance level was set to ≤0,05. Cramers V and η2 was used to measure the effect size.

The results showed that 78% of selected players got re-selected, and most players were entering the system early. A relationship between players birth distribution and selection for the Swedish youth and junior national team was obtained, more players selected were born in the first half of the year. No significant difference in birth distribution was found among the players that played in the World Junior Championship (WJC) in 2017-2021. 92 players were selected for the world junior championship (WJC) rosters. 139 spots were available and 58 of these were taken by underaged players. Underaged players showed a significant difference in birth distribution. Underaged players born in the first half of the year were more likely to be selected as underaged for the U20 WJC rosters compared to their relatively younger peers. No significant difference was found in players height and weight between the four birth quarters.

In conclusion, the Swedish ice hockey national team has adopted a collectivistic approach, players could enter the system at a later stage and still be selected to play in the U20 WJC. Most players are initially selected at age 16, which can indicate that the system is closed. Differences in players birth distribution were found and players born early in the year are more likely to be selected for the national team, however in the WJC squads the birth distribution evens out.

Sammanfattning

Länder investerar mycket pengar i talangutveckling och talangidentifikation. Svenska ishockeyförbundet genomför en omorganisation och ska utvärdera systemet för landslagsuttagningar. Studiens syfte var att undersöka selektions mönstren inom svensk ishockeys ungdoms- och juniorlandslag, och se om relativ ålder påverkar vem som blir uttagen till landslaget. Studier på uttagningar inom ishockey har tidigare genomförts i Kanada i olika ligor, men ingen har undersökt landslagsuttagningar inom ishockey. RAE hänvisas till en urvalsbias, där relativt äldre atleter blir uttagna på grund av att mognad kan missta sig som talang. Spelarnas position undersöktes också för att se om det finns några skillnader i uttagningar mellan olika positioner.

Studien utgick från en kvantitativ ansats, för att analysera landslagsuttagningarna genomfördes en retrospektiv studie. Urvalet bestod i 384 spelare som blev uttagna en gång eller fler, från fem olika generationer 1997–2001. X^2test of association and X^2goodness of fit, och factorial ANOVA användes för att genomföra dataanalyserna. Signifikansnivån sattes till ≤ 0,05. Cramers V och η2 användes för att mäta effektstorleken.

Resultatet visar att 78% av de uttagna spelarna blir omvalda, de flesta spelarna kommer in i systemet tidigt. Ett samband mellan spelares födelsedistribution och uttagning till det svenska ungdoms- och juniorlandslaget erhölls. Fler uttagna spelare var födda under det första halvåret (Q1 och Q2), ingen signifikant skillnad i födelsedistribution erhölls bland de uttagna spelarna för junior världsmästerskapet (JVM) i ishockey, åren 2017–2021. 92 spelare blev uttagna till JVM trupperna. Totalt fanns 139 platser tillgängliga i de svenska JVM trupperna, 58 platser fylldes av underåriga spelare. Underåriga spelare visade en signifikant skillnad i födelsedistribution. Underåriga spelare födda under det första halvåret hade större sannolikhet att bli uttagna som underåriga för U20 JVM trupperna. Ingen signifikant skillnad upptäcktes i spelarnas längd och vikt mellan de olika födelse kvartalen.

Slutsats, svensk ishockeys landslagsuttagningar har en kollektivistisk approach. Det var möjligt för spelare att komma in i systemet senare och fortfarande ha möjligheten att representera Sverige i U20 VM. De flesta spelarna blir uttagna vid 16 års ålder, vilket kan indikera att systemet är stängt. Skillnader i spelarnas födelsedistribution hittades, och spelare tidigt födda på året var över representerade i landslagen, men i junior VM truppen jämnade åldersdistributionen ut sig.

Table of Contents

List of tables

List of figures

1 Introduction

Countries, national governing bodies, and elite sports teams invest a large amount of money and time into talent identification and talent development. The players are seen as human capital for both sporting and financial success (Collins & MacNamara, 2022; De Bosscher & De Rycke, 2017; Ojala, 2021). National governing bodies in many countries are increasingly coordinating and centralizing their talent programs, talented athletes progress through the talent system from regional to national and international selection, which leads to selection, re-selection and de-selection at all age periods (De Bosscher & De Rycke, 2017).

1.1 Talent development systems

Countries have different approaches to talent identification and selection in sports. It is dependent on the size of the sports in that country, a country with fewer athletes in one sport needs to be more available for people than sports with a lot of participants. Swedish ice hockey talent identification and talent development system is illustrated by Ogden and Edwards (2016) as an open system, compared to the Canadian ice hockey system which is presented as a closed system. The Canadian closed system is described as, player transitions from one level of competition to another, the number of players decreases, and the number of roster[1]spots decreases, which makes the sport more exclusive for the few making it to the next step. It could be demonstrated as a pyramid with limited entry points for players. The pyramid model is characterized by having a broad base, with increasingly higher levels of performance and therefore engaged by fewer and fewer people. The pyramid model is also characterized by a systematic exclusion of players build into the model (Ogden & Edwards, 2016).
The Swedish sport model in general is more centered on grassroots and recreational sports and are described as an open system, characterized by multiple entry points, and exit points, and a player can transition back and forth between levels. The Swedish ice hockey federations Vision 2017- 2022 states that they want to go from a triangular to a rectangular system, thereby creating the best conditions for elite athletes, and simultaneously developing the grassroots (Swedish ice hockey federation, 2017; Fahlström et al, 2015). In comparison with the pyramid system that has a systematic exclusion, the rectangle stands for inclusion, the rectangle has alternative routes to elite performance through early specialization and elite

[1] A roster is a list of players that will be playing in a particular game or selected for a camp (Cambridge dictionary, u.å).

performance through sampling. The rectangular way of thinking enables people to still be in the sport even though they are not on an elite level (Centrum för idrottsforskning, 2012). Swedish ice hockey needs to have a more open system, due to differences in the number of licensed players, Sweden cannot afford to lose too many players compared to Canadian ice hockey (Ogden & Edwards, 2016). The open and closed system can be compared to the individualistic and collectivistic approach illustrated by Güllich and Emrich, (2012). It can be argued that the individualistic approach is more of a closed system, characterized by early initial selections. Interventions are made on the selected athletes, the membership in this type of approach is stable and replacements with non-members are infrequent. The resources and time spent on these athletes will increase their individual performance and lead to improved collective success. The collectivistic approach selects the most successful athletes, a recurrent selection procedure is carried out through all ages and periods and is characterized by a high fluctuation with frequent side entries occurring. The group of selected athletes is therefore not as stable in the collectivistic approach compared to the individualistic approach which has a stable group of people that gets certain advantages. Compared to their non-selected peers and are therefore more of an open system (Güllich & Emrich, 2012; Ogden & Edwards, 2016).

1.2 Talent selection

Selections in sport are meaningful and crucial, selections are closely connected to talent identification and talent development, it is the process that determines an athlete´s current competence within a specific sport (Fahlström et al.,2015;Lidor et al., 2009). However, the selection in sport is complex, and there are no guarantees. A common assumption is that current capacity predicts potential which can implicate, that national youth selections favor relatively older players (Barreiros & Fonseca, 2012; Wrang et al., 2018). The identification of talent is subjective and dependent on the selection stakeholders e.g. coaches and scouts (Baker, 2017; Wiseman et al., 2014).

Previous research has shown that talent selections are a dynamic process with continuous selections and de-selections (Barreiros et al., 2014; Barth, Michael et al., 2018; Güllich, 2014; Kalén, Lundkvist, et al., 2021), and that there are differences between the countries and their selection strategies. It depends on how many registered athletes the country has and therefore the selection strategy looks different (Kalén, Padrón-Cabo, et al., 2021). It seems like there is a big variance in the selection and de-selection strategies. It is dependent on the country and sport. Previous research confirms that there is a big variance in the selection strategies, 45 -

55% of German and Portuguese soccer players were re-selected for the national teams (Barreiros & Fonseca, 2012; Güllich, 2014). 50-65% in Norwegian and Danish handball (Bjørndal, Luteberget, et al., 2018; Wrang et al., 2018) and 74-80% in European international basketball (Kalén, Lundkvist, et al., 2021). The re-selection between Portuguese youth and junior squads in swimming was 56% and 38% in judo (Barreiros & Fonseca, 2012). In Austrian skiing large season-to-season variations were found, meaning that in some cases the squads stayed the same and in other years the squads had relatively big variations in skiers de-selected or skiers moved up to a higher squad level (Barth, Michael et al., 2018). Differences between selected and de-selected athletes in hockey, basketball and volleyball were that the selected athletes were more mature and born in the first half of the year, they also had bigger parents regarding height. Selected ice hockey players reached their peak of height velocity earlier compared to non-selected ice hockey players. (Baxter-Jones et al., 2020).

The benefits of being selected to a youth or junior national team squad are that the athletes become visible and attractive to senior elite teams. Despite the benefits of being selected, it is still possible to attain status as an international athlete without early selections, particularly in team and male sports. More senior athletes that never got selected at youth national team levels were selected for the senior rosters compared to athletes that got selected for a youth national team (Barreiros et al., 2014; Barreiros & Fonseca, 2012; Bjørndal, Andersen, et al., 2018).

Research on selections in a hockey context has been conducted in Canada, they have looked at provincial league teams and the characteristics of these players that got selected compared to the de-selected players (Baxter-Jones et al., 2020; Sherar et al., 2006), to illustrate how difficult the talent identification and selections is Farah and Baker (2021) examined the accuracy of talent selection in the National hockey league (NHL) entry draft. The NHL entry draft is a process where teams make selections from a pool of players. Future performance success on forwards in the draft tended to be accurate in the first two draft rounds, success for defensemen seemed to be accurate in the first draft round and then diminish (Farah & Baker, 2021). Studies on national team selections have been conducted examining the selection patterns in handball, football and basketball (Bjørndal, Andersen, et al., 2018; Bjørndal, Luteberget, et al., 2018; Kalén, Lundkvist, et al., 2021; Kalén, Padrón-Cabo, et al., 2021; Wrang et al., 2018). But no studies have been conducted examining the national team selections in ice hockey.

1.3 Relative age effect

Selections at early ages are often influenced by a selection bias influenced by biological attributes, which favors athletes born early in the year that often is more mature. This selection bias is referred to as the relative age effect ,RAE, (Arede et al., 2019; Barreiros et al., 2014; Baxter-Jones et al., 2020; Musch & Grondin, 2001). RAE is a common phenomenon in sports such as football and hockey. It refers to the differences in age between the athletes that have been grouped, common in sports is that the athletes are grouped in one-year cohorts (January- December), which means that there could be a difference in almost one year between the oldest and the youngest. Due to differences in physical and cognitive development, relatively older athletes have an increased likelihood to be seen as talented and being selected to a competitive youth sports team and become elite athletes. Studies have found that selected players in ice hockey are taller and heavier, compared to the de-selected players and age-matched controls (Baker, 2017; Hancock et al., 2013; Roczniok et al., 2013; Sherar et al., 2006).

Studies on RAE have been conducted in the field of ice hockey since the mid 1980s (Barnsley & Thompson, 1988), RAE has been examined mostly in a North American ice hockey context (Baker et al, 2010; Barnsley & Thompson, 1988; Côté et al., 2006; Fumarco et al., 2017; Hancock et al., 2013; Huard Pelletier & Lemoyne, 2022; Lemez et al., 2014; Musch & Grondin, 2001; Nolan & Howell, 2010; Sherar et al., 2006; Turnnidge et al., 2014) and a few studies have investigated the RAE in the ice hockey world championship (IHWC) and world junior championship (WJC) (Bruner et al., 2011; Nykodým et al., 2020). It has been illustrated that early maturation, size advantages and early birthdates have an advantage and increased likelihood for boys to be selected for an elite team (Sherar et al., 2006). Studies on RAE in Swedish ice hockey have been conducted on both women's and men's ice hockey. It reports that RAE is evident at different levels in Swedish ice hockey from youth to senior level among males and females (Stenling & Holmström, 2011, 2014).

Like the differences in selection, RAE differs between countries and sports. Hancock et al. (2013) found that RAE was evident in 5-year-old Canadian ice hockey players, whilst Helsen et al. (2005) described that RAE on average did not start until age 12 in soccer (Hancock et al., 2013; Helsen et al., 2005). RAE is a major factor in the selection of elite youth athletes. Previous literature suggests that athletes born in the first half of the year are more likely to be

successful (Barnsley & Thompson, 1988; Sæther, 2015), 65% of the Swedish junior national team in ice hockey between 2001- 2009 were born in the first half of the year (Bruner et al., 2011). Already at "TV- Pucken"[2] a significant result was found that RAE existed, and the differences in players birth distribution were quite big (Q1 40%, Q2 30%, Q3 19% and Q4 11%) (Stenling & Holmström, 2011).

Studies on RAE in ice hockey have also shown that there has been an overrepresentation of forwards born in the first half of the year, but RAE did not have an impact on the selections of goaltenders (Nykodým et al., 2020; Stenling & Holmström, 2014). However, studies have illustrated that there seems to be a reversal in RAE. Selected players born later in the year were more likely to be re-selected for junior and senior national teams, and players selected as underaged were more likely to continuously be selected until the age of 20. Underaged players are referred to as players selected as one or more years younger than the other players. Early selected players with a young initial selection age were more likely to not represent a higher tier team, because of the turnover of players the relatively older athletes got exchanged for relatively younger or underaged athletes (Barreiros et al., 2014; Fumarco et al., 2017; Güllich & Emrich, 2012; Kalén, Lundkvist, et al., 2021; Wrang et al., 2018).

A possible consequence of early selection and selection bias is that athletes not selected could drop out of their sport. Dropout is referred to as an athlete's early termination from a sporting career before they could reach their peak. Due to a selection bias that the athletes born early have an advantage over their younger peers and are therefore more likely to be seen as talented. Drop-out is related to coaches´ and significant others' views and understanding of talent. There is also a risk that less developed and relatively younger players self-select, which means that they drop out because they feel that they have no chance against the relatively older and more mature athletes (Baker, 2017; Sherar et al., 2006). Early selection and success in youth teams and tournament do not guarantee continuation in their sport, there is a lot of different reasons why athletes decide to drop out, but previous research shows that RAE is a reason for drop-out in sport (Delorme et al., 2011; Kristiansen et al., 2018; Lemez et al., 2014). Other studies on the relationship between drop-out and RAE in sports show that the relationship between RAE and drop-out is shifting and are dependent on the context and characteristics (Wattie et al., 2014).

[2] "Tv- Pucken" is a tournament between district teams, for boys and girls under 15 years of age.

There is a gap in the research regarding the selections in ice hockey, a few studies have been examining the selections and RAE, but no one has looked at the patterns of selections and how many of these initial selections make it to the last selection in ice hockey (Barreiros et al., 2014; Barreiros & Fonseca, 2012; Barth, Michael et al., 2018; Bruner et al., 2011 Güllich, 2014; Kalén, Lundkvist, et al., 2021; Nykodým et al., 2020;Wrang et al., 2018). The studies conducted on selections have not included seeing if there are differences between positions. Despite all the research that exists on the relative age effect only a few have investigated it in a Swedish context, one in women's ice hockey and one in men's ice hockey (Stenling & Holmström, 2011, 2014). Swedish ice hockey has also been the subject of studies regarding RAE in the World Championship (Bruner et al., 2011; Nykodým et al., 2020).

1.4 Aim

The aim of this study is to examine the selection patterns in Swedish youth and junior national teams, from five age groups who has been selected for one or more camps for U16, U17, U18, U19 and U20, and investigate how many of these players made it all the way to the International ice hockey federation (IIHF) U20 WJC, and see if there is a relationship between selection for the Swedish national team in ice hockey, relative age and player position.

Research Questions

1.How many players get selected, re-selected and de-selected within the Swedish ice hockey youth and junior national team?

2. What is the relationship between players birth distribution (RAE) and national team selections?

3. Is there any differences in birth distribution and player position of selected players for the Swedish youth and junior national team in ice hockey?

4. Are there any differences in the height and weight of selected players, depending on the players birth distribution?

5. Is there any relationship between initial selection, RAE, and player position in players selected for the U20 Swedish WJC rosters?

6. Is there a difference in the birth distribution and player position in underaged players selected for the Swedish U20 WJC?

2. Method and Design

A quantitative approach was used to answer the aim and research questions. This study has like previous studies on selections and RAE a retrospective study design, where the sample was available data, and made it possible to get the whole sample of selected players in the Swedish youth and junior national team (Güllich, 2014; Kalén, Lundkvist, et al., 2021; Sæther, 2015). Retrospective studies track back in time, the investigated event has already occurred, and the purpose is to get an understanding of why these events occurred and what effects they made (Barraclough et al., 2022; Jones, 2015; Tenenbaum & Driscoll, 2005). Contact with the Swedish ice hockey federation was made, to collect the national team rosters for various selections.

2.1 Participants/ sample

The sample of this study included Swedish male ice hockey players that had been selected for at least one camp or tournament for the Swedish ice hockey national team in the age categories 1997- 2001. The selections span from 2013 to 2021. A total of 106 rosters were the foundation of this study.

These five-year groups were used to get a clear sample, where players could get selected for most of the selections before the pandemic started. Covid- 19 pandemic should have as little impact as possible to get a clear perspective to examine the selection patterns in Swedish youth and junior ice hockey national teams, how many of these players made it to the U20 WJC and see if there is a relationship between selection for the Swedish national team in ice hockey, relative age and player position.

2.2 Variables and Procedure

The national team rosters were sent from the Swedish ice hockey federation, then these rosters got put together into one file. The original files included information about the players such as name, position, birth date, club, height, and weight. The birth dates for all players were categorized into four quarters (Q1 January to March), (Q2 April to June), (Q3 July – September) and (Q4 October to December) similar to other authors and their research on RAE (Barnsley & Thompson, 1988; Baker et al., 2010) The player´s ages for the year of selection were calculated as selection year – year of birth. Age was used instead of category (U16,

U17, U18, U19, U20) to get a more understandable data because underaged players´ would have been in different birth quartiles for different years, players underaged would in that case have a categorical value of e.g., 5 one year and 1 the next. Therefore, all the players born in a year were put in the same age, no matter the month they were born. Players had one row for every season they were selected for the Swedish youth and junior national team. The players got a categorical value for their first and last selection and if they were selected for the WJC roster.

2.3 Ethical considerations

Data in this thesis were collected from publicly available data on the Swedish ice hockey federations webpage (Swedish ice hockey federation, 2023). All data has been processed with confidentiality. No names will be presented, so the players will stay anonymous. The ethical consideration from Vetenskapsrådet (2002) within humanistic and social science has been taken into consideration for this thesis (Vetenskapsrådet, 2002).

2.3.1GDPR

Data protection regulation (GDPR) is a law from the European Union, it refers to the protection of personal data, Personal data may be used for research purposes if there is a reason for using personal data, chapter4, §3, law (SFS 2018:218) Social security number is okay to be used without consent when it is motivated by the purpose chapter 3 §10 (Lag med kompleterande bestämelser till EU:s dataskyddsförorning, 2018). Personal data are needed for this thesis, players birth dates are needed to be able to categorize them into four quarters. The protection of personal data has been taken into consideration. The data are available on the Swedish ice hockey federations webpage (Swedish ice hockey federation, 2023).

2.4 Reliability and Validity

Rosters of selected players were sent from the Swedish ice hockey federation to the author. This study aimed to examine the selection patterns in Swedish youth and junior ice hockey national teams and investigate how many of these players made it to the U20 WJC and see if there is a relationship between selection for the Swedish national team in ice hockey, relative age and player position. By getting the rosters from the federation the reliability can be seen as high because it can be easily reproduced, with the same method (Armour & Macdonald,

2012). A strong test-retest reliability exists, it is possible to examine the same groups again and get the same results because the measurements are not dependent on external factors that can influence the measurements (Tanenbaum & Driscoll, 2005).

Generalizations about the Swedish national team systems can be made, on player characteristics, it could be hard to make these generalizations over time (Tanenbaum & Driscoll, 2005). The aim of this study was not to generalize, and it is hard to make any generalizations because the sport is constantly changing. The federation is evaluating the national team system, which can imply that the system looks different in the future. Therefore, the test-retest validity cannot be confirmed for this study (Tanenbaum & Driscoll, 2005). Retrospective studies have lower validity than prospective studies (Jones, 2015), but for this study, a retrospective study was the one that was best for the purpose, the Swedish ice hockey federation wanted to know what the selections in the youth and junior national team looked like.

2.5 Statistical Analysis

Analysis was performed using Jamovi version 1.6.23. The descriptive statistics were done through frequency tables. The descriptive statistics sum up the number of selected and de-selected players.

2.5.1 Pearsons X^2test of association

The X^2 test of association or test of independence tests if two or more categorical variables are related or if they are independent, x^2 test of independence was used to answer the research questions about how many players get selected, re-selected and de-selected within the Swedish youth and junior national team. If there are any differences in birth distribution and the player position of selected players for the Swedish youth and junior national team in ice hockey? If there is any relationship between initial selection, RAE, and player position in players selected for the U20 Swedish WJC roster? And if there there is a difference in the birth distribution and player position in underaged players selected for the Swedish U20 WJC. Cramers V was used to calculate the effect size, and if there was any association between the categorical variables. The effect size was interpreted as small(V=0-0.3) Medium (V=0.4-0.5) Large (V= ≥0.5) (O'Donoghue, 2012; Jones, 2015). If the observed frequencies and cell

counts are too small, a Fishers exact test was conducted. It can be used with small and sparsely distributed data, that does not meet the requirement for x^2 tests.

2.5.2 X^2 goodness of fit

Pearson´s X^2 goodness of fit tests was conducted; the goodness of fit test is the traditional test regarding RAE. It tests if the observed frequency distribution of nominal variables matches an expected frequency distribution and is suitable for data in which the observations are independent (Boslaugh, 2012; Ejlertsson, 2012; Navarro & Foxcroft, 2019). The goodness of fit test was used to answer what the relationship between players birth distribution (RAE) and national team selections are.

There are two different ways of doing a goodness of fit test, the first is that the calculations assume that there is a uniform distribution of births among the quarters. The second approach is to use birth date statistics by mount and year for the matching population. In this case Swedish born males from 1997 to 2001. Delorme and Champely (2015) argue that the second approach is more accurate (Delorme & Champely, 2015). The X^2 goodness of fit test was therefore computed for the demographics of this population. During the years from 1997 to 2001, 231 370 boys were born, and the distribution per quartal looks like this (Q1 0,25, Q2 0,27, Q3 0,26, Q4 0,22) (Statistikmyndigheten, 2023). Cramers V was used to calculate the effect size of the X^2 tests. The effect size was interpreted as small (V=0-0.3) Medium (V=0.4-0.5) Large (V= ≥0.5) (O'Donoghue, 2012).

2.5.3 Factorial ANOVA

Factorial ANOVA was conducted to answer if there are any differences in birth distribution and player position of selected players for the Swedish youth and junior national team in ice hockey.

The factorial ANOVA is used to investigate how several factors influence and interact with the dependent variable. η2 was used to calculate the effect size of the ANOVA. A value of η2 =0 indicates that there is no relation and η2 =1 means that the relationship is perfect (Boslaugh, 2012; Navarro & Foxcroft, 2019).

The significance level for the X^2 test and the ANOVA was set at $p \leq 0,05$.

3. Results

The results from the X^2 tests and ANOVA are presented in the results. The results are divided to answer the specific questions. The first section is going to answer what the selection looks like within Swedish ice hockey's youth and junior national team system and how many players that are getting selected, re-selected and de-selected. The second section is going to answer if there is a relationship between players birth distribution (RAE) and selection for the Swedish youth and junior national team, it is also going to answer if there are any differences in the birth distribution and player position selected for the Swedish youth and junior national team in ice hockey, and at last, the second section is answering if there are any differences in height and weight of selected players, depending on the players birth distribution. The third section answers if there is any relationship between initial selection, birth distribution and player position in players selected for the U20 Swedish WJC roster and if there is a relationship between underaged players selected for the Swedish U20 WJC roster, birth distribution and player position.

3.1 Selections in the Swedish youth and junior ice hockey national team

In total 384 players were selected at least once for the Swedish youth and junior national teams for these five age groups 1997-2001. On average a total of 76,8 players were selected for each generation. The results show that the largest proportion of players debuted at the age of 16. Table 1 presents the counts and percentages of the players debut and last selection concerning all 384 selected players. Debuts were slowly decreasing the further up the year´s players reached. 78% of the players debuted in the first two years from the time selection began. It also displays the percentages per age, for example, 229 players played in the national team when they were 16 years old, 226 of these 229 made their debut, and 39 players or 17% of the 229 players were de-selected. 82% of the players selected at the age of 16 were also selected to play games for the national team in that age group. The results show that players mean re-selection rate per age was 73% (16/17: 83%, 17/18: 70%, 18/19: 69%, 19/20: 70%). On average 84% of players was selected to play games in the youth and junior national team.

Table 1

Descriptive statistics players debut an last selection

	Total		Debut			Last Selection			Played games	
Age	N	% of 384	N	% of 384	% players per age selection	n	% of 384	% players per age selection	N	% players per age selection
15	3	1	3	1	100	-	-	-	3	100
16	229	60	226	59	99	39	10	17	188	82
17	248	65	69	18	28	74	19	30	188	76
18	194	51	28	7	14	61	16	31	154	79
19	155	40	36	9	23	47	12	30	150	97
20	163	42	22	6	13	163	42	100	149	91

Note. N=Numbers, % of 384 = comparison of all the selected players, % players per age selection= the number of players that was selected at a certain age.

This table shows the total number of players that was selected at least once for the national team, players initial selection (debut) age and how many that got de-selected (last selection) the percentages in this table are counted from the total 384 players that got selected and the total number of players that was selected for each age.

Table 2 illustrates what the selection and de-selection look like for the different player positions. It helps to gain an understanding of which players that got selected and de-selected per age and position. The result shows that forwards and defenders have a bigger chance to get into the system at a later age, but for goalkeepers, only one was selected from the age of 19-20. On the other hand, table 2 also illustrates that the de-selection follows a pattern for forwards and defenders where the percentages of players de-selected stay at the same levels between ages, goalkeepers' deviate, the largest percentages of last selections except from the last selection at 20 years of age comes at age 17 and differs from the pattern of forwards and defenders.

Table 2

Descriptive statistics debut age and last selection age and their player position

	Debut			Last Selection		
Age	**F**	**D**	**GK**	**F**	**D**	**GK**
15	2 (1%)	0 (0%)	1 (2%)	-	-	-
16	127 (59%)	72 (59%)	27 (61%)	23 (11%)	11 (9%)	5 (11%)
17	36 (17%)	23 (19%)	10 (23%)	40 (18%)	23 (19%)	11 (25%)
18	16 (7%)	7 (6%)	5 (11%)	36 (17%)	17 (14%)	8 (18%)
19	23 (11%)	12 (10%)	1 (2%)	24 (11%)	19 (15%)	4 (9%)
20	13 (6%)	9 (7%)	0 (0%)	94 (43%)	53 (43%)	16 (36%)
Total	217 (100%)	123 (100%)	44 (100%)	217	123	44

Note. F= Forwards, D= Defenders and GK= Goalkeepers

A few players in the system were selected as underaged to teams. In total 101 spots over the years were occupied by underaged players. Which were increasing from the U18 to the U20. Table 3 presents two different variables together with the underaged player variable, so the reader can get an illustration of which team they were representing and how old they were, we could see that out of these 72 spots in the U20 teams taken by underaged players, and that 61 of these was 19 years of age and 11 players was selected as underaged at 18 years of age.

Table 3

Descriptive statistics of underage players by category and by age, respectively

Category	Underaged	Age	Underaged
U16	3 (3%)	**15**	3 (3%)
U17	3 (3%)	**16**	4 (4%)
U18	22 (22%)	**17**	22 (22%)
U19	1 (1%)	**18**	11 (11%)
U20	72 (71%)	**19**	61 (60%)

Note. This table displays both the category that underaged players was representing and what age they were when they were playing as underaged.

3.2 Relationship relative age and Swedish ice hockey national team selection

Analysis of RAE and birth month distributions in Swedish national youth and junior national teams for the age groups 1997- 2001, shows that RAE is apparent in those five-year groups. Tests were conducted through X^2 goodness of fit, X^2 test of association and ANOVA. All the tests under this heading were done on all the 384 players that were selected at least once by the national teams.

To see if any differences in birth distribution were apparent in the Swedish national team selections an X^2 goodness of fit test was conducted (Table 4). The results were significant ($X^2(3)$ =62.73, p<0.001), which shows that the probability of players born early in the year Q1 and Q2 are more likely to be selected for the Swedish ice hockey youth and junior national teams, the effect size was big > 0.5 (Cramer's V=0,70).

Table 4

x^2 goodness of fit test

Birth Quarter	Count	Proportion
1	149	0.39
2	123	0.32
3	70	0.18
4	42	0.11
Total	384	

Note. p <0,001

The goodness of fit test is counted with the expected frequencies from the overall distribution of boys born between the years 1997- 2001, Birth Quarter (Q1, 0,25. Q2 0,27, Q3 0,26 Q4 0,22)

The birth distribution and players´ debut in the system are shown in Table 5. As seen in Table 4, a difference in the birth distribution exists, Table 5 illustrates the players birth distribution concerning when they enter the system. An X^2 test of association was conducted on the variables of age and birth quarter on the player's debut $X^2(15)$ =13,61, (p=0,555). The result was nonsignificant on players debut age and birth distribution. The effect size was small (Cramer's V= 0.11). To exclude that there is a power issue that impacts the result a test on Q1 and Q2 combined and contrasted with Q3 and Q4 was conducted. $X^2(5)$ =5,587, (p=0,349) (Cramers V= 0,121). Fishers exact test= 0,286. It supports that there is no significant

association between players birth distribution and their age for their debut. And that no significant differences exist.

X^2test of association was also conducted on the birth distribution and last selection age (see Table 6) $X^2(12)$ =18,17, (p=0,111). The results indicate that there is no significant difference (association) in players´ birth distribution and last selection and the analysis has a small effect size (Cramer's V=0.111). Another test was also conducted where Q1 and Q2 were combined and contrasted with Q3 and Q4. $X^2(4)$ =11,709, (p=0,020). It shows that there are significant differences in players last selection age and birth quarters with a small effect size (Cramers V= 0.175).

Table 5

Birth distribution and players debut in the Swedish ice hockey national team system

	Birth Quarter				
Age	**1**	**2**	**3**	**4**	**Total**
15	2 (67%)	0 (0%)	0 (0%)	1 (33%)	3 (100%)
16	86 (38%)	83 (37%)	37 (16%)	20 (9%)	226 (100%)
17	27 (39%)	19 (28%)	16 (23%)	7 (10%)	69 (100%)
18	12 (43%)	8 (29%)	4 (14%)	4 (14%)	28 (100%)
19	14 (39%)	7 (19%)	8 (22%)	7 (19%)	36 (100%)
20	8 (36%)	6 (27%)	5 (23%)	3 (14%)	22 (100%)

Note. p = 0,555

Table 6

Birth distribution and players last selection

	Birth Quarter				
Age	**1**	**2**	**3**	**4**	**Total**
16	17 (44%)	14 (36%)	4 (10%)	4 (10%)	39 (100%)
17	34 (46%)	23 (31%)	14 (19%)	3 (4%)	74 (100%)
18	22 (36%)	27 (44%)	6 (10%)	6 (10%)	61 (100%)
19	19 (40%)	15 (32%)	7 (15%)	6 (13%)	47 (100%)
20	57 (35%)	44 (27%)	39 (24%)	23 (14%)	163 (100%)

Note. p=0,111

The players birth distribution and player position were analyzed through an X^2 test of association (Table 7), the results were nonsignificant, $X^2(6)$ =8,70, (p=0,191), no association

in players position and birth distribution was obtained, the effect size was small (Cramer's V=0,11).

Table 7

Players birth distribution and the player position for the selected players

	Birth Quarter				
Player position	**1**	**2**	**3**	**4**	**Total**
F	94 (43%)	65 (30%)	32 (15%)	26 (12%)	217 (100%)
D	41 (33%)	45 (37%)	27 (22%)	10 (8%)	123 (100%)
GK	14 (32%)	13 (30%)	11 (25%)	6 (14%)	44 (100%)
Total:	149 (39%)	123 (32%)	70 (18%)	42 (11%)	384 (100%)

Note. F= Forwards. D= Defenders, GK= Goalkeepers

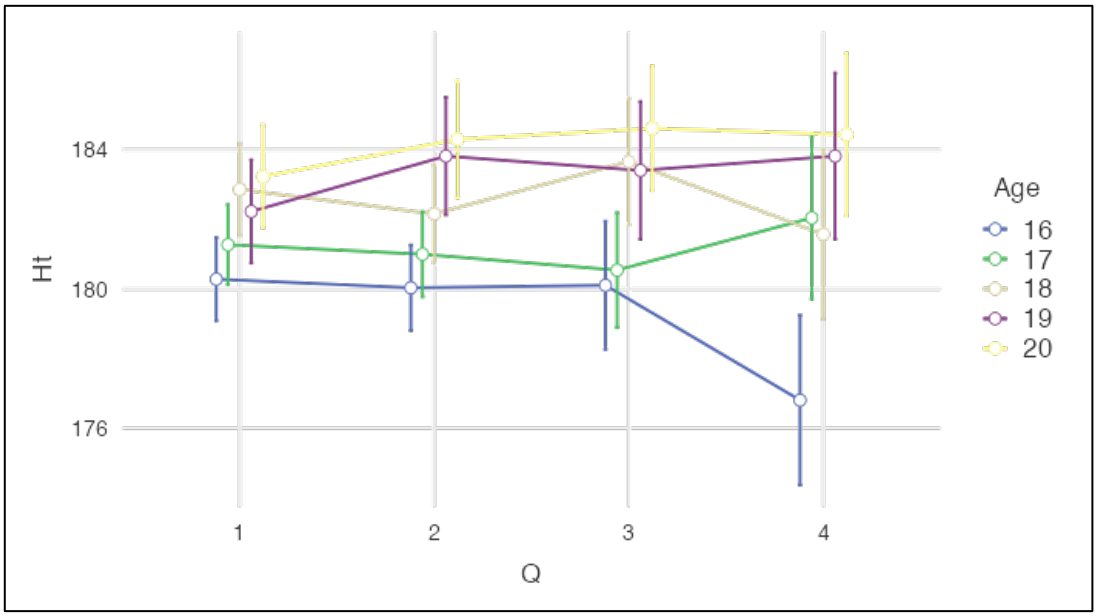
Table 7 illustrates the players birth distribution and the player position for the selected players.

A factorial ANOVA was conducted to see if there was a significant difference in height and weight depending on the player´s birth distribution.

The mean square for height, age, and birth quarter (Figure 1) was 36,65, there was not a significant test result p=0,332 with a significance level set at 0,05 and an effect size of $\eta 2$= 0,01. The F value of Q* Age was 1,13 with 12 degrees of freedom.
The mean square for weight, age, and birth quarter (Figure 2) was 35,44 not significant p=0,657 $\eta 2$ =0,01. The F value of Q* Age was 0,79 with 12 degrees of freedom. The test shows that there are no significant differences in the height and weight of the selected players and the birth distribution. The analysis of variance demonstrated that there was no significant height or weight effect in the findings. The $\eta 2$ shows that there are 0,1% variance between the variables.

Figure 1

The selected players height for each selection year, and the heights relationship with birth quarter

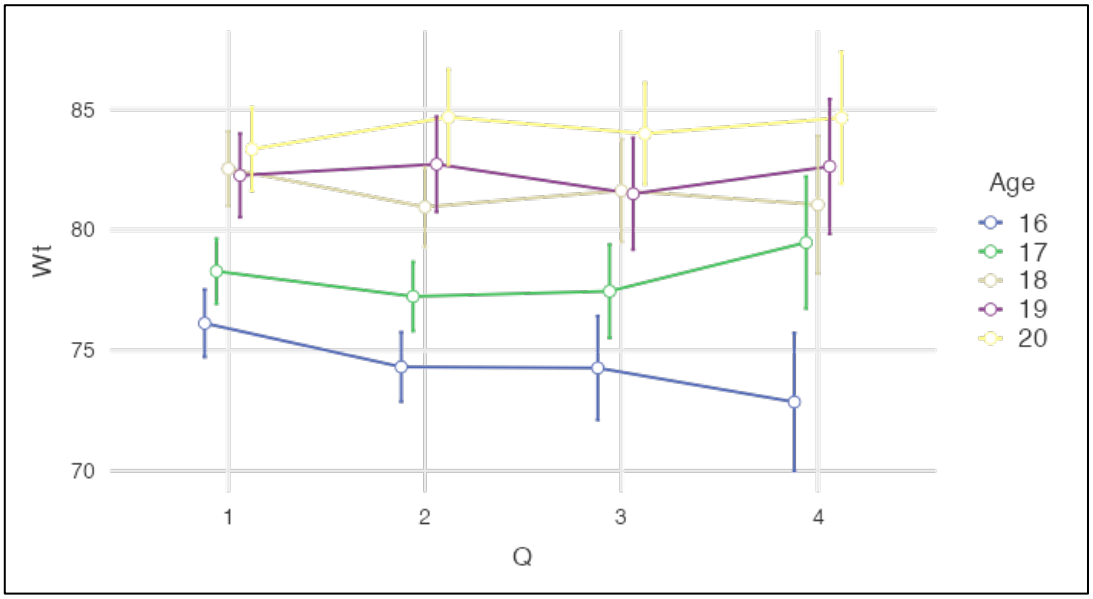


Note. HT= Height, Q= Birth Quarter

Players mean height in relation the players birth distribution, to see if there are any differences in players height, depending on when they are born.

Figure 2

Selected players weight for each selection year, and the heights relationship with birth quarter



* *Note.* WT= Weight, Q= Birth Quarter

Players mean weight in relation the players birth distribution, to see if there are any differences in players weight, depending on when they are born.

3.3 3 Relationship initial selection, relative age, and player position in Swedish WJC roster selection

During those five examined years, 139 spots were available in the Swedish teams in WJC. 92 players were selected for the WJC rosters.

A significant relationship was obtained between age and debut for the players in the WJC rosters. It was calculated with a X^2 test of association, $X^2(5)$ =11,30, (p=0,046). More players that played in the WJC were debuting early, than players that debuted later, with a small effect size Cramer's V=0,17. Table 8 shows the age of the player´s debut in the system, out of the 384 players 92 were selected to represent Sweden in WJC. The first column (debut) presents the debut distribution amongst the 92 players reaching the Swedish WJC team where a significant difference in the number of players that are selected for the Swedish WJC squad. The percentages in the right column display how many percent of the ones that debuted for each age made it to the last selection and WJC.

Table 8

Initial selection age U20 WJC roster

Age	Debut	% of total players debut age
15	3 (3%)	100%
16	56 (61%)	25%
17	12 (13%)	17%
18	7 (8%)	25%
19	9 (10%)	25%
20	5 (5%)	23%

Note. This table displays the 92 players that was selected for Swedish WJC squads, it shows the age of the players debut in the system as well as the percentages of the total number of players initially selected for each age.

X^2 goodness of fit test was conducted on the WJC player´s birth distribution (Table 9), and a nonsignificant relationship was obtained in players that reached the WJC and their birth distribution.

$X^2(3)$ =3,22 (p=0,359). In all players in the WJC rosters, no significant differences could be found in the birth distribution among all the 92 players that represented Sweden in WJC. The effect size is small (Cramer's V= 0,17).

Table 9

Birth Distribution U20 WJC players

Birth Quarter	Played U20 WJC	Proportion
1	29	0,32
2	27	0,29
3	19	0,21
4	17	0,18
Total	92	

Note. U20 WJC= Under 20 World junior championship

The birth distribution of the players selected for the Swedish WJC rosters is illustrated in table above, the expected frequencies of player and birth quarter are counted from the overall boys born in Sweden for the examined age groups.

A nonsignificant relationship was also obtained from all the players in the WJC and their birth distribution and position (Table 11) $X^2(6)$ =7,42, (p=0,284). No significant relationship between player position and birth distribution was observed for the players that played WJC. The effect size was small (Cramer's V= 0,20). Because of the small number of goalkeepers, a test was also conducted to exclude that the results were impacted by a power issue. $X^2(3)$ =12,49, (p=0,006), a significant result was obtained on forwards and defenders birth distribution on players in the WJC rosters. The effect size was small (Cramers V= 0,319).

Table 10

Birth distribution and player position U20 WJC players

	Birth Quarter				
Player position	**1**	**2**	**3**	**4**	**Total**
F	19 (36%)	11 (21%)	10 (19%)	13 (25%)	53
D	8 (30%)	11 (41%)	6 (22%)	2 (7%)	27
GK	2 (17%)	5 (42%)	3 (25%)	2 (17%)	12
Total	29 (32%)	27 (29%)	19 (21%)	17 (18%)	92 (100%)

Note. F= Forwards, D= Defenders, GK= Goalkeepers

An X^2 goodness of fit was also conducted for the underaged players in the WJC rosters. Table 11 illustrates the birth distribution; 58 spots were obtained by underaged players of the 139 total WJC roster spots. A significant relation between the underaged players in WJC and their birth distribution could be found. $X^2(3)$ = 8,70 (p=0,034). The players´ that got to represent the Swedish WJC team underaged were more likely to be born in the first half (Q1 & Q2) of

the year than the second half of the year, and most likely if they were born in the first quarter (January - Mars). A large effect size was found (Cramer's V= 0,67).

Table 11

Birth Distribution underaged players U20 WJC

	Underaged players U20	
Birth Quarter	**WJC**	**Proportion**
1	23	0.40
2	17	0.29
3	11	0.19
4	7	0.12
Total	58	

Note. U20 WJC= Under 20 World junior championship

The test was counted on the expected frequencies from the overall Swedish boys born in the years 1997-2001.

X^2 test of association was conducted on the player´s position and the players birth distribution (Table 12). A significant relationship was found between players´ birth distribution and their player position $X^2(6) = 16{,}02$, (p=0,014) (Fishers exact test =0,009). Players were more likely to be selected as underaged for the WJC if they were born in the first half of the year. It applies to every position. The effect size was small (Cramer's V= 0,37).

Table 12

Birth distribution and player position underaged U20 WJC players

	Birth Quarter				
Player position	**1**	**2**	**3**	**4**	**Total**
F	17 (52%)	6 (18%)	4 (12%)	6 (18%)	33
D	5 (26%)	7 (27%)	7 (37%)	0 (0%)	19
GK	1 (17%)	4 (67%)	0 (0%)	1 (17%)	6
Total	23 (40%)	17 (29%)	11 (19%)	7 (12%)	58

Note. F= Forwards, D= Defenders, GK= Goalkeepers

The table displays the underaged players, position and birth distribution, the percentages are counted for each birth quarter, and finally displays the total birth distribution.

4. Discussion

This study aimed to examine the selection patterns in Swedish ice hockey's youth and junior national teams and investigate how many of the selected players made it to the U20 WJC and see if there is a relationship between selection for the Swedish national team in ice hockey and relative age and player position. This study was needed to fill the existent gap in Swedish ice hockey national team selections because the Swedish ice hockey federation is making a reorganization and evaluation of the national team selection system.

4.1 Selections in the Swedish youth and junior ice hockey national team

A gap in the existing literature found was that no one had examined national team selections in ice hockey, it has been done in other sports, and different settings e.g., minor leagues in Canada, but not in an ice hockey national team setting.

The mean re-selection rate for the investigated groups in Swedish youth and junior ice hockey was 73%. Compared to other studies that have identified a re-selection rate of 40-55% in German and Portuguese soccer (Barreiros & Fonseca, 2012; Güllich, 2014), 50%- 65% in Norwegian and Danish handball (Bjørndal, Luteberget, et al., 2018; Wrang et al., 2018), the re-selection rate in Swedish national team ice hockey is high, but on similar levels reported in international basketball 74%-80% (Kalén, Lundkvist, et al., 2021). Others have argued that the differences are related to the sport's popularity and the number of licensed players. Another possible factor that basketball and ice hockey have a higher re-selection rate than for instance football and handball, can have something to do with the fact that these two sports compared to football and handball has a draft system into NBA and NHL. It is two sports that are big in North America. Therefore, there may be more reason to say that the selection of sport also is influenced by the culture of the specific sport.

With a high re-selection rate and a high number of initial selections, higher than other team sports, it can be argued that the Swedish ice hockey federation has adopted an individualistic approach. However, player development is not centralized to the federation of Swedish ice hockey, player development is dependent on the various clubs and organizations around the country (Fahlström et al., 2015). Therefore, Swedish national team selections in ice hockey have a collectivistic approach, despite the high re-selection rates, players are still entering the

system, and frequent selections, re-selections and de-selections occur but the core of the selected players stay the same (Barth, Michael et al., 2018; Güllich, 2014; Güllich & Emrich, 2012). 155 players are entering the system after the first selection in these investigated generations. It has been argued that the Swedish system is open compared to the Canadian system which has a closed system, but the Swedish national team selections system can be illustrated as a pyramid. With many initial selections as a base where more players are selected and development is important, at later stages, age 18 and up more players get de-selected, the number of spots and players decreases and the focus is more on winning the U18 and U20 WJC, which makes it more exclusive for the players that remain selected. Selected athletes and their position also seems to differ in how open or closed the system is, forwards and defenders are entering the system until the last year of selection, compared to goalkeepers where only one goalkeeper debuted in the system at age 19 and no one at age 20 (Fahlström et al.,2015; Ogden & Edwards, 2016). A possible explanation that fewer goalkeepers are entering the system late is the Matthew effect, players selected for the national team are more successful at a young age, which leads to extended support, which generates expectations of future success and therefore greater resource supply, which creates a gap between selected and non-selected players (Barth, Michael et al., 2018).

The results illustrated that 84% of the players were selected to play games in the Swedish national teams, depending on the age the number of players that played games varies. The highest proportion of players selected that also was playing games was at 19 years of age, and the lowest proportion of players selected to play in games was at 18 years of age. In Norwegian handball, it has been reported that 71-80% of junior national team players had gained competitive game experience in the youth national teams, and 92,7% of senior players had competitive game experience from junior national team competitions (Bjørndal, Luteberget, et al., 2018). In Portuguese soccer out of 170 players selected at the youth level, 93 played a game in the junior national team out of a total of 158 spots that were available at the junior national team level, and 58 played at least one game for the senior national team (Barreiros & Fonseca, 2012).

Despite that, the results do not display when the underaged players made their debut, only for what category and how old they were when they got selected as underaged players. The fact that many players are selected as underaged players support previous studies´ assumptions

about talent selections, that de-selected athletes are replaced by younger athletes (Barreiros et al., 2014).

4.2 Relationship relative age and Swedish ice hockey national team selection

Relative age effect in sports and ice hockey, in general, is well examined, the results from this study illustrate that RAE is apparent in the Swedish youth and junior national teams. Like previous studies, the results prove an overrepresentation of players born in the first half of the year in ice hockey (Baker et al., 2010; Barnsley & Thompson, 1988; Côté et al., 2006; Hancock et al., 2013; Huard Pelletier & Lemoyne, 2022; Lemez et al., 2014; Musch & Grondin, 2001; Nolan & Howell, 2010; Sherar et al., 2006; Turnnidge et al., 2014). It differs a lot from the overall population of boys born in Sweden during 1997- 2001. Compared to the overall population the biggest difference is in the first quarter. 25% of the total number of boys are born in the first quarter, the result from this study demonstrates that 39% of the selected players are born in the first quarter. The most notable differences in birth distribution were found between Q1 and Q4, which aligns with the already existing research (Baker et al., 2010) Previous studies has discussed if RAE already exist before national team selections, and that the selection population is skewed already at youth levels, resulting in a skewed population for coaches to select players from. Similar results have been reported in Canadian ice hockey, French handball and Norwegian handball (Delorme et al., 2011; Lemez et al., 2014; Wrang et al., 2018). As well in Swedish ice hockey where it has been illustrated that RAE is apparent at players under 15, selected for their district team (Stenling & Holmström, 2011).

However, no significant results were obtained on players´ debut concerning RAE, but a significant difference between the players last selection and RAE was obtained. Previous studies have been able to see a reversal in RAE (Fumarco et al., 2017; Kalén, Lundkvist, et al., 2021), but no results indicate that a reversal in RAE is apparent in the Swedish national team selection system. The proportion of players from each quarter is quite stable over the years, and most of the debuting players are born in the first quarter followed by the second quarter. However, it also illustrates that the players that have their last selection and gets de-selected are more frequently born in the first quarter followed by the second quarter. The percentages for players that get de-selected are almost the same for each quarter as for the

percentages for the players that made their debut in the system. Related to the findings in previous studies where it has been discussed that relatively younger athletes that are selected are more likely to be re-selected than the relatively older (Kalén, Lundkvist, et al., 2021).

Previous research has argued that a factor of the selection bias of relatively older players depends on the cognitive and physical maturity of these players, and that selected players were heavier and taller than the non-selected athletes. This data shows no significant differences in height and weight. The results from previous studies vary, a few have found that there is a significant difference in height and weight among selected athletes compared to non-selected athletes and the birth distribution (Baxter-Jones et al., 2020; Sherar et al., 2006). Others have found no differences in height and weight when comparing selected athletes against non-selected athletes and their quarter of birth (Baker et al., 2010). A possible reason for differences in the results from the studies is that different groups have been examined. For example, Baker et al., (2010) examined 9 to 10 years old players, Sherar et al., (2006) 14 to 15 years old players. Baxter- Jones et al., (2020) 11 to 17 years old and this study examined the already selected players in five generations 1997- 2001 from the ages 16 to 20. Despite no significant differences, and that this study did not investigate players that were not selected, it is interesting to take into consideration. It may be a possibility that the players selected for the Swedish national team were taller and heavier compared to the non-selected players for the Swedish youth and junior national team. No significant difference between the players birth distribution and their height and weight was obtained (Baker et al., 2010;Baxter-Jones et al., 2020; Sherar et al., 2006).

4.3 Relationship initial selection, relative age, and player position in Swedish WJC roster selection

The results from the analysis of the players that were selected for the Swedish U20 WJC roster show that there is a significant difference in the players´ debut in the system. 61% of the players made their debut at 16 years of age, compared to other debut ages that range between 3 and 13%. There is still a possibility to be selected for the WJC roster despite later debut age. Other studies that examined national team selection has shown that players that make their debut later have an increased chance of getting re-selected (Barreiros & Fonseca, 2012). This study shows that 17-25% selected for each age, also get selected for the WJC roster. It is what previously has been stated and supports that the Swedish ice hockey national

team system has adopted a collectivistic approach (Güllich & Emrich, 2012). Previous studies have reported that the collectivistic approach is most common in team sports (Güllich, 2014; Kalén, Padrón-Cabo, et al., 2021).

Compared to the overall birth distribution in selected players where a significant difference in the birth distribution could be found, no significant results were obtained for the players that were selected for the U20 WJC rosters. The proportion of players born in the third and fourth quarter is larger, previous studies suggest that younger players have a bigger chance of being re-selected, and that previously selected players are replaced by non-selected players (Barreiros et al., 2014; Barreiros & Fonseca, 2012; Kalén, Lundkvist, et al., 2021; Wrang et al., 2018). So maybe some sort of reversal is apparent in the Swedish ice hockey national team system.
61% of the players in the U20 WJC roster were born in the first half of the year. Compared to previous studies that has reported that during the years 2001- 2009 65% of Swedish players in the WJC rosters were born in the first half of the year (Bruner et al., 2011). A small decrease in RAE can be seen from 2001- 2009 WJC to 2016-2021 WJC. Compared to soccer where an increase was reported from the investigated years 2000/01 and 2010/11. It was reported that Swedish football had the greatest asymmetry, amongst the investigated countries (Helsen et al., 2005). Significant differences in players birth distribution and player position were obtained. Noticeable is the fact that the only position that shows an overrepresentation of players born in Q1 is forwards. Defenders are overrepresented in Q2. Previous studies have shown that differences in RAE exist in the players´ position, where RAE did not influence goalkeepers (Nykodým et al., 2020; Stenling & Holmström, 2014). The small numbers of goalkeepers in the WJC roster, was excluded to avoid issues with the power of the test.

Bigger differences in birth distribution among the underaged players were observed, 69% were born in the first half of the year, where RAE also influenced all player positions even the goalkeepers which by previous research has not been reported (Nykodým et al., 2020; Stenling & Holmström, 2014).

Underaged players in the WJC roster were more frequently born early, a possible reason behind that is that they are more developed than their peers born later in the year. Therefore, a significant result was obtained on underaged players that are selected to represent Sweden at WJC.

These results may indicate that players that are not playing as underaged are born later in the year than the players that are selected as underaged players, a lot of the underaged players are born in the first half of the year. So, on the players in the right age group at U20 WJC there may be a reversal in RAE and will support the argument of several studies that selected players are replaced by younger players (Güllich, 2014; Kalén, Lundkvist, et al., 2021; Wrang et al., 2018).

The result confirms what previous studies have stated about the complexity, and how hard talent identification is. It seems to be more dependent on maturity at lower ages, therefore the most underaged players are born in the first two quarters. The fact that players are entering the system at multiple points and still have the chance to play in the WJC roster, just shows how complex talent identification and talent development is. If it is hard to predict talent in the draft to NHL imagine how hard it is to predict talent at 15 or 16 years of age, players born early in the year are chronologically older than their later-born peers, which may lead to differences in height, weight and coordination, and the relatively older are through earlier exposure to the sport more tactical and technical (Farah & Baker, 2021; Helsen et al., 2005; Musch & Grondin, 2001). The results also prove that players do not have to be the best at age 16 or 17, it is still a possibility to be successful in sports and ice hockey. There the federation wants to go towards more of a rectangular system, where players can develop at their own pace and not drop out (Centrum för idrottsforskning, 2012).

4.4 Method discussion

Retrospective studies have lower validity than prospective studies (Jones, 2015). For this study, a retrospective study was the one that was best for the purpose. The Swedish ice hockey federation wanted to know what their selections in the youth and junior national teams looked like. The advantages of using already existing data are that the gathering process is faster, as well as no one can drop out like it can happen for instance when interviews or experiments are used as the method. It was the most appropriate method, for the thesis purpose. The method made it possible to get the whole sample of players.

The reason to examine the youth and junior roster instead of following through and investigating how many of these players that are selected for the senior national team roster is because the senior national team rosters in ice hockey are not that good of an indicator. All

the best players rarely represent the senior national team, the few times is in the Olympics. In the senior world championship, players that are not in the NHL playoff have the chance to represent the national team, together with players in different European leagues. So, the junior squads are the last time when the best Swedish players are grouped.

The goodness of fit test was used to see if there were any differences in players´ birth distribution, the way of doing the goodness of fit test and compare with the expected frequencies from the overall boys born in the years 1997-2001, Delorme and Champely, (2015) argues that this is a better way of doing the goodness of fit when looking at RAE. A uniform distribution makes the calculations easier, but it makes it harder to control if any type I errors is made (Delorme & Champely, 2015). On the other hand, an even better way of conducting the goodness of fit would be to know how many from these groups started to play ice hockey, if the distribution was skewed already from the beginning or if it is developed into a skewed distribution.

Significant differences were found on RAE for all the players selected at least once and for the underaged players´ in the WJC rosters and the association between underaged players birth distribution and player position. Otherwise, the results were not significant. Despite most tests being statistically non-significant it is still a result, it provides an answer that there is no association between two or more variables (Jones, 2015).

Measures can be influenced by injured players and if players play in the national hockey league, where the clubs did not make it okay to leave and play U20 WJC. Covid 19 can also influence the results in the WJC rosters, for the last group of players born in 2001, but the purpose of using these groups of players was so that the covid-19 pandemic should have as little impact as possible, and still be up to date, with the most recent rosters, and they had gone through all the selections before the pandemic started. The pandemic did not affect more than just one selection.

4.5 Future studies

Future studies could investigate what happens after the national team selections at age 20. Are there any differences depending on their initial selection age, and how long in the selections the players were selected? Is there a bigger chance for WJC players to play at higher levels

than their peers that were de-selected at earlier stages? Did they continue to play, or did they drop out of ice hockey?
It is also possible to continue to see how many of these players that are representing the senior national team roster at any time, the difficulty with that is that the senior national team is not a good indicator of success, therefore it would be more interesting to see where the selected athletes end up. Another possible angle to study in the future is to build upon the player position and selections, is there any difference between them, and what are the characteristics of each position?

4.6 Practical application

The Swedish ice hockey federation is doing a re-organization and looking over their national team selection system. This work will help the federation to get an understanding of selection patterns in Swedish ice hockey's youth and junior national teams. How many of these players made it to the U20 WJC? And, if there is a relationship between selection in the Swedish national team in ice hockey, relative age, and player position.
It will help the Swedish ice hockey federation evaluate their selection system and see if some changes are necessary to get better results, in terms of tournaments but also player development.
This study has also looked at how it differs between positions which have not been done before, previous studies have illustrated that an RAE differs between positions, but no one has looked at the selections regarding positions.

5. Conclusion

Selections in sports are meaningful and crucial, they are closely connected to talent identification and talent development. Talent selection is a dynamic process with continuous selections and de-selections.

The findings from this study highlight that Swedish ice hockey´s youth and junior national team selections have adopted a collectivistic approach. Players can enter the system at later ages. But the majority debuted when they were 16 years old. A large amount of the players in the Swedish ice hockey national team system were re-selected. Differences was found in players debut and their player position. Forwards and defenders could still enter the system late, but harder for goalkeeper to enter the system at later ages.

RAE was apparent in the Swedish national team system. Players in Q1 and Q2 were overrepresented in the Swedish ice hockey youth and junior national team system. Forwards and defenders born in the first half of the year were more likely to be selected for the Swedish ice hockey youth and junior national team. However, RAE had no impact on the initial selection in the different ages, but differences in birth distribution was obtained in players that exited the system at different ages.

A high percentage of the players that were selected for the U20 WJC roster were initially selected at the age of 16. No RAE was found on the 92 players that were selected for the U20 WJC roster. 139 roster spots were available in the U20 WJC. It has been stated that a possible reason for RAE is that maturity is mistaken for talent, and therefore relatively older players are selected, this study found no significant differences in height and weight compared to the players birth distribution. The RAE was similar across player position in the WJC rosters.

References

Arede, J., Ferreira, A. P., Gonzalo-Skok, O., & Leite, N. (2019). Maturational Development as a Key Aspect in Physiological Performance and National-Team Selection in Elite Male Basketball Players. *International Journal of Sports Physiology and Performance*, *14*(7), 902–910. https://doi.org/10.1123/ijspp.2018-0681

Armour, K.M. & MacDonald, D. (2012). *Research methods in physical education and youth sport*. Milton Park, Abingdon, Oxon: Routledge.

Baker, J. (2017). *Routledge Handbook of Talent Identification and Development in Sport*. Taylor and Francis.

Baker, J., Cobley, S., Montelpare, W. J., Wattie, N., & Faught, B. E. (2010). Exploring proposed mechanisms of the relative age effect in Canadian minor hockey. *International Journal of Sport Psychology*, *41*(2), 148-159.

Barnsley, R. H., & Thompson, A. H. (1988). Birthdate and success in minor hockey: The key to the NHL. *Canadian Journal of Behavioural Science / Revue Canadienne Des Sciences Du Comportement*, *20*(2), 167–176. https://doi.org/10.1037/h0079927

Barraclough, S., Till, K., Kerr, A., & Emmonds, S. (2022). Methodological Approaches to Talent Identification in Team Sports: A Narrative Review. *Sports*, *10*(6), 81. https://doi.org/10.3390/sports10060081

Barreiros, A., Côté, J., & Fonseca, A. M. (2014). From early to adult sport success: Analysing athletes' progression in national squads. *European Journal of Sport Science*, *14*(sup1), S178–S182. https://doi.org/10.1080/17461391.2012.671368

Barreiros, A. N., & Fonseca, A. M. (2012). A Retrospective Analysis of Portuguese Elite Athletes' Involvement in International Competitions. *International Journal of Sports Science & Coaching*, *7*(3), 593–600. https://doi.org/10.1260/1747-9541.7.3.593

Barth, Michael, Güllich, Arne, & Emrich, Eike. (2018). The rich get richer and the poor get poorer—The Matthew mechanism as an approach to explain selection effects and the occurrence of multiple medalists in the "production" of international success in alpine ski racing. *Current issues in sport science, 3*(008) https://doi.org/10.15203/CISS_2018.008

Baxter-Jones, A. D. G., Barbour-Tuck, E. N., Dale, D., Sherar, L. B., Knight, C. J., Cumming, S. P., Ferguson, L. J., Kowalski, K. C., & Humbert, M. L. (2020). The role of growth and maturation during adolescence on team-selection and short-term sports participation. *Annals of Human Biology*, *47*(4), 316–323. https://doi.org/10.1080/03014460.2019.1707870

Bjørndal, C. T., Andersen, S. S., & Ronglan, L. T. (2018). Successful and unsuccessful transitions to the elite level: The youth national team pathways in Norwegian handball. *International Journal of Sports Science & Coaching*, *13*(4), 533–544. https://doi.org/10.1177/1747954117740014

Bjørndal, C. T., Luteberget, L. S., & Holm, S. (2018). The Relationship Between Early and Senior Level Participation in International Women's and Men's Handball. *Journal of Human Kinetics*, *63*(1), 73–84. https://doi.org/10.2478/hukin-2018-0008

Boslaugh, S. (2012). *Statistics in a Nutshell* (Vol. 2012). O´Reilly Media.

Bruner, M. W., Macdonald, D. J., Pickett, W., & Côté, J. (2011). Examination of birthplace and birthdate in world junior ice hockey players. *Journal of Sports Sciences*, *29*(12), 1337–1344. https://doi.org/10.1080/02640414.2011.597419

Cambridge Dictionary. (u.å.). *Team roster*. https://dictionary.cambridge.org/dictionary/english/team-roster

Centrum för idrottsforskning (2012) För framtids segrar: En analys av det svenska elitidrottssystemet (2). ISBN: 978-91-979562-5-3

Côté, J., Macdonald, D. J., Baker, J., & Abernethy, B. (2006). When "where" is more important than "when": Birthplace and birthdate effects on the achievement of sporting expertise. *Journal of Sports Sciences*, *24*(10), 1065–1073. https://doi.org/10.1080/02640410500432490

Dave Collins, & MacNamara, A. (2022). *Talent Development: A practitioner and Parents Guide* (Second edition, Vol. 2022). Routledge.

De Bosscher, V., & De Rycke, J. (2017). Talent development programmes: A retrospective analysis of the age and support services for talented athletes in 15 nations. *European Sport Management Quarterly*, *17*(5), 590–609. https://doi.org/10.1080/16184742.2017.1324503

Delorme, N., Chalabaev, A., & Raspaud, M. (2011). Relative age is associated with sport dropout: Evidence from youth categories of French basketball: Relative age effect and dropout. *Scandinavian Journal of Medicine & Science in Sports*, *21*(1), 120–128. https://doi.org/10.1111/j.1600-0838.2009.01060.x

Delorme, N., & Champely, S. (2015). Relative Age Effect and chi-squared statistics. *International Review for the Sociology of Sport*, *50*(6), 740–746. https://doi.org/10.1177/1012690213493104

Ejlertsson, G. (2012). *Statistik för hälsovetenskaperna* (2:3, Vol. 2012). Studentlitteratur.

Fahlström, P. G., Gerrevall, P., Glemne, M., & Linnér, S. (2015). *Vägarna till landslaget: Om svenska elitidrottares idrottsval och specialisering* (FoU-rapport 2015:1).

Farah, L., & Baker, J. (2021). Accuracy from the slot: Evaluating draft selections in the National Hockey League. *Scandinavian Journal of Medicine & Science in Sports*, *31*(3), 564–572. https://doi.org/10.1111/sms.13874

Fejes, A. & Thornberg, R. (2019). *Handbok i kvalitativ analys.* (3 ed). Stockholm: Liber

Fumarco, L., Gibbs, B. G., Jarvis, J. A., & Rossi, G. (2017). The relative age effect reversal among the National Hockey League elite. *PLOS ONE*, *12*(8), e0182827. https://doi.org/10.1371/journal.pone.0182827

Güllich, A. (2014). Selection, de-selection and progression in German football talent promotion. *European Journal of Sport Science*, *14*(6), 530–537.

https://doi.org/10.1080/17461391.2013.858371

Güllich, A., & Emrich, E. (2012). Individualistic and Collectivistic Approach in Athlete Support Programmes in the German High-Performance Sport System. *European Journal for Sport and Society*, *9*(4), 243–268. https://doi.org/10.1080/16138171.2012.11687900

Hancock, D. J., Ste-Marie, D. M., & Young, B. W. (2013). Coach Selections and the Relative Age Effect in Male Youth Ice Hockey. *Research Quarterly for Exercise and Sport*, *84*(1), 126–130. https://doi.org/10.1080/02701367.2013.762325

Helsen, W. F., van Winckel, J., & Williams, A. M. (2005). The relative age effect in youth soccer across Europe. *Journal of Sports Sciences*, *23*(6), 629–636. https://doi.org/10.1080/02640410400021310

Huard Pelletier, V., & Lemoyne, J. (2022). Early Sport Specialization and Relative Age Effect: Prevalence and Influence on Perceived Competence in Ice Hockey Players. *Sports*, *10*(4), 62. https://doi.org/10.3390/sports10040062

Jones, I. (2015). *Research methods for sports studies*. (Third edition.) London: Routledge.

Kalén, A., Lundkvist, E., Ivarsson, A., Rey, E., & Pérez-Ferreirós, A. (2021). The influence of initial selection age, relative age effect and country long-term performance on the re-selection process in European basketball youth national teams. *Journal of Sports Sciences*, *39*(4), 388–394. https://doi.org/10.1080/02640414.2020.1823109

Kalén, A., Padrón-Cabo, A., Lundkvist, E., Rey, E., & Pérez-Ferreirós, A. (2021). Talent Selection Strategies and Relationship With Success in European Basketball National Team Programs. *Frontiers in Psychology*, *12*, 666839. https://doi.org/10.3389/fpsyg.2021.666839

Kristiansen, E., MacIntosh, E. W., Parent, M. M., & Houlihan, B. (2018). The Youth Olympic Games: A facilitator or barrier of the high-performance sport development pathway? *European Sport Management Quarterly*, *18*(1), 73–92. https://doi.org/10.1080/16184742.2017.1383499

Lag med kompletterande bestämmelser till EU:s dataskyddsförordning (SFS 2018:218) https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/lag-2018218-med-kompletterande-bestammelser_sfs-2018-218

Lemez, S., Baker, J., Horton, S., Wattie, N., & Weir, P. (2014). Examining the relationship between relative age, competition level, and dropout rates in male youth ice-hockey players: Dropout from youth ice-hockey. *Scandinavian Journal of Medicine & Science in Sports*, *24*(6), 935–942. https://doi.org/10.1111/sms.12127

Lidor, R., Côté, J., & Hackfort, D. (2009). ISSP position stand: To test or not to test? The use of physical skill tests in talent detection and in early phases of sport development. *International Journal of Sport and Exercise Psychology*, *7*(2), 131–146. https://doi.org/10.1080/1612197X.2009.9671896

Musch, J., & Grondin, S. (2001). Unequal Competition as an Impediment to Personal Development: A Review of the Relative Age Effect in Sport. *Developmental Review*, *21*(2),

147–167. https://doi.org/10.1006/drev.2000.0516

Navarro DJ and Foxcroft DR (2019). learning statistics with jamovi: a tutorial for psychology students and other beginners. (Version 0.70). DOI: 10.24384/hgc3-7p15 [Available from url: http://learnstatswithjamovi.com]

Nolan, J. E., & Howell, G. (2010). Hockey success and birth date: The relative age effect revisited. *International Review for the Sociology of Sport*, *45*(4), 507–512. https://doi.org/10.1177/1012690210371560

Nykodým, J., Bozděch, M., Agricola, A., & Zháněl, J. (2020). The Relative Age Effect at the Ice Hockey World Championships (IHWC) in the years 2015–2017. *Journal of Human Kinetics*, *75*(1), 150–159. https://doi.org/10.2478/hukin-2020-0044

O'Donoghue, P. (2012). *Statistics for Sport and Exercise Studies*. Taylor and Francis.

Ogden, J., & Edwards, J. R. (2016). Are Canadian Stakeholders Resting on Their Laurels? A Comparative Study of the Athlete Pathway Through the Swedish and Canadian Male Ice Hockey Systems. *Journal of Sport Management*, *30*(3), 312–328. https://doi.org/10.1123/jsm.2014-0172

Ojala, A.-L. (2021). Nurturing and sidelining capitalism in discourses of player potentiality in Finnish ice hockey. *Sport in Society*, *24*(9), 1574–1589. https://doi.org/10.1080/17430437.2020.1763309

Roczniok, R., Maszczyk, A., Stanula, A., Czuba, M., Pietraszewski, P., Kantyka, J., & Starzyński, M. (2013). Physiological and physical profiles and on-ice performance approach to predict talent in male youth ice hockey players during draft to hockey team. *Isokinetics and Exercise Science*, *21*(2), 121–127. https://doi.org/10.3233/IES-130487

Sæther, S. A. (2015). Selecting players for youth national teams – a question of birth month and reselection? *Science & Sports*, *30*(6), 314–320. https://doi.org/10.1016/j.scispo.2015.04.005

Sherar, L. B., Baxter-Jones, A. D. G., Faulkner, R. A., & Russell, K. W. (2006). Do physical maturity and birth date predict talent in male youth ice hockey players? *Journal of Sports Sciences, 25* (8), 879–886. DOI: 10.1080/02640410600908001

Statistikmyndigheten, (20 april 2023) *Födda och döda per månad efter kön. År 1851–2022* Retrieved from: https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__BE__BE0101__BE0101G/ManadFoddDod/

Stenling, A., & Holmström, S. (2011). Talangjakt= Talangslakt? *Svensk idrottsforskning*, 20(1), 19–23. Retrieved from: http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-44283

Stenling, A., & Holmström, S. (2014). Evidence of Relative Age Effects in Swedish Women's Ice Hockey. *Talent development & excellence, 6*(1), 31-40.

Swedish ice hockey federation (2023) Våra Landslag.Retrived from: https://www.swehockey.se/landslag/vaara-landslag/

Swedish ice hockey federation (2017) Strategi 2017- 2022. Retrieved from: https://www.swehockey.se/svensk-ishockey/svenska-ishockeyfoerbundet/strategi-2017-2022/.

Tenenbaum, G. & Driscoll, M.P. (2005). *Methods of research in sport sciences: quantitative and qualitative approaches*. Oxford: Meyer & Meyer Sport

Turnnidge, J., Hancock, D. J., & Côté, J. (2014). The influence of birth date and place of development on youth sport participation: Contextual factors and sport participation. *Scandinavian Journal of Medicine & Science in Sports*, *24*(2), 461–468. https://doi.org/10.1111/sms.12002

Vetenskapsrådet (2002). *Forskningsetiska principer inom humanistisk-samhällsvetenskaplig forskning.* Stockholm: Vetenskapsrådet. ISBN:91-7307-008-4

Wattie, N., Tietjens, M., Cobley, S., Schorer, J., Baker, J., & Kurz, D. (2014). Relative age-related participation and dropout trends in German youth sports clubs. *European Journal of Sport Science*, *14*(sup1), S213–S220. https://doi.org/10.1080/17461391.2012.681806

Wiseman, A. C., Bracken, N., Horton, S., & Weir, P. L. (2014). The Difficulty of Talent Identification: Inconsistency among Coaches through Skill-Based Assessment of Youth Hockey Players. *International Journal of Sports Science & Coaching*, *9*(3), 447–455. https://doi.org/10.1260/1747-9541.9.3.447

Wrang, C. M., Rossing, N. N., Diernæs, R. M., Hansen, C. G., Dalgaard-Hansen, C., & Karbing, D. S. (2018). Relative Age Effect and the Re-Selection of Danish Male Handball Players for National Teams. *Journal of Human Kinetics*, *63*(1), 33–41. https://doi.org/10.2478/hukin-2018-0004

Appendix 1

Literature search

I bilagan Litteratursökning ska du återge de sökningar du har gjort för att hitta tidigare forskning inom ditt ämnesområde. Se Uppsatsguiden för exempel på hur bilagan kan fyllas i.

Purpose and questions:

examine the selection patterns in Swedish youth and junior national teams and see if there is a relationship between selection for a national team and relative age.

- What does the selection patterns look like? Who gets selected, re-selected and de-selected?
- Does RAE effect the national team selections?
- Which players are making it to the last selection, U20 WJC?
- Is RAE apparent in the selections in U20 WJC?
- Does the initial selection age make any difference in the players that got to represent the Swedish WJC squads

Vilka sökord har du använt?

Ämnesord och synonymer svenska	Ämnesord och synonymer engelska
Talangidentifiering Talang utveckling Selektering Ishockey Ungdomsidrott Junioridrott	*Talent identification* *Talent development* *Talent detection* *Talent selection* *Selection* *Hockey/ ice hockey* *Sport* *Youth sport* *Junior sport* *Talent detection* *National team*

Var och hur har du sökt?

Databaser och andra källor	Sökkombination
Ebsco. Sport discuss. Psych iNFo. Google Scholar.	Selection ”and” Ice hockey National team “and” Dropout RAE ”and” ice hockey Relative “age” effect ice hockey Talent identification “and” ice hockey Selection patterns in sport Talent development in sport Talent selection and ice hockey Talent selection and RAE Talent detection “and” RAE Talent detection “and” sport

Kommentarer

Litteraturlistor från tidigare forskning har också använts för att hitta material, redan använd kurslitteratur.

Google scholar har använts för att snabbt hitta artiklar när det varit svårt att hitta något nytt och därefeter använt liknande ord i sökningen.

Den huvudsakliga databasen som använts ät Sport Discuss.